Chile´s Pathway to Green Growth: Measuring progress at local level

OECD
BETTER POLICIES FOR BETTER LIVES

LEED
BUILDING MORE & BETTER JOBS

Disclaimer

This work is published on the authority of the Secretary-General of the OECD. The opinions expressed and arguments employed herein do not necessarily reflect the official views of the Organisation or of the governments of its member countries.

This document and any map included herein are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

Acknowledgements

This report is the result of an international project of the OECD LEED Committee on "Measuring the potential of green growth: Towards a local transition to a low-carbon economy" in collaboration with partners and experts from Chile, Denmark, Germany, Luxembourg and the Netherlands. It presents results and policy recommendations from the analysis of several regions in Chile. The report is the result of combined efforts and strong co-operation between local authorities and local and international experts, in particular in partnerships with Alwine Woischnik and Cristóbal de la Maza of the Division of Information and Environmental Economics, Ministry of for the Environment, Chilean Government.

The experts participating in the OECD mission to Chile provided valuable input to this report and the authors are grateful for the contributions and comments received on different parts of the document: Dr. Lutz Franzke, Mayor of Königs Wusterhausen (Germany), Hans Bruyninckx of Leuven University (Belgium) and Alvaro Shee of the Ministry of Environment, Chile. We also acknowledge also the Ministry of labour, Chile and all the organisations and participants on the workshop held in Chile in December 2012.

This case study report was prepared by Cristina Martinez-Fernandez, OECD LEED Programme, with Alwine Woischnik, Cristóbal de la Maza and Samantha Sharpe (Consultant) of the University of Technology. LEED is supervised by Sylvain Giguère, Head of the LEED Division, and Sergio Arzeni, Director of the Centre for Entrepreneurship, SMEs and Local Development.

Executive summary

Green growth is an ambition and challenge for many local areas and regions. The ambition comes from the desire to act on climate change and take advantage of positive environmental and economic external factors that can flow from these activities. The challenge lies in managing policy action on climate change in a time of competing policy demands, including impacts of economic downturns and unemployment and demographic change.

Green growth means fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies. In the case of developing countries, such as Chile, the subject of this report, this combination can seem especially challenging when poverty eradication and basic services are top of policy makers minds. However engaging in the green growth agenda can offer economic and investment opportunities as well as ways to improve environmental and social quality.

The impacts of climate change and the activities taking place to reduce carbon emissions are evident at local levels as much as at national or global levels. However, to date much of the attention on understanding impacts and customising policy to balance negative impacts has taken place at the national or sector level. This OECD project examines impacts and activities at the local level and the policy recommendations that flow from this analysis are also targeted at the community and regional level.

This report is one of five studies of different local areas and their pathway to green growth. Each study has as its unit of analysis a local area within a specific national and industrial context and therefore the research results are specific to these areas. Other case study areas include Copenhagen, Denmark, Ghent in Belgium, Belval in Luxembourg and the Brandenburg region of Berlin in Germany.

In selecting each of these areas, typologies of different regions were also considered. The typology explored in this report is how regions with carbon intensive assets that can have dramatic effects on employment and economic development but also environmental impacts, such as increased emissions and pollution, can manage the transition to green growth. In examining selected regions in Chile in detail this report provides an understanding of how the economic and employment development of this region can support both low carbon transition and growth, and by example provide guidance to other regions that also face a similar mix of development and low-carbon growth ambitions.

The Chile context

Chile is one of the countries with higher economic development in Latin America. The country's GDP has more than double in the last 20 years, which has helped to improve the quality of life of its citizens. Economic growth in recent years has improved the quality of life of its inhabitants. Specifically, between 1980 and 2012 the Human Development Index of Chile has grown significantly from 0.638 to 0.819. Since the 1990s, the country has been able to significantly reduce poverty; however, near 15% of the population is still living in this condition. Therefore, efforts regarding "sustainable consumption and production" or "green growth" must be analyzed taking into account this background.

In recent years there has been a major concern of both the public and private sector for reducing the negative impact on the environment. Chile faces environmental challenges including as air pollution, soil contamination, climate change, waste, threats to biodiversity, water shortage and water contamination.

Green growth in Chile

In Chile, the green growth concept is barely known also sometimes it is misunderstood. Some private and public actors consider the path to green growth only as an issue about cost, that is, they have a negative approach to this concept. The opinion that this concept can also imply opportunities is still raw in many people.

Chile has initiated some steps on the road to green growth in the context of sustainable development and the boosting of green innovation. Chile´s continued green growth strategy should be based then in a scheme with three key pillars:

1. *Sustainability sectorial strategies*: sustainable mining, sustainable tourism, sustainable construction, sustainable agriculture, etc.
2. *Economic instruments and other complementary mechanisms*: extended producer responsibility, tradable emissions permits, voluntary agreements, fuel taxation, green public procurement, eco-labeling, tradable fishing quotas, tradable water rights, etc.
3. *Innovation*: cross-sector environmental technology, energy efficiency and renewable energies, etc.

Contents

Chapter 1: The Green Growth challenge

The pressure to decarbonise our economies and production systems is growing, and there is increasing need for policy attention to accelerate the industrial transition required to achieve the levels of emissions reduction required to avoid dangerous climate change. The challenge of the green transition for policy attention is also being matched by other short and long-term policy challenges. The economic recessions and continuing high levels of unemployment in many OECD member countries is stretching public resources. Demographic trends, such as an ageing population, are also affecting labour markets.

Two recent OECD reports (OECD 2012a; b) highlight the expected impacts of these fundamental demographic and economic changes over the coming four decades to 2050:

- An additional 2 billion people will need to be accommodated, with rising living standards across all countries and a quadrupling of global GDP.
- Increasing life expectancy will mean an ageing population for some countries, while for other countries, particularly developing countries, young populations and workforces will be a competitive advantage.
- The majority (70%) of people will be living in cities by 2050, offering resource efficiency opportunities but also placing greater emphasis on the need for solutions to air pollution, traffic congestion, and the management of water, waste and energy in urban environments.

The growth of carbon emissions at the global scale continues, although there is significant regional variation. In Annex 1[1] countries annual emissions in 2010 were collectively 3.7% below 1990 levels, with Kyoto Protocol countries[2] collectively at 12.4% below 1990 levels (IEA 2012). However in absolute terms global emissions are increasing as growth in emissions from non-Annex1 countries outpaces the rate of decline in other countries. Non-annex 1 countries now account for 54% of global emissions (IEA 2012).

Green growth means fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies. The OECD Green Growth Strategy adopted by the Ministerial Council Meeting in 2011 posited Green Growth as the pursuit of economic growth and development, while preventing costly environmental degradation, climate change, biodiversity loss, and unsustainable natural resource use (OECD Green Growth Strategy 2011[3]). In developing countries this combination can seem especially challenging when poverty eradication and basic services are top of policy makers minds. However engaging in the green growth agenda can offer economic and investment opportunities as well as ways to improve environmental and social quality.

[1] The Annex I Parties to the 1992 UN Framework Convention on Climate Change (UNFCCC) are: Australia, Austria, Belarus, Belgium, Bulgaria, Canada, Croatia, the Czech Republic, Denmark, Estonia, European Economic Community, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Lichtenstein, Lithuania, Luxembourg, Malta, Monaco, the Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom and United States.

[2] Kyoto Protocol countries are all Annex 1 countries except for except for Malta, Turkey and Belarus.

[3] www.oecd.org/greengrowth

Achieving greener growth will involve capitalising on opportunities to develop new green industries, jobs and technologies, as well as managing the transition for greening the more traditional sectors and the associated employment and distributional effects. It will require adopting new technologies, developing new products and supporting new patterns of demand from households, companies and governments.

There is very limited information regarding how progress can be assessed when standards and measures are uncertain and based on traditional measures of economic activity. While efforts at the national level are progressing, and many initiatives can be found at the local level, there are a significant number of inconsistencies, and a lack of agreement concerning the indicators needed to analyse, amongst other questions: How do local economies, firms, clusters and regional ecosystems adjust to low-carbon activities? How are local labour markets making the transition? How do firms re-structure their organisation and production processes? How do skills, education and training systems adapt to the development of new areas of growth?

In the case of developing countries, such as Chile, the subject of this report, indicators can also provide an opportunity to learn from the experience of other countries and accelerate greening at the same time as economic development.

The need for measurable indicators has been well established within the framework of the greening strategy; targeting four areas of analysis (see Figure 1.1 below):

- Changes in productivity in the use of environmental assets and natural resources
- Natural asset base
- Environmental dimensions of quality of life
- Policy responses and economic opportunities.

This monitoring will be essential for policymakers at national levels to create and implement green growth strategies. The progress towards green growth will not be equally distributed within countries; therefore it is also important that progress be monitored at the *local and regional levels.*

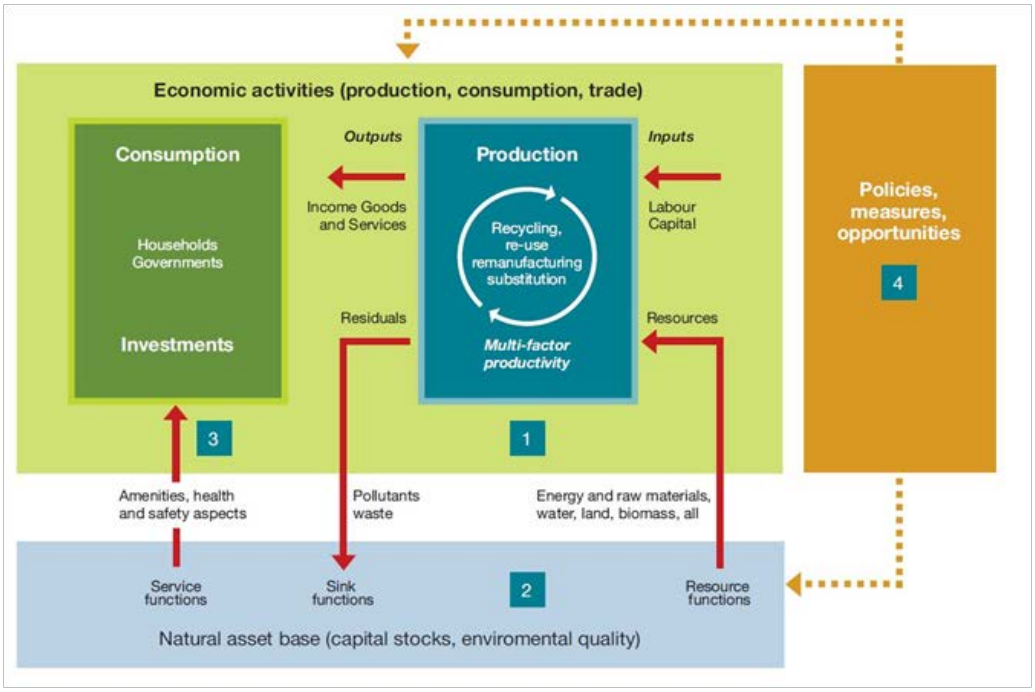
The central tenet of the green growth framework is the recognition of natural capital as a factor of production and its role in enhancing well-being (OECD 2011b). This provides a new dimension for understanding growth and is a counterpoint to how economic activity has been measured and understood throughout much of the modern era, with gross domestic product (GDP) being the central measure for understanding economic performance. The weakness with the GDP approach is that it fails to account for depletion of natural assets in the current production and consumption regimes, and how these natural stocks are just as important and relevant to current and future growth as capital and labour stocks.

Natural capital stocks include natural resource stocks (both renewable and non-renewable), land, and ecosystems (as shown in Figure 1.1.). Alongside recognition of the natural asset base within the economic model, the indicator framework includes an understanding of policies and measures that can provide a balance between the factors of economic activity. Public policy is needed to provide incentives and develop market structures, which will allow trade-offs between production, consumption and the natural asset base to be made over longer periods of time. It will

also allow encouragement and incubation of innovations that can provide a more efficient, less burdensome use of our natural capital in the future.

The green growth framework understands growth not only through the prism of economic activities of production consumption and trade, but also through the inter-relationships of these activities with our natural asset base and the public policy measures and mechanisms available to our governments.

Figure 1 OECD Framework for Green Growth Indicators



Source: OECD Green Growth Strategy (2011)

Box 1 OECD's framework for thinking about green growth

Economic growth is conventionally thought of as the process through which workers, machinery and equipment, materials and new ideas and technologies contribute to producing goods and services that are increasingly valuable for individuals and society. A framework for thinking about green growth builds on this with four additional elements:

Capturing the importance of changes in the comprehensive wealth of an economy. This means attention to all types of capital: natural (e.g. ecosystems); human (e.g. education and skills); physical (e.g. machinery and equipment); and the intangible assets, which are so crucial to human progress, such as ideas and innovation. Captured within this are some important aspects of growth, including the nature of trade-offs, which arise at the frontier of production possibilities. For example, substituting environmental assets in production or consumption is not necessarily a smooth process; critical thresholds can be crossed after which assets that are renewable cease to be so (e.g. fisheries or soil), or assets that are non renewable are depleted to a point where substitution with other inputs or goods and services becomes impossible (e.g. climate or biodiversity), potentially short-circuiting growth in well-being. This introduces uncertainties regarding thresholds, irreversible outcomes and discontinuities, all of which complicate policy design.

Incorporating the dual role played by natural capital in this process. Natural capital contributes to production by providing crucial inputs, some of which are renewable but others of which are not. It also influences individual and social welfare in various ways, via the effects the environment has on health, through its amenity value and through provision of ecosystem services.

Acknowledging that investment in natural capital is an area in which public policy intervention is vital, due to market incentives being either weak or non-existent. This is largely because the contribution of natural capital to production is often not priced and the contribution of natural capital to individual welfare is not appropriately valued. The lack of proper valuation and market incentives or signals can affect behaviour and truncate the foresight of households and firms in ways that set the economy on trajectories that are unsustainable (or conversely, which miss growth opportunities), or that are not necessarily maximising well-being. This means that in many cases, better management of natural capital (e.g. via proper valuation of pollution) will be consistent with higher GDP and a lower environmental impact of economic activities. A clear example is when an inefficient energy mix (involving excessive use of fossil fuels) is improved upon by eliminating harmful fossil fuel subsidies.

Recognition that innovation is needed to attenuate trade-offs that arise between investing in (depleting) natural capital and raising consumption or investing in other forms of capital. Indeed, once resource productivity is raised and inefficiency eliminated, a "frontier" is reached along which these trade-offs become more pronounced. Through innovation, the frontier at which trade-offs start to bind can be pushed outwards; essentially greening growth.

Source: OECD Towards Green Growth, 2011

The OECD has identified seven main sources of green growth (OECD 2011b):

- Productivity enhancements through greater efficiencies of resource use.
- Innovation in addressing environmental problems spurred by policies and frameworks encouraging conditions for innovation.
- New markets from the demand for 'green' technologies, goods and services, and the job growth opportunities these new markets will bring.
- Confidence from investors with greater predictability and policy stability.
- Stability of macro-economic conditions and reducing the price volatility around resource costs.
- Resolution of resource bottlenecks (including human capital resources) that can make new investments more costly.
- Resolving imbalances in natural systems that will reduce the risks of more profound and abrupt changes to the natural environment through climate change.

The transformation of industries will have a large impact on regional and local ecosystems for employment creation, development of skills and green entrepreneurship. However, although there are significant upsides for some local areas and regions, for others the positive effects of the low-carbon transition will be outweighed by negative job losses. A solid empirical foundation by which to understand how the low carbon transition will unfold at the regional and local level is still lacking. The *"Indicators of local transition to a low carbon economy"* project is part of an effort to provide more empirical evidence at the local level.

The identification of indicators is therefore imperative in order to measure economic progress towards low-carbon activities in such a way that policies, strategies and programmes can be periodically informed by data that is solid and comparable yet relevant to the local area, industry clusters and regional ecosystems under analysis.

Local dynamics of green growth

There are two main reasons why monitoring and understanding progress towards green growth needs to be tracked at the national/ international level and the local level:

i. The impacts of climate change will be variable at a local level;
ii. The impacts of responding to climate change, such as carbon pricing, switching to less carbon intensive energy supply and production, and appropriating the opportunities presented by a transition to a low carbon economy (including both the creation of new employment and industries) will be distributed differently across regions. This will be especially evident in labour markets.

Therefore, whilst national and international responses are required for carbon emissions mitigation, it is at the local and regional levels that strategies for dealing with the impacts of mitigation action will be required.

Of the sources of growth, four have local dynamics that are directly relevant to this project:

- Productivity enhancement through efficient resource use;

- Innovation in addressing environmental problems;
- New markets and employment opportunities from green technologies, products and services; and
- Resolution of resource bottlenecks, including human capital development (e.g. skills and training).

Despite limited capacities to respond to climate change, especially the mitigation component, with the majority of the effective policy levers existing at the national level in most countries, local authorities do have policy levers available in procurement and energy efficiency activities within their own buildings and urban environments. Local government can encourage the adoption of green skills through promotion of sustainability and triple bottom line reporting, and sustainable practices in the building and construction industry.

Chile: Socioeconomic context

Chile is one of the countries with higher economic development in Latin America. The country's GDP has more than double in the last 20 years, which has helped to improve the quality of life of its citizens. The Central Bank of Chile confirmed recently that Chile's gross domestic product grew 5.6% in 2012. Thus, the GDP was approximately of 268 billion dollars, which means a GDP per capita of nearly 16,200 dollars.[4] Projections of the Organization for Economic Co-operation and Development (OECD) foresee that Chile will lead growth among member countries by 2014.[5]

However, this growth rate has begun to a slowdown in 2013 due to the fall in prices of raw materials and effects of the global economic crisis. Moreover, according to the IMD World Competitiveness Center (WCC) of Switzerland, Chile ranks in 2013 the 30th place (out of 60 countries), which implies a decline as the country ranked 28th in 2012 and 25th place in 2011. As the IMD states, Chile, together with Brazil, Argentina and Venezuela are "all losing ground and being challenged by the emerging competitiveness of Asian nations".[6]

Chile is characterized by an open and export-oriented economy, being mining the main exporting sector based primarily on copper. Mining is the corner stone for economic and social development of Chile. As the National Society of Mining (SONAMI, its acronym in Spanish) states, between 2006 and 2011 mining reached 64.3% of total exports.[7]

The mining sector also leads foreign direct investment in Chile. According to the Foreign Investment Committee (CIE, its acronym in Spanish), between 2009 and 2012 there was a total FDI of US$ 81,516 million. The ranking was as follows: mining 50.1%, services 26.6%, electricity, gas and water 10.9%, industry 7.9%, construction 2.4%, transport and communications 1.7%, and agriculture and fishing 0.5%.[8]

[4] Banco Central Chile. Available at: http://www.bcentral.cl/estadisticas-economicas/publicacionesestadisticas/trimestrales/pdf/CuentasNacionales_cuarto_trimestre2012.pdf
[5] http://stats.oecd.org/Index.aspx?DataSetCode=EO92_INTERNET
[6] "IMD World Competitiveness Rankings 2013". Available at: http://www.imd.org/news/World-Competitiveness-2013.cfm
[7] SONAMI: "Memoria Anual 2010-2011". Available at: http://www.sonami.cl/digital/memoria/memoria20112012/
[8] CIE: "Estadísticas IED en Chile, 2009-2012". Available at: http://www.inversionextranjera.cl/

The largest copper mining in the world is concentrated in the north of the country. In the central area predominates agriculture mainly horticulture and vineyards. Forest and pulp industry, as well as salmon industry are characteristic of the south. Construction has had a strong rise in recent years, especially in the Metropolitan Region in central Chile. Also as a result of the earthquake in February 27, 2010, construction has become important in some regions from the center to the south.

Chilean coasts alongside its territory offer high quality fisheries and benthonic resources. The whole country stands by a large and varied natural beauty, but while in the north and in the center dominates sun and beach tourism, in the south people practice adventure and nature-based tourism.

All this sectors project strong growth rates the forthcoming years witch will be boosted by Chile's increasing integration into the world economy implied in the signing of 22 Free Trade Agreements (FTAs), which involves a total of 60 countries.[9]

With respect to the labor market, according to data from the National Institute of Statistics (INE, its acronym in Spanish), the unemployment rate reached 6.6% in 2012 (and 6.2% from December 2012 to February 2013).[10] Female unemployment rate stood at 8.7% between 2010 and 2012. In recent years there has been a gradual decline in unemployment, which has made of Chile a country with one of the lowest unemployment rates in the world.

Economic growth in recent years has improved the quality of life of its inhabitants. Specifically, between 1980 and 2012 the Human Development Index of Chile has grown significantly from 0.638 to 0.819. As the Global Human Development Report of UNDP states, Chile is located in place 40 of a total of 187 countries, ranking first in Latin America.[11]

Since the 1990s, the country has been able to significantly reduce poverty; however, near 15% of the population is still living in this condition. Therefore, efforts regarding "sustainable consumption and production" or "green growth" must be analyzed taking into account this background.

According to the INE, the average monthly income of workers reached 390,365 of Chilean pesos in 2011, an increase of 8.4% compared to 2010. The estimated average income of employees was 427,130 pesos (approx. US$854), while the average income of people who are self-employed reached 228,900 pesos (approx. US$458).[12] The current minimum wage (fixed by law) is 193,000 pesos (approx. US$386).

The OECD highlights in its *Better Life Index* of 2012 that "the average household net-adjusted disposable income is 11 039 USD a year, much less than the OECD average of 23 047 USD a year. But

[9] DIRECON: "Acuerdos Comerciales Vigentes". Available at: http://www.direcon.gob.cl/acuerdo/list
[10] INE: http://www.gobiernodechile.cl/especiales/cifras-de-empleo-periodo-2010-2013/
[11] PNUD: "Informes Nacionales sobre Desarrollo Humano para Chile". Available at: http://hdrstats.undp.org/es/paises/perfiles/chl.html
[12] INE: "Nueva encuesta suplementaria de ingresos". Available at: http://www.ine.cl/canales/chile_estadistico/mercado_del_trabajo/nene/nesi/archivos/resultados2011/nota_estadistica_nesi_2011.pdf

there is a considerable gap between the richest and poorest – the top 20% of the population earn 13 times as much as the bottom 20%"[13]. It is worth mentioning that inequality is manifested not only on the distribution of income, that is, there are often vulnerable sectors most exposed to the negative impacts on the environment.

To sustain growth rates Chile face huge challenges in particular at the energy sector. Expectations of strong economic development are associated with an increase in energy demand by the productive sectors. The task is to ensure energy supply adopting at the same time an energy mix that reconciles economic development with environmental protection. In the past, the growth rates of energy demand have been equal to or have exceeded economic growth rates. It is expected that initiatives to increase energy efficiency can achieve the so-called "decoupling" in the mid and long term, that is, energy demand rates will be lower than the rates of economic growth.

Chile has a high dependence on foreign energy regarding fossil fuels, which involves paying the highest prices in Latin America and above OECD average. In fact, the use of coal has been increasingly important in the energy mix, in response to the energy predicament in the past decade. According to data of 2011, "the electricity mix was made up of 3% from NCRE[14] sources, 34% from hydroelectricity and 63% from thermoelectricity"[15].

The *National Energy Strategy 2012-2030* published in February 2012 the following key data: i) "The country currently has a total generating capacity of 16,970 MW" and ii) "Growth rates of approximately 6% to 7% are projected for electricity consumption in Chile between now and 2020, which means that total electricity demand will reach almost 100,000 GWh by that year. This will require increasing the supply by more than 8,000 MW through new generation projects during that period".[16]

To achieve N*ational Energy Strategy projections, b*oth public and private sectors will play a key role, in particularly the new environmental institutional framework. This framework includes the creation in 2010 of the Ministry of Environment and the Environmental Impact Assessment Agency (SEA, by its acronym in Spanish); and the newly launched Superintendence of the Environment (enforcement and compliance bureau) and the Environmental Courts operating since December 2012.

[13] OECD: "Better Life Index Chile". Available at: http://www.oecdbetterlifeindex.org/countries/chile/
[14] Non-Conventional Renewable Energies
[15] Ministry of Energy, Chile: "National Energy Strategy 2012-2030". Santiago. Available at: http://www.minenergia.cl/documentos/estudios/national-energy-strategy-2012-2030.html
[16] Ministry of Energy: "National Energy Strategy 2012-2030", page 7

BOX: population and administrative regional regime

Figure 2 Regions of Chile

N°	Region	Capital
XV	Arica y Parinacota	Arica
I	Tarapacá	Iquique
II	Antofagasta	Antofagasta
III	Atacama	Copiapó
IV	Coquimbo	La Serena
V	Valparaíso	Valparaíso
RM	Metropolitana	Santiago
VI	O´Higgins	Rancagua
VII	Maule	Talca
VIII	Biobío	Concepción
IX	Araucanía	Temuco
XIV	Los Ríos	Valdivia
X	Los Lagos	Puerto Montt
XI	Aysén	Coyhaique
XII	Magallanes	Punta Arenas

According to the National Institute of Statistics (INE) estimations, Chile has approximately 16 and a half million inhabitants. By observing the distribution of the population in the 15 regions, population is concentrated in three regions accounting for 62% of all population; 40% of Chileans are living in the Metropolitan Region, followed by the Biobío Region with 12% and Valparaiso with 10%.[17]

[17] http://www.biobiochile.cl/2012/08/31/ine-adelanto-datos-del-censo-2012-que-muestra-un-aumento-de-101-en-la-poblacion-chilena.shtml

Environmental challenges at the national level

For different reasons, in recent years there has been a major concern of both the public and private sector for reducing the negative impact on the environment, a fact that is manifested, among others, on major investments to prevent or mitigate environmental damage.

Before referring to the steps of Chile to green growth, first it is necessary to consider the environmental challenges which Chile has to face nationwide. This subchapter describes some of the most important environmental problems in Chile, such as air pollution, soil contamination, climate change, waste, threats to biodiversity, water shortage and water contamination. Most of these and other environmental problems are covered with great detail in the 1st Official Environment Status Report 2011, published by the Ministry of Environment of Chile in 2012 and available in English at the Ministry´s website.[18] The elaboration of this report responds to Law 20.417 on General Bases of the Environment of 2010 (previously, Law 19.300 of 1994), as well as to the recommendations of the OECD expressed in its publication "Environmental Performance Assessment of Chile" of 2005.

Air pollution

Thermal power plants, copper smelters, transport and wood heating are the main causes of poor air quality in Chile. According to estimates, in Chile "at least 10 million people are exposed to an annual $PM_{2.5}$ average concentration higher than 20 micrograms per cubic meter"[19].

This means "that more than 4,000 people die prematurely each year due to cardiopulmonary diseases associated to chronic $PM_{2.5}$ exposure. This figure represents more than double the number of deaths in car accidents"[20]. Pollution exposure also is associated with other health costs due to its harmful health effects on morbidity events and detriment deeply population quality of life.

Population of 31 cities and municipalities throughout the country is expose to concentrations above 20 micrograms of $PM_{2,5}$ per cubic meter, the maximum limit laid down in national regulations. Most of these cities are located in the central and southern Chile. Lower income communities are many times the most affected with the concomitant health problems.

Different measures have been adopted to address the serious air pollution problems, mainly emission standards. New regulations to control emissions from power plants[21], smelters[22] and traffic[23], involve approximately 3,000 MM dollars (present value) including investments, operating, maintenance and environmental monitoring costs, over the next 10 years.[24]

---

[18] Ministry of Environment: "Official Environment Status Report 2011". Available at: http://www.mma.gob.cl/1304/articles-52016_OEnvironmentSReport.pdf

[19] Ministry of Environment: "Official Environment Status Report 2011", Santiago, 2012, page 53

[20] Idem

[21] Costs associated with the standard: 600 MMUS$, according to the National Commission of Environment (CONAMA). Report: "Análisis general de impacto económico y social de una norma de termoeléctrica". Santiago de Chile, 2009.

[22] Costs associated with the standard: 1.400 MMUS$, according to the Ministry of Environment. Report: "Análisis general de impacto económico y social de la norma de emisión del anteproyecto norma de emisión para fundiciones de cobre y fuentes emisoras de arsénico". Santiago, 2012.

[23] Ministry of Environment. Report: "Análisis general del impacto económico y social de la aplicación de nuevas normas de emisión para vehículos livianos a nivel nacional". Santiago, 2012. Associated costs: 560 MMUS$. – Report: "Análisis general del impacto económico y social de la aplicación de nuevas normas de emisión para vehículos medianos a nivel

At a local level, figure 2 shows how the Metropolitan Region activated a Prevention and Decontamination Plan (PPDA, its acronym in Spanish) from 1998, updated in 2010 that has allow this area two cut by half $PM_{2.5}$ concentrations in 20 years keeping high economic growth rates at the same time. It should be noted that the PPDA operates a credit base emission trading system for PM and NOX compensation at the industrial sector[25].

At the south of the country air pollution main responsible is wood consumption for heating purposes. Many measures have been taken to face this challenge namely stricter emission standards for firewood heaters, replacement of existent heaters by less polluting and more efficient ones, incentives to increase availability of dry firewood, labeling schemes, financial aid for home isolation improvements in order to reduce energy demand, as well as educational programs to reinforce community awareness and education. At a local level decontamination plans have been set in place being the one for Temuco and Padre Las Casas in Region IX Araucanía the first to be approved.

Production and consumption of firewood represents an important energy source in rural and residential areas of several regions from the center to the south and accounts for approx. 20% of the country´s primary energy supply.[26] In recent years, problems associated with the production and consumption of firewood has become more evident with emissions from firewood burning in the center-south of Chile as the main responsible for the high $PM_{2.5}$ concentrations. Firewood consumption is a cultural and social issue aggravated by the low relative price of this energy source.

Due to this reality it is urgent to determine a sustainable path for wood burning use emphasizing that on average is a carbon neutral fuel. If is not possible to deal with its local externalities the alternative will be the consumption of fossil fuels and therefore increment CO_2 emissions.

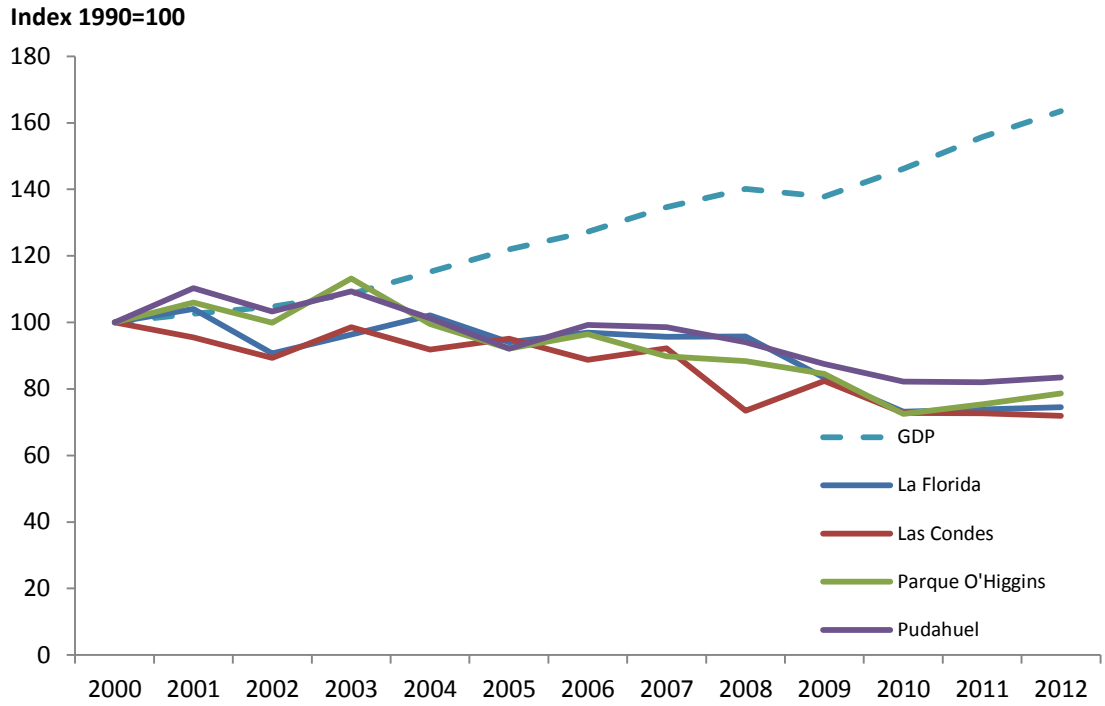
nacional". Santiago, 2012. Associated costs: 60 MMUS$. – Report: "Análisis general del impacto económico y social de la aplicación de nuevas normas de emisión para vehículos pesados a nivel nacional". Santiago, 2012. Associated costs: 330 MMUS.

[24] Estimations of the Chilean Ministry of Environment

[25] Ministerio de Salud, Chile: "Aire. Compensación de Emisiones". Available at: http://www.asrm.cl/paginasSegundoNivel/NivelTecnico.aspx?param1=192&param2=113/192&param3=-1

[26] Ministerio de Energía, Chile: "Balance Nacional de Energía 2009"

Figure 3: PM2.5 Concentration and GDP, Selected communes Metropolitan Region - (2000-2012)



Source: MMA 2013 and Banco Central

Soil contamination

Soil pollution is principally caused by waste from industrial processes; mining, agriculture and urban waste, often accumulate without further precautions.

Mining, as explained above, is the most important economic sector in Chile. Besides water pollution (especially through mine tailings) and air pollution associated with smelters; metal mining significantly modifies the landscape and pollute the soil. In recent decades, Chilean agriculture has significantly raised the massive use of agrochemicals (fertilizers and pesticides), which contaminate soil and groundwater. Landfills, deposits of industrial waste and waste sites of the population, have increased in recent years, some of them in an illegal status.

The Ministry of Environment exposes "that in Chile there is no a detailed diagnosis on abandoned productive activities, thus making it practically impossible to know the amount and characteristics of the contaminated soils and sites"[27].

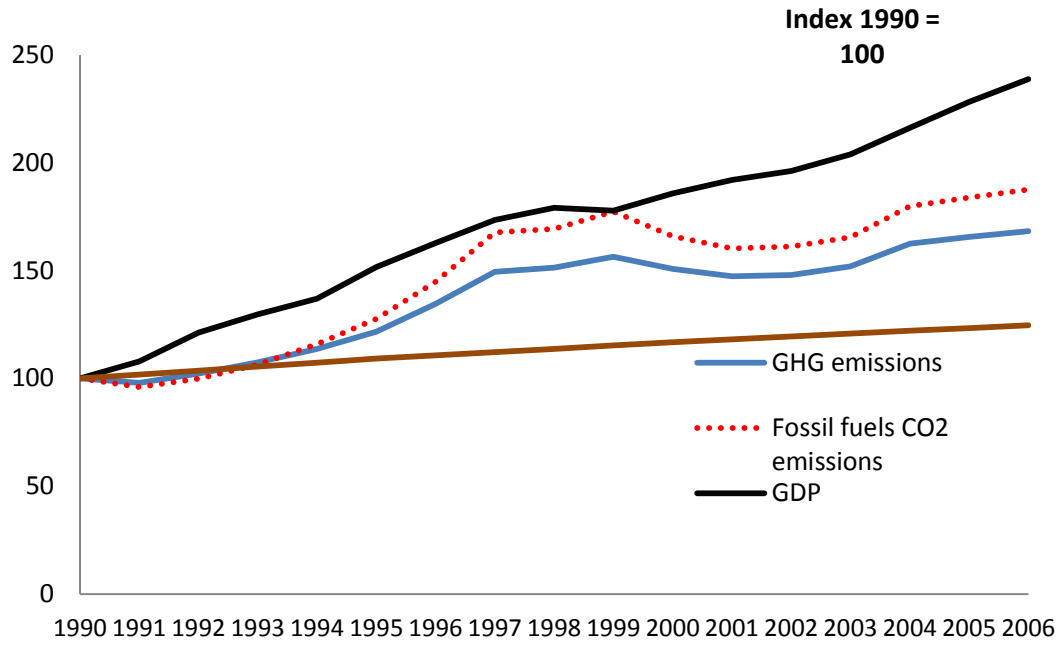
With respect to the prevention of new contaminated sites, Chile has given big steps with the promulgation of Law 20.551 on Closure of Mining Work Sites that reinforce the "polluter pays" principle. On the other hand, the Supreme Decree N° 78 of the Ministry of Health from 2009 related with the storage of hazardous substances and the Supreme Decree N° 148 of the Ministry of Health from 2003 with respect to the manipulation of hazardous waste has helped to manage the risk of soil contamination.

[27] Ministry of Environment: "Official Environment Status Report 2011", page 119

Climate Change

Between 1990 and 2006, greenhouse gases emissions (excluding land use, land use change and forestry) increased approximately 70%, GDP grew more than twice and the population increased approximately 25% in the same period.[28] As figure 3 shows, in that space of time, GHG emissions grew slower than the economy.

Figure 4: National GHG emissions, GDP units and population (1990-2006)



Source: CONAMA (2008a, 2010b y 2010c), INE and OECD

According to 2007 estimates, Chile contributes only 0.26% to the global emissions of greenhouse gases, ranking place 44 among 186 countries.[29] However, the country is highly vulnerable to global warming. According to the vulnerability categories set out in Article 4.8 of the UN Framework Convention on Climate Change, Chile presents 7 of the 9 characteristics of vulnerability identified.[30]

One of the current visible manifestations of climate change is the loss of mass as the general trend of most glaciers in Chile, which affects less availability of water in watersheds with consequent negative impacts on productive activities such as mining and agriculture.

As the Economic Commission for Latin America and the Caribbean (ECLAC) states, depending on the climate scenario selected Chile could experiment an average increase in temperature by

[28] Ministry of Environment: "Official Environment Status Report 2011", pages 440 and 443
[29] Idem, page 428
[30] Biblioteca de Congreso Nacional de Chile. "Estrategia Nacional de Cambio Climático". Available at: http://www.bcn.cl/carpeta_temas_profundidad/temas_profundidad.2007-04-11.5841476988/Estrategia%20nacional%20_2006.pdf

about 1°C over the next 30 years, between 1°C and 2°C in an intermediate period (2040-2070) and an increase between 3°C and 4°C at the end of the century. The third scenario implies a reduction in annual rainfall of approx. 30% in central Chile and an increase of them in the extreme south.[31]

In a scenario without measures, the projections for Chile indicate a steady increase of GHG emissions. However, different actions could reduce GHG emissions. ECLAC points out measures aimed reduce energy demand and promote energy efficiency. Other measures are related to the reduction of coal supply sources, as well as the promotion of electricity generation from renewable energies.

With respect to the economic impact, the ECLAC study indicates that for the higher emissions A2 scenario[32] climate change could have a cost ranging from US$ 22,000 million to US$ 320,000 million. In the B2 scenario with lower emissions, the values range from a net profit of US$25.000 million to a cost of US$40,000 million. These data indicate that in the A2 scenario, Chile could lose 1.1% annual of GDP.

These facts reinforce Chile´s commitment with a low carbon future. In 2008, the government adopted the National Action Plan on Climate Change, which implies the development of sectorial adaptation, and mitigation plans. In this context, "the country has made a voluntary commitment to the challenge of joining global efforts to mitigate global emissions of greenhouse gases (GHGs), submitting Appendix II of the Copenhagen Agreement to the Secretariat of the Convention, in which Chile has agreed to take mitigation actions that will enable it to reduce, by 2020, 20 percent of its projected emissions since 2007, through Nationally Appropriate Mitigation Actions (NAMAs)"[33].

Chile was the first country worldwide which registered a National Appropriate Mitigation Action (NAMA) of domestic mitigation based on reductions achieved by energy efficiency improvements in companies through clean production agreements. As stated by the National Cleaner Production Agency (CPL, its acronym in Spanish), voluntary mitigation actions of more than 4,000 companies under the Clean Production Agreements (APL, its acronym in Spanish) will allow to reduce 18.4 million tons emissions of greenhouse gases to the year 2020.[34]

Policies such as law 20.257 to promote Non-Conventional Renewable Energies (NCRE) that enacted the target of 10% for NCRE by 2024 has also contribute to reduce the national GHG footprint. As the Center for Renewable Energies (CER, by its acronym in Spanish) states, in 2012, NCRE contributed with 4.82% to total energy generation. Among NCRE that are in operating condition (in total 881 MW), biomass has been the most important source (394 MW) in installed capacity, while solar energy has had little importance (3.6 MW).[35]

[31] CEPAL: "La Economía del Cambio Climático en Chile", Santiago, May 2012, page 13

[32] With respect to future climate scenarios (until 2100), the Intergovernmental Panel on Climate Change (IPCC) defined two scenarios of GHG emissions: A2 and B2. In the case of A2, the international economy has dynamic character with an intensive use of fossil fuels.

[33] Ministry of Environment: "Official Environment Status Report 2011", page 448

[34] CPL: "Reconocimiento mundial a esfuerzos de Chile para combatir el cambio climático". Available at: http://www.produccionlimpia.cl/link.cgi/Noticias/1820

[35] CER: "Reporte anual 2012". Available at: http://cer.gob.cl/sobre-las-ernc/datos-y-estadisticas/

However, this trend is changing. According to the CER, in late 2012, several projects were under construction (270 MW), a large proportion of projects (6721 MW) have been approved by the Environmental Evaluation System (SEA, by its acronym in Spanish) and another important number of projects were in a state of environmental qualification by the SEA (3607 MW)[36].

Other cost effective measures to reduce carbon emissions are related with energy efficiency. In 2005 was created the National Energy Efficiency Program (PPEE, by its acronym in Spanish), which had the following main areas: the creation of a culture of energy efficiency in the population, the formulation of a national policy, the creation of a regulatory framework, the adoption of economic, tax and financial incentives to encourage energy efficiency in the sectors industry, mining, construction, transportation, housing, etc.[37] These tasks are undertaken since 2010 by the Chilean Agency for Energy Efficiency (AChEE, by its acronym in Spanish).

The *Energy Efficiency Action Plan 2012-2020 (PAEE20)*, managed by the AChEE, "has the goal of attaining a 12% decrease in the projected energy demand for 2020. This will allow for an estimated reduction of more than 41,500 Tcal (Teracalories) by 2020, which represents 1,122 MW of displaced electricity and 4,150,000 non-consumed Toe (Tonnes of Oil Equivalent)"[38].

Under the government's commitment to move towards a culture of energy efficiency in Chile, in 2013 it will provide more than $ 7 billion pesos (US$ 14 million) to implement energy efficiency measures.[39] Among recent measures, the Ministry of Energy has launched an energy efficiency label for companies.[40]

As highlighted by the Ministry of Energy, along with the economic benefits, this development would contribute to job creation, higher levels of industrial production and lower CO2 emissions, but above all, a more efficient use of energy would contribute to the decoupling of economic growth from energy demand.

It must be highlighted that Chile is an active participant of World Bank Partnership for market readiness and has been awarded with US$ 3 MM to assist the process of preparing groundwork for a political decision on the potential implementation of an emission trading in Chile's energy sector.

Waste

In recent years there has been a sharp increase in waste (domestic and industrial), due to population growth, changes in consumption patterns and increased industrial production.

[36] Idem
[37] Comisión Nacional de Energía: "Informe final de evaluación Programa País Eficiencia Energética". Available at: http://www.dipres.gob.cl/595/articles-38654_doc_pdf.pdf
[38] Ministry of Energy: "National Energy Strategy 2012-2030", page 17
[39] AChEE: "Más de $7 mil millones se destinarán en 2013 para impulsar la eficiencia energética en el país". Available at: http://www.acee.cl/noticia/m%C3%A1s-de-7-mil-millones-se-destinar%C3%A1n-en-2013-para-impulsar-la-eficiencia-energ%C3%A9tica-en-el-0
[40] AChEE: "Ministerio de Energía lanza Sello de Eficiencia Energética para Empresas". Available at: http://www.acee.cl/noticia/ministerio-de-energ%C3%ADa-lanza-sello-de-eficiencia-energ%C3%A9tica-para-empresas

According to the Ministry of Environment, in 2009 waste generation was 16.9 million tons, of which 6.5 million tons were domestic waste and 10.4 million tons were industrial waste.[41] Comparing waste generation per capita by municipalities in the Metropolitan Region shows that Vitacura (the district with the highest per capita GDP of Chile) generates 2.09 kg/day/inhabitant. In contrast, the municipality of Curacaví, in which economic resources are scarce, waste generation per capita is 0.54 kg/day/inhabitant.[42] In this context, "communes with the highest incomes do not have final waste disposal sites, exporting their waste to other communes"[43].

One of the main challenges is the valorization of waste through recycling or the use of waste as fuel. The estimated valorization rate of waste is approx. 10% according to data from 2010.[44] However, as table 1 shows, for several products valorization of waste is significantly higher, due to the growth of the waste collection market.

Some municipalities are promoting selective waste collection and recycling. There exists an informal market with recyclers and intermediaries for paper and cardboard collection, scrap metal, as well as a formal market of recycling companies for paper and cardboard, scrap metal, plastic and metal sheets.[45]

Among the initiatives regarding this challenge the Ministry of Environment is currently drafting a bill to promote efficient waste management incorporating the Extended Producer Responsibility principle (REP, its acronym in Spanish).

[41] Ministry of Environment: "Official Environment Status Report", page 141
[42] Idem, page 145
[43] Idem, page 148
[44] Idem, page 160
[45] Ministry of Environment: "Official Environment Status Report", page 147

Table 1: Generation and valorization by type of industrial and municipal waste

Product	Generation (ton/year)	Growth rate (%)	Valorization rate (%)	Base year
Tires	53,560	3%	22%	2012
Electronic appliance	7,674	-	19%	2008
Electric appliance	18,666	-	-	2010
Light bulbs	5,269	2%	-	2010
Newspapers and magazines[2]	252,000	-	-	2011
Medicaments	92	-	-	2013
Paguicides	0,5	-	-	2000
End of life vehicles	67,400	-	-	2009
Batteries	26,100	2%	52%	2008
Lubricants	72,150	4%	52%	2008
Portable batteries	4,337	-	-	2011
Packaging - Glass	292,014	8%	45%	2012
Packaging -Metal-Aluminum	100,665	3%	35%	2012
Packaging - Beverage cartons	18,380	7%	20%	2012
Packaging -PET	60,260	11%	19%	2012
Packaging –Other plastics	355,934	4%	10%	2012
Packaging –Cardboard and paper	474,650	6%	50%	2012
Packaging - Paguicides	1,052	-	25%	2012
Total	**1,810,028**			

Source: Ministry for the environment, 2013

Biodiversity

Chile has a great richness of flora and fauna, from extremely arid deserts in the North to rainforests in the South. Different ecosystems (terrestrial, marine and continental aquatic) accounts approx. 30,680 species, of which between 22% and 25% are endemic[46].

Among the main threats to biodiversity in Chile are the introduction of exotic species, logging of native forests, forest fires, water pollution, fisheries overexploitation and changes in land use.[47]

Regarding the protection and conservation of biodiversity, protected areas are owned by the State, in which the extractive use of resources is restricted. The National System of Wild Protected Areas of the State (SNASPE, its acronym in Spanish) is managed by the National Forestry Corporation (CONAF, its acronym in Spanish), which depends on the Ministry of Agriculture. The SNASPE is responsible for 35 National Parks, 49 National Reserves and 16 Natural Monuments. In total "they cover an area of 14.5 million ha, representing 19.3 percent of the national territory. Ecosystem

[46] Idem, pages 265 and 266
[47] Idem, pages 273-281

services provided by the country´s protected areas have a total economic value of USD 1,460 million"[48].

While protected areas by the State have existed since the beginning of the 20th century, the purchase of land by individuals who dedicate these protected natural areas for conservation and ecotourism activities was a new phenomenon from the 90´s. However, currently there is no public policy to promote private protected areas.

The implementation of economic instruments to foster the cooperation between the public and private sectors in biodiversity conservation is a pending issue. The environmental performance review about Chile, published in 2005 by OECD and ECLAC[49], "suggests developing a strategic vision of the complementary roles of state and private protected areas in order to achieve a coherent network of core protected areas, buffer zones and ecological corridors. Recent progress has been made in this direction through the draft bill for the creation of the Biodiversity and Protected Areas Service (SBAP, its acronym in Spanish), which incorporates incentives to the private sector for the creation of private protected areas"[50].

At the international level, Chile has signed different agreements on biodiversity, such as the Convention on Biological Diversity (ratified in 1994). In this context, the government has developed several Global Environment Fund (GEF) projects. One of the most recent ones aims to protect particular ecosystems from Invasive Alien Species such as Juan Fernandez Archipelago witch is considered one of the 34 hotspots of global biodiversity.[51]

Since 2013 governs the new Fisheries Act (Law n° 20.657), which incorporates sustainability as a primary objective, as well as the concept of Maximum Sustainable Yield (RMS, its acronym in Spanish), oriented on international standards. Among the remarkable points are: the splitting of the catch quota between industry (45%) and fishing (55%) for a period of 20 years; and tradable fishing licenses for 20 years, renewable as long as it complies with the environmental, fishing and labor requirements.[52]

Water resources

Regarding water availability, Chile has water resources per capita above the world average. However, the availability of water varies considerably by region. In the North, the availability is below 800 m^3/person/year, while in the South surpasses 10,000 m^3/person/year.[53]

[48] Source: CONAMA-GEF-PNUD, 2010, published by the Ministry of Environment: "Official Environment Status Report", page 290
[49] CEPAL/OECD: "Evaluaciones del desempeño ambiental. Chile". Santiago. Available at: www.eclac.cl/publicaciones/xml/2/21252/lcl2305e.pdf
[50] Ministry of Environment: "Official Environment Status Report", page 297
[51] GEF. Available at: http://www.thegef.org/gef/news/support-aichi-target-9-strengthening-national-invasive-alien-species-management-chile
[52] Ministerio de Economía, 2012: "Chile gana con la aprobación de la Nueva Ley de Pesca y Acuicultura. Available at: http://www.economia.gob.cl/2012/12/19/chile-gana-con-la-aprobacion-de-la-nueva-ley-de-pesca-y-acuicultura.htm
[53] World Bank data, 2011, published by the Ministry of Environment: "Official Environment Status Report", page 325

Glaciers, which are important water reservoirs, lose mass by the effects of climate change and also are affected by some mining projects. Groundwater, which is considered in principle abundant in Chile, suffers the overexploitation of this resource in northern regions.

On the other hand, between the Metropolitan Region and the north of the country, water demand exceeds supply, while from the Region O'Higgins to the south; the availability of water is greater than the demand. In the first case, the scarcity of water resources causes some conflicts between agriculture and mining activities.[54]

In 1981 was enacted the Water Code which incorporates the system of water rights. In a study published by ECLAC in 1997 on the "Commercialization of water rights in Chile" is mentioned as positive aspects that "the system has not only effectively promoted the efficient use of water resources, but also has contributed to encourage new private investment in infrastructure and allowed to reallocate water rights both among farmers and regarding other uses".[55] In 2011, the World Bank reaffirms these aspects, but expressed the following criticism: "The lack of transparency of transactions and market informality are important issues that affect the results of this market. Costs associated with a transaction may increase due to the difficult process of finding potentially suitable buyers or sellers. Moreover, the asymmetry of information between market participants has increased, which may lead to a redistribution of water and its related economic activities in a few inequitable manner with respect to exchange earnings."[56]

With regard to water quality, it should be noted that northern waters have a natural high saline content and arsenic concentration. In the center of the country, naturally include heavy metals such as copper, while in the south the water is of good general quality.

With respect to effluent discharges, pollutants are coming from point sources (liquid industrial waste or domestic wastewater) or diffuse sources (agriculture and forestry activities). Regarding point sources, there are rather strict regulations; however, there is serious difficulties controlling water pollution from diffuse sources. In this context, a year ago, the OECD noted that policies against water pollution from agricultural uses has not been successful in its member countries in the past ten years, and as solution proposed to apply the polluter pays principle[57]. Rural waste water treatment also remains pending.

[54] World Bank data, 2011, published by the Ministry of Environment: "Official Environment Status Report", page 332

[55] CEPAL: "Comercialización de los derechos de agua en Chile", Santiago, December 1997. Available at: http://www.eclac.cl/cgibin/getProd.asp?xml=/publicaciones/xml/7/4617/P4617.xml&xsl=/ddpe/tpl/p9f.xsl&base=/tpl/top-bottom.xslt

[56] Banco Mundial: "Chile. Diagnóstico de la gestión de los recursos hídricos". Santiago, 31 March 2011, pages viii and ix.

[57] OECD: "Water quality and agriculture: meeting the policy challenge". Paris, March 2012

Chapter 2: Chile´s pathway to green growth

Before describing green growth in Chile, reference should be made to OECD´s understanding of this concept, above all, because the concept is not yet part of a broad discussion in Chile.

In the context of the financial and economic crisis, the OECD adopted in 2009 the development and implementation of a *Green Growth Strategy*, which was considered to be "the way out of the crisis"[58]. What´s more, the crisis could serve as a catalyst to making urgent and necessary policy reforms that would benefit the economy, the environment and employment.

The *Declaration on Green Growth* was adopted at the Meeting of the Council at Ministerial Level in June 2009 and signed by the ministers of 34 countries; 30 member countries and four candidate countries, including Chile.[59] With its official entry to the OECD in May 2010, Chile reiterated its commitment to the Green Growth Strategy of this international organization.

Green Growth is a new strategy at the international level that goes beyond the mere "greening" of the economy in the quantitative sense and aims to promote economic growth, contribute to environmental protection, increase employment and improve social justice and equity.

According to the definition of the OECD, "Green growth means fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies. To do this it must catalyze investment and innovation, which will underpin sustained growth and give rise to new economic opportunities"[60].

In this context, green growth emphasizes higher growth rates, especially through the greening of existing industries, as well as through the creation of new companies, the so-called eco-businesses. This process involves the creation of jobs directly and indirectly related to environmental protection ("green jobs"), and also requires the appropriate education and training to meet the business demand for skilled workers and professionals.

One of the difficulties recognized by the OECD is to have a better understanding to bridge the gap between theory and practice. Thus, the OECD has created with other institutions the Green Growth Knowledge Platform (GGKP), in which are involved the Global Green Growth Institute (GGGI), the United Nations Environment Programme (UNEP) and the World Bank.[61]

After some years working with green growth topics, the OECD published in its recently synthesis paper "*What have we learned from attempts to introduce green-growth policies?*" the following main conclusions:[62]

---

[58] OECD: "Major world economies aim for ´green growth´ as the way out of the crisis". Paris, 25 June 2009. Available at: http://www.oecd.org/document/63/0,3343,en_2649_201185_43164671_1_1_1_1,00.html

[59] OECD: "Declaration on Green Growth". Paris, 25 June 2009. Available at: http://acts.oecd.org/Instruments/ShowInstrumentView.aspx?InstrumentID=70&InstrumentPID=67&Lang=en&Book=False

[60] OECD: "Towards Green Growth", Paris, 2011

[61] OECD: "Green Growth Knowledge Platform". Paris, February 2012

[62] OECD Green Growth Paper: "What have we learned from attempts to introduce green-growth policies?", Paris. March 2013, page 2

i. “Green-growth policies are likely to have beneficial welfare effects in the long term, but short-term transition costs have hampered their implementation.
ii. Despite some progress, green-growth frameworks remain limited in scope. The main challenge here is to coordinate policies and to develop indicators and instruments to monitor implementation progress.
iii. Pricing instruments have been widely used in green-growth strategies, but have also been complemented by regulations or subsidies that can address market and information failures and are more politically acceptable.
iv. Countries need to pursue efforts to manage natural resources in a sustainable manner. This requires the development of indicators to properly value natural resources.
v. Innovation is key to foster green growth and could be encouraged by a mix of policies within a coherent framework. Technology transfers have an important role to play, as long as trade and financial flows can circulate freely.
vi. Countries are concentrating more and more effort to invest in resilient infrastructure and adaptation policies, but additional public and private financing need to be mobilized.
vii. One important challenge is to overcome resistance to reforms and to find ways to compensate losers in a cost-effective way.”

The aforementioned publication stresses also the importance of the social dimension, saying that “green-growth strategies need to pay specific attention to many of the social issues and equity concerns that can arise as a direct result of greening the economy – both at the national and international level”.

The green growth concept cannot be a closed definition, because we are in a transition process and with different realities between countries. It is a new concept that requires understanding. What is really green growth; what are the elements that differentiate green growth from current growth; do we understand all the same, that is, developed, emerging and developing countries, when we talk about green growth? Furthermore, specific issues cause controversy, i.e., the effect of green taxes on growth.

In the midterm, Chile should aspire to the “*environmental convergence*” with other OECD countries, which implies to face challenges, but also taking opportunities. But, it is worth highlighting and as pointed out by the OECD that in the context of a transition to a greener economy, the policies and tactics used should be designed for specific national circumstances: “There is no ´one-size-fits-all´ prescription for implementing green growth. Greening the growth path of an economy depends on policy and institutional settings, level of development, resource endowments and particular environmental pressure points. Advanced, emerging, and developing countries will face different challenges and opportunities.”[63]

In Chile, the green growth concept is barely known also sometimes it is misunderstood. Some private and public actors consider the path to green growth only as an issue about cost, that is, they have a negative approach to this concept. The opinion that this concept can also imply opportunities is still raw in many people.

[63] OECD: “Green Growth at the OECD: Selected areas of ongoing work”, Paris, 2011, page 1

According to the OECD, technology cooperation would promote green growth, however, in our view, in the medium term Chile should generate national capabilities and develop a local market of environmental goods and services.

With respect to the Chilean market of environmental goods and services, a study presents the following results: "The EGS market grew from $2.4 billion in 2005 to $3.4 billion in 2010, and from 1.4 percent of GDP in 2005 to 1.7 percent of GDP in 2010 and is expected to reach 1.8 percent of GDP in 2012 with annual growth in the 7-8 percent range."[64]

Table 2 shows the value of different categories of products and environmental services in Chile in 2010. This table includes imports but excludes exports by Chilean companies. As the authors of the study states: "foreign firms who enter the market and invest in Chile bring jobs, technology and engage in partnerships with local firms, so their entry into the market isn´t always at the expense of local firms". This study makes no reference to the subsectors renewable energy or energy efficiency related to the industry, buildings, transport, etc.

It is known that the production and export of environmental technology has become an important economic factor in some developed countries, and has also created a significant number of green jobs. The countries that have entered late into the global environmental market (such as Chile) are with disadvantage of having to import environmental technology, paying relatively high prices.

[64] Case Study "Chile Environmental Industry 2011", produced by Environmental Business International, Inc. and Nathan Associates Inc., for the United States Agency for International Development (USAID), Washington. October 2011, pages 6 and 9

Table 2: Value of Chilean EGS industry by subsector, 2010

Subsector	Revenue in US$ mil	Share %
Water equipment and chemicals	221	7.3%
Air pollution control equipment	52	1.7%
Instruments and monitoring systems	15	0.5%
Waste management equipment	26	0.9%
Solid waste management	380	12.6%
Hazardous waste management	118	3.9%
Consulting and engineering	160	5.3%
Remediation/industrial services	27	0.9%
Analytical services	14	0.5%
Water utilities, wastewater treatment	2,012	66.5%
Total EGS Industry	**3,024**	**100**

Source: Case Study "Chile Environmental Industry 2011", produced by Environmental Business International

The environmental policy instruments (legislation, regulation, prevention and decontamination plans, emission standards, incentives, clean production agreements, etc.), as well as external market demand for environmentally sustainable products, have encouraged and fostered the development of an environmental market. The international commitments, which Chile has signed in areas such as climate change and biodiversity, also have been an influence.

In this context it is interesting to recall the forecast, expressed in 2005 by the German economic institute IFO about the growth of environmental markets in different regions of the planet. According to this estimates, North America, Western Europe and Japan (the leading countries of environmental markets for many years) would have in the coming years an environmental market growth at an annual average of only 1%, while emerging countries or developing regions would have a strong growth of its environmental market, for example, China with 12% and South America with 9%.[65]

Probably, the major challenges that Chile still has in environmental matters, along with its opportunities, will boost an important growth of its market for environmental goods and services.

Concrete steps towards green growth

In our view, Chile has initiated the road to green growth some years ago if we understand this concept as changes in consumption and production in the context of sustainable development and

[65] Ursula Triebswetter, Johann Wackerbauer: "Struktur und Entwicklung der Nachfrage auf dem Umweltschutzmarkt". In: "Die Umweltwirtschaft in der Region München". IFO-Institut für Wirtschaftsforschung. München, May 2005

the boosting of green innovation. Chile´s green growth strategy should be based then in a scheme with three key pillars:

4. *Sustainability sectorial strategies*: sustainable mining, sustainable tourism, sustainable construction, sustainable agriculture, etc.
5. *Economic instruments and other complementary mechanisms*: extended producer responsibility, tradable emissions permits, voluntary agreements, fuel taxation, green public procurement, eco-labeling, tradable fishing quotas, tradable water rights, etc.
6. *Innovation*: cross-sector environmental technology, energy efficiency and renewable energies, etc.

As this report shows, some of these approaches are already in place and others have to be driven.

Sustainability sectorial strategies

Virtually all economic sectors are incorporating sustainability into their business management. As stated earlier, the drivers are the requirements in export markets of Chilean companies, national environmental legislation becoming stricter, and an incipient but growing citizen concern for their health and for the environment. Here we present some sectors and their strategies to undertake sustainability issues.

Mining

Mining in Chile, especially copper extraction, has a great influence on national economic development. According to the Ministry of Mining, between 2006 and 2010, mining has accounted for almost 20% of total GDP. [66]

Chilean companies are also betting heavily on this sector. According to the Chilean Copper Commission (COCHILCO, as its acronym in Spanish), between 2012 and 2020, the national capital firms will invest in mining for about 46,000 million dollars. Among the challenges facing the sector is the demand for electricity, which will double between 2012 and 2020.[67]

Environmental issues have become key challenges for the public and private mining sector: growing energy demand, limitation of emissions and discharges, waste management, mine closure, environmental liabilities, etc. One of the significant problems corresponds to air pollution by sulfur dioxide emissions caused by large mining smelters.

Responding to environmental conflicts with some communities, which are becoming more demanding regarding new mining projects, the State mining company CODELCO has published a project with 11 standards, of which 8 are environmental and 3 related with communities. The main objective of the development and implementation of those standards is "to raise the performance

[66] Ministerio de Minería: “Desafíos Energéticos de la Minería”. Workshop “Energías Renovables No Convencionales para la minería”. Santiago, 4 August 2011

[67] Ministerio de Minería: “Demanda de energía eléctrica de la minería del cobre se duplicará al año 2020”. Press release. Santiago, 29 August 2012

levels of management in the environment and in the communities, responding to major impacts of our operations and projects".[68]

Specifically, environmental standards are with respect to "air pollution", "energy efficiency and climate change", "water and liquid industrial waste," "solid waste", "massive tailings", "land, soil and landscape", "biodiversity", "mine closure", while others are related to standards regarding "community development ", "community relations" and "indigenous people". Each standard is divided into sections "principle", "baseline", "impact management", "predict the future" and "strategic indicators".

In the awakening of national legislation, but also because of voluntary measures, mining has made significant investments in technological innovation in the face of cleaner production. For example, several mining companies have signed Clean Production Agreements (APL). The voluntary measures include investment in renewable energy projects.

One of the most important copper reservoirs is Chuquicamata in Region II, Antofagasta, which is the biggest open pit mine in the world. In Chuquicamata (owned by State miner CODELCO) was launched the first photovoltaic solar plant in the north of Chile. It is a pioneering initiative in the country and in the mining sector, which has been developed without fiscal subsidies. The solar plant amounts 1 MW equivalent to the daily electricity required for 1,000 families.[69]

As expressed, the sector is essentially export oriented and therefore more and more mining companies published their sustainability report, as well as the measurement and verification of the carbon footprint of their products and organizations, obtaining certifications according to international standards.

Tourism

Today, tourism in Chile is not a cyclical phenomenon. Gradually this sector has become an increasingly important economic factor and prospects seem good. According to the National Tourism Strategy 2012-2020, Chile was visited by over three million foreigners in 2011. The government hopes that this figure will reach 4 million foreign tourists in 2014. The contribution of tourism to GDP is estimated at 3.2%, hoping that this figure will double rising up to 6% in 2020. Until to 2020, the government aims to generate 40,000 direct jobs and 160,000 indirect jobs by this means.[70]

The economic importance of the Chilean tourism sector can also manifest in relation to other sectors of the country. Thus, tourism generated revenues of approximately US$ 2,300 million in 2011 (international visitors) and was on the 4th place with respect to exports of goods and services (behind mining, the fruit industry, and pulp and paper sector).

[68] CODELCO: “Estándares Ambientales y Comunitarios. Proyecto Estructural Medio Ambiente y Comunidades”. Santiago, March 2012

[69] Ministerio de Minería: “Chuquicamata inicia operaciones de la primera planta solar en el desierto del país”. Press release. Santiago, 13 June 2012

[70] Secretaría de Turismo / Ministerio de Economía: “Estrategia Nacional de Turismo 2012-2020”. Santiago, January 2013, pages 10-17

Optimistic prospects accentuate and emphasize the comparative advantages the country has: a natural and cultural wealth, security and economic and political stability. Economic data exposed are the best manifestation that the Chilean tourism can become a strategic factor for the development of the country.

However, there are still a number of obstacles to more rapid development of the industry, which include: lack of infrastructure, insufficient resources, lack of better coordination of public and private agencies involved, seasonal activity, scarce use for tourism in natural protected areas, and finally, insufficient training of human resources. Add to that, Chile has strong competitors such as Australia and Costa Rica which since many years are preferred destinations for foreign tourists looking for "the natural and remote".

In this context, the issue of sustainability is becoming increasingly important. The mentioned National Tourism Strategy 2012-2020 is based on five pillars: promotion, sustainability, investment and competitiveness, quality and human capital, and market intelligence.

Some actors are particularly concerned about the issue of sustainability. According to them, on the most important tourism fairs in the world, Chile is not qualified as a sustainable destination. It is most well known as a nature-based tourism, but not as a sustainable tourism. There are some positive examples of sustainable tourism, but they are considered individual and isolated efforts and not the result of a joint policy.[71]

For that reason, the Federation of Tourism Enterprises Chile (FEDETUR) and the Secretariat of Tourism (Ministry of Economy) have teamed up to develop a distinction in sustainability for tourism services. Since there is already a “tourism quality seal”[72], they have chosen to name the new initiative as "distinction in sustainability". In a first phase, the goal is to certify tourist accommodations, and then the new system will recognize tour operators, transportation, food and touristic destinations.

Regarding the distinction system for tourist destinations, the Secretariat of Tourism has identified three local destinations: Easter Island, the Cajon de Maipo (near Santiago) and Lake Llanquihue (Region X “Los Lagos”). Sustainability encompasses the three fundamental pillars:[73]

i. The economic analysis of sustainable management includes: economic viability, local prosperity, jobs related to tourism, quality and visitor/resident satisfaction, and supply policy.
ii. The environmental analysis of sustainable management includes: tourist territory management, water management, energy management, waste management, biodiversity conservation and carbon footprint.

[71] Reportage “Chile se aproxima a tener una distinción propia de turismo sustentable”, in: Ruta de la Sustentabilidad (magazine). La Segunda. Santiago, 21 November 2012, pages 4-6

[72] The development of a Regulatory System of Quality for Tourism Services (*Sistema Normativo de la Calidad de los Servicios Turísticos*) has been co-financed by the Chilean Economic Development Agency (CORFO), and developed by the National Tourism Service (SERNATUR) and the National Standards Institute (INN), with the participation of tourism enterprises; its involved the development of 48 standards in three areas: tourist accommodation, adventure tourism and tourist guides.

[73] Francisco Allard, Sustainability Coordinator, Secretariat of Tourism, Ministry of Economy. Presentation at the Workshop “Measuring the Potential of Local Green Growth in Chile”, organized by OECD-LEED, the Chilean Ministry of Environment and the Chilean Ministry of Labour and Social Protection. Santiago, 29-30 November 2012

iii. The socio-cultural analysis of the sustainable management includes: the contribution to local development, community welfare, development of supply of cultural elements, and protection of historical and cultural heritage.

Construction

Construction has a high impact on the environment, i.e, it is the sector that produces more waste than any other economic activity. As for energy, the construction sector accounts for 26% of final energy consumption in Chile, of this, 81% corresponds to the residential sector.[74] However, there are no data on how the quality of environment affects the building sector, i.e., how air pollution influences in construction.

The greatest potential for action is in existing homes, because less than 2% of homes built meet the minimum of thermal requirements. Since some years the State has promoted energy efficiency, creating a label for energy efficiency in homes.

According to data from Chile Green Building Council, in the last two years has tripled the demand for LEED[75] certification. In December 2012 there were 19 LEED certified buildings, 153 registered projects.[76] The vast majority of these buildings are in the Metropolitan Region.

In order to incorporate sustainable criteria in construction, in August 2011 was signed the Sustainable Construction Ministerial Agreement between the Ministry of Public Works, Housing and Urban Development, and the Ministries of Environment and Energy. These ministries and other public and private organizations are working to create the National Strategy for Sustainable Construction.

At the local level, sustainable construction is mostly found in tourist accommodations, which are built with characteristics materials of each region (in the south, with wood). It is known that especially foreign tourists looking for authentic and naturally construction. However, there is no information on the amount of typical regional buildings.

Agriculture: wine production

The wine industry is an important economic sector for the country. Chilean wine, grown on 120,000 hectares, has had a total turnover of approx. US$ 2,200 million in 2012. The industry exports 75% of its production, equivalent to US$ 1,600 million. The sector employs about 100,000 people.[77]

---

[74] Ragnar Brandt, Head Technical Division, Ministry of Housing and Urbanism. Presentation about "Construcción Sustentable" at the Workshop "Measuring the Potential of Local Green Growth in Chile", organized by OECD-LEED, the Chilean Ministry of Environment and the Chilean Ministry of Labour and Social Protection. Santiago, 29-30 November 2012

[75] LEED (Leadership in Energy & Environmental Design) is a certification system for sustainable buildings.

[76] Chile Green Building Council. Newsletter. December 2012. Available at: http://www.chilegbc.cl/user/noticias/Newsletters%20Chile%20GBC.pdf

[77] Todovinos. "Chile: Industria del vino pierde competitividad". 29 October 2012. Available at: http://www.todovinos.cl/noticias/4164-chile-industria-del-vino-pierde-competitividad; and CCV. Interview. President Andrés Pérez Cruz. Available at: http://www.ccv.cl/noticias_datos.php?id_noticia=1670

In recent years, several winemakers are seriously concerned about sustainability. Concha y Toro, the largest wine company in Chile, created in 2008 an area of sustainability with the initial aim of measuring its CO_2 emissions. As recognized in the company, it was a reaction to the requirements of international markets, which began to express issues such as carbon footprint. Today, the company uses glass bottles 14% lighter, generates less CO_2 emissions and uses less energy in the production phase.

Moreover, Concha y Toro was the first winery in the world which calculated its water footprint; this time in a proactive attitude, anticipating the requirements of international markets. They are conscious of water scarcity that may affect in the short or medium term their production.[78]

An important part of the wine industry is grouped in "Wines of Chile", an association which promotes a Code of Sustainability. This code has three pillars: "environment-friendly", "economically viable" and "socially just". The Sustainability Code was developed by the initiative of some vineyards in conjunction with the University of Talca. So far, nearly 30 vineyards have obtained the distinction "Certified Sustainable Wine of Chile".[79]

Economic instruments and other complementary mechanisms

Economic instruments use market forces as drivers of compliance of environmental goals. This type of mechanism can internalize, at the time of the act of consumption, the externality associated with each product. Its main advantage is efficiency compared to command and control measures (Rodriguez, 2002).

Command and control measure can also be a proper alternative to achieve Chile's environmental goals and generate opportunities for green growth. Its use must be deciding case by case basis recognizing alternative policies such as economic instruments gains and losses including its political viability. Nevertheless, it is preferable to use the most economically efficient instruments as possible in order to reduce the cost burden on the economy.

In this context, the OECD states that "regulatory instruments have drawbacks relative to pricing instruments because they fail to provide an intrinsic mechanism for ensuring that environmental targets be attained at the least economic cost"[80].

Among the most widely used economic instruments to control externalities priced instruments, environmental trading systems and subsidies are recognized, but they have been complemented also by mechanisms to face information failures, voluntary agreements, education policies, among others. As aforementioned, Chile counts with several economic instruments in different stages of design or implementation to aboard its environmental challenges.

Regarding information mechanisms, Chile has signed Free Trade Agreements (FTAs) with 60 countries. In the very near future, the country's products will reach markets with over 3,000 million

[78] Valentina Lira, Sustainability Manager of Concha y Toro: "Para los mercados la huella del agua será el próximo paso natural", in: Ruta de la Sustentabilidad (magazine), La Segunda. Santiago, 28 March 2012, pages 14-15
[79] Consorcio Vinos de Chile. "Código Nacional de Sustentabilidad de la Industria Vitivinícola Chilena". Available at: http://sustentavid.org
[80] OECD: "Towards Green Growth". Paris 2011, page 46

potential consumers. Many of these consumers, especially in Europe and North America, are increasingly well informed and concerned about their health and the environment, and therefore, require products grown and manufactured under environmentally sustainable conditions. At the same time, health authorities in importing countries are strengthening environmental requirements.

All this implies that export companies of Chile must face new challenges from rising environmental requirements. Along with higher quality standards, the environmental variable has become a key to access and remain in international markets. That is, quality and environment are increasingly essential elements of business competitiveness.

In this context, environmental certifications and products with eco-labels play an important role because they allow companies to differentiate themselves positively, and thus acquire value added products. With respect to some ISO certifications, according to the Certified Companies Register[81], in Chile there are currently 495 companies certified with ISO 9001 and 87 companies with ISO 14001.

Already many Chilean economic sectors have created their own label for organic or sustainable products. Of course, third party certification and not just self-declarations would increase the added value of products, and also prevent misleading advertising.

On the other hand, cleaner production, that is, the improvement of production processes, has had a boom in Chile from the point of view of hygiene and safety, but also from the environmental perspective with criteria such as energy efficiency. Clean Production Agreements (APL, by its acronym in Spanish) are signed between business associations, companies of a given sector (agriculture, mining, construction, etc.) and the National Cleaner Production Agency (CPL, by its acronym in Spanish), the public institution responsible in matters committed to the agreements and dependent on the Ministry of Economy.

According to data from 2011, 34 productive sectors had signed a clean production agreement, which involved more than 4,400 companies and approx. 6,500 production facilities. These companies accounted for sales equivalent to 18% of GDP and 38% of Chilean exports. The 83% of these companies are within the category MSMEs (micro, small and medium enterprises).[82] Obviously, a major concern of economic sectors for cleaner production reduces contamination of air, soil, water, and brings an important social benefit due to reduced health expenditures.

Companies in Chile, which offer environmentally sustainable products and services, are growing. Some companies apply Corporate Social Responsibility (CSR) as a strategic element of their business. They worry about the working conditions of their workers, or maintain a good relationship with the neighborhood/community, taking social and environmental commitment that goes beyond national law, but sometimes lags behind the standards of international bodies.

According to the study "Corresponsables 2012" (*Co-Responsable 2012*), commissioned by the Global Compact Network Chile (UNO), linked to the University Andrés Bello (UNAB), between 2006 and 2011, the number of sustainability reports increased by 117%, reached 39 in 2011. Almost all

[81] Registro Empresas Certificadas, www.registrocdt.cl

[82] Areaminera (magazine): “Rafael Lorenzini: APL aporta a la seguridad de la pequeña minería”. Available at: http://www.aminera.com/revistas-mineria-chile/29948-rafael-lorenzini-director-ejecutivoapl

reports have been prepared in accordance with the Global Reporting Initiative (GRI). In Latin America, Brazil had 168 sustainability reports in 2011, in Mexico the number was 61, in Argentina 56 and in Colombia 50.[83] Considering that Chile is a smaller economy relatively to Brazil, Mexico, Argentina or Colombia, the number of responsible businesses that have adopted a policy to measure and report on their environmental and social impacts is a very positive sign regarding sustainable production.

Significantly, in 2008, the Chilean Army published its 1st "Report on Social Responsibility", noting environmental and social commitment. In the same year, the University of Santiago (USACH) published as the first university in Latin America its Report on Social Responsibility according to GRI criteria.

Another trend is that companies are measuring their carbon, most induced by the demands of international markets. They are generally large firms that alongside implement carbon mitigation plan. However, a number of companies go beyond their sphere of production and try to motivate their employees to ride bikes on their way to work (multinational company Alstom) or share the car with other workers of the same company (Chilean airline LAN)[84].

As exposed, today we can observe in Chile multiples initiatives aimed at achieving an economic development that takes into greater consideration the environment. The changes in the productive sectors are induced by increased pressure from international markets on Chilean export companies, as well as by stricter environmental regulation at the national level. At the same time, the environmental awareness of consumers is growing, but not necessarily manifested in a strong demand for eco-friendly products and services.

It must be kept in mind that the cultural, economic and social conditions in develop countries and in emerging countries are different. High levels of social and economic well-being facilitate the demand for environmentally certified products. In Chile, the economic capacity to pay a higher price for an ecological product is still limited for many people.

In developed countries, the role of civil society, and above all, consumer associations, are a key aspect. The demands of an informed and concerned consumer with respect to health and regarding environmental matters and quality of life pushed the creation and consolidation of a market for environmental goods and services. In Chile, this market is relatively incipient.

In general, environmental awareness is quite low in Chile. According to the survey by the Center for Public Studies (CEP, by its acronym in Spanish), conducted in July-August 2012, among the problems to which the government should devote more effort, concern for the environment was in 12th place with 5%.[85] On the other hand, recent months have seen strong environmentally motivated protests from communities in different parts of the country.

[83] Diario Pulso: "117% aumentó la cantidad de reportes de sustentabilidad en los últimos cinco años". Santiago, 10 April 2013

[84] La Segunda, Ruta de Sustentabilidad: "Empresas involucran a trabajadores para disminuir su huella de carbono". Santiago, pages 14-15

[85] CEP: "Estudio Nacional de Opinión Pública". N° 67, Santiago, July-August 2012

One of the crosscutting issues of the Ministry of Environment is environmental education, aimed at raising awareness on sustainability among the population. Between the lines of action figure the "local environmental management" which grants a Municipal Environmental Certification. Also worth noting the National System of Environmental Certification of Educational Establishments (SNCAE, its acronym in Spanish), a program conducted by the Ministry of Environment, the Ministry of Education and UNESCO (United Nations Educational, Scientific and Cultural Organization).[86]

In the context of Education for Sustainable Development, the Ministry of Education is focused on specific topics proposed by UNESCO. Among the nine areas is "Sustainable Lifestyles" which seeks to "generate a change in behavior and consumption habits, considering that the impact of our economic decisions is reflected in social and environmental terms, both at the local and the global level, with consequences in the present and in the future"[87]. This task

Green public procurement represents a key instrument in this matter, because the demand of the State for green products and services encourages the adaptation of existing firms to environmental requirements, promotes the creation of new enterprises (eco-business), promotes innovation in new products and production processes, contribute to the modernization of a country as a whole and indirectly creates a significant number of jobs related to environmental protection (green jobs). Ultimately, green public procurement enhances the creation of a national market for environmental goods and services.

Since recently, Chile is implementing a policy of sustainable public procurement (environmental and social criteria), led by the Public Procurement and Contracting Bureau (under de Ministry of Finance). Related to this, the Ministry of Environment of Chile has developed since 2012 a project, largely funded by the Asia-Pacific Economic Cooperation (APEC), entitled "*Green Public Procurement in the Asia-Pacific Region: Challenges and Opportunities for Green Growth and Trade*". In January 2013, an international workshop was organized in the framework of this project, which had the following conclusions:[88]

i. Challenges of GPP development in APEC economies are related to the definition of environmental criteria, the integration of GPP practice in the daily activities of procurers and officers, capacity building and the development of a monitoring system.
ii. The co-existence of hundreds of eco-labels is a challenge in terms of identification and selection of green products by policy makers and public procurers.
iii. Differences among economies in the definition of environmental criteria and verification standards remain an important non-tariff trade barrier that should be undertaken.
iv. These common challenges also present opportunities for trade in green products and cooperation regarding methods for estimating GPP benefits and the elaboration of environmental criteria databases.

[86] Ministerio de Medio Ambiente, Chile: http://www.mma.gob.cl/1304/w3-propertyvalue-16234.html, and http://www.mma.gob.cl/educacionambiental/1319/w3-propertyvalue-16354.html

[87] Ministerio de Educación: "Cómo llegamos a ser una comunidad educativa sustentable. Educación para el Desarrollo Sustentable". Santiago, March 2013, pages 10-11

[88] APEC / Ministry of Environment, Chile: Workshop on "Green Public Procurement in the Asia-Pacific Region: Challenges and Opportunities for Green Growth and Trade". Jakarta, Indonesia, January 31 and February 1, 2013.

v. APEC can facilitate the exchange of best practices on green public procurement between developed and developing economies and promote future collaboration, capacity building and exchange of information regarding GPP.
vi. The database of environmental criteria defined in APEC economies is a useful tool to share information among APEC economies that would support the definition of trade strategies to promote trade in EGS.
vii. The collaboration of APEC with international organizations, such as UNEP or OECD, should be encouraged in order to facilitate capacity building, exchange information and best practices.

Innovation/Eco-innovation or green innovation

In the context of green growth, environmental innovation is a key aspect. The EU Panel on Eco-Innovation defined eco-innovation as followed: "The creation of novel and competitively priced goods, processes, systems, services and procedures designed to satisfy human needs and provide a better quality of life for everyone with a whole life cycle minimal use of natural resources (materials including energy and surface area) per unit output, and minimal release of toxic substances."[89]

The "first mover advantage", in other words, "the first to move wins", can be observed in developed countries in the field of eco-innovation and environmental technology. The competition is strong and emerging countries have to adapt; if they do not, they will simply be kept out of international markets. This presents challenges, but also opportunities. In general, the dynamic of eco-innovation is rather emergent in Chile, above all, because Chile is an importing country in the area of environmental technology, what has not boosted own research and investment in eco-innovation.

Nevertheless, there is still no specific promotion of eco-innovation. On the other hand, there are already many projects that are promoted in the context of innovation which have an environmental component, but they are not focus directly as eco-innovation. For example, INNOVA CORFO (the Chilean Economic Development Agency) has an innovation program for sustainable tourism and a project focused on the certification of environmental quality and energy efficiency for public buildings, but they are still at a very early stage. Also the sector of construction may represent a great potential with respect to eco-innovation due to different possibilities for economic savings (energy, water, material). In this sense, INNOVA/CORFO (Ministry of Economy) is considering to create a program of innovation and entrepreneurship in sustainable construction.

As also occurs in developed countries, and as expressed by the innovation and eco-innovation expert Hans Bruyninckx from the University Leuven in Belgium and now executive director of the European Environment Agency, "environmental and innovation policies are traditionally separated". Specifically, "environmental policy is rarely aimed at core issues of innovation" and "innovation policy has a little environmental focus and is not driven by concerns about sustainability".[90]

[89] Source: Raimund Bleischwitz, Wuppertal Institute "Eco-innovation – putting the EU on the path to a resource and energy efficient economy". Workshop at the ITRE Committee of the European Parliament. Brussels, 6 October 2009
[90] Hans Bruyninckx: "Green growth and innovation". Presentation at the workshop "Measuring the Potential of Local Green Growth in Chile", organized by OECD-LEED, the Chilean Ministry of Environment and the Chilean Ministry of Labour and Social Protection. Santiago, 29-30 November 2012

Regarding innovation in general, and eco-innovation in particular, both public and private investment in R&D&I (Research & Development & technological Innovation) are fundamental. Total expenditure on R&D in Chile is very low compared to the OCDE average of total expenditure on R&D of 2.4% of GDP. Chile's expenditure increased from 0.4% in 2009 to 0.5% of GDP in 2010. The State financed 43.5% of spending on R&D in 2010, while the share of enterprises reached 41% in 2010. [91]

In 2010, the National Council of Innovation for Competitiveness (CNIC, its acronym in Spanish) commissioned international experts reviewing its innovation and competitiveness agenda. In opinion of these experts, "Chile does not need another round of analytical studies; it needs policy engagement and political commitment to implementing changes than can vastly improve its environment for innovation"[92].

In this context, it should mentioned the Competitiveness and Innovation Programme between Chile and the European Union (born in 2007, but operating only since 2009), which contains 11 initiatives amounting to a total investment of 18.6 million euros. Both Chile and the EU assume 50% of these resources. Among the 11 initiatives include support for the adoption of clean technologies to SMEs.

In order to approach the gap with developed countries, in September 2012 came into force a new law that will allow companies to recover up to 49% of what they invest in R&D. The Tax Incentive Act for Private Investment in Research and Development (R&D) is considered key in the context of the "Year of Innovation", which has been declared by the Chilean government for 2013.

This initiative involves a budget of 1,000 million dollars. The agenda includes more than 100 activities and the coordinated work of more than twenty ministries and public services. The cornerstones of this initiative are "science and human capital", "entrepreneurship and competitiveness" and "quality of life". The Ministry of the Environment, as part of this initiative, this year has launch the first environmental entrepreneurship and innovation contest finance by the environmental protection fund.

Small and medium businesses need specific support from the public sector. First, the implementation of environmental regulations can have important economic effects, and second, support for entrepreneurship and innovation facilitates the creation of new SMEs that can respond to new demands for ecological products and services.

As the OECD states: "Many empirical studies have shown the aggregate relationships between entrepreneurship and SME activity and economic growth and job creation. These growth and job creation effects happen through innovation, as new firm creation and SME growth increase productivity and bring new or under-utilized resources into use."[93]

[91] Ministerio de Economía, Fomento y Turismo: "Informe de Resultados. Encuesta de Gasto en Investigación y Desarrollo. Análisis a partir de la 2° Encuesta Nacional de Gasto y Personal en Investigación y Desarrollo (I+D), 2009-2010". Santiago, July 2012

[92] CNIC. International Evaluation Panel. "Evaluation Report of National Innovation Strategy for Competitiveness, Chile". Santiago, 10 March 2010

[93] OECD Studies on SMEs and Entrepreneurship: "SMEs, Entrepreneurship and Innovation". Paris, 2010, page 24

In the case of Chile, probably it would be necessary to improve the task of information regarding technical, financial and training aspects, which provide State agencies such as CORFO[94], SERCOTEC[95], INDAP[96], among others. In the context of development policy to reach a greater number of SMEs, these instruments could allow environmental adaptation.

With respect to innovation, it should mention the support from institutions such as the Fundación Chile or INNOVO USACH, the Center for Innovation and Technology Transfer at the University of Santiago de Chile, through its business incubator which also supports the development of new businesses on the environment.

According to the National Commission for Scientific and Technological Research (CONICYT, by its acronym in Spanish), the increasing openness to international markets requires Chilean producers an ongoing effort with respect to expanding expertise, scientific and technological development, technological transference, and innovation.[97]

Innovation capacity depends, first, of the company: its growth strategy and international integration, its ability to develop knowledge and technology adaptation. Second, it depends on the strength of the national innovation system, that is, the availability of appropriate public policies and the support of an academic sector that can respond to the scientific research required.[98] Therefore, the new trend in Chile is to establish long term relationships between academia, research centers and private producers. A recent program in place attracts International Centers of Excellence to install in Chile. The government to boost scientific and technological capabilities of the country, as well as promoting technology transfer supports these prestigious organizations.

Effects on green jobs and green skills

Jobs related directly or indirectly to environmental protection are not a new phenomenon. In developed countries, since the 1970´s, jobs have progressively been created in areas such as waste treatment, recycling, management and water treatment, decontamination of air and soil, etc., focused on the production of cleaner technology.

In the last decade, policies and strategies to combat climate change have promoted the creation of many new jobs, particularly in the areas of renewable energy and energy efficiency; at the same time, more importance is being placed on this future potential.

A study conducted in 2008 by the Worldwatch Institute, commissioned by the United Nations Environment Programme (UNEP), the International Labour Organization (ILO), the International Organization for Employers (IOE) and the International Trade Union Confederation (ITUC) concluded

[94] CORFO = Corporación de Fomento de la Producción (Economic Development Agency), under de Ministry of Economy, Development and Tourism
[95] SERCOTEC = Servicio de Cooperación Técnica (Technical Cooperation Agency), under de Ministry of Economy, Development and Tourism
[96] INDAP = Instituto de Desarrollo Agropecuario (Agricultural Development Agency), under de Ministry of Agriculture
[97] CONICYT: "The wine and vine grape production sector in Chile. Research capabilities and science & technology development areas". Santiago, June 2007, page 8
[98] Graciela Moguillansky, Juan Carlos Salas y Gabriela Cares: "Capacidad de innovación en industrias exportadoras de Chile: la industria del vino y la agroindustria hortofrutícola". CEPAL, Serie comercio internacional, n° 79. Santiago, November 2006, page 17

that only in the field of renewable energy, employment reached worldwide approx. 2.3 million people.[99]

However, it is not easy to develop green jobs studies covering different environmental areas. The OECD points out that "there is no common definition of a ´green job´ yet, so estimates vary widely". As a result, and depending on which area is being considered, there are very different estimates with respect to job creation. In this context, "a study for European Union countries presents three definitions which imply EU-wide green jobs shares that range from 2% to 21%".[100]

Green jobs are not understood without the existence of a market for environmental goods and services, which in the case of Chile began to grow slowly since 1994 with the promulgation of the Law on General Bases of Environmental N° 19.300, which marked the beginning of an environmental policy.

In general, Chile lacks studies both on the volume of the market of environmental goods and services and the employment created in relation to environmental protection. The country has the challenging task of elaborating detailed information that account for jobs created and that indicate the potential for future employment in environmental matters. The methodologies used in studies prepared by the OECD may be useful for such purposes.

An exception presents a study about Chile, which was developed with financial support from the governments of Australia, New Zealand and the United Stated, and the support of the Asia-Pacific Economic Cooperation (APEC). With respect to jobs created, the market for environmental goods and services "employed an estimated 28,700 workers in about 2,010 private companies in 2010"[101].

Regarding several environmental sectors, "water utilities and wastewater treatment systems account for 60 percent of the EGS market in 2010. Water equipment and chemicals and solid waste management are the second- and third-largest segments in terms of revenue, although solid waste is estimated to be the second-largest employer, with about 7,000 jobs in Chile"[102].

Environmental-related employment represents a major challenge for countries to adapt their educational and training systems to new requirements in this area. According to experts, all professions need to incorporate environmental variables in the future. The viewpoint of the German Federal Institute for Vocational Training (Bundesinstitut für Berufsbildung, BIBB) is that jobs related to the environment have a guarantee of future.[103]

Today, many existing professions require knowledge and skills pertaining to the environment, without being classified as "environmental professions". For example, architects must be

[99] Worldwatch Institute Report "Green Jobs: Towards decent work in a sustainable, low-carbon world", commissioned by UNEP, ILO, IOE and ITUC, Nairobi. September 2008, page 7
[100] OECD: "Green Growth Strategy Synthesis Report". Paris, 31 January 2011, page 63
[101] Case Study "Chile Environmental Industry 2011", produced by Environmental Business International, Inc. and Nathan Associates Inc. for the United States Agency for International Development (USAID), October 2011, page 6
[102] Case Study "Chile Environmental Industry 2011", produced by Environmental Business International, Inc. and Nathan Associates Inc. for the United States Agency for International Development (USAID). Washington, October 2011, page 6
[103] Revista "Natur", n° 7, 1996, Grasbrunn, Germany, page 102

knowledgeable about thermal insulation, and car mechanics must know that used oil is classified as hazardous waste and must be disposed of properly. Moreover, new occupational profiles have emerged that attempt to respond to the demands of the environmental market, such as “environmental consultant”, “environmental manager” or “solar technician”.

In Chile, education and training in these areas has increased significantly in recent years. Universities offer a fairly wide range for careers related to environmental issues, such as "environmental engineering", "landscape engineering", "marine biology", "pedagogy in natural sciences", "ecotourism", etc. There is also a wide range of environment-related postgraduate, such as "Master in Environmental Planning and Management", "Master of Regional Development and Environment", "Masters in Natural Resource Economics", etc. Also, the private technical institutions (Instituto Profesional, IP and Centro de Formación Técnica, CFT) offer training in environmental issues.

According to the experiences of some developed countries, renewable energies and energy efficiency (especially in homes and buildings) are going to be the “big winners” with respect to the creation of green jobs. In addition, there are a host of new challenges and opportunities, such as storage and distribution of renewable energy, management of integrated water cycles (water reuse, desalination, efficient irrigation), integrated management of eco-systems, ecological transport systems, the cross-section of clean production technologies, organic farming, sustainable tourism, demand for consultants (life cycle analysis of products and processes, measurement and verification of carbon footprint, water footprint, carbon certification, advice on Clean Development Mechanism, etc.). These and other areas are also the challenges and opportunities of Chile in the context of a transition to a greener economy.

Many of the mentioned professions require primarily an engineering science education or education in natural sciences. However, not always is necessary to train experts with high academic standards. A lot of small and medium businesses demand environmental technicians and claim precisely the lack or scarcity of training in this regard.

This is one of the major challenges in Chile, that is, to address the mismatch between education and training of human resources in environment issues and the labor market needs. Also the public sector (at national, regional and municipal level) needs to move in this direction. For example, many officials in charge of public procurement have no greater knowledge of environmental issues.

It is necessary to consider and analyze the positive and negative effects of environmental measures and investments on employment across all sectors. The national and global balance can be positive, that is, environmental protection and cleaner production create and do not destroy jobs.

The changes that companies face in an increasingly globalized and competitive world also affect the labour market in Chile. More pressure is placed on workers and professionals today due to the demand for increased flexibility. Certain work skills have become obsolete, while other new skills are now required by the production and service sectors. Among these, green skills are increasingly important regarding employability, which may be defined as a person´s ability to obtain and/or maintain employment or subsequent jobs throughout his/her working life.

Saving natural resources and reducing pollution necessarily require permanent technological development. R&D is considered the key factor for technological innovations. This is especially true for the so-called "integrated environmental solutions", that is, those technologies that minimized or prevent contamination at its source. According to forecasts, the new eco-efficient technologies will have a significant rise in the coming years and, although it is not yet possible to account for its impact on employment by methodological problems, strong demand is expected for a highly skilled workforce, both in regarding the development and subsequent application of these technologies.

Chile is thus faced with a double challenge: on the one hand, the incorporation of environmental technology in the production processes, which is usually imported technology, but whose installation and maintenance create jobs and necessarily require appropriate education and training. On the other hand, Chile is developing its own environmental technology, which is originally developed for its own environmental needs, but it can also be an area of future exports.104 For example, mining has developed environmental technologies for its sector. In this case, job creation is produced not only in the installation phase but also in the field of production.

As noted above, the investment, both public and private R&D&I (Research & Development & technological Innovation) plays a key role for the adaptation of existing businesses to the environmental requirements and the creation of new enterprises (eco-business), and consequently, the generation of jobs. It should be noted, that the environmental field is a relatively new economic dimension in Chile that affects the labor market. Here we refer to few current data and future expectations of some environmental sectors related to job creation.

Regarding waste collection and recycling, there are “incompatible definitions and a lack of data gathering”[105], which makes it very difficult to give global figures about job creation. Particularly in developing countries, this sector is characterized by a large number of informal collectors, who often work in hazardous conditions. Moreover, this type of work only allows for basic survival. This area is in Chile under development and can be considered an important source of future employment. It opens up a field for the collection, transportation, recycling, treatment and disposal of waste, as well as energy use of organic waste or waste exchange between companies.

There are limited data on the relationship between waste collection, recycling and jobs created. In 2005, a small newspaper article that referred to a study by the University of Chile, but without more information about the source, stated that the area of collection and sale of scrap employed nearly 180,000 people across the country; they perceived an income of between 150,000 and 220,000 Chilean pesos monthly (approximately between 260 and 380 dollars). These revenues are rather low, but above the minimum wage, which achieved in July 2005 127,500 Chilean pesos monthly (approximately 220 dollars).

According to estimates by the International Labour Organization (ILO) in 2012, in Chile, recyclers earn their income from the sale of recycled materials to recycling companies, intermediaries or recycling centers. Many of these waste pickers working in landfills or in the streets.

[104] Alwine Woischnik: “El medio ambiente y su incidencia en la economía, el empleo y la capacitación: con especial referencia al caso de Chile”, published by National Training and Employment Agency (SENCE) / Ministry of Labour and Social Protection. Nota Técnica N° 10. Santiago, Agosto 2005

[105] Michael Renner: “Green Jobs: Working for People and the Environment”. Worldwatch Report publication, October 2008. Summary available at: http://www.worldwatch.org/node/5925

ILO estimates “60,000 recyclers at the country level and some 180,000 people living from this activity. About 60% of the pickers are women.”[106]

There are interesting examples at the local level. Since 2010, the commune of Peñalolén (Metropolitan Region) has developed the campaign "Optimism that transforms - Recycle!", in which collaborates the municipality of Peñalolén, the Foundation Casa de la Paz and the Coca-Cola Foundation. The 14 professional which participate collected 112 tons of solid waste in 3 years, with coverage of about 1,400 families. The objective of this program is that garbage collection aims at social inclusion, as a means for generating economic entrepreneurship in highly vulnerable people, and at the same time having environmental benefits. Along with incomes, the 14 professional recyclers received certificates and new tricycles from the municipality.[107]

In relation to employment in the tourism sector the following should be noted: The tourism industry in general is characterized by many small and few large companies. Also, the impact on employment is higher in the small than in large companies. Companies dedicated to nature-based tourism, rural tourism, agritourism, ethnic tourism, etc., quintessential fall within the small, especially in the micro enterprise, which means that the impact on employment is even greater.

One feature of this segment (birdwatching, rafting, trekking, canopy, etc.) is in fact that they are not massive activities, but more personalized, which means an increase in the need for small-group guides. This implies a great challenge to the education and training of human resources.

The demand for this type of tourism has grown in Chile in recent years, which has meant a wide range of employment creation: construction of small-sized hotels, expansion of infrastructure, information technology management, environmental impact assessment of a project, tourism development planning, specific training for guides and instructors, languages, promotion of local agricultural products, selling of handcrafts, gastronomy, etc.

The fact that still is not possible reliably to quantify (for conceptual and methodological issues) employment created in nature-based tourism or sustainable tourism does not mean that it does not exist or that the amount of employment is not important. Worldwide demand for these new forms of tourism increasingly will have positive effects on employment, especially in the countries receiving this type of economic activity.[108]

Finally, studies elaborated in different countries highlight renewable energies as a key contributor to the following: the improving of energy problems, the fight against climate change, the contribution to economic growth and the creation of a significant number of jobs. In the case of Spain, employment related to renewable energies has multiplied by 30 in only 11 years: from 3,522 in 1998 to 109,368 in 2009[109].

[106] OIT: “Promoción de Empleos Verdes en el Reciclaje (Chile)”. Available at: http://www.ilo.org/santiago/temas/empleos-verdes/WCMS_205393/lang--es/index.htm

[107] http://www.penalolen.cl/noticia/recicladores-de-penalolen-son-certificados-por-la-municipalidad-y-reciben-nuevos-triciclos

[108] Alwine Woischnik: “Turismo de Naturaleza, Empleo y Capacitación: Oportunidades y Desafíos para Chile”, published by National Training and Employment Agency (SENCE) / Ministry of Labour and Social Protection, Nota Técnica, N° 3. Santiago, March 2005

[109] Fundación Biodiversidad and Observatorio de la Sostenibilidad en España (OSE): “Informe Empleo verde en una economía sostenible”. Madrid, 2010

Chile has a high potential regarding any kind of renewable energy, but as exposed the contribution of NCRE to the energy mix is still relatively low. However, by 2013, the Center for Renewable Energies (CER) mainly focuses its efforts to promote NCRE in the country's regions. CER´s Executive Director said: "From north to south, we will focus on self-sufficiency with renewable energy since the entry into force of the Net Billing Act opens the possibility of generating own energy from NCRE, injecting the surplus into the electrical system. Citizens require information to know the details of the benefits of this initiative."[110]

This development will have a positive impact on employment. Probably still not at the stage of production of renewable energy technology, as it is mostly imported technology, but in the construction and maintenance of renewable energy facilities.

Moreover, Chile could diversify this subject. Regarding some countries, like Spain, and in relation to wind energy, this technology was first imported, then the licensed production was developed in their own country, and finally, technology for wind energy has become an important issue for export.

These are not the only areas in which in Chile it will be possible to create jobs related to the environment. The market for environmental goods and services is much broader, and the great needs that Chile has in environmental matters (described in Chapter 1) imply opportunities for job creation and require proper training in environment issues.

[110] María Paz De la Cruz: "Centro de Energías Renovables avanza en la consolidación y financiamiento de las ERNC", in: "Proyecciones económicas", magazine. La Segunda. Santiago, 13 December 2012, page 7

Chapter 3: Local green growth initiatives

Before turning to some local green growth initiatives, it seems interesting to refer to the subject of entrepreneurship in Chile. The Ministry of Economy, Development and Tourism has conducted a survey of microbusinesses in 2011. The study divided four macro zones: Northern Zone, Centre-South Zone, Southern Zone and Metropolitan Region. From the analysis highlights (among others) the following results:[111]

- There are 1.730.000 entrepreneurships in the country: 35% in the Metropolitan Region, 32% in Centre-South Zone, 20% in the Southern Zone and 13% in the Northern Zone.
- Entrepreneurship by necessity: It is quite similar in the four macro zones around 40%.
- Low use of technology: 2% of the entrepreneurship in the Northern Zone have websites, while in the Metropolitan Region reaches 7%.
- Commerce is the most important activity: In the Metropolitan Region the 45% in this sector is entrepreneur. In the remaining areas the importance of commerce followed by agriculture is maintained.
- The informality of entrepreneurs is very high (formally entrepreneur means that his activity is registered in the National Taxation Service); the average of the four macro areas is 59%, highlighting the Southern Zone with the highest percentage (74%).
- In relation to employment generating by entrepreneurs, it is noteworthy that 81% do not hire workers, compared with 19% who employs people through a contract.
- There are no major differences in funding: The majority of businesses funded their startup with own resources in each macro zone.

According to the Global Entrepreneurship Monitor (GEM), developed in 2012 by the Global Entrepreneurship Research Center, Faculty of Economics and Business of the University of Development (UDD, as its acronym in Spanish), Chile has a rate of entrepreneurship in adulthood (18 to 64) of 23.4%. This percentage includes the businesses of up to 3.5 years of existence. In Latin America, Chile is second only to Ecuador with 26.6%. It is notably, that Chile has had an increasing rate of entrepreneurship in recent years, in 2006, the rate was 9.2%.[112] According to the director of this study, in Chile has decreased the entrepreneurship by necessity and has increased the entrepreneurs who create a business because they see an opportunity, a fact that is explained by the good labor market situation.[113]

However, there are many entrepreneurs that could not start, keep up and grow without government help. CORFO, the Chilean Economic Development Agency, which belongs to the Ministry of Economy, is dedicated to promote entrepreneurship, innovation and growth in Chile. The institution has different programs for supporting and financing a wide variety of initiatives, such as Start-Up Chile, Seed Fund and Go to Market. Some of these initiatives have originated at the local level, but managed with the support of CORFO expand nationally and even internationally.

[111] Ministerio de Economía: "El mapa del emprendimiento en Chile. Análisis a partir de los resultados de la encuesta de microemprendimiento (EME) 2011". Santiago, 12 March 2012. Available at: http://sgc.sercotec.cl/ksemilla/Boletin_EME_geografia.pdf

[112] GEM: "Actividad Emprendedora en Chile y el Mundo 2012". Available at: http://www.udd.cl/wp-content/uploads/2013/04/GEM-Chile-2012-Reporte-Actividad-Emprendedora.pdf

[113] Innovación. Available at: http://innovacion.cl/2013/04/chile-tiene-la-tasa-de-emprendimiento-mas-alta-del-mundo/

Also is worth mentioning initiatives such as the Green Start Up Program of the Chile Foundation which organized in 2012 (together with INNOVA CORFO, the municipality of Vitacura and the water supply and treatment company Aguas Andinas) the second version of award winning companies. In 2012, 114 enterprises postulated for this contest.

Lately, many green initiatives at the local and regional level and many eco-businesses have been created, but not all are able to survive. However, only in some years we can have reliable information regarding the existence, for example, for 5 years, of the majority of these new companies.

In this context it is worth noting "Chile Verde", a public-private non-profit organization whose main objective is to spread environmental initiatives and projects of individuals, companies and institutions that are being made around the country level. They have a wide range of actions, such as publication of books (in Spanish and English), a traveling exhibition, a website, a bank of outstanding cases at the regional and local levels, etc.[114]

The following examples are a sample of enterprises which achieve a successful combination between economic and environmental variables - and in some cases even the social dimension- including initiatives at municipal and governmental level.

Metropolitan Region of Santiago
Socio-economic context, environmental situation and management

As at the national level, green growth strategy should be based on a socio-economic and regional environmental analysis. In this subchapter it is not intended to make an exhaustive description of the Metropolitan Region in this regard, but it does point out some important aspects in relation to the three pillars of sustainable development.

The Metropolitan Region of Santiago (RMS) is one of Chile's 15 regions. It is the smallest region in the country (15403.2 km2), but the most populated region with 6,683,852 inhabitants, equivalent to 40.33% of the total population (according to preliminary data from the Census 2012). The RMS is administratively divided into six provinces and 52 communes. The Province of Santiago is one of the six provinces and has 32 municipalities. Between 1970 and 2012 there has been a gradual and significant decrease in the rate of population growth.

According to data collected in the “Regional Development Strategy 2012-2021”, the GDP of the Metropolitan Region in 2010 was equivalent to 44.4% of national GDP. Economic activities were headed by financial services (34.9%), followed by commerce (15.1%), industry (11.6%), etc. Unemployment stood at 7% in the quarter from March to May 2012. Poverty has been reduced significantly in the last 20 years, however, in 2011 there were still 117 camps were lived approx. 4,600 families. The segregation (lack of integration) of socioeconomic groups is one of the characteristics of the RMS, i.e. the upper classes live in exclusive suburbs, while the lower

[114] The books "Chile Verde 2010" and "Chile Verde 2012" can be downloaded from the website http://www.porunchileverde.cl/chile-verde-2012

socioeconomic population concentrates in other suburbs of the city. The Gini index stood at 0.57 in 2009 over the country index at 0.55.[115]

With respect to new enterprises, the Ministry of Economy, Development and Tourism has conducted in 2011 a survey of microbusinesses. According to the results, there are 1.730.000 entrepreneurships at the national level and 605.500 entrepreneurships in the Metropolitan Region (35%).[116]

Regarding the environmental situation, one of the biggest concerns is the air pollution. According to 2007 data, the distribution of particulate matter sources corresponded to transport (34%), industry (27%), residential firewood burning (15%) and other stationary sources (22%). According to the Regional Environmental Strategy of the RMS, the causes that contribute to poor air quality, are "the geographical and meteorological factors specific to the region, as well as its status as capital city and its constant development and growth (industry, automotive park, public transportation, heating, etc.) "117. Add to that the worsening of ventilation during the winter period.

However, are the lowest income communities in the western sector of Santiago (Cerro Navia, Lo Prado, Pudahuel, etc.) that recorded higher levels of air pollution with consequent health problems.

Among the measures are the Prevention and Air Pollution Control Plan for the Metropolitan Region (PPDA, as its acronym in Spanish) from 1998, updated in 2004. The goals are focused on ending the environmental pre-emergency episodes and meet the primary standards118 of air quality. It should be noted that in the RMS operates a Emissions Compensation System: PM compensation for industrial boilers, PM compensation through creation of green areas, compensation CO and NOx removing non-catalytic taxis and converting buses to natural gas, etc.[119]

Regarding water availability are considered three important components: the allocation of water use rights, the available water flow (which depends on local hydrological regimes) and the effects of global climate change implies for the region. According to ECLAC, and on climate change, "the total water deficit (for human consumption and industrial) in the Santiago basin would 6m3/seg. for the period of 2011-2040. This deficit provides an average annual cost of 1.1 million dollars a year, not counting the costs of quality control and effects on agricultural land."[120]

---

[115] Programa de las Naciones Unidas para el Desarrollo (PNUD), Gobierno Regional Metropolitano de Santiago: "Estrategia Regional de Desarrollo 2012-2021. Región Metropolitana de Santiago". Pending final review version. 4 January 2013

[116] Ministry of Economy: "El mapa del emprendimiento en Chile. Análisis a partir de los resultados de la encuesta de microemprendimiento (EME) 2011". Santiago, 12 March 2012, http://sgc.sercotec.cl/ksemilla/Boletin_EME_geografia.pdf

[117] "Estrategía Regional de Medio Ambiente", en el marco de la Estrategia Regional de Desarrollo. Región Metropolitana. Developed by Centro de Estudios de Desarrollo (CED), Santiago, July 2012, pages 70 and 73

[118] Primary standards of environmental quality relate to pollution risks to life or health of the population.

[119] For more information see: http://www.asrm.cl/paginasSegundoNivel/NivelTecnico.aspx?param1=192&param2=113/192&param3=-1

[120] Data published in "Estrategia Regional de Desarrollo 2012-2021", page 37

The soil is affected by a strong urban growth (residential and industrial), on the one hand, and has a high risk of erosion due to deforestation and climate change effects on the other.[121]

Regarding the availability of green areas, data published by the Urban Observatory (Ministry of Housing and Urbanism) demonstrate that all Chilean regions are below of the WHO standard of 9m2/inhabitants. In the case of the Metropolitan Region the green area average is 3.4m2/inhabitants.

Moreover, the availability of green areas has a clear correlation with the socioeconomic status of the communities. Specifically, the municipality of Vitacura in the Metropolitan Region, which has the highest socioeconomic status of the country, the green areas reach 56.2m2/inhabitants, while in the commune El Bosque in the same region, which has one of the lowest income, the green area is 1.8 m2/inhabitants.[122]

In relation to household waste, reuse and recycling of the same has not been developed in an integrated manner in many districts of the RMS. The Ministry of Health, the institution that has the jurisdiction over this type of waste, has several regulations about it. As for industrial waste, it shows the lack of regulations and appropriate spaces for final disposition of these, which has led to illegal dumping, which has damaged soils and surface waters.[123]

Comparing the waste generation per capita by municipalities in the Metropolitan Region it shows that Vitacura (the district with the highest per capita GDP of Chile) generates 2.09 kg/day/inhabitant. In contrast, the municipality of Curacaví, in which economic resources are scarce, the waste generation per capita is 0.54 kg/day/inhabitant.[124] As the Ministry of Environment states, communes with higher incomes do not have waste disposal sites, exporting their waste to other communities.

Air pollution: Clean wood stoves at Temuco, Region IX Araucanía

Temuco is the capital of the Region La Araucanía and is located 670 kilometers on the south of Santiago. It currently has a population of approx. 250,000 inhabitants. In 2011, the Araucanía Region had the highest poverty rate in the country (22.9%), whereas in the case of Temuco reached 19.5% (at the national level stood at 14. 5% in 2011). The unemployment rate in Temuco was 12.6% in 2011 and 12.1% in the Araucanía Region, while the national rate was 7.7% in 2011.[125]

Moreover, Temuco is one of the most polluted cities in Chile mainly because of the use of wood for heating purposes, often with high moisture content, by its population. In June 2013, for a few days an environmental emergence was declared and the use of firewood was banned.

However, to reduce air pollution the Ministry of Environment is implementing several measures, one of which is the replacement of highly polluting stoves through more efficient and less polluting stoves. Following the entry into force of Atmospheric Decontamination Plan in 2010 its

[121] Estrategia Regional de Desarrollo 2012-2021, pages 40-42
[122] Ministry of Environment: “Official Environment Status Report”, pages 226 and 227
[123] Estrategia Regional de Medio Ambiente, pages 129-130
[124] Ministry of Environment: “Official Environment Status Report”, page 145
[125] Ministerio de Desarrollo Social, Chile: “Encuesta de Caracterización Socioeconómica Nacional (CASEN), 2011”

establish the replacement of 12,000 stoves. This policy can boost local production of cleaner heating systems and the production of a higher quality biomass fuels.

It should be emphasized that burning of wood is carbon neutral, but if not dealt with local externalities, the alternatives will be the consumption of fossil fuels, and therefore CO2 emissions. Firewood consumption is a cultural and social issue too because the low price of this energy source.

Soil contamination: Tailings basin clean up at Andacollo, Region IV Coquimbo

Through Supreme Decree No. 8 of 2009, the Ministry General Secretary of the Presidency declared the locality Andacollo and the surrounding areas as saturated zone because particulate matter PM10 (as 24-hour concentration and annual concentration).[126] This area has a population of approx. 10,300 inhabitants.

An emissions inventory prepared by the National Environmental Center (CENMA, its acronym in Spanish) in 2011, estimated that 78% of the emissions are caused by mining activities. As the main source of emissions was identified truck traffic. On the other hand, the emissions generated in the city of Andacollo correspond to powder suspension because of traffic, followed by emissions generated by wind action in the mine tailings.[127]

Mining companies have initiated actions to progress in solving the problem of pollution from mine tailings. One of the initiatives of the company Minera Teck is the implementation of the project "Recovery of Abandoned Tailings Contaminated Soils". The project, which was submitted to the Environmental Impact Assessment Agency (SEA, its acronym in Spanish) involves an estimated investment of approx. US$ 1 million. The first step is the recovery of the land, followed by the creation of public use areas. In the case of Minera Dayton, the company will implement in cooperation with the Ministry of Environment the "Sanitation Program of Abandoned Tailings in the Andacollo commune", which includes tailings extraction (because the content of mercury), landscape restoration and closure of one of tailings.[128]

The significant investments related to the described initiatives can involve the creation of a significant number of jobs. In addition, it will encourage the development of skills that can be used to implement similar projects in other locations.

Climate change: Electricity for remote communities, Region X Los Lagos

According to the governmental Center for Renewable Energies (CER, by its acronym in Spanish), in 2013, six remote communities will have electricity through the use of photovoltaic solar energy. Until now, they have obtained power only through expensive equipment that operates with diesel. These communities, located in the Region X Los Lagos in southern Chile, are very difficult to access. To one of them, the small port of Huellelhue, it is only possible to arrive it by sea or by land

[126] http://seia.sea.gob.cl/archivos/729_Antecedentes_Generales.pdf
[127] CENMA: "Diagnóstico de Calidad de Aire y Medidas de Descontaminación para Andacollo. Solicitado por la Ilustre Municipalidad de Andacollo". Santiago, 2011
[128] Minería Chilena (magazine): "Plan de Descontaminación de Andacollo. Tras la búsqueda de un aire limpio", N° 377, November 2012. Available at: http://www.mch.cl/revistas/index_neo.php?id=2426

along a path on foot or horseback between 4 and 6 hours, and depending on the weather conditions.[129]

The communities will benefit from the project "Provision of micro power generation solutions based on NCRE for very isolated families from the Region". More than 60 families will have electricity generated by solar panels installed in homes and community halls. The costs of this project are 400 million pesos (approx. US$ 842.000). Financing is done through the Solidarity and Social Investment Fund (FOSIS, by its acronym in Spanish), institution under the Ministry of Social Development, and the Regional Funds of the government. The Center for Renewable Energies, under the Ministry of Energy, is the body that oversees and provides technical support for this social development project.[130]

In our opinion, the case is a good example to show that green growth does not only happen in large environmental technology projects. The described project is developed at a very small scale linking environmental, economic and social criteria. This type of project can also provide competitive advantages for local companies to assist its development.

Waste: Organic recycling at the Municipality of La Pintana, Metropolitan Region

The Metropolitan Region of Santiago (RMS) is one of Chile's 15 regions. It is the smallest region in the country (15403.2 km2), but the most populated region with 6,683,852 inhabitants, equivalent to 40.33% of the total population (according to preliminary data from the Census 2012). The GDP of the Metropolitan Region in 2010 was equivalent to 44.4% of national GDP. Economic activities were headed by financial services (34.9%), followed by commerce (15.1%), industry (11.6%), etc. Unemployment stood at 7% in the quarter from March to May 2012. Poverty has been reduced significantly in the last 20 years, however, in 2011 there were still 117 camps were lived approx. 4,600 families. The segregation (lack of integration) of socioeconomic groups is one of the characteristics of the RMS, i.e. the upper classes live in exclusive suburbs, while the lower socioeconomic population concentrates in other suburbs of the city. The Gini index stood at 0.57 in 2009 over the country index at 0.55.[131]

The RMS is administratively divided into six provinces and 52 communes. The Province of Santiago is one of the six provinces and has 32 municipalities. La Pintana, with approx. 182,600 inhabitants, is a commune which average low income (until 2009 was the poorest commune in the Metropolitan Region).

About 19% of organic waste generated by inhabitants of the municipality of La Pintana is recycled. Organic waste, which is more than 50% of the total waste of the commune, is collected by a municipality truck and taken to compost where a large part is transformed by earthworm into

[129] http://cer.gob.cl/blog/2013/05/seis-localidades-extremas-de-los-lagos-seran-electrificadas-gracias-a-energias-renovables-no-convencionales/

[130] CER. Available at: http://cer.gob.cl/blog/2013/05/seis-localidades-extremas-de-los-lagos-seran-electrificadas-gracias-a-energias-renovables-no-convencionales/

[131] PNUD, Gobierno Regional Metropolitano de Santiago: “Estrategia Regional de Desarrollo 2012-2021. Región Metropolitana de Santiago”. Pending final review version. Santiago, 4 January 2013

humus. Thus, ten kilos of waste are reduced into humus of 1.6 kilos, which is used as fertilizer to increase green areas and also for the plant nursery in the municipality.[132]

The commune, which began that experience 10 years ago, is the country´s leading municipality in this area. However, this initiative was not generated by environmental awareness, but by economic necessity of the municipality. Reducing waste means important savings for the municipality, due to fewer tons reaching landfills, and because each square meter of green area is maintained at a lower cost.

Today, and after an awareness campaign, 35 tons per day of vegetables are collected that involve a saving of 350,000 pesos (approx. US$ 700) a day to the municipality. The humus produced by the earthworm reaches a price of 20,000 pesos per kilo (approx. US$ 40). Additionally, the municipality recycles used oil collected from homes and businesses. This transforms 100 liters of oil (the daily) in 100 liters of biodiesel that is used as an additive in the commune collection trucks.[133]

The exemplary work of La Pintana in environmental innovation has received significant recognition nationally and internationally. The commune has positioned itself as a leader in the implementation of a successful management model regarding its ecosystem, involving the community. According to the Department of Environmental Management (Dirección de Gestión Ambiental) of the municipality, the development of technical strategies and policies have allowed to strengthened environmental vision in terms of the Local Agenda 21.[134]

Biodiversity: Huilo -Huilo Biological Reserve, Region XIV Los Ríos

Huilo Huilo Biological Reserve is a private protected area in the middle of the Patagonian Andes and in the heart of the rainforest Valdivian Eco-region.135 The reserve covers 100,000 hectares of unique nature, with a great diversity of endemic flora and fauna, with glacial lakes, countless rivers and native forests. In 2007, this landscape has been declared a Biosphere Reserve by UNESCO.

The information below is a summary of the presentation by Dr. Alexandra Petermann, Director of the reserve, given at the workshop on "Measuring the Potential of Local Green Growth in Chile", held in Santiago, Chile, in November 2012 and organized by OECD LEED, the Ministry of Environment and the Ministry of Labour and Social Protection.

The land in southern Chile, which was purchased in the early 90s by the Petermann family, was first used for timber industry. The reserve was created in 1999 with the objective to dedicate it to wildlife conservation and ecotourism. The attractions of the reserve include: botanical trail, cultural route, path of spirits, sculpture park, adventure tourism, books that rescue ancestral tradition of native peoples, volcano museum, conservation center for endangered animals, etc.

[132] *Qué Pasa* (magazine): “Verdes por necesidad”. Available at: http://www.quepasa.cl/articulo/actualidad/2012/06/1-8703-9-verdes-por-necesidad.shtml

[133] http://diario.latercera.com/2011/03/03/01/contenido/santiago/32-61132-9-el-exito-del-reciclaje-organico-a-domicilio-en-la-pintana.shtml

[134] For more information see: http://www.digap.cl

[135] The Valdivian rainforest eco-region is one of the 25 most valuable and threatened eco-regions of the planet.

Among several national and international awards highlights the "Virgin Holidays Responsible Tourism Award 2012".

One of the objectives of the managers of the reserve has been the incorporation of community into activities, with the idea of putting in value and rescuing their culture, but also to offer them income related to the conservation of this place and ecotourism offerings. In this context, the inhabitants of nearby communities are engaged in handicrafts (embroidery, wood carvings), beekeeping, etc. and in the sale of their products. The accommodations, built in the forest, have been constructed in complete harmony with the natural environment. Over 90% of people who develop Huilo Huilo constructions are from nearby communities.

Between 2006 and 2010, the average growth of tourism has been 57%. This growth has also enabled overcome the seasonal nature of tourism in this zone. This development has led to an increase of the population of the villages around the reserve. For Panguipulli, commune with a high rate of poverty and unemployment, the population has grown by 5.7% between 2002 and 2012. For the municipalities Neltume and Puerto Fuy, growth has meant 10.3% in the same period.

In many rural areas of Chile the population decreases and moves to the cities due to lack of work. In the described case, the trend is reversed, that is, people return to their villages to be part of sustainable tourism.

Water resources: Biotechnology for waste water with "Biofiltro"

The entrepreneur Matías Sjogren started his business Biofiltro with two people in the Metropolitan Region in 2010. He exposed: "Using an innovative and sustainable process called the BIDAR system, which uses bacteria and earthworm humus to process organic waste in wastewater and industrial liquid waste, the Biofiltro team is able to obtain clean water suitable for irrigation, which accounts for 70% of water usage worldwide. Additionally, in contrast to conventional wastewater and industrial liquid waste treatment systems, which use harsh chemicals and produce harsh pollutants as a byproduct of the purification process, the BIDAR system´s biologically based, chemical-free process instead generates byproducts that can be used as natural fertilizer while allowing treatment plants to save up to 80% on energy costs as compared to conventional technologies."[136]

With the support of CORFO, the Chilean Economic Development Agency, Biofiltro has been able to grow and expand, now has 50 employees, is present in three continents and has patents in more than 35 countries. The company has received several international awards, such as the first place in the prestigious Clean Tech Open Silicon Valley Competition.

Matías Sjogren recognizes: "CORFO has helped us to maintain the energy and perseverance needed to launch a business. It´s easy to feel alone in this process, but knowing that we have the support of an institution like CORFO gives us the energy to keep putting in the effort that all start-ups need in order to become successful businesses."[137]

[136] CORFO: "Clean Water for All". Available at: http://www.english.corfo.cl/press-room/success-stories/clean-water-for-all
[137] Idem

Green growth at Organic Vineyards Emiliana, Region VI O´Higgins

According to José Guilisasti, general manager of Organic Vineyards Emiliana (belonging to Concha y Toro), the vision and philosophy of this company is to produce high quality wines under the concept of sustainability through organic and biodynamic agriculture138. This concept is applied since the mid-2000s, and today, company data indicate 861 hectares of grapevines free of chemicals and approx. 50 hectares of grapevines that are in transition to organic cultivation.139 As the company explains, organic and biodynamic wine is demanded especially in markets of European countries.

In this context, Organic Vineyards Emiliana was certified with "Demeter", an association formed in Germany that certifies biodynamic quality of products in more than 40 countries. Since 2009, the company publishes an annual sustainability report, prepared according to the GRI (Global Reporting Initiative) methodology.

However, the company's commitment goes far beyond, including workers, communities and consumers. In 2011, Emiliana was certified under the fairtrade concept FLO (Fairtrade Labelling Organization). Between the Catholic University of Chile and the company exists an agreement in which people of vineyard´s surrounding towns receive training courses. All the children of their workers receive a scholarship to study. Workers have been granted land to have a garden where learning urban organic farming and eat more healthy food. The company gave part of his land to nearby towns to which young people can play sports. The company also offers courses for their workers to apply energy saving at home.[140]

OECD LEED representatives and a group of international experts could observe these experiences in a visit of the vineyard "Los Robles" (Region VI O´Higgins), where have been explained different environmental progresses: carbon free in the production phase, use of lighter glass bottles to reduce CO2 emissions in transport by sea and land, measuring of the water footprint, use of renewable energy such as biomass and solar energy, use of biodiesel (5%) on tractors, energy savings through the replacement of bulbs, put into practice the principle of 3Rs (Reduce, Recycle and Reuse).

Emiliana's vision has open to the company new markets of high payer consumers that weight heavily the environmental performance of producers and has cut down them costs regarding energy consumption.

[138] The biodynamic agriculture was founded by the Austrian philosopher Rudolf Steiner (1861-1925) as a method of organic farming which interrelated soil, plants and animals through a holistic vision. It uses an astronomical sowing and planting calendar. This concept has influenced in an important manner the development of modern organic farming.
[139] CCV: "El mayor viñatero orgánico del mundo". Reportage about José Guilisasti, general manager of Vineyard Emiliana. Available at: http://www.ccv.cl/reportajes_datos.php?id_reportaje=235
[140] Interview with José Guilisasti and María de la Luz Tirado, Sustainability Manager, by Alwine Woischnik, Chilean Ministry of Environment. Santiago, 9 January 2013

Chapter 4: Measuring green growth progress at a local level

To improve the process of designing and implementing public policies is important to have systematized information available timely and efficiently. In turn, it is important to define a set of indicators for adequate monitoring of such policies.

According with ECLAC, indicators provide information about complex and dynamic changing processes in a synthesize manner. With appropriate indicators, public authorities who monitor processes may forward trends and avoid undesirable results. Those who implement policies can measure their effectiveness, can calibrate instruments and programs and focus efforts in a timely manner. Indicators can also provide the means to define the expected outcomes and to establish goals using an objective metric. [141]

Some OCDE countries do not yet count with national green growth indicators. Moreover, indicators defined by countries that do count with this instrument many times cannot allow international comparison. The OECD is aware of this problem and states that "monitoring progress towards green growth requires indicators based on internationally comparable data"[142], but declares also that "what is true for most indicators also holds for green growth indicators: they are always limited in *some* respect and, in particular in international comparisons, they need to be interpreted within a country-specific context in mind"[143]. In order to monitor the process towards green growth, the OECD has proposed a set of indicators, which are grouped into five areas presented in table 3[144]. In the case of Chile, this information is available for selected green growth indicators on the OECD website statistics section (http://stats.oecd.org/).

Although national green growth indicators are a key instrument to monitor progress, local indicators must also be proposed. An indicator is a variable that displays meanings that are not immediately apparent when presented properly contextualized and described depending on the value assumed at a time, a particular territory, sector and other context relating aspects[145]. Consequently, to adequately monitor progress at local level efforts must be put in measuring progress also regarding sectorial and territorial context.

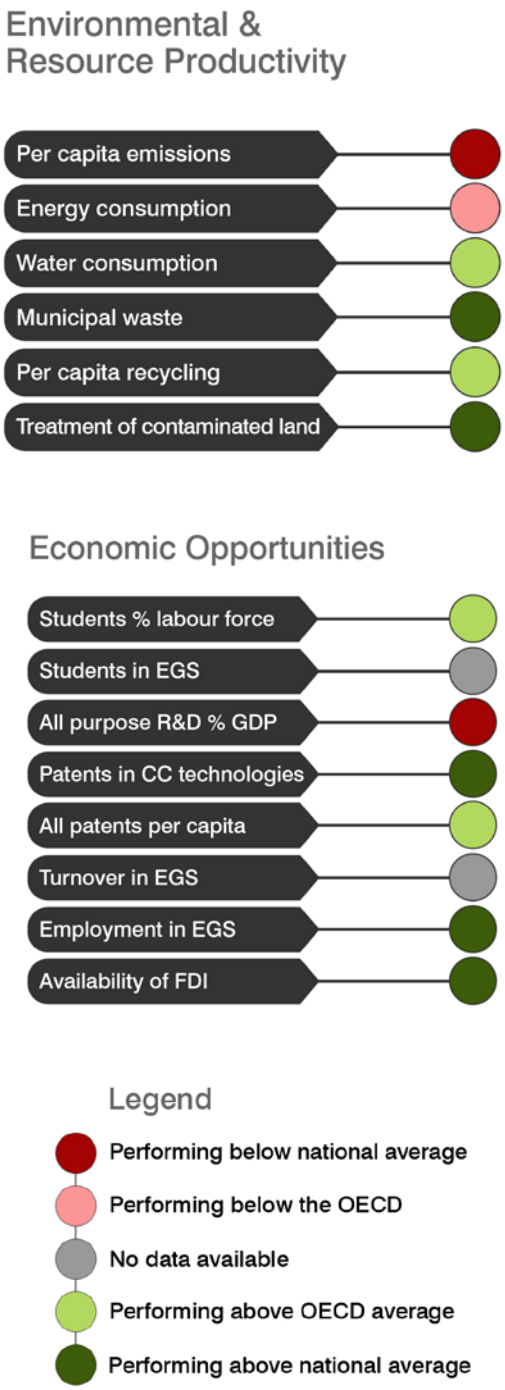
[141] CEPAL, 2009. *Guía metodológica para desarrollar indicadores ambientales y de desarrollo sostenible.* Serie Manuales No 61. Santiago de Chile, junio de 2009.
[142] http://www.oecd.org/greengrowth/greengrowthindicators.htm
[143] OECD: "Monitoring Progress Towards Green Growth OECD Indicators". Draft. Paris, February 2011, page 10
[144] OECD-LEED: "Green growth in the Benelux: Indicators of local transition to a low-carbon economy in cross-border regions". Paris 2013, page 92
[145] CEPAL, 2009. *Guía metodológica para desarrollar indicadores ambientales y de desarrollo sostenible.* Serie Manuales No 61. Santiago de Chile, junio de 2009.

Table 3: OECD Indicator groups and themes

Indicator groups	Topics covered
1.The environmental and resource productivity of the economy	- Carbon and energy productivity - Resource productivity: materials, nutrients, water - Multi-factor productivity
2.The natural asset base	- Renewable stocks: water, forests, fish, resources - Non-renewable stocks: mineral resources - Biodiversity and ecosystems
3.The environmental dimensions of quality of life	- Environmental health and risks - Environmental services and amenities
4.Economic opportunities and policy responses	- Technology and innovation - Environmental goods and services - International financial flows - Prices and transfers - Skills and training - Regulations and management approaches
5.Socio-economic context and characteristics of growth	- Economic growth and structure - Productivity and trade - Labour markets, education and income - Socio-demographic patterns

There is growing evidence that the transformation of industries and regional and local ecosystems to a low-carbon economy can bring opportunities for job creation, development of skills and green entrepreneurship oriented to new areas of growth and fostering new technologies towards commercialization and new forms of production and services. Although we still lacking a solid empirical foundation (even more at the regional and local level) on key indicators for which data can be available at sub-regional levels several pilot experiences suggest a "dashboard" data visualisation tool is useful to take the indicators one step further for policy prioritization. The dashboard tool splits indicators into two categories: *i)* environmental and resource efficiency; and *ii)* economic opportunities (see example from Brandenburg, Germany, below).

Figure 5. Schönefelder Kreuz dashboard[146]



[146] See full report at http://www.oecd.org/cfe/leed/lowcarbon.htm

The development of indicators requires the construction and maintenance of statistics and the availability of an integrated system with continuous flows of information to update this process over time. Basic statistics for calculating indicators are constructed from data using a predefined set of statistical procedures derived from national standards and international statistical recommendations. The basic statistical series are then a set of data that has been subjected to a thorough statistical validation process, which have been structured according to a proper classification. A primary component of statistics is that they must be fully described and supported by metadata. [147]

In this regard Chilean Environmental Law has features that are valuable tools to contribute to these purposes. Article 70 of Law 19.300 on General Bases of the Environment establishes the requirement of developing state of the environment reports every four years at national, regional and local levels[148]. However, once a year should present a consolidated report on the environmental situation at national and regional levels (Law 19.300 Article 70 ñ).

In parallel, the Ministry of Environment is working on improving the National Environmental Information System (Article 31 ter of Law 19.300), so that is the main gateway to environmental information in the public sector of the country. Along with this process, it is seeking to provide all public environmental information available at the public sector. To this end, the Ministry implemented a metadata catalog consisting on maps, documents, indicators and databases, information that can be consulted and downloaded from its web page that follows Geonetwork, Dublin Core and ISO 19115 standards to construct its metadata system. The Ministry has also initiated a process to undertake the elaboration of environmental accounts at national, regional and local levels.

To conclude, in the case of Chile, indicators need to be developed for local/regional transition to a low-carbon economy, and also for local/regional transition to a low-pollution and resource-efficient economy. Table 4 presents selected additional indicators per region and sector that could be integrated in the dashboard tool and pursue the data needed at local level.

[147] CEPAL, 2009. *Guía metodológica para desarrollar indicadores ambientales y de desarrollo sostenible.* Serie Manuales No 61. Santiago de Chile, junio de 2009.

[148] In 2012 it was published the "Official Environment Status Report 2011" according with the model pressure-state-response propose by OECD (http://www.mma.gob.cl/1304/w3-article-52016.html).

Table 4: Selected local indicators per region and sector

Subject	Location	Sector	Indicators	Metric
Air Pollution	Temuco (IX Region Araucanía)	Residential	Less polluting stoves sales	#/year
			Dry firewood consumption	m3/year
			Pellet consumption	m3/year
			Certified companies for dry firewood	#/year
			Air pollution private and public Investments	USD/year
			Related Patents	#/year
			Related Employment	#, % total workforce
Soil Contamination	Andacollo (IV Region Coquimbo)	Mining	Tailings removed	tons, Ha
			Minerals recovered	Cu, Au Kg/year
			Soil contamination private and public Investments	USD/year
			Creation of public use areas	m^2
Climate Change	Remote communities (X Region Los Lagos)	Energy	Beneficiary families	#/year
			Solar FC Install Capacity	MW
			Climate Change private and public Investments	USD/year
Waste	La Pintana (Region Metropolitana RM)	Residential	Organic waste	t/year
			Recycled organic waste	% total waste
			Cost savings	USD/year
Biodiversity	Huilo-Huilo (XIV Region Los Ríos)	Tourism	National visitors	#/year
			International visitors	#/year
			Related Employment	#, % total workforce
Water Resources	Rural areas	Residential	Waste Treatment Coverage	% of total Population
			Water resources private and public Investments	US$
			Related Patents	#/year

List of Acronyms

AChEE	Agencia Chilena de Eficiencia Energética
APEC	Asia-Pacific Economic Cooperation
APL	Acuerdo de Producción Limpia
CCV	Corporación Chilena del Vino
CENMA	Centro Nacional del Medio Ambiente
CEP	Centro de Estudios Públicos
CEPAL	Comisión Económica para América Latina y el Caribe
CER	Centro de Energías Renovables
CIE	Comité de Inversiones Extranjeras
CNE	Comisión Nacional de Energía
CNIC	Consejo Nacional de Innovación para la Competitividad
COCHILCO	Comisión Chilena del Cobre
CODELCO	Corporación Nacional del Cobre
CONAMA	Comisión Nacional del Medio Ambiente
CONICYT	Comisión Nacional de Investigación Científica y Tecnológica
CORFO	Corporación de Fomento de la Producción
CPL	Consejo Nacional de Producción Limpia
DIRECON	Dirección General de Relaciones Económicas Internacionales
ECLAC	Economic Commission for Latin America and the Caribbean
FTAs	Free Trade Agreements
GEF	Global Environment Facility
GEM	Global Entrepreneurship Monitor
GHG	Greenhouse Gas
IMD WCC	IMD World Competitiveness Center
INE	Instituto Nacional de Estadísticas
NAMA	Nationally Appropriate Mitigation Action
NCRE	Non-Conventional Renewable Energies
OECD	Organization for Economic Co-operation and Development
OIT	Organización Internacional del Trabajo
PAEE	Plan de Acción de Eficiencia Energética
PNUD	Programa de las Naciones Unidas para el Desarrollo
PPDA	Plan de Prevención y Descontaminación Atmosférica
PPEE	Programa País Eficiencia Energética
REP	Responsabilidad Extendida del Productor
SEA	Servicio de Evaluación Ambiental
SONAMI	Sociedad Nacional de Minería
UNDP	United Nations Development Programm

References

AChEE (Agencia Chilena de Eficiencia Energética). *Más de $7 mil millones se destinarán en 2013 para impulsar la eficiencia energética en el país.* Available at: http://www.acee.cl/noticia/m%C3%A1s-de-7-mil-millones-se-destinar%C3%A1n-en-2013-para-impulsar-la-eficiencia-energ%C3%A9tica-en-el-0

AChEE, 2013. *Ministerio de Energía lanza Sello de Eficiencia Energética para Empresas.* Available at: http://www.acee.cl/noticia/ministerio-de-energ%C3%ADa-lanza-sello-de-eficiencia-energ%C3%A9tica-para-empresas

Allard, Francisco. Secretaría de Turismo / Ministerio de Economía. Presentation at the workshop *Measuring the Potential of Local Green Growth in Chile.* Organized by OECD-LEED, the Chilean Ministry of Environment and the Chilean Ministry of Labour and Social Protection. Santiago, 29-30 November 2012

Areaminera (magazine). *Rafael Lorenzini: APL aporta a la seguridad de la pequeña minería.* 4 January 2011. Available at: http://www.aminera.com/revistas-mineria-chile/29948-rafael-lorenzini-director-ejecutivoapl

APEC / Ministry of Environment, Chile. Workshop *Green Public Procurement in the Asia-Pacific Region: Challenges and Opportunities for Green Growth and Trade.* Jakarta, Indonesia, January 31 and February 1, 2013

Banco Central Chile, 2012. *GDP*. Available at: http://www.bcentral.cl/estadisticas economicas/publicacionesestadisticas/trimestrales/pdf/CuentasNacionales_cuarto_trimestre2012.pdf

Banco Mundial, 2011. *Chile. Diagnóstico de la gestión de los recursos hídricos.* Santiago, 31 March 2011

Biblioteca de Congreso Nacional de Chile. *Estrategia Nacional de Cambio Climático.* Available at: http://www.bcn.cl/carpeta_temas_profundidad/temas_profundidad.2007-04-11.5841476988/Estrategia%20nacional%20_2006.pdf

Bleischwitz, Raimund. Wuppertal Institute. *Eco-innovation – putting the EU on the path to a resource and energy efficient economy*. Workshop at the ITRE Committee of the European Parliament. Brussels, 6 October 2009

Brandt, Ragnar. Ministerio de Vivienda y Urbanismo. *Construcción Sustentable.* Presentation at the workshop *Measuring the Potential of Local Green Growth in Chile.* Organized by organized by OECD-LEED, the Chilean Ministry of Environment and the Chilean Ministry of Labour and Social Protection. Santiago, 29-30 November 2012

Bruyninckx, Hans. *Green growth and innovation.* Presentation at the OECD-LEED workshop "Measuring the Potential of Local Green Growth in Chile". Organized by OECD-LEED, the Chilean

Ministry of Environment and the Chilean Ministry of Labour and Social Protection. Santiago, 29-30 November 2012

CCV (Corporación Chilena del Vino). *El mayor viñatero orgánico del mundo.* Reportage about José Guilisasti, general manager Vineyard Emiliana. 2007. Available at: http://www.ccv.cl/reportajes_datos.php?id_reportaje=235

CCV. Interview. President Andrés Pérez Cruz. 2013. Available at: http://www.ccv.cl/noticias_datos.php?id_noticia=1670

CENMA (Centro Nacional del Medio Ambiente). *Diagnóstico de Calidad de Aire y Medidas de Descontaminación para Andacollo. Solicitado por la Ilustre Municipalidad de Andacollo*. Santiago, 2011

CEP (Centro de Estudios Públicos): *Estudio Nacional de Opinión Pública*. N° 67, July-August 2012

CEPAL (Comisión Económica para América Latina y el Caribe), 1997. *Comercialización de los derechos de agua en Chile.* Santiago, December 1997. Available at: http://www.eclac.cl/cgibin/getProd.asp?xml=/publicaciones/xml/7/4617/P4617.xml&xsl=/ddpe/tpl/p9f.xsl&base=/tpl/top-bottom.xslt

CEPAL/OECD, 2005. *Evaluaciones del desempeño ambiental. Chile*. Available at: *www.eclac.cl/publicaciones/xml/2/21252/lcl2305e.pdf*

CEPAL, 2012. *La Economía del Cambio Climático en Chile.* Santiago, May 2012

CEPAL, 2009. *Guía metodológica para desarrollar indicadores ambientales y de desarrollo sostenible.* Serie Manuales No 61. Santiago de Chile, junio de 2009

CER (Centro de Energías Renovables). *Reporte anual 2012.* Available at: http://cer.gob.cl/sobre-las-ernc/datos-y-estadisticas/

CER. *Seis localidades extremas de Los Lagos serán electrificadas gracias a energías renovables no convencionales.* Available at: http://cer.gob.cl/blog/2013/05/seis-localidades-extremas-de-los-lagos-seran-electrificadas-gracias-a-energias-renovables-no-convencionales/

Chile Green Building Council. Newsletter. December 2012. Available at: http://www.chilegbc.cl/user/noticias/Newsletters%20Chile%20GBC.pdf

Chile Verde. *Chile Verde 2010* (book) and *Chile Verde 2012* (book). Available at: http://www.porunchileverde.cl/chile-verde-2012

CIE (Comité de Inversiones Extranjeras). *Estadísticas IED en Chile, 2009-2012.* Available at: http://www.inversionextranjera.cl/

CNE (Comisión Nacional de Energía). *Informe final de evaluación Programa País de Eficiencia Energética.* Santiago, August 2008. Available at: http://www.dipres.gob.cl/595/articles-38654_doc_pdf.pdf

CNIC (Consejo Nacional de Innovación para la Competitividad). International Evaluation Panel. *Evaluation Report of National Innovation Strategy for Competitiveness, Chile*. Santiago, 10 March 2010

CODELCO (Corporación Nacional del Cobre). *Estándares Ambientales y Comunitarios. Proyecto Estructural Medio Ambiente y Comunidades*. Santiago, March 2012

CONAMA (Comisión Nacional del Medio Ambiente). *Análisis general de impacto económico y social de una norma de termoeléctrica.* Santiago, 2009

CONICYT (Comisión Nacional de Investigación Científica y Tecnológica). *The wine and vine grape production sector in Chile. Research capabilities and science & technology development areas*. Santiago, June 2007

Consorcio Vinos de Chile. *Código Nacional de Sustentabilidad de la Industria Vitivinícola Chilena.* Available at: http://sustentavid.org

CORFO (Corporación de Fomento de la Producción). *Clean Water for All*. Available at: http://www.english.corfo.cl/press-room/success-stories/clean-water-for-all

CPL (Consejo Nacional de Producción Limpia). *Reconocimiento mundial a esfuerzos de Chile para combatir el cambio climático.* Available at: http://www.produccionlimpia.cl/link.cgi/Noticias/1820

De la Cruz, María Paz. *Centro de Energías Renovables avanza en la consolidación y financiamiento de las ERNC*. Published by *Proyecciones económicas* (magazine). La Segunda. Santiago, 13 December 2012

Diario Pulso. Newspaper. *117% aumentó la cantidad de reportes de sustentabilidad en los últimos cinco años*. Santiago, 10 April 2013

DIRECON (Dirección General de Relaciones Económicas Internacionales). *Acuerdos Comerciales Vigentes.* Available at: http://www.direcon.gob.cl/acuerdo/list

Environmental Business International, Inc. and Nathan Associates Inc. *Case Study Chile Environmental Industry 2011.* Commissioned by the United States Agency for International Development (USAID), Washington D.C., October 2011

Fundación Biodiversidad and Observatorio de la Sostenibilidad en España. *Informe Empleo verde en una economía sostenible.* Madrid, 2010

GEF (Global Environment Facility). *Support to Aichi Target 9: Strengthening National Invasive Alien Species Mngt. in Chile.* Available at: http://www.thegef.org/gef/news/support-aichi-target-9-strengthening-national-invasive-alien-species-management-chile

GEM (Global Entrepreneurship Monitor). *Actividad Emprendedora en Chile y el Mundo 2012.* Available at: http://www.udd.cl/wp-content/uploads/2013/04/GEM-Chile-2012-Reporte-Actividad-Emprendedora.pdf

Gobierno de Chile. *Cifras de Empleo: Período 2010-2013.* Available at: http://www.gobiernodechile.cl/especiales/cifras-de-empleo-periodo-2010-2013/

IMD World Competitiveness Center, 2013. *IMD World Competitiveness Rankings 2013.* Available at: http://www.imd.org/news/World-Competitiveness-2013.cfm

INE (Instituto Nacional de Estadísticas). *Nueva encuesta suplementaria de ingresos.* Available at: http://www.ine.cl/canales/chile_estadistico/mercado_del_trabajo/nene/nesi/archivos/resultados2011/nota_estadistica_nesi_2011.pdf

Innovación, Chile. *Chile tiene la tasa de emprendimiento más alta del mundo.* Available at: http://innovacion.cl/2013/04/chile-tiene-la-tasa-de-emprendimiento-mas-alta-del-mundo/

La Segunda. Ruta de la Sustentabilidad (magazine). *Chile se aproxima a tener una distinción propia de turismo sustentable.* Santiago, 21 November 2012

La Segunda, Ruta de Sustentabilidad (magazine). *Empresas involucran a trabajadores para disminuir su huella de carbono*. Santiago

Lira, Valentina. *Para los mercados la huella del agua será el próximo paso natural*. In: La Segunda. Ruta de la Sustentabilidad (magazine). Santiago, 28 March 2012

Minería Chilena (magazine). *Plan de Descontaminación de Andacollo. Tras la búsqueda de un aire limpio*. N° 377, November 2012. Available at: http://www.mch.cl/revistas/index_neo.php?id=2426

Ministerio de Desarrollo Social, Chile: *Encuesta de Caracterización Socioeconómica Nacional (CASEN), 2011.* Santiago

Ministerio de Economía, Fomento y Turismo, Chile, 2012. *El mapa del emprendimiento en Chile. Análisis a partir de los resultados de la encuesta de microemprendimiento (EME) 2011*. Santiago, 12 March 2012. Available at: http://sgc.sercotec.cl/ksemilla/Boletin_EME_geografia.pdf

Ministerio de Economía, Fomento y Turismo, Chile, 2012. *Chile gana con la aprobación de la Nueva Ley de Pesca y Acuicultura.* Available at: http://www.economia.gob.cl/2012/12/19/chile-gana-con-la-aprobacion-de-la-nueva-ley-de-pesca-y-acuicultura.htm

Ministerio de Economía, Fomento y Turismo, Chile, 2012. *Informe de Resultados. Encuesta de Gasto en Investigación y Desarrollo. Análisis a partir de la 2° Encuesta Nacional de Gasto y Personal en Investigación y Desarrollo (I+D), 2009-2010*. Santiago, July 2012

Ministerio de Educación, Chile, 2013. *Cómo llegamos a ser una comunidad educativa sustentable. Educación para el Desarrollo Sustentable*. Santiago, March 2013

Ministerio de Energía, Chile. *National Energy Strategy 2012-2030.* Available at: http://www.minenergia.cl/documentos/estudios/national-energy-strategy-2012-2030.html

Ministerio de Energía, Chile. *Balance Nacional de Energía 2009.* Santiago

Ministerio del Medio Ambiente, Chile, 2012. *Official Environment Status Report 2011.* Available at: http://www.mma.gob.cl/1304/articles-52016_OEnvironmentSReport.pdf

Ministerio del Medio Ambiente, Chile, 2012. *Análisis general de impacto económico y social de la norma de emisión del anteproyecto norma de emisión para fundiciones de cobre y fuentes emisoras de arsénico.* Santiago, 2012

Ministerio del Medio Ambiente, Chile, 2012. *Análisis general del impacto económico y social de la aplicación de nuevas normas de emisión para vehículos livianos a nivel nacional.* Santiago, 2012

Ministerio del Medio Ambiente, Chile, 2012. *Análisis general del impacto económico y social de la aplicación de nuevas normas de emisión para vehículos medianos a nivel nacional.* Santiago, 2012

Ministerio del Medio Ambiente, Chile, 2012. *Análisis general del impacto económico y social de la aplicación de nuevas normas de emisión para vehículos pesados a nivel nacional.* Santiago, 2012

Ministerio del Medio Ambiente, Chile. *SEREMI del Medio Ambiente cambiará más de mil ochocientas estufas gracias a programa de recambio de calefactores a leña en viviendas de Temuco y Padre Las Casas.* Available at: http://www.mma.gob.cl/1304/w3-article-53171.html

Ministerio del Medio Ambiente, Chile. *Eje transversal: Educación Ambiental.* Available at: http://www.mma.gob.cl/1304/w3-propertyvalue-16234.html

Ministerio del Medio Ambiente, Chile. *SNCAE, Sistema Nacional de Certificación Ambiental de Establecimientos Educacionales*. Available at: http://www.mma.gob.cl/educacionambiental/1319/w3-propertyvalue-16354.html

Ministerio de Minería, Chile. *Desafíos Energéticos de la Minería*. Workshop *Energías Renovables No Convencionales para la minería*. Santiago, 4 August 2011

Ministerio de Minería, Chile. *Chuquicamata inicia operaciones de la primera planta solar en el desierto del país*. Press release. Santiago, 13 June 2012

Ministerio de Minería, Chile. *Demanda de energía eléctrica de la minería del cobre se duplicará al año 2020*. Press release. Santiago, 29 August 2012

Ministerio de Salud, Chile. *Aire. Compensación de Emisiones*. Available at: http://www.asrm.cl/paginasSegundoNivel/NivelTecnico.aspx?param1=192&param2=113/192&param3=-1

Moguillansky, Graciela; Salas, Juan Carlos y Cares, Gabriela. *Capacidad de innovación en industrias exportadoras de Chile: la industria del vino y la agroindustria hortofrutícola*. Published by CEPAL, Serie comercio internacional, N° 79. Santiago, November 2006

OECD.StatExtracts. *GDP.* Available at: http://stats.oecd.org/Index.aspx?DataSetCode=EO92_INTERNET

OECD, 2009. *Declaration on Green Growth.* 25 June 2009. Available at: http://acts.oecd.org/Instruments/ShowInstrumentView.aspx?InstrumentID=70&InstrumentPID=67&Lang=en&Book=False

OECD, 2009. *Major world economies aim for ´green growth´ as the way out of the crisis*. Available at: http://www.oecd.org/document/63/0,3343,en_2649_201185_43164671_1_1_1_1,00.html

OECD, 2010. Studies on SMEs and Entrepreneurship. *SMEs, Entrepreneurship and Innovation.* Paris,

OECD, 2011. *Green Growth Strategy Synthesis Report*. Paris, 31 January 2011

OECD, 2011. *Monitoring Progress Towards Green Growth OECD Indicators.* Draft. Paris, February 2011

OECD, 2011. *Towards Green Growth*. Paris

OECD, 2011. *Green Growth at the OECD: Selected areas of ongoing work*. Paris

OECD, 2012. *Better Life Index Chile.* Available at: http://www.oecdbetterlifeindex.org/countries/chile/

OECD, 2012. *Green Growth Knowledge Platform.* Paris, February 2012

OECD, 2012. *Water quality and agriculture: meeting the policy challenge.* Paris, March 2012

OECD, 2013. Green Growth Paper. *What have we learned from attempts to introduce green-growth policies?* Paris, March 2013

OECD. *Green growth indicators.* Available at: http://www.oecd.org/greengrowth/greengrowthindicators.htm

OECD-LEED. *Project on Measuring the Potential of Green Growth. Indicators of Local Transition to a Low-Carbon Economy.* Available at: www.ecd.org/cfe/leed/projects

OECD-LEED, 2013. *Green growth in the Benelux: Indicators of local transition to a low-carbon economy in cross-border regions*. Paris, 2013

OIT (Organización Internacional del Trabajo). *Promoción de Empleos Verdes en el Reciclaje (Chile)*. Available at: http://www.ilo.org/santiago/temas/empleos-verdes/WCMS_205393/lang--es/index.htm

Petermann, Alexandra. *Reserva Biológica Huilo Huilo. Un Destino Sustentable.* Presentation at the workshop *Measuring the Potential of Local Green Growth in Chile.* Organized by OECD-LEED, the Chilean Ministry of Environment and the Chilean Ministry of Labour and Social Protection. Santiago, 29-30 November 2012

PNUD (Programa de las Naciones Unidas para el Desarrollo). *Informes Nacionales sobre Desarrollo Humano para Chile.* Available at: http://hdrstats.undp.org/es/paises/perfiles/chl.html

PNUD. Gobierno Regional Metropolitano de Santiago. *Estrategia Regional de Desarrollo 2012-2021. Región Metropolitana de Santiago*. Pending final review version. Santiago, 4 January 2013

Qué Pasa (magazine). *Verdes por necesidad.* Available at: http://www.quepasa.cl/articulo/actualidad/2012/06/1-8703-9-verdes-por-necesidad.shtml

Registro Empresas Certificadas. Chile. Available at: www.registrocdt.cl

Renner, Michael: *Green Jobs: Working for People and the Environment*. Worldwatch Report publication. October 2008. Summary available at: http://www.worldwatch.org/node/5925

Rodriguez, Manuel, 2002. Gestión ambiental en América Latina y el Caribe. Bogotá, Colombia.

Secretaría de Turismo / Ministerio de Economía, Chile. *Estrategia Nacional de Turismo 2012-2020*. Santiago, January 2013

SONAMI (Sociedad Nacional de Minería). *Memoria Anual 2010-2011.* Available at: http://www.sonami.cl/digital/memoria/memoria20112012/

Todovinos. *Chile: Industria del vino pierde competitividad.* 29 October 2012. Available at: http://www.todovinos.cl/noticias/4164-chile-industria-del-vino-pierde-competitividad

Triebswetter, Ursula and Wackerbauer, Johann: *Struktur und Entwicklung der Nachfrage auf dem Umweltschutzmarkt.* In: *Die Umweltwirtschaft in der Region München*. IFO-Institut für Wirtschaftsforschung. München, May 2005

Woischnik, Alwine. *Turismo de Naturaleza, Empleo y Capacitación: Oportunidades y Desafíos para Chile*. Published by National Training and Employment Agency (SENCE) / Ministry of Labour and Social Protection, Chile. Nota Técnica N° 3. Santiago, March 2005

Woischnik, Alwine. *El medio ambiente y su incidencia en la economía, el empleo y la capacitación: con especial referencia al caso de Chile*. Published by National Training and Employment Agency (SENCE) / Ministry of Labour and Social Protection, Chile. Nota Técnica N° 10. Santiago, Agosto 2005

Woischnik, Alwine. Interview with José Guilisasti, general manager of vineyard Emiliana, and María de la Luz Tirado, sustainability manager of Emiliana. Santiago, 9 January 2013

Worldwatch Institute Report. *Green Jobs: Towards decent work in a sustainable, low-carbon world*. Commissioned by UNEP, ILO, IOE and ITUC. Nairobi, September 2008

Annex A
Note on contributors

Dr. Cristina Martinez-Fernandez is a Senior Policy Analyst on Employment and Skills, Green Growth and Southeast Asia at the Organisation for Economic Co-operation and Development (OECD), Local Economic and Employment Development (LEED) Programme. She works on issues related to the challenges of skills and training systems for SMEs, entrepreneurial and innovation activities; industrial policy, climate change and the transformation of labour markets into the low-carbon economy; and the challenges of demographic change and an ageing society for skills and employment development. Cristina also manages the OECD/LEED initiative on Employment and Skills Strategies in Southeast Asia (ESSSA). Before joining the OECD she was an Associate Professor at the Urban Research Centre, University of Western Sydney in Australia where she led the Urban and Regional Dynamics Program, which analyses industry change, urban performance and socio-economic development within the frameworks of innovation, globalisation and the knowledge economy.

Dr. Samantha Sharpe is Principal Research Fellow at the Institute for Sustainable Futures, University of Technology Sydney. Her research focuses on regional economic development, innovation and technology development within firms, and science-based commercialisation of technology. Science and technology policy, particularly in the areas of green technology and economic development policy, are of ongoing research interest. Outcomes of this research are policy development and industry advice around the support of innovative activity in places, the incubation of new technology, and the role public policy can play in the "green economy" in establishing emerging markets for environmental technologies and services, particularly in energy efficiency and renewable energy.

Dr. Alwine Woischnik has a Ph.D. in Economics and Social Sciences from the University of Nuremberg/Germany and a Master in Environmental Management of Enterprises from the Autónoma University of Madrid/Spain. In Spain she has been (among others) member of the governmental Advisory Council of Environment and coordinator of the Environmental Department of the trade union UGT. In Chile she worked first in the Labour Ministry regarding the relationship between employment and environment. After this period she began her professional activity in the National Commission of Environment (CONAMA), now Ministry of Environment, where she is Sustainability Coordinator in the Division of Information and Environmental Economics. Her main thematic areas are: "Sustainable Public Procurement", "Social and Environmental Responsibility of the Public Sector", "Eco-business and Green Jobs", "Green Growth" and "Eco-innovation". On these issues also has extensive university teaching and publications.

Cristóbal de la Maza studied at the Pontifical Catholic University of Chile in which he got his degree as an Industrial Civil Engineer with a Diploma in Transportation. His main area of research is social evaluation of environmental policies using tools such as cost-benefit. He has been consultant for public institutions such as CONAMA, PNUD and SECTRA. Also he has worked as a professor at University Andrés Bello on subjects such as Transport Economics and Transportation Technology. He currently works at the Ministry for the Environment of Chile in charge of the Division of Information and Environmental Economics. Under his responsibility are tasks such as cost-benefit analysis of quality standards, emission standards and decontamination plans; economic instrument design and implementation; and the management of environmental statistics. Currently his efforts are focus on the design of emission trading schemes, extended producer responsibility framework legislation, green public procurement policy, the design of a national eco labeling system, the development of environmental indicators, and the publication of reports on the state of the environment. Cristobal has extensive work on sustainable development, advising the Minister for the

Environment at Rio+20 summit. He has recently being appointed Board member of 10 Year Framework of Programmes on Sustainable Consumption and Production (10YFP) and Board member of the Renewable Energy Center of Chile.

Annex B

Workshop Summary Note and Agenda

Summary Note

The OECD LEED Programme, the Ministry of Environment of Chile, and the Ministry of Labour and Social Protection of Chile co-organized a workshop on "Measuring the potential of local green growth in Chile". The event, which took place in Santiago, Chile, on 29th and 30th of November 2012, was focused on measurable indicators for a local transition to a low-pollution, low-carbon and resource-efficient economy in different regions of Chile and centered on three sectors: construction, tourism, and firewood consumption and production.

Mr. Sergio Arzeni, Director OECD CFE, Dr. Cristina Martínez, Senior Policy Analyst OECD LEED, Professor Hans Bruyninckx from the University of Leuven, Belgium, and Dr. Lutz Franzke, Mayor of Königs-Wusterhausen in Brandenburg, Germany, were part of the OECD delegation. Experts from other international organizations such as the World Bank, ECLAC, ILO, UNEP, CAF, IADB participated in the workshop along with several high officials from the co-organizing ministries, as well as a wide range of public Chilean institutions such as the Ministries of Economy, Energy, Agriculture, Tourism (SERNATUR), Foreign Affairs (DIRECON), CPL, CORFO, CODELCO, Fundación Chile, etc. There were also representatives from the private sector (FEDETUR; EUROCHILE, Corparaucanía, Huilo Huilo Biological Reserve), universities, trade unions, embassies and NGOs. Information on the event and presentations can be found on the OECD website Indicators of Local Transition to Low-Carbon Economy.

The two-day workshop was opened by Mr. Leonel Sierralta, Undersecretary (s) from the Chilean Ministry of Environment. The introductory session was conducted by Dr. Cristina Martínez, OECD LEED, and Dr. Alwine Woischnik, Chilean Ministry of Environment.

The first part of the meeting covered conceptual approaches such as "green growth and innovation", "greening production and consumption", "green entrepreneurship", and "green jobs and green skills".

Then, experts in the topic presented theme notes about "sustainable tourism", "sustainable construction", and "consumption and production of firewood", focused in the items (1) Environmental assets, (2) Green production and consumption, (3) Green jobs and skills, (4) Sustainable strategies for local public and private actors. The discussion in the roundtable sessions also has been focused on these regional/local and sectoral issues. Experts and participants tried to identify measurable indicators for a local transition to a low-pollution, low-carbon and resource-efficient economy.

Theme 1: SUSTAINABLE TOURISM, considering environmental assets, green production and consumption, green jobs and skills, and sustainable strategies for local public and private actors.

According to the National Tourism Strategy 2012-2020, Chile was visited by over three million international tourists in 2011. The contribution of tourism to GDP is estimated at 3.2%, hoping the government that this figure is doubled rising to 6% in 2020. Optimistic prospects accentuate and emphasize the comparative advantages the country has: a natural and cultural wealth, security, and economic and political stability.

Many of the foreign tourists are attracted by the nature of the country. The most important natural assets in Chile include volcanoes, islands, glaciers, the highland lakes, deserts, the Patagonia part, the valleys and the sea. Chile´s tourism depends entirely on the quality of these environmental assets.

Some actors were particularly concerned about the issue of sustainability. According to them, on the most important tourism fairs in the world, Chile is not qualified as a sustainable destination, but it is most well known as a nature-based tourism. There are some positive examples of sustainable tourism, but they are considered individual and isolated efforts and not the result of a joint policy.

For this reason, the Federation of Tourism Enterprises Chile (FEDETUR) and the Secretariat of Tourism (Ministry of Economy) have teamed up to develop the theme of sustainability for tourism services. Regarding this new label system, there were three local destinations identified as pilot projects: Easter Island, the Cajon de Maipo (near Santiago) and Lake Llanquihue (Region Los Lagos in the south). Sustainability encompasses the three fundamental pillars and concrete indicators:

- The economic analysis of sustainable management includes: economic viability, local prosperity, jobs related to tourism, quality and visitor/resident satisfaction, and supply policy.

- The environmental analysis of sustainable management includes: tourist territory management, water management, energy management, waste management, biodiversity conservation and carbon footprint.

- The socio-cultural analysis of the sustainable management includes: the contribution to local development, community welfare, development of supply of cultural elements, and protection of historical and cultural heritage.

In relation to employment in the tourism sector should be noted that companies dedicated to nature-based tourism, quintessential fall within the small, especially in the micro enterprise, which means that the impact on employment is even greater than in large companies. One feature of this segment is precisely that they are not mass activities, but more personalized, which implies a challenge to the education and training of human resources. In this sense, it is necessary to reduce the gap between the supply of training institutes and the demand from touristic enterprises for qualified personal.

The fact that we still cannot reliably count (for conceptual and methodological issues) the employment created in nature-based tourism or sustainable tourism does not mean that the number of employment is not important. Increasing worldwide demand for these new forms of tourism will have increasingly positive effects on employment, especially in the countries receiving this type of tourism.

Theme 2: SUSTAINABLE CONSTRUCTION, considering environmental assets, green production and consumption, green jobs and skills, and sustainable strategies for local public and private actors.

Construction has a high impact on the environment, i.e. it is the sector that produces more waste than any other economic activity. As for energy, the construction sector accounts for 26% of final energy consumption in Chile, of this, 81% corresponds to the residential sector. However, there are no data on how the quality of environment affects the building sector, i.e., how air pollution influences in construction.

The greatest potential for action is in existing homes, because less than 2% of homes built meet the minimum of thermal requirements. Since some years the State has promoted energy efficiency, creating a label for energy efficiency in homes.

In order to incorporate sustainable criteria in construction, in August 2011 it was signed the Sustainable Construction Ministerial Agreement between the Ministry of Public Works, Housing and Urban Development, and the Ministries of Environment and Energy. These ministries and other public and private organizations are working to create the National Strategy for Sustainable Construction.

Innovation and technological development are considered key for the sustainability of the sector. The sector of construction may be the economic activity which has the greatest potential with respect to different

kind of savings (energy, water, material). In this sense, the aforementioned ministries are working with INNOVA/CORFO (Ministry of Economy) to create a program of innovation and entrepreneurship in sustainable construction.

Regarding indicators related to sustainable construction, there is not a baseline. The medium-term goal is that Chile will be a country with a new standard of construction and cities where sustainability is real. Regarding this, it is necessary to identify and develop precise and measurable indicators to assess the development of each of the initiatives, in an individually and jointly manner.

However, we have first indicators: according to data from Chile Green Building Council, in the last two years the demand for LEED certification has tripled. Specifically, today there are 25 LEED149 certified buildings, 158 registered projects and the first LEED Platinum building.

At the local level, sustainable construction is mostly found in tourist accommodations, which are built with characteristics materials of each region. It is known that especially foreign tourists looking for authentic and naturally construction. However, there is no information on the amount of typical regional buildings.

Regarding skills of qualified personnel, it is observed that in many universities do not exists a specific curricula for sustainable construction, and professional institutes lack a wide offer for technicians in this new area. Moreover, failure to properly define what is meant by the term "green job" in order to develop relevant indicators.

Theme 3: CONSUMPTION AND PRODUCTION OF FIREWOOD, considering environmental assets, green production and consumption, green jobs and skills, and sustainable strategies for local public and private actors.

The projections of economic growth in Chile for the next years (approx. 4% in 2013) involve a high energy demand, raising the need for an adequate and efficient energy supply, both in the context of sustainable development and economic growth.

In this context, production and consumption of firewood acquire special meaning in Chile as an important energy source in rural and residential areas of several regions from the center to the south: from Region VIII Biobío, Region IX Araucanía, Region XIV Los Ríos, Region X Los Lagos to Region XI Aysén – but of different intensity. According to estimates, firewood accounts for approx. 20% of the country´s energy supply.

In recent years, problems associated with the production and consumption of firewood have become more evident, both in the environmental area (air pollution, forest sustainability) and public health (primarily pollution within the households). Emissions from burning firewood in the center-south of Chile are largely responsible for the high concentrations of PM10 and PM2.5, the most harmful particles. Health costs because the contamination provoked by firewood burning have been estimated at approx. 270 million dollars per year.

It should be emphasized that burning of wood is carbon neutral, but if not dealt with local externalities, the alternatives will be the consumption of fossil fuels, and therefore CO2 emissions. Firewood consumption is a cultural and social issue too because the low price of this energy source.

To reduce the negative effects associated with the production and consumption of firewood, significant efforts have been made lately, which can be measured through indicators for the local level, but still there are no studies about it.

[149] LEED (Leadership in Energy and Environmental Design) is an internationally recognized program for green buildings. LEED addresses the entire lifecycle of a building.

Measurable advances through indicators can be (amongst others): improvements in air quality (PM 10, PM 2.5), implementation of new cleaner technology (market share cleaner heating equipment and change out of existing stoves), thermal insulation of existing homes, growth of entrepreneurs engaged in the sale of dry firewood, creation of "green jobs" associated with dry firewood production and heating technology, capacity building (new skills), etc.

Concluding panel

First of all, indicators need a systemic approach, a systemic perspective. This applies to any productive sector and also to the local level. I.e., in construction must be considered in terms of sustainability, the materials, infrastructure, buildings, green areas, education and training, etc.

On the other hand, we need realistic and feasible indicators to measure the progress of local transition to a low-pollution, low-carbon and resource-efficient economy. This means not many or too ambitious indicators with which cannot be met but a few relevant indicators.

It is important to measure economic opportunities, i.e., what level of research and development invested in green innovation (efficient stoves) is required. Or what is the intensity of green jobs or green training programs. In this sense, it is necessary to consider green training and green jobs as a system.

On the way to a greener economy it is key to include local authorities, above all, the mayors and to coordinate policies and programmes with different levels of government and different Ministries involved. With respect to indicators, we can measure the capacity of local institutions to promote policies and green initiatives.

Finally, the first step should be a dialogue among all stakeholders. And together, make a diagnosis and establish a prospective. That is, where we are, what data we have at the national, regional and local level, where we want to go as a society considering the horizon of a green economy, a green growth. This is a big challenge for OECD countries in general and Chile in particular.

OECD Workshop
MEASURING THE POTENTIAL OF LOCAL GREEN GROWTH IN CHILE
Indicators of local transition to a low-pollution, low-carbon and resource-efficient economy

Regional and sectorial approaches:
Sustainable Tourism – Sustainable Construction – Consumption and Production of Firewood

Santiago, Chile, 29th -30th November 2012

Agenda

Organised by

OECD LEED Programme, Ministry of Environment of Chile,
Ministry of Labour and Social Protection of Chile

Hosted by

The Ministry of Environment of Chile and the Ministry of Labour and Social Protection of Chile

Background

Chile continues to experience an increasing integration into the world economy, which implies, among others, that export companies are facing increasing environmental requirements. The environment has become a key aspect of competitiveness in international markets.

Furthermore, to improve the environmental quality of the country requires great efforts to reduce pollution of different types, as well as an efficient use of resources, followed by the reduction of greenhouse gas emissions.

In turn, Chile's OECD membership presents additional challenges, both in the context of changing patterns of production and consumption, and in the framework of a more sustainable economy. Specifically, green growth emphasizes improving growth rates, particularly through greening existing industries, as well as through new eco-businesses.

This process involves the creation of qualified jobs that require appropriate education and vocational training for greening jobs and skills.

The workshop will try to apply this background to the sectors "tourism", "construction", and "firewood consumption and production", focusing on different regions of Chile. In all these areas the Government of Chile has taken important commitments and is making significant efforts – together with other stakeholders – to move towards sustainability in these and other sectors.

In this context, Chile needs to identify measurable indicators for a local transition to a low-pollution, low-carbon and resource-efficient economy.

The workshop and the related case study are proposed within the framework of the OECD Green Growth Strategy. The results of the whole OECD-LEED project – especially the above mentioned indicators – will be the base for different regional and local decision makers.

More information on the project can be found at this website: www.oecd.org/cfe/leed/lowcarbon.htm.

Venue: Hotel Gran Palace, Huérfanos 1178, Santiago, Chile

■ Thursday, 29th November 2012

Morning Session	
8:30 – 9:00	*Arrival and registration*
9:00 – 9:30	**Welcome and Opening** Leonel Sierralta, Undersecretary of the Ministry of Environment (s) Bruno Baranda, Undersecretary of the Ministry of Labour and Social Protection Sergio Arzeni, Director, OECD Centre for Entrepreneurship, SME´s and Local Development and Head, OECD LEED Programme
9:30 – 10:30	**Introduction Session** ■ **The OECD project on ´Measuring the Potential of Green Growth´** Dr. Cristina Martínez, Senior Policy Analyst, OECD LEED Programme ■ **The case of Chile** Dr. Alwine Woischnik, Sustainability Coordinator, Ministry of Environment
10:30 – 11:00	*Coffee break*
11:00 – 13:30	**Conceptual approaches** (approx. 15 min. for each presentation) ■ **Green growth and innovation** Prof. Dr. Hans Bruyninckx, HIVA- University of Leuven, Belgium ■ **Greening production and consumption** Mara Murillo, Subdirector, Regional Office for Latin America and the Caribbean, United Nations Environmental Programme (UNEP) ■ **Green entrepreneurship** Humberto Salinas, Pi-Partner Group, EmprendeVerde, Chile ■ **Green jobs and green skills** Linda Deelen, Specialist Enterprise and Local Economic Development, International Labour Organization (ILO) **Chair**: José Luis Samaniego, Director, Sustainable Development Division, Economic Commission for Latin America and the Caribbean (ECLAC) ***Questions and Answers***
13:30 – 15:00	*Lunch*
Afternoon Session	
15:00 – 15:15	**Explanation of presentations and roundtable sessions** Experts in the art will present theme notes about “sustainable tourism”, “sustainable construction”, and “consumption and production of firewood”, focused in the items: quality of the environment; environment-related research and innovation; environmental policy; environmental requirements in international markets and voluntary measures; greening production and consumption, with emphasis on eco-labels; challenges and opportunities for small and medium enterprises; creation of green jobs and challenges for green skills. The next step will be to work in roundtable sessions. The roundtable sessions are one of the primary forms suggested by OECD for data collection for the local case studies. Each sector and selected regions will be analyzed according to the following issues: 1. Green environmental assets. 2. Greening production and consumption. 3. Green jobs and skills for transition to a low-pollution, low-carbon and resource-efficient economy. 4. Sustainable strategies for local public and private actors. There are three one-hour and 15 minutes sessions on this program with eight working groups. Two working groups ran in parallel each time. Each session will serve to invite participants to respond to the material they have heard in the presentations before (theme notes) and first suggestions for local indicators of transition for this topic. The local session leader introduces each topical session. Discussions then take place amongst all workshop participants grouped around the tables in order to identify priorities of what matters for local/regional transition and what might be measured. Each table has a discussion leader (facilitator) and a rapporteur, which will present the results of his/her group in the plenary. A member of the OECD expert delegation will also be on each roundtable to welcome participants, pose questions, and add commentary to the roundtable discussions. Then, an expert panel discussion (one by sector) will be focused on identifying measurable indicators for a local/regional transition to a low-pollution, low-carbon and resource-efficient economy.

Roundtable session 1. **Green environmental assets**	**Roundtable session 2.** **Greening production and consumption**
Every region and sector will start the process of transitioning to a low-carbon, low-pollution and resource-efficient economy with different endowments of assets – environmental, industrial and human capital. This roundtable session investigates the environmental assets and addresses issues of environmental quality such as air, soil and water quality, and availability of green spaces and biodiversity. Also how the local areas and sectors contribute to this quality by improvements in different environmental aspects, implementation of innovations, voluntary measures (environmental certifications), etc. The theme notes will present some analysis of the environmental quality of the selected regions and the advances and current situation of the tourism and construction sectors and the firewood area. Key questions to be addressed include: How important are these environmental assets to the selected Chilean regions? How will they assist to local/regional area in transitioning to a low-pollution, low-carbon and resource-efficient future? What are the concrete efforts and advances of the tourism and construction sectors and the firewood area in Chile? Which indicators can be used?	This roundtable examines the local/regional industry base, its links with the wider economic and labour markets to surrounding areas and highlights key competitive advantages. This session will also look at the prevalence of start-up and spinout businesses. On the other hand, this session discuss the potential of the selected sectors and area (tourism, construction and firewood) for “greening” economic development, by increasing economic activities that ensure lower pollution, lower carbon and resource efficiency of production and operation. Identifying emerging opportunities for the region and selected sectors for economic development that do not rely on increased material production and consumption will also be discussed. Key questions to be addressed include: What is the potential of the tourism and construction sectors and the firewood area for “greening” in Chile? What is the potential of other related industrial sectors for “greening”? How will this affect the competitiveness of Chile as a whole? Which indicators can be used to monitor the transition?

	Roundtable session 3. **Green jobs and skills for transition to a low-pollution, low-carbon and resource-efficient economy** The development of new "green" sectors and the "greening" of existing industrial sectors is closely related to the ability of the region to attract and retain the right pool of talent and skills, create the right labour market conditions and support and retain "green know how". Moreover, many work skills have become obsolete, while other new skills are now required by the production and service sectors, which we can observe also in the environmental field. In this context, of special interest in this theme is the situation of green jobs and skills in the tourism and construction sectors, as well as in the firewood area in Chile. On the other hand, this session will examine the operation of local training and skills development organizations regarding this new demand. *Key questions to be addressed include:* What are the characteristics of green jobs and skills in the tourism and construction sectors, and in the firewood area in Chile? What are the challenges of these sectors regarding green jobs and skills? What is the demand of the local/regional labour market about it and does this demand for qualified personnel meet the offer of professionals in the labour market? What support and mechanisms are required for transition to a low-pollution, low-carbon and resource-efficient economy in Chile? Which indicators can be used for monitoring the transition?	**Roundtable session 4.** **Sustainable strategies for local public and private actors** Policy makers and other regional, local and sectorial stakeholders are faced with the challenges of combining a business-friendly and competitive local and sectorial economy that offers employment and skills development opportunities for inhabitants but at the same time protects and enhances the natural environment. *Key questions to be addressed include:* What should the policy priorities be for local/regional public authorities and for enterprises to stimulate a new economy? How do we identify these priorities? What should the role of government and other stakeholders be in understanding and acting on issues such as job creation for young people, access to capital, emissions reduction, environmental protection, and social integration? What are the specific challenges, priorities and necessary support for sectors such as tourism, construction and firewood consumption and production in Chile? Which indicators can be used for monitoring this process?
15:15 – 15:30	**Theme 1: Sustainable Tourism in Easter Island, Center and South of Chile (Regions: Valparaíso, Región Metropolitana, Los Lagos)** Francisco Allard, Sustainability Coordinator, Secretariat of Tourism, Ministry of Economy	
15:30 – 16:45	**Roundtable session related to indicators for sustainable tourism** 1. Green environmental assets 2. Greening production and consumption 3. Green jobs and skills for transition to a low-pollution, low-carbon and resource-efficient economy 4. Sustainable strategies for local public and private actors Facilitator: Mauricio Castro, Professional, National Council for Clean Production (CPL) Expert: Dr. Lutz Franzke, Mayor, Königs-Wusterhausen, Brandenburgo, Germany	
16:45 – 17:00	**Presentation of working groups results**	
17:00 – 17:30	*Coffee break*	

17:30 – 18:30	**Panel session: comments and proposals** Sergio Arzeni, Director, OECD Centre for Entrepreneurship, SME´s and Local Development and Head, OECD LEED Programme Javier Obach, Head Research Division, National Tourism Agency (SERNATUR) Omar Hernández, Coordinator Innovation Programs, Chilean Economic Development Agency (CORFO) Eduardo Katz, Director, Protected Wild Areas, National Forestry Corporation (CONAF) Alexandra Petermann, Biological Reserve Huilo Huilo **Chair:** Eugenio Yunis, Vice-Executive Pres. FEDETUR; Ex-Coordinator Sustainability UNWTO ***Questions and Answers***
18:30	**Closing first day**
Evening Session	
19:00	**Cocktail reception hosted by the Ministry of Environment of Chile**

■ Friday, 30th November 2012

Morning Session	
10:00 – 10:15	**Theme 2: Sustainable Construction in Main Cities** Ragnar Branth, Head Technical Division, Ministry of Housing and Urbanism
10:15 – 11:30	**Roundtable session related to indicators for sustainable construction** 1. Green environmental assets 2. Greening production and consumption 3. Green jobs and skills for transition to a low-pollution, low-carbon and resource-efficient economy 4. Sustainable strategies for local public and private actors Facilitator: Antonia Biggs, Technical Coordinator, Ministry of Environment Expert: Linda Deelen, Specialist Enterprise and Local Economic Development, ILO
11:30 – 11:45	**Presentation of working groups results**
11:45 – 12:15	*Coffee break*
12:15 – 13:15	**Panel session:** Dr. Lutz Franzke, Mayor, Königs-Wusterhausen, Brandenburgo, Germany Juan Pablo Yumha, Professional, Ministry of Housing and Urbanism Helen Ipinza, Sectorial Adviser, Chilean Economic Development Agency, INNOVA CORFO Javier Hurtado, Head Research Division, Chilean Chamber of Construcción (CChC) Dr. Nicola Borregaard, Manager of Energy and Climate Change, Fundación Chile **Chair:** Mauricio Ilabaca, Adviser Executive Director, National Council for Clean Production (CPL) ***Questions and Answers***
13:15 – 15:00	*Lunch*

Afternoon Session	
15:00 – 15:15	**Theme 3: Firewood Consumption and Production in the South of Chile (Regions: VIII, IX, X, XI – Biobío, Araucanía, Los Lagos, Aysén)** Marcelo Fernández, Head Atmospheric Affairs Office, Ministry of Environment
15:15– 16:30	**Roundtable session related to indicators for firewood consumption and production** 1. Green environmental assets 2. Greening production and consumption 3. Green jobs and skills for transition to a low-pollution, low-carbon and resource-efficient economy 4. Sustainable strategies for local public and private actors Facilitators: Jimena Silva, Atmospheric Affairs Office, Ministry of Environment Expert: Prof. Dr. Hans Bruyninckx, HIVA-University of Leuven, Belgium
16:30 – 16:45	**Presentation of working groups results**
16:45 – 17:15	*Coffee break*
17:15 – 18:15	**Panel session:** comments and proposals Prof. Dr. Hans Bruyninckx, HIVA-University of Leuven, Belgium Govinda Timilsina, Research Economist, Climate Change & Clean Energy, Development Research Group, World Bank Diego Benavente, Executive Director, Corparaucanía Vicente Rodríguez, General Secretary, National System of Firewood Certification (SNCL) Ricardo Katz, Researcher, Center for Public Studies (CEP), Chile Bruno Carriquiry, Adviser, Atmospheric Affairs Office, Ministry of Environment **Chair:** Marcos Serrano, Head Department of Statistics and Environmental Information, Ministry of Environment ***Questions and Answers***
18:15 – 18:45	**Concluding panel** Dr. Cristina Martínez, Senior Policy Analyst, OECD LEED Programme Linda Deelen, ILO Specialist Enterprise and Local Economic Development, International Labour Organization (ILO) Mara Murillo, Subdirector, Regional Office for Latin America and the Caribbean, United Nations Environmental Programme (UNEP) Dr. Alwine Woischnik, Sustainability Coordinator, Ministry of Environment **Chair:** Rodrigo Monardes, Head OECD Department, DIRECON, Ministry of Foreign Affairs
18:45	**Closing** Leonel Sierralta, Undersecretary of the Ministry of Environment (s) Bruno Baranda, Undersecretary of the Ministry of Labour and Social Protection Sergio Arzeni, Director, OECD Centre for Entrepreneurship, SME´s and Local Development and Head, OECD LEED Programme

List of participants

N°	Name	Position	Organisation
1	Aguirre, Militza	Innovation Programme Sustainable Tourism	INNOVA CORFO Chile
2	Allard, Francisco	Sustainability Coordinator, Secretariat of Tourism	Ministry of Economy, Chile
3	Alvarado, Perla	Second Secretary, Head of Economic Affairs and Cooperation	Embassy of Mexico
4	Álvarez, Raúl	Adviser	CODELCO Chile
5	Álvarez, Rolando	Project Director, Climate Change and Sustainability Area	MGC
6	Amar, Francisca	Coordinator Planning and Environment Unit	National Tourism Agency (SERNATUR), Chile
7	Arias, Jennifer	Adviser, Department for International Affairs	Ministry of Finance
8	Arzeni, Sergio	Director of OECD Centre for Entrepreneurship, SME´s and Local Development. Head of OECD-LEED Programme	OECD
9	Baquedano, Verónica	Professional, National Council for Clean Production	CPL Chile
10	Baranda, Bruno	Undersecretary	Ministry of Labour and Social Protection (MINTRAB), Chile
11	Benavente, Diego	Executive Director	Corparaucanía
12	Berríos, Lilia		EUROCHILE
13	Biggs, Antonia	Technical Coordinator, Research Division	Ministry of Environment, Chile
14	Borregaard, Nicola	Manager of Energy and Climate Change	Fundación Chile
15	Boyer, Florence	Head of Innovation Projects, Business Foundation	EUROCHILE
16	Branth, Ragnar	Head Technical Division	Ministry of Housing and Urbanism, Chile
17	Broschek, Roberto	Charge of Economic Affairs	Embassy of Sweden
18	Bruyninckx, Hans, Prof. Dr.	HIVA	University of Leuven, Belgium
19	Calcagni, Paola	Adviser, OECD Department	DIRECON, Ministry of Foreign Affairs
20	Camussi, Ludovico	Head, Economic and Trade	Embassy of Italy

N°	Name	Position	Organisation
21	Carassou, Justine	Office, Consultant, Tourism Department, Business Foundation	EUROCHILE
22	Carriquiry, Bruno	Atmospheric Affairs Office	Ministry of Environment, Chile
23	Carrillo, Francisco	Adviser Undersecretary	Ministry of Labour and Social Protection (MINTRAB), Chile
24	Castro, Mauricio	Professional	National Council for Clean Production (CPL), Chile
25	Conca, Paola	Head Sustainable Trade Department	PROChile
26	De la Cruz, Felipe	Research Division	Ministry of Environment Chile
27	Deelen, Linda	ILO Specialist Enterprise and Local Economic Development	ILO Chile
28	Elgueta, Sebastián	Professional, Department of Environmental Economics	Ministry of Environment
29	Emhart, Cristián	Project Manager, Energy & Climate Change	Fundación Chile
30	Enríquez, Joel	Counselor Trade Affairs	PROMéxico,
31	Espinoza, Raimundo	President	Copper Workers Federation (FTC)
32	Fernández, Marcelo	Head Atmospheric Affairs Office	Ministry of Environment, Chile
33	Fernández-Armesto, Victoria	Lawyer	
34	Franzke, Lutz, Dr.	Mayor	Königs-Wusterhausen, Germany
35	Galán, Lucas		
36	García Mataix, Marta		
37	Giaconni, Carolina	Professional	National Council for Clean Production (CPL), Chile
38	Gómez, Mónica	Researcher	Embassy of Australia
39	Gómez, Rudy	First Secretary and Consul	Embassy of Guatemala
40	Gonzáles, Luis	Adviser	Ministry of Finance
41	Henríquez, Cristián		Institute of Geography Universidad de Chile
42	Henríquez, Osvaldo	Home Office	SUBDERE

N°	Name	Position	Organisation
43	Hernández, Omar		CORFO, Chile
44	Hormazábal, Gloria	Director School of Business and Management	Universidad de Concepción
45	Hurtado, Javier	Head Research Division	Chilean Chamber of Construction (CChC),
46	Ichinohe, Tasuko	Coordinator, Department of Programs	JICA Chile
47	Ilabaca, Mauricio	Adviser Executive Director	National Council for Clean Production (CPL), Chile
48	Ipinza, Macarena	Architect, Purchasing Department	Ministry of Environment, Chile
49	Ipinza, Helen		INNOVA CORFO
50	Katz, Eduardo	Director, Protected Wild Areas,	National Forestry Corporation of Chile (CONAF),
51	Katz, Ricardo	Researcher	Center for Public Studies (CEP), Chile
52	Kneppers, Ben	Project Manager, Energy and Climate Change	Fundación Chile
53	Kobayashi, Toshimi	Sub-Representative and Chief Department of Programs	JICA Chile
54	Kramer, Frank, Dr.	Project Manager	Program ECLAC-GIZ,
55	Leiva, Silvia	Advisers coordinator	Ministry of Labour and Social Protection (MINTRAB),
56	Lemaitre, Guillermo	Head International Affairs Office	CODELCO
57	Lepisto, Hanna	First Secretary	Embassy of Finland
58	Levy, Arlette		National Tourism Agency (SERNATUR), Chile
59	López Calderón, Gustavo	Ambassador of Guatemala	
60	Loyola, Claudio	Head of Public Market	ChileCompra, Ministry of Finance
61	Martínez, Cristina, Dr.	Senior Policy Analyst, Centre for Entrepreneurship, SME´s and Local Development (CFE).	OECD-LEED Programme
62	Monardes, Rodrigo	Head OECD Department	DIRECON, Ministry of Foreign Affairs
63	Morales, Jorge	Professional	National Council for Clean

N°	Name	Position	Organisation
			Production (CPL), Chile
64	Murillo, Mara	Subdirector, Regional Office for Latin America and the Caribbean	United Nations Environmental Programme (UNEP),
65	Nalegach, Constance		International Affairs Office, Ministry of Environment, Chile
66	Obach, Javier	Head Research Division	National Tourism Agency (SERNATUR), Chile
67	Olguín, Juan		Copper Workers Federation (FTC)
68	Ortega, Virginia	Adviser Labour Studies	Ministry of Labour and Social Protection (MINTRAB),
69	Paolillo, Alfredo	Environment Directorate	Development Bank of Latin America
70	Petermann, Alexandra		Biological Reserve Huilo Huilo
71	Pla, Jaime	Adviser	Ministry of Labor and Social Protection (MINTRAB)
72	Prussing, Pablo	Head Office Internacional Affairs	ChileCompra, Ministry of Finance
73	Rivas, Humberto	Professor “School of Ecotourism”, Adviser World Tourism Organization	Universidad Andrés Bello (UNWTO)
74	Rodríguez, Mayo	Head Area Sustainability and Environmental Management	GreenLabUC (DICTUC), Universidad Católica
75	Rodríguez, Vicente	General Secretary	National System of Firewood Certification (SNCL)
76	Rojas, Oscar	Adviser, Foreign Trade Department	Ministry of Economy
77	Román, Beatriz	Adviser Sustainable Tourism, Innovation Programme	INNOVA Corfo
78	Ruz, Ximena	Director, Clean Production Agreements	National Council for Clean Production (CPL), Chile
79	Salinas, Humberto	CEO Co-founder	PiPartner Group EmprendoVerde, Chile
80	Salvador, Jorge	Attaché for Economic and	Embassy of Portugal

N°	Name	Position	Organisation
		Trade Affairs	
81	Samaniego, José Luis	Director of Sustainable Development Division	CEPAL
82	Serrano, Marcos	Head Department of Statistics and Environmental Information	Ministry of Environment
83	Schaeffer, Juan Pablo	General Manager of Corporate Affairs and Sustainability	CODELCO
84	Shee, Álvaro	Professional, Department of Statistics and Environmental Information	Ministry of Environment
85	Siemens, Meike	Coordinator Project LECD, Climate Change Office	Ministry of Environment, Chile
86	Sierra, Daniel	Corporate Manager of Labour Affairs	CODELCO
87	Silva, Jimena	Atmospheric Affairs Department	Ministry of Environment, Chile
88	Smyk, Radoslaw	Second Secretary	Embassy of Poland
89	Tapia, Luis	Research Division	Ministry of Environment, Chile
90	Torrealba, Jaime		SUBDERE Home Office
91	Timilsina, Govinda	Research Economist (Climate Change & Clean Energy), Development Research Group	World Bank
92	Vargas, Carlos	Researcher	
93	Woischnik, Alwine, Dr	Coordinator Sustentability Research Division	Ministry of Environment, Chile
94	Yumha, Juan Pablo		Ministry of Housing and Urbanism (MINVU), Chile
95	Yunis, Eugenio	Vice-Executive President Ex-Coordinator Sustentability	FEDETUR World Tourism Organization (UNWTO),

ABOUT THE OECD

The Organisation for Economic Co-operation and Development (OECD) is a unique forum where the governments of 34 market democracies work together to address the economic, social and governance challenges of globalisation as well as to exploit its opportunities. The OECD's way of working consists of a highly effective process that begins with data collection and analysis and moves on to collective discussion of policy, then decision making and implementation. Mutual examination by governments, multi-lateral surveillance and peer pressure to conform or reform are at the heart of the OECD's effectiveness. Much of the material collected and analysed at the OECD is published on paper or online: from press releases and regular compilations of data and projections to one-off publications or monographs on particular issues; from economic surveys of each member country to regular reviews of education systems, science and technology policies or environmental performance. For more information on the OECD, please visit www.oecd.org/about.

The OECD member countries are: Australia, Austria, Belgium, Canada, Chile, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The European Commission takes part in the work of the OECD.

ABOUT LEED

The OECD Programme on Local Economic and Employment Development (LEED) has advised governments and communities since 1982 on how to respond to economic change and tackle complex problems in a fast-changing world. Its mission is to contribute to the creation of more and better quality jobs through more effective policy implementation, innovative practices, stronger capacities and integrated strategies at the local level. LEED draws on a comparative analysis of experience from the five continents in fostering economic growth, employment and inclusion.

Chile´s Pathway to Green Growth: Measuring progress at local level

OECD
BETTER POLICIES FOR BETTER LIVES

Ministerio del Medio Ambiente
Gobierno de Chile

LEED
BUILDING MORE & BETTER JOBS