

**REPORT** APRIL 2016

## CONSIDERATIONS FOR A CLIMATE FINANCE STRATEGY IN CHILE

**INGRID HOLMES, GABRIELA MOYA, PAULA ROLFFS, DILEIMY OROZCO & TAYLOR DIMSDALE**

---

## ACKNOWLEDGEMENTS

We would like to express our special thanks to Cristián Retamal as a diligent member of this project who contributed through extensive research and stakeholder engagement throughout different stages of this project. We also thank the Minister of Finance of Chile, in particular Jorge Valverde, Marcela Palominos and Sofía Aroca for their participation and comments on this work.

Furthermore, we would like to thank for the helpful contributions of the Stakeholder Group, all interviewees, as well as all those who revised the final report:

Alejandro Miranda, Andrés Alcalde, Angelina Espinoza, Annie Dufey, Brian Heaphy, Carlos Abogabir, Carlos Finat, Christian Patrickson, Christoph Tagwerker, Claudio Alatorre, Claudio Seebach, Cristián Mosella, Daniel Perdómo, Diego Lizana, Fernando Garrido, Hernán Sepulveda, Javiera Alvarado, Jillian van der Gaag, Jorge Gómez, Juan Ladrón de Guevara, Juan Pedro Searle, Leonel Tapia, Luciano González, Manuel Martínez, Mara Angelini, Marcel Silva, Maricel Gibbs, Maritza Jadrijevic, Martha Castillo, Miguel Alarcón, Nicola Borregaard, Oscar Melo, Rodrigo Violic, Rubén Muñoz, Stephan Remler, Tomás Baeza, Ubaldo Elizondo, Viviana Huerta, Ximena Ubilla, as well as all the workshop participants.

Project partners who took part throughout the development of the project:

UK Embassy in Santiago: Heather Goodale.

Ministry of Environment: Jillian van der Gaag (former), Felipe Osses, Fernando Farías, Sophie Siemens (former).

---

## About E3G

E3G is a global, independent, non-profit organisation operating in the public interest to accelerate the global transition to sustainable development. E3G builds cross-sectoral coalitions to achieve carefully defined outcomes, chosen for their capacity to leverage change. E3G works closely with like-minded partners in government, politics, business, civil society, science, the media, public interest foundations and elsewhere. [www.e3g.org](http://www.e3g.org)

Berlin office  
Neue Promenade 6  
Berlin, 10178 – Germany  
Tel: +49 (0) 30 2887 3405

Brussels office  
Rue de la Science 23  
1040 Brussels, Belgium  
Tel: +32 (0)28 93 92 12

London office  
47 Great Guildford Street  
London SE1 0ES, UK  
Tel: +44 (0)20 7593 2020

Washington DC office  
1250 24th Street NW  
Suite 300  
Washington DC , WA 20037  
United States  
Tel: +1 202 466 0573

© E3G 2015

## Copyright

This work is licensed under the Creative Commons Attribution-NonCommercial-ShareAlike 2.0 License.

You are free to:

- > Copy, distribute, display, and perform the work.
- > Make derivative works.

Under the following conditions:

- > You must attribute the work in the manner specified by the author or licensor.
- > You may not use this work for commercial purposes.
- > If you alter, transform, or build upon this work, you may distribute the resulting work only under a license identical to this one.
- > For any reuse or distribution, you must make clear to others the license terms of this work.
- > Any of these conditions can be waived if you get permission from the copyright holder.

Your fair use and other rights are in no way affected by the above.



---

**REPORT** APRIL 2016

# **CONSIDERATIONS FOR A CLIMATE FINANCE STRATEGY IN CHILE**

**INGRID HOLMES, GABRIELA MOYA, PAULA ROLFFS, DILEIMY  
OROZCO & TAYLOR DIMSDALE**

---

# CONTENTS

ACKNOWLEDGEMENTS.....	2
About E3G.....	3
Copyright.....	3
PREFACE.....	11
EXECUTIVE SUMMARY.....	12
1. PROJECT BACKGROUND AND RATIONALE.....	22
1.1 Background.....	22
1.2 Context.....	22
2. OBJECTIVES AND METHODOLOGY.....	26
2.1 Objectives.....	26
2.2 Methodology.....	26
2.3 Overview of data sources.....	27
2.4 Methodology for data collection and analysis.....	29
2.5 Challenges in conducting the research.....	30
3. THE CHILE CHALLENGE.....	31
3.1 Climate change in the context of Chile.....	31
3.2 Overview of the institutional and policy landscape - focus on the electricity and agricultural sector.....	38
4. OVERVIEW OF FINANCE SECTOR AND RESOURCES IN CHILE.....	43
4.1 Introduction.....	43
4.2 National Sources of Finance: role in financing Chile’s INDC.....	45
4.3 International finance.....	53
5. CHILE’S REAL ECONOMY OPPORTUNITIES AND CHALLENGES.....	59
5.1 Successes, challenges and opportunities in mitigating climate change.....	59
5.1a Non-Conventional Renewable Energy.....	62
5.1b. Challenges for the NCRE sector.....	65
5.1c. Energy Efficiency.....	69
5.1d. Challenges for Energy Efficiency.....	71
5.2 Successes, challenges and opportunities in adapting to climate change.....	76
5.2a Agriculture.....	76
5.2b Managing climate risk in the broader economy.....	78
6. CONCLUSIONS ON MOVING FORWARD TO DEVELOP A NATIONAL FINANCE STRATEGY FOR CHILE.....	80
6.1 Chile is not alone.....	80
6.2 Developing an NFS and moving decision making process forward in the short term.....	81

---

6.3 Medium and long term actions towards an NFS .....	91
7. ANNEXES .....	93
Annex I. Institutions interviewed by sector and topic.....	93
Annex II. Stakeholder Group.....	96
Annex III. Workshop participants .....	97
Annex IV. Detailed methodology for data collection and analysis.....	99
Annex V. Ministry of Agriculture (Minagri): list of institutions .....	100
Annex VI. Climate change related plans, policies and initiatives .....	102
Annex VII. Technical assistance / international cooperation .....	106
Annex VIII. Chile’s NAMAs .....	107
Annex IX. Climate change related policies in agriculture .....	109
Annex XI. Forecasted amount of electricity requested via auctions.....	112
Annex XII. Infrastructure investment estimates.....	113
Annex XIII. Potential of solar PV, CSP, wind and hydro in Chile .....	114
Annex XIV. Actors consulted for final report.....	115
8. REFERENCES.....	116

## List of figures

Figure 1 Developing stakeholder-endorsed policy development processes.....	19
Figure 2 Policy objectives planning and implementation.....	20
Figure 3 Short, medium and long term actions towards an NFS.....	21
Figure 4 Approach.....	27
Figure 5 Approach to data collection and analysis.....	29
Figure 6 National institutions involved in climate change planning and policy in Chile	39
Figure 7 Chile’s national plans and examples of policy instruments related to climate change and respective institutions (set out by sector) .....	41
Figure 8 Chile’s climate change mitigation targets, renewable energy and energy efficiency goals and key milestones. ....	42
Figure 9 Public and Private Ecosystem for Low Carbon Finance .....	43
Figure 10 Assets under management by financial intermediaries in Chile .....	44
Figure 11 NCRE investment in Chile by source .....	45
Figure 12 Overview of Chile’s finance system .....	46
Figure 13 Resources in Chile’s Pension System .....	49

---

Figure 14 Pension Funds as % of GDP in 4 Latin-American countries .....	49
Figure 15 NDB activities for attracting private investment .....	53
Figure 16 Top 10 countries by amount approved 2003-2015 .....	55
Figure 17 GCF Results Management Framework .....	57
Figure 18 FDI Flows in Chile per country and sector 2009-2014.....	57
Figure 19 Left: Installed power capacity (17,586 MW). Right: Power generation 2013 (68.050 GWh).....	61
Figure 20 Energy Efficiency under 2°C scenario .....	69
Figure 21 Energy and electricity consumption in Chile (2012) (Total energy consumption left; electricity consumption right).....	70
Figure 22 Gross agriculture and forestry GDP participation (2008) .....	76
Figure 23 Developing stakeholder-endorsed policy development processes.....	84
Figure 24 Policy objectives planning and implementation.....	91
Figure 25 Short, medium and long term actions towards an NFS.....	92
Figure 26 – Investment required in the energy sector 2013 - 2023.....	113
Figure 27 – Total investment required in infrastructure between 2014-2018 and 2014- 2023 .....	113

## LIST OF TABLES

Table 1 Lessons learned from past E3G experience .....	24
Table 2 Overview of banks in Chile by market share.....	47
Table 3 Mitigation and adaptation targets and goals.....	60
Table 4 NCRE potential, installed capacity and capacity under construction in MW (as of January 2016) .....	63
Table 5 Non-financial and financial barriers/challenges to further scaling up NCRE in Chile .....	66
Table 6 Non-financial and financial barriers/challenges as well as consideration related to EE in Chile .....	73

---

---

## ABBREVIATIONS

<b>ACERA</b>	Chilean Renewable Energy Association
<b>ACHEE</b>	Chilean Energy Efficiency Agency
<b>AFP</b>	Pension Fund Administrators
<b>ANESCO</b>	Chilean Energy Efficiency Enterprise Association
<b>BDBs</b>	Bilateral Development Banks
<b>BNEF</b>	Bloomberg New Energy Finance
<b>CADENA</b>	Comité de Ayuda a Desastres y Emergencias Naturales
<b>CAF</b>	Andean Development Corporation
<b>CDM</b>	Clean Development Mechanism
<b>CEPAL</b>	Economic Commission for Latin America and the Caribbean
<b>CER</b>	Certified Emission Reduction
<b>CGIAR</b>	Consultive Group for International Agricultural Research
<b>CIE</b>	Foreign Investment Committee
<b>CIF</b>	Climate Investment Funds
<b>CIFES</b>	Centre for Innovation and Support for Sustainable Energy
<b>CMSCC</b>	Council of Ministers for Sustainability and Climate Change
<b>COP21</b>	the 21st Conference of the Parties
<b>CORFO</b>	Chilean Economic Development Agency
<b>CSP</b>	Concentrated Solar Power
<b>CTF</b>	Clean Technology Fund
<b>DAC</b>	Development Assistance Committee
<b>DCC</b>	Department of Climate Change
<b>DFIs</b>	Development Finance Institutions
<b>EE</b>	Energy Efficiency
<b>EIB</b>	European Investment Bank
<b>ENAP</b>	National Oil Company
<b>ESCO</b>	Energy Service Company
<b>EU</b>	European Union
<b>FDI</b>	Foreign Direct Investment
<b>FIT</b>	Feed-In Tariff
<b>GCF</b>	Green Climate Fund

---



---

<b>GDP</b>	Gross Domestic Product
<b>GEF</b>	Global Environment Fund
<b>GHG</b>	Green House Emissions
<b>GIZ</b>	Deutsche Gesellschaft für Internationale Zusammenarbeit German Corporation for International Cooperation
<b>GWh</b>	Gigawatt hour
<b>ha</b>	Hectare
<b>IEA</b>	International Energy Agency
<b>IFC</b>	International Finance Corporation
<b>ILO</b>	International Labour Organisation
<b>IMF</b>	International Monetary Fund
<b>INDAP</b>	National Institute for Agricultural Development
<b>INDC</b>	Intended Nationally Determined Contribution
<b>IRENA</b>	International Renewable Energy Agency
<b>LECB</b>	Low Emission Capacity Building Programme Chile
<b>LEDS</b>	Low Emission Development Strategies
<b>LEDS GP</b>	Low Emission Development Strategies Globally and for Latin America
<b>LEDS LAC</b>	Low Emission Development Strategies Latin America
<b>LULUCF</b>	Land Use, Land Use Changes and Forestry
<b>MDBs</b>	Multilateral Development Banks
<b>MIGA</b>	Multilateral Investment Guarantee Agency
<b>Minagri</b>	Ministry of Agriculture
<b>MiRig</b>	Geothermal Risk Mitigation Program
<b>MMA</b>	Ministry of Environment
<b>MWh</b>	Megawatt hour
<b>Nafin</b>	Nacional Financiera -Mexico's National Development Bank
<b>NAMAs</b>	Nationally Appropriate Mitigation Actions
<b>NCRE</b>	Non-conventional Renewable Energy
<b>NDBs</b>	National Development Banks
<b>NFS</b>	National Finance Strategy
<b>NPBs</b>	National Public Banks
<b>ODA</b>	Official Development Assistance
<b>ODEPA</b>	Office of Agricultural Studies and Policies

---

---

<b>OECD</b>	Organisation for Economic Co-operation and Development
<b>ONEMI</b>	Ministry of Internal Affairs and Public Security
<b>PANCC</b>	Plan de Acción Nacional de Cambio Climático
<b>PPAs</b>	Power Purchase Agreements
<b>PV</b>	Solar photo voltaic
<b>RE</b>	Renewable Energy
<b>REDD+</b>	Reducing Emission from Deforestation and Forest Degradation
<b>RMF</b>	Result Management Framework
<b>SAC</b>	Catastrophe Agricultural Insurance
<b>SDGs</b>	Sustainable Development Goals
<b>SBIF</b>	Superintendence of Banks and Financial Institutions
<b>SEC</b>	Superintendence of Electricity and Fuels
<b>Sernageomin</b>	Servicio Nacional de Geología y Minería
<b>SIC</b>	Sistema de Interconectado Central
<b>SING</b>	Sistema de Interconectado del Norte Grande
<b>SISCLIMA</b>	Sistema Nacional de Cambio Climático
<b>SME</b>	Small and Medium Enterprise
<b>SP</b>	The Superintendent of Pensions
<b>TCX</b>	Currency Exchange Fund
<b>USD</b>	United States Dollar
<b>UNFCCC</b>	United Nation Framework Convention on Climate Change
<b>WII</b>	Weather Index Insurance

---

---

## PREFACE

Chile is at a critical point in its development and needs to attract new and redirect existing financial resources to make the transition into a low-carbon climate-resilient economy. The country is also facing key challenges related to scarce public funding; economic and social vulnerability related to the impacts of global recession and falls in commodity prices especially for copper, Chile's main export product; and environmental vulnerability due to the increasing threat of climate change. It also needs to make efficient use of international resources given that from 2017 Chile will no longer be eligible for Official Development Assistance (ODA).<sup>1</sup>

Since 2009, E3G has been working with a range of governments to build a systemic understanding of the finance challenge in different regions and help them to develop strategic responses to meeting those challenges. What we have learned is that achieving the necessary scale and pace of sustainable investment needed requires a strong and credible political commitment to build investor confidence in the long-term sustainability of policy frameworks, underpinned by a dynamic and coordinated policy and financing strategy. We call this approach "National Financing Strategies to meet climate and development goals".

A National Finance Strategy (NFS) aims to empower countries to define their overall climate-resilient development objectives and set out potential means to finance them. The focus is on how international and national public finance can be deployed alongside policy initiatives to maximise the 'crowding-in' of private capital to deliver climate-resilient development aims.

This report sets out a framework with which Chile could start to develop its own NFS. It offers recommendations for how this approach could be taken forward – including identifying where further research and dialogue with key stakeholders is needed. The analysis is based on scoping work undertaken in Chile during 2012-2014. This has been supplemented during 2015-2016 with further in-depth analysis and stakeholder consultation to understand the challenges and opportunities for Chile as it moves forward to build a climate-resilient economy. The report provides an overview of the policy and finance landscape in Chile, and analysis of the challenges Chile faces in delivering its low carbon and climate-resilient development objectives, and has a particular focus on the approaches and policy opportunities to mobilise the national/international public/private finance needed to ensure its implementation.

---

<sup>1</sup> In accordance with the Development Assistance Committee (DAC) rules for revision of the DAC List for ODA recipients, Chile exceeded the high income country threshold in 2012 and 2013 and will graduate from the List in 2017 if it remains high income country until 2016. OECD 2015.

---

## EXECUTIVE SUMMARY

In 2015, Chile set itself a target to reduce greenhouse gas (GHG) emissions by 30% per unit of gross domestic product (GDP) by 2030.<sup>2</sup> This is enshrined in its INDC. An NFS is needed to enable Chile to meet its INDC through implementing its Climate Change Action Plan (Plan de Acción Nacional de Cambio Climático – PANCC) and meeting its targets both for mitigation but also adaptation by 2030. The Government has committed to putting this NFS for climate change in place by 2018 and is just at the beginning of considering how to develop it. In the first instance, there needs to be an agreement on what the framework for the NFS should look like – with a shared understanding of what needs to be financed, over what timeline, where the financing should come from and how it can be delivered. This document aims to provide supporting material to enable an NFS for climate change to be developed.

### The Chile Challenge

Even if temperature increase is limited to 1.5°C Chile will face severe impacts on its resources and ecosystems. The country is highly vulnerable to the impacts of climate change, and shows features of the 9 vulnerability criteria established by the United Nation Framework Convention on Climate Change (UNFCCC), including low costal level throughout its territory, arid and semi-arid areas; areas prone to natural disasters; areas prone to drought and desertification; and areas with fragile ecosystems, including mountain ecosystems. Many of these features will impact economic productivity and need to be addressed when planning infrastructure. They will also have a material impact on agricultural productivity.

Per capita emissions in Chile are equal to the global average but have been rising in recent years. The energy industry is the largest contributor of emissions and electricity consumption and prices have been forecast to rise by approximately 30% over the next decade<sup>3</sup>. The resulting need to decarbonise the electricity system can go in hand with the government's aim of reducing electricity prices, increasing energy security by using domestic energy sources, as well as achieving its goals of increased energy efficiency and participation of renewable energy sources.

There are a wide range of national institutions, plans, policies, targets and initiatives related to both mitigation and adaptation underway in Chile designed to help achieve these goals. Many of these existing efforts are captured in Chile's INDC which includes five pillars of action: mitigation, adaptation, capacity building and strengthening, technology development and transfer, and finance. Within Chile the overarching climate change planning in Chile is done by the PANCC.

---

<sup>2</sup> "In addition, and subject to the grant of international monetary funds, the country is committed to reduce its CO2 emission per GDP unit by 2030 until it reaches a 35% to 45% reduction with respect to the 2007 levels".  
INDC of Chile towards the COP 2015.

<sup>3</sup> National Energy Strategy 2012-2030. Note: Due to recent developments in power generation decrease in cost and economic slowdown, these figures might need to be corrected, but there will still be a likely increase of electricity demand.

---

While growth has slowed recently, Chile has been one of the fastest growing economies in the Latin-American region. According to the International Monetary Fund (IMF), Chile's strong macroeconomic fundamentals mean the country is slightly better situated in terms of predicted GDP growth compared to other countries of the Latin-American region, which are all similarly dependent on commodity exports for income. The longer-term impact of the commodity price shock on Chile's GDP will partly depend on the country's ability to reallocate resources away from traditional support for mining and toward other productive sectors.

Climate change is highly linked to Chile's economic situation and development. Adapting to climate risks and investments towards a low carbon energy system can have multiple benefits for the country's development towards a smart, competitive, inclusive and resource efficient economy. As such, ensuring that climate and development agendas go hand-in-hand and reinforce each other will be an opportunity as well as a challenge when it comes to the implementation of national actions.

### **Finance sector and resources**

A sharp 'pulse' of investment is required over the next 15 to 20 years to meet Chile's financing needs, especially in infrastructure. For example, it is estimated that over USD 24bn will need to be invested in energy infrastructure alone.<sup>4</sup> Current analysis suggests that this level of investment cannot be supported on the balance sheets of existing energy companies and utilities. It is also beyond the reach of public budgets. Therefore, private investors will be crucial in financing Chile's INDC. Understanding and mapping where capital sits within the finance system as well as the risk appetite and return on investment needed by the institutions that deploy that capital is key to understanding how to develop an effective NFS.

Chile has one of the most well-developed private finance systems in Latin America and investment in clean energy in Chile was USD 8.5bn for the period 2009-2015, equal to growth of 162% over 10 years. **Commercial banks**, along with **private equity**, have traditionally been the 'first movers' on clean energy financing – notably through project finance. The ability of banks to price and manage risk – which is critical in the construction phase of new projects – and to blend different sources of finance means they are important financial players in the development of any NFS. Around one third of all banks operating in Chile are financing renewable energy projects including wind, solar and small hydro, accounting for USD 314m 2013.<sup>5</sup>

While appetite appears to be increasing, bank participation in the sector appears much lower than in other countries of the Organisation for Economic Co-operation and Development (OECD) and with a narrower focus on large-scale projects. The low uptake has a variety of causes, including unfamiliarity with the technology, a lack of project finance skills, and the small size of projects. There is a case to be made for

---

<sup>4</sup> See Annex XII for a breakdown of this financing requirement.

<sup>5</sup> FOMIN- IDB Group and Bloomberg New Energy Finance 2014.

---

Government to work to widen the focus of the banks to look at smaller-scale investments as part of its NFS. Furthermore, much of the concessional finance offered to private banks is done through direct relationships with international **development finance institutions (DFIs)**. While this makes sense in terms of establishing the market, looking toward the long-term a more strategic approach is needed. As part of moves to develop an NFS, consideration should be given to how DFIs can be involved in a more strategic discussion about targeted public finance offerings to the highest value areas.

Long-term **institutional investors** like pension funds will also be an important source of capital. Chile has the largest portfolio of pension assets under management in the Latin-American region, representing 69.5% of GDP. By 2050, assets under management could reach 90% of GDP<sup>6</sup>. Chile's pension system has been rated as having a sound structure in an international comparison, and has a significant volume of resources (USD 168.3bn)<sup>7</sup> that could be invested in long-dated assets such as non-conventional renewable energy (NCRE). They can alleviate the pressure on public balance sheets – and the involvement of private sector actors in financing of projects are generally agreed to improve the quality of infrastructure projects by bringing private sector rigour to financing decisions.

**National Development Banks (NDBs)** have a key role to play in overcoming the investment gap both in terms of building confidence in stable policy regimes through the alignment of public and private financial interests and also in building capacity in low carbon investment. Their dual role is focused on complementing and catalysing the private sector through their insights into local opportunities and risks and also their relationship with the local private finance sector. In 2014, NDBs had contributed more than half of climate finance flows.<sup>8</sup> For example, Nacional Financiera (Nafin) had an important role in Mexico's 105% growth in clean energy in 2015 through one of the largest onshore wind energy portfolios globally at an estimated USD 2.2bn for 1.6GW.<sup>9</sup> In Chile, NDBs have played an important role in promoting and shaping economic growth and increasing social and financial inclusion. Given that NDBs have been critical in promoting renewable energy investment and climate-proofing key sectors of the economy (including agriculture) there is a strong case to be made for putting them at the centre of the development of NFS.

Despite their relatively small size compared to the total amounts invested in Chile, the **international climate funds** are strategically important for a number of reasons, including for attracting private investment through enabling NDBs and Multilateral Development Banks (MDBs) to develop risk-sharing instruments and fostering learning and develop the technical capacity to deliver climate-resilient investment. Going forward the **Green Climate Fund (GCF)** could become one of the largest sources of international climate finance.

---

<sup>6</sup> CEPAL 2015a; CEPAL 2015b; and BBVA Research 2015.

<sup>7</sup> At the end of May 2014. Cervera, A. 2014.

<sup>8</sup> CPI 2015.

<sup>9</sup> Frankfurt School, UNEP Centre and BNEF 2016.

---

## Real economy opportunities and challenges

While an economy-wide approach will be needed to facilitate Chile's transition to a low-carbon and climate-resilient economy, the electricity sector and the agricultural sector are particularly important due to their respective potentials to both reduce emissions and develop climate-resilience.

Good progress has been made in decarbonising the energy sector and Chile recently put in place several specific renewable energy and energy efficiency targets. There has been a strong push in Chile to diversify its energy supply and Chile has become one of the top destinations for renewable energy investment. Installed NCRE<sup>10</sup> capacity has more than doubled from around 5.5% in 2013 to 11.5% in 2015.<sup>11</sup> The rapid growth of NCRE in the electricity mix can be attributed partly to the low cost of solar and wind technologies relative to fossil fuels and partly to the changes to the energy auctioning system, which enabled NCRE technologies to compete on a level playing field with fossil fuel power plants. The fact that some NCRE can compete without subsidies is a significant competitive advantage for Chile. But there is still a financing gap for energy infrastructure. It has been estimated that around USD 24.3bn needs to be invested between 2014 and 2023 in Chile's energy infrastructure, mostly in electricity generation and distribution.

Solar photo voltaic (PV) and concentrated solar power (CSP) offer the largest development potential for Chile. The vast potential for and rapid growth of investment in solar makes it a strategically important resource for Chile. As such, it has been selected as a sector for which further analysis of opportunities and barriers to scaling-up should be considered more closely. The other sector identified as being especially interesting is geothermal – this is on the basis of its currently under-exploited but nonetheless significant resource potential.

Chile has been making progress on improvements to energy efficiency, and energy intensity has decreased 5% between 2008 and 2014.<sup>12</sup> Policy efforts primarily include voluntary standards in place for industry and mining. However, Energy 2050<sup>13</sup> highlights that despite this progress, there is still much room for improvement.

A wide range of barriers will need to be addressed to meet the full potential for NCRE and energy efficiency. For NCRE deployment these include issues related to electricity grid connection and expansion, improvements to the regulatory framework, issues with land ownership, challenges for small-scale and distributed projects, and lack of awareness of financial instruments, among others. For energy efficiency they include insufficient or inaccurate information, the lack of track record in terms of market

---

<sup>10</sup> In Chile, renewable energy is classified as 'conventional' and 'non-conventional'. For several decades, large-scale hydropower was Chile's largest power source. For this reason it is classified as 'conventional'. All other renewable sources – including small hydropower – are classified as 'non-conventional'.

<sup>11</sup> CIFES 2016.

<sup>12</sup> Source of information: Consultation with Ministerio de Energía.

<sup>13</sup> Energía 2050

---

development, and uncertain revenues streams. These considerations should be taken into account in the development of an NFS.

With respect to adaptation needs, this analysis focuses in particular on the agricultural sector and broader issues of climate risk in the economy and infrastructure. While the agricultural sector has seen improvements in productivity growth and exports, challenges remain related to the sector's socio-economic structure: 93% of the farmland is owned by 7.6% of landowners with property of 100 ha or larger.<sup>14</sup> Because small farmers are particularly vulnerable to climate change, which compounds the inequality in access to resources, reducing vulnerability and increasing resilience is one of the Government's main policy priorities. Generally, smallholders are essential for food security as they provide over 80% of the food consumed in a large part of the emerging and developing world.<sup>15</sup> Chile's main climate change vulnerabilities and related needs for adaptation and resilience include decreased water availability and increased extreme weather events, including floods and droughts. A key component of a risk management strategy should include ensuring access to insurance against losses. This year, a new Department of Integral Risk Management to Address Climate Emergency is being created, which will specialise in risk management to address problems of climate disasters in agriculture with a particular focus on smallholders.

In addition to the impacts it will have on the agricultural sector, climate change also poses risks to the wider economy and infrastructure. While early alert response for disasters has been good and has helped minimise losses, recovery is still an area where further work is required. From 2000 to 2009, there was on average a natural disaster every two years, with a cumulative economic cost of over USD 1bn. In 2010, the "catastrophe of the year" resulted in a loss of about USD 30bn, equivalent to 18% of GDP.<sup>16</sup> The approach to post-disaster recovery has been ad-hoc. A key element of developing an NFS should therefore be to develop longer-term risk management strategies and instruments to increase resilience and adaptive climate-resilient infrastructure.

### **Conclusions on moving forward to develop a NFS**

What emerges immediately from the mapping, analysis and stakeholder engagement undertaken during the project is that the Government is already undertaking much of the groundwork to develop an NFS. For example the new PANCC (2017-2022) is already setting overall objectives and identifying key issues for developing an NFS. This should be commended. Going forward a clear framework is needed for the NFS development process. This should be focused on answering three obvious – but critically important - questions:

- What overall objectives need to be delivered?
- Who needs to be involved in achieving them?

---

<sup>14</sup> ODEPA 2013b.

<sup>15</sup> IFAD and UNEP 2013.

<sup>16</sup> Brain, I. and Mora, P. 2012.



- 
- How will decision-making processes move forward?

For Chile, the overall objective is clear, as it is set out in the INDC – but some work still needs to be done to clarify and coordinate sectoral priorities. Key stakeholders have been identified through this work – and have signalled their willingness to work together to develop an NFS. The next phase is to determine how the decision making will move forward.

We set out five steps the Government can consider as short term actions to develop its NFS.

#### ***Step one. Identify sectoral priorities and facilitate institutional coordination***

Chile has developed a comprehensive set of plans, initiatives and targets setting out how it will address climate change. The next step is to ensure coherence amongst all policy efforts related to climate change; as such, the integration of policy efforts to ensure coherence should be a core theme of the process of developing the NFS. In this way clashing policy objective and conflict created by areas of responsibility that are not clearly delineated can be avoided - and some progress with delivery ensured. Delivering an overarching policy framework setting out the integrated role of different sectors in meeting overarching climate-resilience goals will be the first step. Chile's climate change law (which is currently being considered) could act as a cohesive top-down 'umbrella' framework to achieve this. The PANCC also provides an opportunity to streamline and further coordinate climate change policy objectives across the relevant sectors of the economy. Good institutional coordination will also be important. Many different ministries are involved in climate change policy making and delivery in Chile. This is quite right – but also underlines the importance that, with so many government departments, stakeholders involved, it is clear where lines of responsibility lie and how coordination will be managed on a strategic but also day-to-day basis.

#### ***Step two. Identify and set up working groups for priority areas***

Complex problems can be best addressed by bringing key experts and stakeholders together to develop effective solutions. Working groups are a well-tested method for bringing such individuals and organisations together. Dialogue and consensus building between government, institutions and core stakeholders ensures a broad understanding of national climate objectives so that financing solutions can be developed. Dialogue should include a wide range of stakeholders (targeted as appropriate to the issue at hand) from key government departments, business, investment and commercial institutions, insurance companies, long term investors, microfinance and national and international development institutions. An inclusive approach offers a number of benefits including allowing capacity building to understand issues and opportunities and dynamism in solving problems.

Through this work we have identified three priority areas that the NFS should focus on in the short term. The suggested areas are: energy; climate resilience for agriculture and infrastructure; getting to scale on finance. In addition, suggestions for key issues to be discussed for each priority area and the stakeholders likely to be willing and able to engage in NFS-related dialogue are included.

---

### **Priority area 1: Energy**

- **Ensuring the relation of new transmission and distribution grid matters both demand and NCRE supply and that project momentum is maintained.** **Stakeholders:** Technical experts from the Energy 2050 working groups, including stakeholders from different sectors including public and private financiers.
- **Expanding and diversifying NCRE.** **Stakeholders:** Ministry of Energy, Centre for Innovation and Support for Sustainable Energy (CIFES), Chilean Economic Development Agency (CORFO), academia, civil society, key industry representatives – both from companies and trade associations, such as ACERA– as well as the finance and investment sectors. Actors involved in the NCRE working group of the Energy 2050 process.
- **Promoting energy efficiency.** **Stakeholders:** Ministry of Energy, Division of Energy Efficiency, Chilean Energy Efficiency Agency (AChEE), CORFO, key industry representatives – both from companies and trade associations, such as ANESCO (ESCO<sup>17</sup> association), equipment manufacturers, international experts as well as the finance and investment sectors.

### **Priority area 2: Climate resilience for agriculture and infrastructure**

- **Meeting agricultural adaptation and resilience needs.** **Stakeholders:** Ministry of Agriculture (Agroseguros, INDAP, ODEPA, Department of Integral Risk Management), local government, insurance companies, commercial banks, representatives from the agricultural sector, academia, civil society, international experts such as CGIAR and World Bank who can show how cooperative approach and insurance instruments have worked elsewhere.
- **Managing natural disaster and climate-related risks.** **Stakeholders:** Hacienda, Ministry of Environment, Ministry of Public Works, Servicio Nacional de Geología y Minería (Sernageomin), Ministry of Housing, Ministry of Health, ONEMI – Ministry of internal affairs and public security, MDBs, international re-insurers, international experts (including government and commercial experts on managing risk).

### **Priority area 3: Getting to scale on finance**

- **Scaling up finance – connecting institutional investors to infrastructure investment.** **Stakeholders:** Hacienda, Ministry of Public Works, Ministry of Housing, Ministry of Energy, MDBs, Chile’s Pension Funds, Superintendencia of Banks, Central Bank, Chilean Chamber of Construction.

---

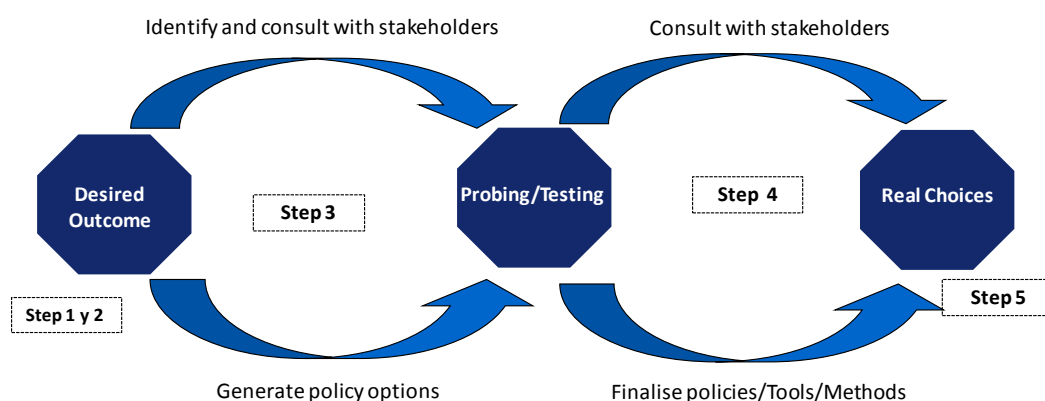
<sup>17</sup> Energy Service Company.

- **Addressing the aggregation challenge. Stakeholders:** Hacienda, Ministry of Public Works, Ministry of Housing, Ministry of Energy, NPBs, MDBs, private banks, Chile’s Pension Funds, energy investors.

**Step three. Develop and then test core propositions around key priority areas to build the NFS**

Based on the analysis undertaken (desk-top research, interviews with stakeholders and international experience), the following areas of focus for policy dialogue are suggested – as a means to develop core propositions that can be used to build the NFS. The figure provides an overview of how propositions can be developed and tested with stakeholders. It covers both steps 3 and 4 of the process described here.

Figure 1 Developing stakeholder-endorsed policy development processes



**Step four: Seek wider feedback on emerging policy propositions**

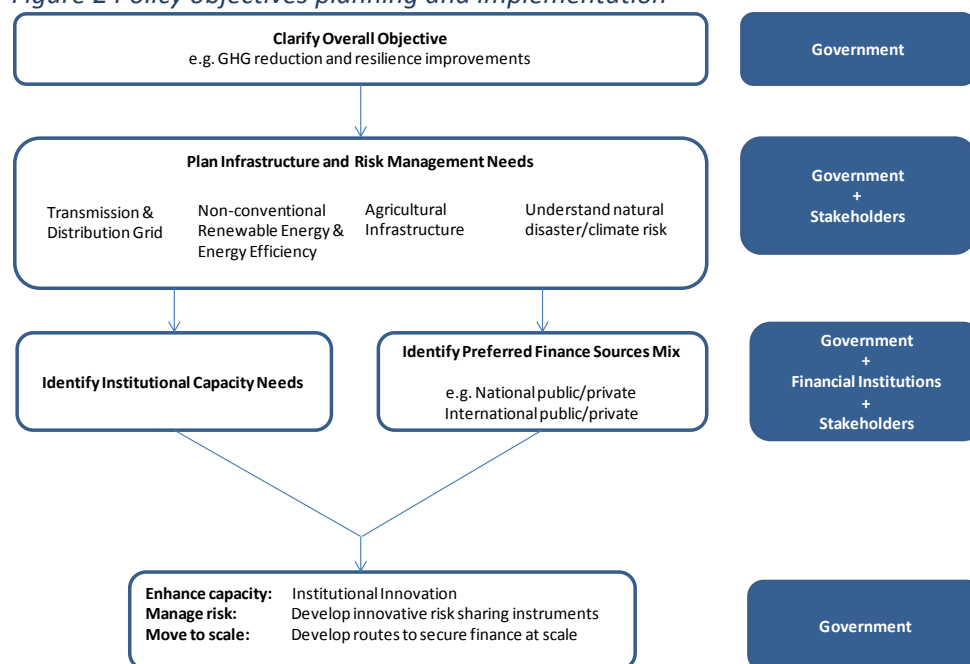
Once key policy propositions have been developed, it is considered good practice to then consult with a wider stakeholder community. Public consultation is a regulatory process by which the public's input on matters affecting them is sought. Its main goal is to improve the efficiency, transparency and public involvement in large-scale projects or laws and policies. Feedback provided can then be considered by the Government as policy proposals are finalised.

**Step five: Finalise policy proposals, draw together in a single document setting out the NFS plan and develop legislation as needed**

Once policy proposals are finalised, the final step will involve taking the recommendations emerging from the NFS development process and work to implement them. This could take the form, for example, of the publication of a White Paper on unlocking long-term finance for building a climate-resilient Chile – with a set of regulatory and fiscal reforms to enable direct investment by domestic pension funds in NCRE and grid infrastructure or a White Paper on building a resilient agricultural sector that includes details of proposal to develop cooperative water

sharing rights, a plan for investment backed by new public-private risk-sharing instruments developed with the GCF/MDBs/national public banks, and a new skills training programme using technical expertise from institutions such as CIFES. From this process and clear “story”, the optimal mixture of institutional innovation/reform; policy initiatives and regulation; and financing instruments can be identified and delivered to achieve the overall policy objectives. The Figure below shows how the macro and micro level issues fit together and the role of Government and wider stakeholders in developing effective choices and solutions.

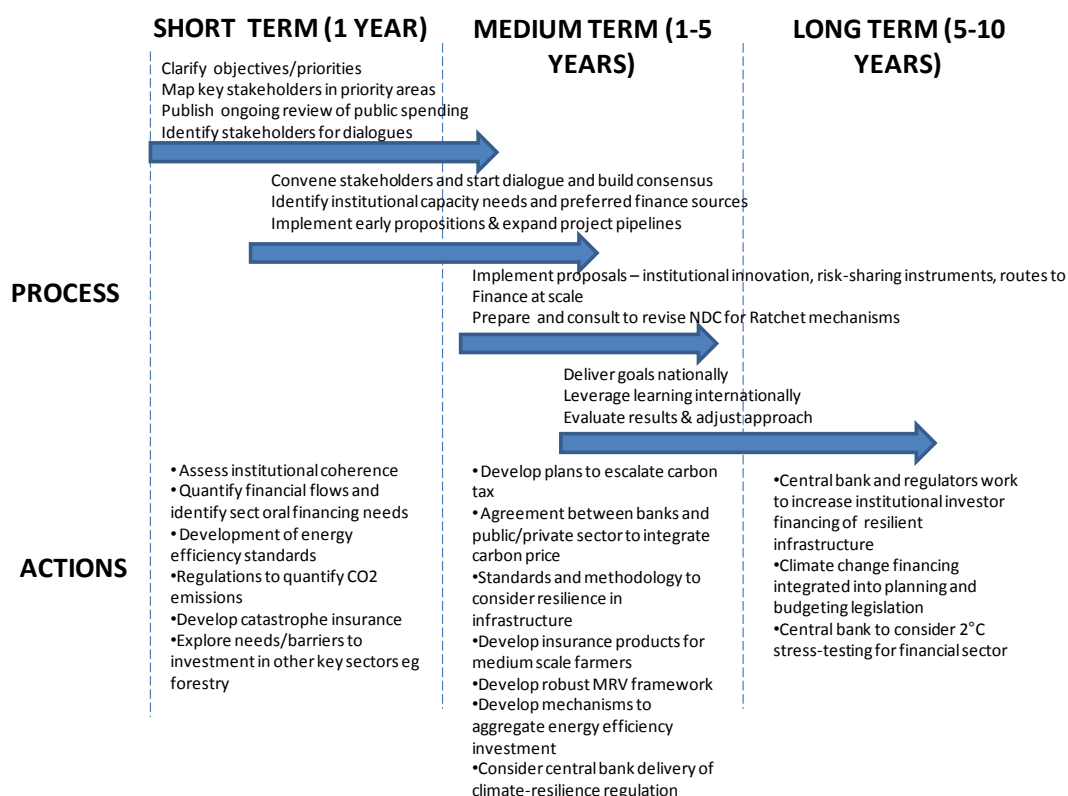
*Figure 2 Policy objectives planning and implementation*



### Medium and long term actions towards an NFS

Medium and long term actions should focus on implementing propositions so that the overall NFS goals can be delivered. In this way Chile’s obligation to deliver its NFS and its INDC goals can be fulfilled. The figure below sets out short, medium and long term actions.

Figure 3 Short, medium and long term actions towards an NFS



The opportunities and the challenges facing Chile regarding increasing investment in NCRE and energy efficiency and in improving the resilience of the agricultural sector are similar to those facing many other countries. Efficient decarbonisation of the Chilean economy (to meet some of goals of the forthcoming PANCC and deliver GHG reductions in line with the Paris Agreement) will mitigate the draining effect of increasing fossil fuel costs, promote security, competitiveness, investment and growth. Catalysing investment in sustainable agriculture and developing instruments and institutions capable of mitigating the worst effects of climate-related and wider natural disasters will do the same as they insulate the economy from event-related economic shocks.

Across the globe new innovations are pointing the way to how this can be best achieved through ‘greening finance’. Chile is now in a position to learn from this, use the insights to promote forward-looking dialogue with stakeholders and key national and international institutions, and develop an NFS that will enable Chile to build an inclusive, prosperous and climate-resilient economy.

---

# 1. PROJECT BACKGROUND AND RATIONALE

## 1.1 Background

This report represents the output of a year-long project focused on assisting the Government of Chile in developing options for its National Finance Strategy (NFS) to set out how the country can transition to a low-carbon and climate-resilient economy. It was undertaken in partnership with the Ministry of Environment and the Ministry of Finance of Chile and primarily funded by the Foreign and Commonwealth Office Prosperity Fund, co-financed with funds from the Low Emission Capacity Building Programme Chile (LECB) and E3G.

Chile submitted its national climate change commitment – or Intended Nationally Determined Contribution (INDC) for 2030 - to the 21<sup>st</sup> Conference of the Parties (COP21) of the United Nation Framework Convention on Climate Change (UNFCCC) in Paris 2015. The INDC includes finance as one of the five core pillars and states that Chile will develop an NFS by 2018. Chile is also developing a new Climate Change Action Plan (Plan de Acción Nacional de Cambio Climático – PANCC (2017-2022) and recently endorsed a new long-term Energy Policy for 2050.

Chile is at a critical point in its development and needs to attract and redirect a whole range of financial resources to transform its economy. The country is facing key challenges related to scarce public funding; economic and social vulnerability related to the impacts of global recession and falls in commodity prices especially for copper, Chile's main export product; and environmental vulnerability due to the increasing threat of climate change. It also needs to make efficient use of international resources because from 2017 Chile will no longer be eligible to receive Official Development Assistance (ODA) from developed countries. As such, a strategic approach to using public finance and wider reforms and regulations to tap into all possible private finance sources is needed in order to scale up limited available public funding. An NFS approach aims to empower countries to define their overall climate-resilient development objectives and set out potential means to finance them. The focus is on how international/national public finance can be deployed along side policy initiatives to maximise the 'crowding in' of private capital to deliver climate-resilient development aims.

## 1.2 Context

In December 2015, at COP21, a historic agreement to tackle climate change was made. The Paris Agreement strengthened the global goal to keep global temperature increase well below 2°C and to pursue efforts to limit it to 1.5°C. It added a more specific target to achieve global peaking of GHG emissions as soon as possible, and to

---

reach GHG emission neutrality in the second half of the century. This goes further and faster than anything previously agreed.<sup>18</sup>

Governments in both developed and emerging economies have woken up to the opportunities presented by the low-carbon race to secure their competitiveness and prosperity in future global markets. This is being achieved through a mixture of targeted public investment and supportive policy and institutional frameworks. The necessary technologies are available and costs are falling - offering numerous investment opportunities for the countries and investors that choose to seize them.<sup>19</sup> In 2015, USD 329bn was invested in clean energy.<sup>20</sup> While in the European Union (EU) investment has been falling since its peak of USD 119.5bn in 2011 (due to the impact of the financial crisis, austerity policies and related policy uncertainty), it has been growing in other parts like China and Latin America. In China investment is now getting closer to the EU on a per capita basis, 27.2% and 17.2% respectively for 2015 Q4. Meanwhile in Latin America (excluding Brazil) it increased from USD 12.2bn in 2013 to USD 14.8bn in 2014.<sup>21</sup>

Across the globe, INDCs<sup>22</sup> and Low Emission Development Strategies (LEDS) are in place. While cumulatively current pledges add up to a global temperature increase of 2.7°C, higher than 2°C target (and the 1.5°C 'stretch' target), a ratchet mechanism has been agreed - whereby countries will strengthen INDCs on a 5-year cycle to close the gap on global ambition. This means INDCs and LEDs must become dynamic process with rising ambition<sup>23</sup> – and a dynamic strategy for meeting the financing requirement to achieve these dynamic goals will need to be put in place.

The scale of the financing challenge is significant. The International Energy Agency (IEA) estimates that around USD 13.5tr investment is needed in energy efficiency and low-carbon technologies between 2015 and 2030 in order to meet the INDCs.<sup>24</sup> Countries around the world are developing a range of different approaches to closing this financing gap. What they share in common is an understanding that the level of investment needed is beyond the capacity of public balance sheets to deliver, and that the private sector must be mobilised. As a result we are seeing that across the globe different elements of the policy, regulatory, institutional and financial innovations needed are now emerging as part of what has been called a “quiet revolution”<sup>25</sup>.

Since 2009 E3G has been working with a range of governments to build a systemic understanding of the finance challenge in different regions - and help them to develop strategic responses to meeting those challenges (see Table 1 for a summary E3G's

---

<sup>18</sup> UNFCCC 2015b.

<sup>19</sup> Mirova 2015.

<sup>20</sup> Clean Energy Investments include clean energy smart technologies and renewables (biofuels, biomass, geothermal, marine, small hydro, solar, wind offshore wind and transmission). For further details see BNEF Clean Energy Investment Factpack, 2016.

<sup>21</sup> Frankfurt School, UNEP Centre and BNEF 2015; and Bloomberg New Energy Finance 2016.

<sup>22</sup> INDCs will turn into Nationally Determined Contributions (NDCs) after ratification of the Paris Agreement.

<sup>23</sup> Mabey et al. 2015.

<sup>24</sup> IEA 2015.

<sup>25</sup> UNEP-FI 2015.

work on national financing strategies and its impact – including references to key documents and sources).

What we have learned is that achieving the necessary scale and pace of sustainable investment needed requires a strong and credible political commitment to build investor confidence in the long-term sustainability of policy frameworks, underpinned by a dynamic and coordinated policy and financing strategy. We have called this approach “National Financing Strategies to meet climate and development goals”.

This report sets out a framework with which Chile could start to develop its own National Financing Strategy to meet its climate and sustainable development goals. It makes key recommendations for how this approach could be taken forward – including identifying where further research and dialogue with key stakeholders is needed. The analysis is based on scoping work undertaken in Chile during 2012-2014.<sup>26</sup> This has been supplemented during 2015/2016 with further in-depth analysis and stakeholder consultation to understand the challenges and opportunities for Chile as it moves forward to build a climate-resilient economy.

The analysis draws on E3G’s wider experience in the region, notably in Mexico, Peru and Colombia, where we have been working with the governments to develop National Financing Strategy Frameworks.<sup>27</sup> We also draw on lessons learned from E3G engagement in the UK debate – which led to the creation of the world’s first Green Investment Bank; the EU debate – which led to the reform of the European Investment Bank’s Energy Lending Policy, review of Solvency II regulation and creation of a new public-private risk-sharing fund focused on supporting high value low carbon investment; and in China – where green finance and the establishment of a green development fund are core elements of the 13<sup>th</sup> Five Year Plan.<sup>28</sup>

*Table 1 Lessons learned from past E3G experience*

Region	E3G recommendation	Policy impact
UK	2009: Accelerate transition to a clean economy through creation of Green Investment Bank and green bonds. <sup>29</sup>	2011: Creation of a Green Investment Bank with assets of GBP3.8bn under management. <sup>30</sup> 2016: UK Green Finance Initiative established. E3G is a member of the group – green bond market development is a core focus of the work. <sup>31</sup>
EU	2011: Accelerate clean	2013: Reform of Energy Lending Policy to

<sup>26</sup> Naidoo et al. 2014.

<sup>27</sup> The work in Mexico has been funded by the UK Foreign Office. We have been working with The National Institute for Ecology and Climate Change and the Environment Ministry. In Peru it has been funded by CDKN, and Zennstrom Philanthropies. We worked with Libélula, a Peruvian consulting firm. In Colombia the work has been funded by the Inter-American Development Bank. We are working with the Presidential Agency for International Cooperation and other Colombian ministries.

<sup>28</sup> China Daily 2015.

<sup>29</sup> Climate Change Capital and E3G 2009; Holmes and Mabey 2010; and Veys 2010.

<sup>30</sup> Green Investment Bank 2016.

<sup>31</sup> Business Green 2016.



	<p>energy financing through reform of the European Investment Bank – double low carbon investment and screen out high carbon investment.<sup>32</sup></p> <p>2011: Address market capacity limits by reviewing financial regulation to enable insurers and pension funds to invest in low carbon infrastructure.<sup>33</sup></p> <p>2015: Align public finance instrument support to develop pipeline of ‘harder to do’ but high value investment including energy efficiency.<sup>34</sup></p>	<p>screen out high carbon energy investment.<sup>35</sup></p> <p>2015: Absolute volumes of climate investment continue to rise, reaching EUR 20.6bn in 2015, making EIB the biggest climate investor in Europe.<sup>36</sup></p> <p>2015: Change to Solvency II rules (to enable institutional investors to invest in infrastructure); Review of pensions regulation.<sup>37</sup></p> <p>2015: European Strategic Fund for Investment Regulation applies screening criteria that positively screen energy efficiency and decentralised energy investments.<sup>38</sup></p>
CHINA	<p>2014: Set up a green finance dialogue – exchange between green and climate policy makers, public and private investors.<sup>39</sup></p>	<p>2015: China’s Thirteenth 5 Year Plan includes green finance and green development fund.<sup>40</sup></p>

<sup>32</sup> Holmes et al. 2012.

<sup>33</sup> Ibid.

<sup>34</sup> Bergamaschi et al. 2015.

<sup>35</sup> EIB 2013.

<sup>36</sup> EIB 2016.

<sup>37</sup> European Commission 2015.

<sup>38</sup> Regulation (EU) 2015/1017 of the European Parliament and of the Council of 25 June 2015.

<sup>39</sup> Amin et al 2014.

<sup>40</sup> China’s 13<sup>th</sup> 5-years plan published mid-March 2016.

---

## 2. OBJECTIVES AND METHODOLOGY

### 2.1 Objectives

The core aim of this report is to provide an enabling framework to assist Chile as it undertakes its low-carbon and climate-resilient economy transition, by identifying initial options for decision-makers to consider in the process of developing a National Finance Strategy. This includes consideration of short, medium and long term potential actions and policy options. The report provides an overview of the policy and finance landscape in Chile, and analysis of the challenges Chile faces in delivering its low carbon and climate resilient development objectives, and has a particular focus on the approaches and policy opportunities to mobilise the national/international public/private finance needed to ensure its implementation.

### 2.2 Methodology

The research underpinning the report aimed:

- To understand financing gaps and opportunities in meeting its INDC and low carbon and resilient potential – with a focus on mitigation via non-conventional renewable energy (NCRE) and energy efficiency (EE); and adaptation of the agricultural sector (notably small-scale agriculture);
- To understand the existing policy and regulatory landscape related to climate change and the two focus sectors;
- To map the financial ecosystem in Chile, and identify relevant financial actors from the public and private sector that are likely to play a key role in delivering Chile's NFS;
- To identify key sources and examples of public finance both at a national and international level for leveraging private capital;
- To identify gaps in connecting capital to investments that need to be addressed in the short, medium and long term; and
- Identifying international best practices and testing findings to support the process for building an NFS for Chile.

A five-step approach was taken (as shown in Figure 4).

Figure 4 Approach



## 2.3 Overview of data sources

This is a qualitative study, supported by quantitative data on financial trends collected from a wide variety of external sources. The analysis was based on extensive desk-based research<sup>41</sup>, complemented by semi-structured interviews followed by a process of testing findings with a High Level Stakeholder Group (consisting of national government, finance, private sector and academic experts and international experts). It is through dialogue with the High Level Stakeholder Group emerging policy recommendations were developed. Quantitative data were obtained primarily from reports from Bloomberg New Energy Finance, Climate Policy Initiative, CEPAL, international monetary fund (IMF), IRENA, IEA, and Climate Scope.

### **Step 1: Mapping of the national climate finance ecosystem in Chile - key actors and sources of finance.**

<sup>41</sup> The NFS approach is new and cutting edge, as such the academic literature base is limited. For this reason, the literature search was wider. It included official government policy documents; reports from international agencies including the OECD, World Bank, G20 and New Climate Economy; reports from MDBs; newspaper articles and other media; reports and public information from companies and institutions; information provided by stakeholder group members including association commissioned studies, official summary minutes updating project status and activities, workshop presentations and reports and policy document drafts. A comprehensive list of data sources and documents used in this study is included in the references.

---

The mapping and sector analysis was conducted through desk-based research complemented by 20 semi-structured interviews with key experts from the public sector, the private and financial sectors and academia (see Annex I for a list of interviewees by actor and theme). This allowed the identification of successes as well as emerging challenges Chile faces related to climate finance, as well as a deeper understanding some of the specific challenges in key sectors. The mapping focused was in relation to financing of NCRE and energy efficiency and adaptation in small-scale agriculture. This mapping work enabled the identification of several emerging challenges that Chile faces in relation to the financing of these sectors, which could be an early focus for the NFS.<sup>42</sup>

### **Step 2: Identification and involvement of key stakeholders to ensure an inclusive and credible process**

Identification and convening of a High-Level Stakeholder Group was key to the work. The group was needed to provide guidance and feedback on considerations for the NFS and ensure sustainability of the initiative after the project is completed. Experts were identified in collaboration with the Ministry of Environment and included the following:

- Public sector: Representatives of the key sectors (electricity and agriculture)
- Private sector: Representatives of key associations (electricity sector as main focus sector)
- Finance sector: Representatives of commercial and public banks

Representatives of the public sector were invited through official invitations ('oficios') which formalised their participation and commitment (see Annex II for a list of all Group members).

### **Step 3: Collating relevant lessons and experiences of other countries to stimulate discussion**

E3G has wide-ranging experience of working on NFS and broader climate finance issues in Europe, Latin America and China. As such we have been able to identify key repeating themes around challenges with delivering NFS. These include challenges with both developing and financing dispersed investment in renewable energy and energy efficiency and challenges with accelerating private sector investment into riskier projects and business models, amongst others. E3G collated and presented an overview of lessons learned and good practices, e.g. on institutional coordination around climate finance among public and private actors and risk mitigation through public banks, which can offer lessons for the challenges Chile is facing and which might be considered for the NFS.<sup>43</sup>

---

<sup>42</sup> Original focus of the project was on NCRE and less on energy efficiency. It was decided to focus more on energy efficiency as financing needs and challenges were identified.

<sup>43</sup> Lessons learned and good practices that were presented include: Risk mitigation through public banks - The UK Green Investment Bank; Institutional coordination – Colombia SISCLIMA Climate Finance Committee; Institutional capacity building -

---

#### Step 4: Presentation of initial findings and facilitation of discussions

A workshop was held with the High Level Stakeholder Group and other key actors to assess Chile's specific challenges. The workshop was held on the 18<sup>th</sup> of November 2015 (see Annex III for a list of participants) and focused on: sense checking early analysis; sharing international experiences; and building a shared understanding of the barriers and opportunities with delivering NFS. The aim was to have both an intellectual understanding of the issues but also start a dialogue between the public and private sector focused on a common understanding of challenges and opportunities for climate finance in Chile. As such the objective was to generate an open discussion amongst participants from government, private and finance sectors and civil society on the challenges that were identified through the mapping, as well as on the international experiences and their possible application in the context of Chile.

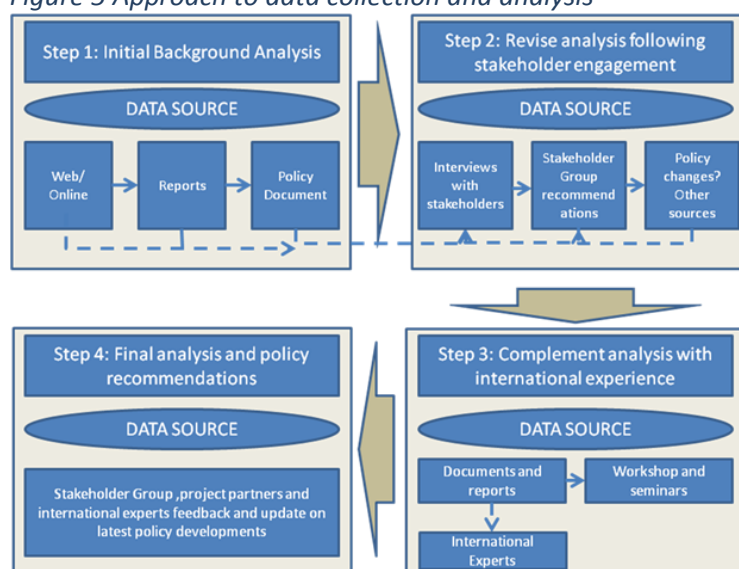
#### Step 5: Produce a policy report with recommendations

The final report (this report) sets out the method and high level findings. It also sets out recommendations for building a process, including early issues to focus on, and policy options that can be considered over the short medium and long term in developing Chile's NFS.

## 2.4 Methodology for data collection and analysis

The approach to data collection and analysis followed a step-wise, logical and iterative process with built-in feedback loops to ensure that all information was up-to-date and credible.

*Figure 5 Approach to data collection and analysis*



The very detailed methodology is set out in Annex IV.

---

GCF funded project on Climate Resilient Infrastructure Mainstreaming in Bangladesh; Financial instruments - Mexico CADENA index-based insurance/ attention to natural disasters; Green bonds to mobilise institutional investors.

---

---

## 2.5 Challenges in conducting the research

Several challenges emerged that should be key considerations for Chile's Government as the NFS is developed.

**Access to quantitative data.** There is a lack of access and availability of granular data on climate finance at a country level, as financial information is often not sub classified specifically as climate finance. This is an issue in other countries we have worked – and is frequently mentioned in the literature as a challenge in developing an accurate assessment of the climate finance landscape.

**Confidentiality with financial institutions.** Access to detailed information from financial institutions is limited due to confidentiality regulation in the finance sector and market sensitive information. This is an issue in other countries we have worked.

**Changing policy landscape and responses from stakeholders.** Since work on this project was initiated there have been a significant number of policy developments that have taken place in Chile, in the context of the run up to the UNFCCC Paris conference and other reform processes. These include the development of Chile's INDCs, Energy 2050 agenda and policy, updated results of impacts of participation of non-conventional renewable energy generation as a result of new auctioning rules. It is important to note that the 2016 Climate Change Action Plan was under development at the time of publishing the report, hence limitations on incorporating it. As a result this has required frequent updating of the project research and inputs. In this context responses from stakeholders proved difficult at certain points in particular where a reform process or policy was in development in addition to changes of personnel in institutions.

E3G's expertise in participatory process ensures the strategic approach is considered as relevant by a variety of stakeholders and reinforced by showing Chile's leadership and sharing learning internationally. As part of this project, lessons were shared at the annual meetings of Low Emission Development Strategies Globally and for Latin America, (LEDS GP and LEDS LAC).<sup>44</sup> Chile also took part in a panel discussion at COP21 UNFCCC in Paris sharing experiences with Mexican counterparts and views from development banks and Multilateral Development Banks (MDBs).

---

<sup>44</sup> Dominican Republic, 12-16 October 2015.

---

## 3. THE CHILE CHALLENGE

In starting to develop an NFS, it is important to understand what the NFS needs to deliver. Much of this is captured in the objectives and policies set out by the Government. Therefore it is important to understand the policy and institutional landscape. This chapter aims to help achieve that. It sets out climate change in the context of Chile, including need for mitigation and adaptation: emissions and vulnerability; Chile's INDC – a national response to climate change; and economic situation and development needs, energy and agricultural policy. It also provides an overview of policy landscape - national institutions, plans, policies and targets related to climate change with a focus on the electricity and agricultural sector.

### 3.1 Climate change in the context of Chile

Climate change is a global risk which requires joint action. The COP21 of the UNFCCC in Paris Agreement in December 2015 reflects a turning point for limiting climate change below dangerous levels and building a low-carbon economy.<sup>45</sup> The Paris Agreement indicates a clear objective of shifting the economy by “Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development”<sup>46</sup>, which will have deep implications for public and private investment decisions and the financial system as a whole. Alongside the formal agreements at COP21 there have been a large number of commitments for additional action to reduce greenhouse gas (GHG) emissions and increase resilience, including by investors and companies, which shows an increased awareness of the private sector to act on climate change.

Furthermore, Paris has enabled a regime in which all countries make commitments to reduce GHG emissions and manage the impacts of climate change. In 2015 close to 190 governments submitted their INDCs and which state their GHG emission mitigation goals by 2030 as well as other relevant actions to fight climate change and its impacts.<sup>47</sup> The aggregate effect of current INDC pledges until 2030 would result in an emission gap of 26–59% above the required GHG emission reduction to achieve the current global goal of limiting temperature increase to a maximum of 2°C above pre-industrial levels as agreed by the UNFCCC.<sup>48</sup>

Last year also saw another global commitment, when the Sustainable Development Goals (SDGs) as part of the UN 2030 Agenda for Sustainable Development were

---

<sup>45</sup> UNFCCC 2015b. The agreement will be open for signature from April 2016 and enter into force 30 days after at least 55 Parties covering at least 55% of the emissions have deposited their instruments of ratification (Article 21).

<sup>46</sup> UNFCCC 2015b, p. 21.

<sup>47</sup> Mabey et al. 2015.

<sup>48</sup> UNFCCC 2015a.

---

agreed.<sup>49</sup> They intend to guide countries towards a common agenda to end poverty and direct them on a growth path that secures healthy economies, fairer societies and a thriving environment. One of the 17 SDGs is to ‘Take urgent action to combat climate change and its impacts’.

**In Chile, climate change is highly linked to the country’s economic situation and development. Adapting to climate risks and ensuring a low-carbon, sustainable pathway can have multiple benefits for the country’s development towards a smart, competitive, inclusive and resource efficient economy. As such, ensuring that climate and development agendas go hand-in-hand and reinforce each other will be an opportunity as well as a challenge when it comes to the implementation of national actions.**

### **3.1a Chile’s need for mitigation and adaptation**

Chile’s per capita emissions are equal to the global average but lower than in other OECD countries. The country represents a very small share of global GHG emissions, but still needs to urgently act in order to address climate change related socioeconomic and environmental challenges. In absolute terms, GHG emissions in Chile have been increasing. During 1990 – 2010 GHG emissions have risen by 83.5%. The main sources of increased emissions are the energy sector and land use, land use changes and forestry (LULUCF). Emissions of the energy sector increased by 104% between 1990 and 2010, reaching close to 75% of Chile’s total emissions in 2010, according to the country’s First Biannual Update Report. The energy industry (mainly electricity generation) is the largest contributor to the sector's emissions with 40.3%, followed by transport (mainly road transportation) with 30.5% and manufacturing industries and construction with 18.1% (of which around 50% derive from the mining sector).<sup>50</sup> At the same time, for the period of 2012-2020, electricity consumption in Chile is projected to grow at around 6-7% and electricity prices have been forecast to rise by approximately 30% over the next decade.<sup>51</sup> As such efficient use of energy will be a key tool to offset increased costs to industry, businesses and households, and to limit GHG emissions.<sup>52</sup>

**The resulting need to decarbonise the electricity system can go hand with the government’s aim of reducing electricity prices, increasing energy security by using domestic energy sources, as well as achieving its goals of increased energy efficiency and participation of renewable energy sources.<sup>53</sup> Furthermore it can drive decarbonisation in other sectors of the economy such as heat and transport that are otherwise disaggregated and more difficult to change.** The government puts great

---

<sup>49</sup> UN General Assembly 2015.

<sup>50</sup> Ministerio de Medio Ambiente 2014 and INDC of Chile towards the COP 2015.

<sup>51</sup> National Energy Strategy 2012-2030. Note: Due to recent developments in power generation cost decrease and economic slowdown, these figures might need to be corrected, but there will still be a likely increase of electricity demand.

<sup>52</sup> CEPAL 2015.

<sup>53</sup> Energy Agenda 2014-2018; and Energy 2050.



---

importance to the energy and particularly the electricity sector in terms of economic development, seeing it as the 'engine of development'.<sup>54</sup>

Regarding adaptation, the Paris Agreement states that countries should be "Enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to contributing to sustainable development and ensuring an adequate adaptation response in the context of the temperature goal (of 1.5°C - 2°C above pre-industrial level)"<sup>55</sup>. **Even if temperature increase was limited to the stretch target of 1.5°C, Chile would face severe impacts on its resources and ecosystems. The country is highly vulnerable to the impacts of climate change, and shows features of the 9 vulnerability criteria established by the UNFCCC, including low coastal level throughout its territory, arid and semi-arid areas; areas prone to natural disasters; areas prone to drought and desertification; and areas with fragile ecosystems, including mountain ecosystems.**<sup>56</sup> **Many of these features will impact on economic productivity – and need to be addressed when planning infrastructure. They will also have a material impact on agricultural productivity.**

For infrastructure, effective planning (both infrastructure and financial planning) to manage climate risk will be a key element of developing a NFS. For infrastructure the greatest impacts of a changing climate include the cascading failures across water, power, telecoms and transport networks. As Superstorm Sandy showed, the greatest impacts of increasingly extreme weather come from cascading failures across water, power, telecoms and transport networks. In New York, power outages led to failures in other infrastructure systems such as rail lines, wireless and Internet infrastructure and refineries, ultimately costing over USD 50bn in damages. A changing climate also intensifies already rising resource pressures. Across the globe this is a newly emerging area of research.<sup>57</sup> Water availability could become a major economic constraint without demand management.

The impacts of climate change on the agricultural sector are multiple and could lead to the geographical displacement of certain crops and changes in yields, in some cases limiting their long-term sustainability, so specific means to adapt to the effects of climate change on this sector is critically necessary. The main impacts include drought risk in the central region and decreased rainfall in the southern region as well as a temperature rise across the country which would shift current climate zones to the south. There is concern that the shift of climate zone will see agricultural production forced to move to the south of the country.<sup>58</sup> The wine production area for example is seeing increased temperatures and reduced water availability: 95% of the vineyards have problems with water supply. In some regions, the area suitable for vineyards is expected to decrease by 25%.<sup>59</sup> **The Government recognizes this and is making**

---

<sup>54</sup> Government Programme 2014-2018; Energy Agenda 2014-2018; and Energy 2050.

<sup>55</sup> UNFCCC 2015b, Article 7; Paragraph 1.

<sup>56</sup> INDC of Chile towards the COP 2015.

<sup>57</sup> As an example of early stage research on these issues, see UK Water Regulator research can be found at: [http://www.ofwat.gov.uk/sustainability/climatechange/rpt\\_com\\_met\\_rainfall.pdf](http://www.ofwat.gov.uk/sustainability/climatechange/rpt_com_met_rainfall.pdf)

<sup>58</sup> Source of information: Interview with Ministerio de Agricultura/ODEPA.

<sup>59</sup> ODEPA 2013a.

---

sustainable water use and improving the resilience of farming a priority.<sup>60</sup> Small scale farmers, who make up the largest proportion of farmers in Chile, are particularly affected by climate change impacts and are an early target for support.<sup>61</sup>

### 3.1b Chile's INDC – a national response to climate change

Chile's INDC represents a plan to address the above stated challenges in mitigation and adaptation. The INDC includes 5 pillars: mitigation; adaptation; capacity building and strengthening; technology development and transfer; and finance. It has put forward a GHG reduction target of 30% per unit of GDP based on 2007 levels by 2030, which under current GDP growth predictions, would in fact allow a continued increase in GHG emissions. The target will be increased to 35-45% levels if international financial support (grants) can be secured<sup>62</sup>. The targets are focused on highest emitting sectors: energy, industrial processes, use of solvents and other products, agriculture and waste. A specific LULUCF goal is also included, committing to the sustainable management and restoration of 100,000ha of native forest by 2030, subject to the approval of a Law on Native Forest Recovery and Forestry Development. The INDC also states that by 2018 Chile will seek funding for and implement concrete actions of its adaptation plans (see Chapter 3.2) to increase resilience in the country; increase mitigation synergies; strengthen the institutional adaptation framework; and prepare metrics and measurement mechanisms for the adaptation plans. In relation to capacity building and strengthening, the INDC emphasizes Chile's aim to share its experiences with other countries; develop and share modelling projections; and develop instruments to promote research and capacity building at the national and sub-national, especially with regards to adaptation. Chile also aims to have a strategy for technology development and transfer that includes a mapping of technological needs and priorities related to climate change.<sup>63</sup>

The identification and mobilisation of (new) sources of finance is critical in the context of moving towards a low-carbon and climate-resilient pathway, and for achieving and even increasing the ambition of climate change targets as set out in the INDC, **including a national finance strategy for climate change by 2018**. The NFS process creates the opportunity to gain clarity on investment needs and opportunities and can build the basis of an enabling environment to supports the mobilisation and

---

<sup>60</sup> The Government has stated "One of the major issues to boost the sector refers to the efforts made in the efficient use of water, drainage and irrigation technology. 2012 and 2013 have been drought years in the centre and central south of the country, which has obliged the Ministry to take measures to support and stimulate the sector that have gone significantly beyond the historical norm. These actions have helped raise the productivity of the sector, shown by the increase in export volumes and an increased supply to the domestic market of some products ... Actions to improve irrigation and drainage has been a particular focus of the work to improve the sector's competitiveness. Water is not only one of the essential raw materials for agriculture, but is also one of our fundamental areas of concern, given the scenarios of increasing water scarcity predicted for Chile, linked to climate change predictions ODEPA 2013b, pp. 13-14. Ministerio del Medio Ambiente and GIZ 2013.

<sup>61</sup> Also of interest is the fact that in 2010 the agricultural sector was the second largest GHG emitter, accounting for 15% of Chile's GHG emissions. Ministerio de Medio Ambiente 2014; Government Program 2014-2018; and ODEPA 2013.

<sup>62</sup> Previously, in 2009 at COP15 in Copenhagen, Chile had pledged a "... 20% deviation below the Business-as-Usual emissions growth trajectory by 2020, as projected from year 2007". Government Program 2014-2018.

<sup>63</sup> Low-carbon technology development and transfer is seen as one opportunity to reduce economic dependence and strengthen the productive capacity of the country. In its INDC, Chile states to develop a strategy for technology development and transfer by 2018. INDC of Chile towards the COP 2015.

---

reallocation of finance flows to meet INDC goals. **Chile sets out that its NFS will deliver: periodic analysis of public spending on climate change both direct and indirect updatable every year from 2020; creation of an internal institutional framework which allows the management and coordination of the relationship with the GCF, which from a multi-sectoral perspective will be in charge of raising and evaluating the portfolio of bankable projects, among other functions; and design of financial instruments that could be used for purposes such as adaptation and technology transfer.** In that context, Chile acknowledges that having a good assessment of its financing needs will help in determining an optimal financing portfolio as well as the sustainable provision of public and private resources.<sup>64</sup>

Chile's INDC was developed via a High Level Dialogue involving key government ministries combined with a public consultation process. This has helped mainstream discussion of Chile's climate change mitigation and adaptation needs in government – and raise awareness of the issues and opportunities more broadly in society. The next step is to build on this momentum and working towards a strategic approach of identifying financing needs and mobilising diverse sources of finance will empower Chile to effectively turn these climate commitments into action through creating an NFS.

Having an NFS in place will help Chile to meet its INDC and to review progress and potentially increase their ambition to 2030. This will be particularly relevant to 2020 when countries have to report their progress and will increase their ambition. **An NFS will also enable Chile to position itself well to receive international funds from MDBs and from other sources including the GCF.**<sup>65</sup> This will be particularly important as in 2017 Chile will not be eligible to receive ODA, as it has exceeded the high-income country threshold.<sup>66</sup>

### 3.1c Economic situation

Chile's need for mitigation and adaptation is strongly linked to the country's economic development. Over the past decade, Chile has been one of Latin America's fastest-growing economies. However, GDP growth was only 1.9% in 2014, a decline from the 4.2% seen in 2013.<sup>67</sup> This was a result of the slowdown in the mining sector caused by a fall in global demand for a range of commodities (including copper) and resulting decline in copper prices (which fell nearly 50% between 2011 and 2015). Mining makes up around 57% of Chile's exports, mostly through the export of copper. As a result, for 2016, Chile's GDP growth forecast has recently been cut to 2-3%.<sup>68</sup> However, according to the IMF, Chile's strong macroeconomic fundamentals mean the country is slightly better situated in terms of predicted GDP growth compared to other countries of the Latin American region, which are all similarly dependent on

---

<sup>64</sup> Ibid.

<sup>65</sup> UNFCCC 2015b, COP Decision; Paragraph 24.

<sup>66</sup> OECD 2015.

<sup>67</sup> World Bank Data 2016.

<sup>68</sup> Banco Central de Chile 2015.

---

commodity exports for income. The longer-term impact of the commodity price shock on Chile's GDP will partly depend on the country's ability to reallocate resources away from traditional support for mining and toward more productive sectors.<sup>69</sup>

### 3.1d Energy policy

Since the 1980s Chile's economy has been driven by a neo-liberal agenda. During this time period, the country's economy has been widely privatised and the state's involvement in economic planning and regulation has declined. The electricity sector is one example of this process. Chile's energy policy of the last few decades has been founded on competition between privately owned entities and on limiting the role of the state in entrepreneurial activities. Since the 1980s power generation, transmission and distribution grids have been separated and run by private entities.<sup>70</sup> This was consistent with the assumption that competitive markets would deliver an appropriate level of security of power supply.<sup>71</sup>

This approach has started to change over the past years as electricity prices started to rise and energy security declined. Chile's 2014-2018 Energy Agenda emphasizes that "the last ten years in Chile have been marked by cuts of natural gas from Argentina, severe and long periods of drought, difficulties in granting environmental permits, insufficient entry of new projects and businesses in the electricity generation sector and low investment in infrastructure in generation and transmission"<sup>72</sup> which would require a paradigm shift in the energy sector with a more active role of the State. The government has now taken a clear line on its role in energy planning stating: "The Chilean society expects the state to play a role in planning and management (of the energy system) that considers all stakeholders in defining a solid and consistent strategy that will orient the market"<sup>73</sup>. **A key challenge for Chile – and one faced by many other countries – is how to redirect market activities through reform processes to support public policy outcomes needed for Chile's INDC.**

### 3.1e Agricultural policy

The general focus of Chile's agricultural policy of the past 20 years has been on supporting small-scale agriculture and the development of export markets. Current agricultural policy has two priorities: (i) to reduce inequality among farmers; (ii) to support inclusive growth, including economic, social, and environmental and cultural considerations in rural areas.

The Government Programme, which each government publishes, states that it aims to "...protect our resources and our small and medium producers"<sup>74</sup>. Furthermore, the Government Programme stresses that "... we need to recover Minagri's leadership which has declined over the past 4 years, re-establishing public-private collaboration

---

<sup>69</sup> Eyraud 2015; INDC of Chile towards the COP 2015; IMF 2015.

<sup>70</sup> Pollitt 2004; and Cámara Chilena de la Construcción 2014.

<sup>71</sup> IEA 2009.

<sup>72</sup> Energy Agenda 2014-2018, p.12.

<sup>73</sup> Ministerio de Energía 2015, p. 9. Translated by the author.

<sup>74</sup> Gobierno de Chile 2014a. Translated by the author.

---

entities together with the actors of food supply chains ...”<sup>75</sup>. It emphasises that the current institutional structure does not respond adequately to the development needs of the agriculture and food sector.<sup>76</sup> The current government administration has put a strong focus on adapting climate change, which had not been a priority for previous governments. For this reason much of the underpinning analysis – such as climate change-related impacts and risks – to develop policy solutions has only just begun and the development of solutions is at an early stage.<sup>77</sup>

### 3.1f Development planning

Chile’s development needs are set out by the 2014-2018 Government Programme. It has three fundamental reforms programmes: education, tax and constitution. Additionally, the Programme spans four key areas: Economic program, Protection and opportunities, Decentralization, Planning and Development, and Civil Rights. Within the Economic Sub-programme there are ten priority areas that include the energy and agricultural sector.<sup>78</sup> The agenda spans a wide range of areas, including a comprehensive reform of the education system, but also structural reforms of its economy, notably, the tax reform and economic programme proposals with the objective being to foster stronger and more inclusive growth. An IMF assessment of the Government Programmes found that it has potential to increase the productive potential and GDP growth in the long-run, but that implementing it effectively and in a timely fashion will be crucial.<sup>79</sup> This sentiment chimes well with the need for a more holistic approach to planning and financing development that takes into account current and future needs – including building in climate-resilience – and how finance resources can be mobilised at scale in the short and the longer term to achieve overall objectives.

In addition to national plan, Regional Development Plans are in place for the 15 regions of the country. Because Chile is geographically a very diverse country, it is important that development and climate change related needs are addressed regionally. The Development Plan for the metropolitan area of Santiago, for instance, focuses on barriers and potential for regional human development and puts forward regional strategic guidelines. For climate change, there is a strategic objective to promote a regional system to adapt to the effects of climate change.<sup>80</sup> For the Development Plan of O’Higgins, a southern region with large agricultural activity, climate change is considered as one of the plan’s components, recognising the impact of climate change on agricultural productivity. One of the four related Development Plan guidelines is to promote the participation of different stakeholders in the various sectors/systems in order to integrate sectoral policies with adaptation to climate change. Finally in terms of institutions, Regional Climate Change Committees exist whose function is to promote and facilitate the implementation at local and regional

---

<sup>75</sup> Government Program 2014-2018.

<sup>76</sup> Government Program 2014-2018.

<sup>77</sup> Source of information: Interview with Ministerio de Agricultura/ODEPA.

<sup>78</sup> Government Program 2014-2018.

<sup>79</sup> Santoro 2015.

<sup>80</sup> Gobierno Regional Metropolitano de Santiago and UNDP 2012.

---

level of sectoral (adaptation) plans and other actions related to climate change. These need to be delivered in line with regional and local needs, integrating climate change into other regional policies.<sup>81</sup>

Chile's INDC does emphasize the need to align climate change and development objectives. It sets out the numerous vulnerabilities of the country, one of the largest being its dependence on international markets for revenues through commodity exports as well as challenges related to social inequality. For this reason the INDC states: "Chile hopes to reduce its greenhouse gas emissions while decreasing poverty and inequality as well as continue advancing toward sustainable, competitive, inclusive and low-carbon development"<sup>82</sup>. Low-carbon technology development and transfer is seen as one opportunity to reduce economic dependence and strengthen the productive capacity of the country. In its INDC, Chile states to develop a strategy for technology development and transfer by 2018.<sup>83</sup>

### 3.2 Overview of the institutional and policy landscape - focus on the electricity and agricultural sector

**Institutions** – The institutional picture is complex. Figure 6 shows, at a high level, how the different institutions relate. National level relationships only are shown – as the regional architecture is still being developed. Much institutional innovation is happening – which demonstrates the growing importance of this agenda. While the climate change agenda at national level is led by Ministry of Environment, several other sectoral plans and policies - particularly those of the Ministry of Energy and the Ministry of Agriculture - also directly or indirectly impact on climate change mitigation, adaptation and resilience outcomes. While institutional innovation is need to respond the complex challenges addressing climate change brings, this can risk incoherence at a time when clear goals and aims and strong coordination to meet those aims while managing the needs to many different stakeholder is needed. This is something to consider as the institutional landscape continues to develop.

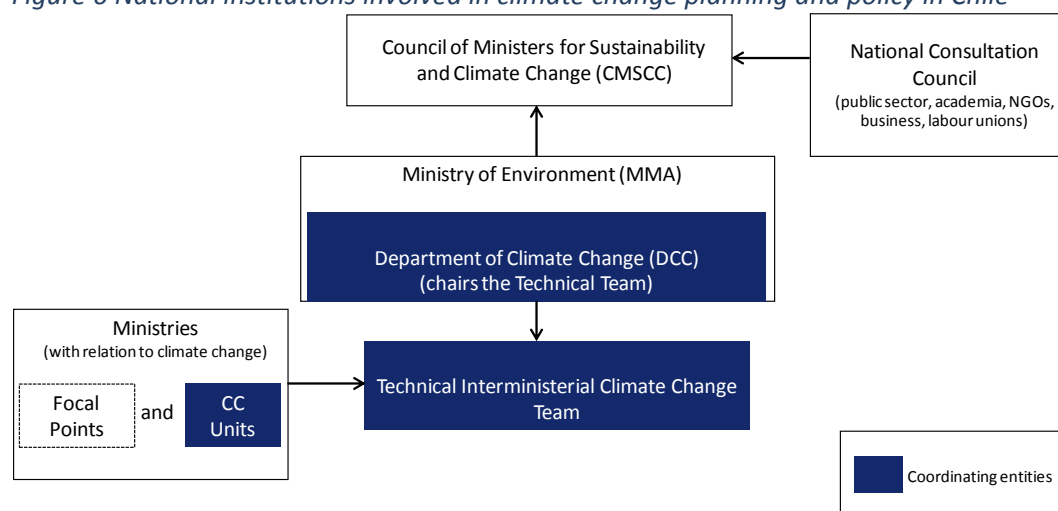
---

<sup>81</sup> Universidad de Chile, Poch SA, Adapt-Chile 2015.

<sup>82</sup> INDC of Chile towards the COP 2015, p. 11.

<sup>83</sup> INDC of Chile towards the COP 2015.

Figure 6 National institutions involved in climate change planning and policy in Chile



Source: Universidad de Chile, Poch SA, Adapt-Chile 2015.

The Ministry of Environment (MMA) and the Ministry of Energy of Chile are both relatively new bodies, created in 2010, in order to strengthen environmental institutions and to develop the country's energy policy, respectively. Among the mandates of the MMA, Law 20417 stipulates that "it corresponds particularly to the MMA to propose policies and formulate plans, programs and action plans on climate change"<sup>84</sup>. Within the MMA, the Department of Climate Change (DCC) has the task of articulating the work, studies and consulting support with regard to climate change within the country. It is also in charge of supporting international UNFCCC negotiation processes (which are led at international level by the Ministry of Foreign Affairs), GHG inventory and measurement, institutional arrangements and awareness-raising around climate change. The Ministry of Finance (Hacienda) has the authority for fiscal and tax policy - it also has an increasing role in addressing finance related issues linked to climate change. Last year, a new area "Sustainable Economic Growth and Natural Resource Management" was created and Hacienda is Chile's institutional link to the GCF. In addition, the Council of Ministers for Sustainability became the Council of Ministers for Sustainability and Climate Change (CMSCC) in 2014, with a focus on proposing policies and implementing processes to the President of Chile to ensure sustainable management, use and exploitation of natural resources and addressing climate change.<sup>85</sup>

Linked to the Ministry of Energy, there are two institutions, the Centre for Innovation and Support for Sustainable Energy (CIFES) and the Chilean Energy Efficiency Agency (ACHEE). Regarding energy efficiency, the functions of design and development of policies are the responsibility of the Energy Efficiency Division of the Ministry of Energy, the implementation of the programs stemming from such policies is carried out by AChEE, which is a public-private institution linked to the Ministry of Energy. Regarding renewable energy, the Renewable Energy Division is in charge of developing

<sup>84</sup> Ministerio Secretaría General de la Presidencia 2010.

<sup>85</sup> Ministerio de Medio Ambiente 2014.

---

policies, plans, programs to promote the incorporation of the renewable energy into the energy matrix. With respect to climate change, the Sustainable Development Division is responsible for designing adaptation and mitigation plans for the energy sector, and for evaluating cost-effective mitigation economic instruments. CIFES, aims to support the Ministry of Energy and the Chilean Economic Development Agency (CORFO), a national development finance institution (see Chapter 4) with the design, implementation, assessment and promotion of publicly financed strategic programs and projects seeking to innovate and boost sustainable energy. Finally, the functions of control and supervision are the preserve of the Superintendence of Electricity and Fuels (SEC).

Within the Ministry of Agriculture (Minagri), there exist 13 different institutions (for list and description of all institutions see Annex V). Climate change work is coordinated through an intra-ministerial technical committee which meets once or twice per month. Within the Ministry, the Office of Agricultural Studies and Policies (ODEPA) is in charge of coordinating the Ministry's work related to climate change. **This year, a new Department of Integral Risk Management to Address Climate Emergency is being created, which will specialise in risk management to address problems of climate disasters in agriculture with a particular focus on smallholders.** The Department will have three sub-departments, which will be responsible for (i) preparing reports and studies; prevention and monitoring; (ii) develop and promote risk management tools; and (iii) attention to natural disasters.<sup>86</sup> The **National Institute for Agricultural Development (INDAP)** is another central agency, providing loans and grants to small-scale farmers that can be used for adaptive measures. Finally, the Ministry also aims to develop and promote subsidised insurance for small-scale farmers in the agricultural sector.<sup>87</sup>

**Frameworks, policies and initiatives** - Figure 6 sets out how the national and sectoral regulatory frameworks, policies and initiatives as well as the governmental institutions inter-relate. It does not provide an exhaustive list of policy instruments and initiatives, but it gives an idea of the most relevant public sector efforts related to climate change as well as the institutional governance of each sector. Overarching climate change planning in Chile is done by the National Climate Change Action Plan (Plan de Acción Nacional de Cambio Climático – PANCC) and the National Adaptation Plan was approved by the Council of Ministers in December 2014. This is complemented by sectoral adaptation plans, covering seven sectors.

For a detailed overview of relevant climate change, energy sector and agricultural policies see Annex V and VI. An overview is shown below

---

<sup>86</sup> Agroseguros 2015.

<sup>87</sup> Source of information: Interview with Ministerio de Agricultura/ODEPA; INDAP 2016; and Agroseguros 2016a.



Figure 7 Chile's national plans and examples of policy instruments related to climate change and respective institutions (set out by sector)

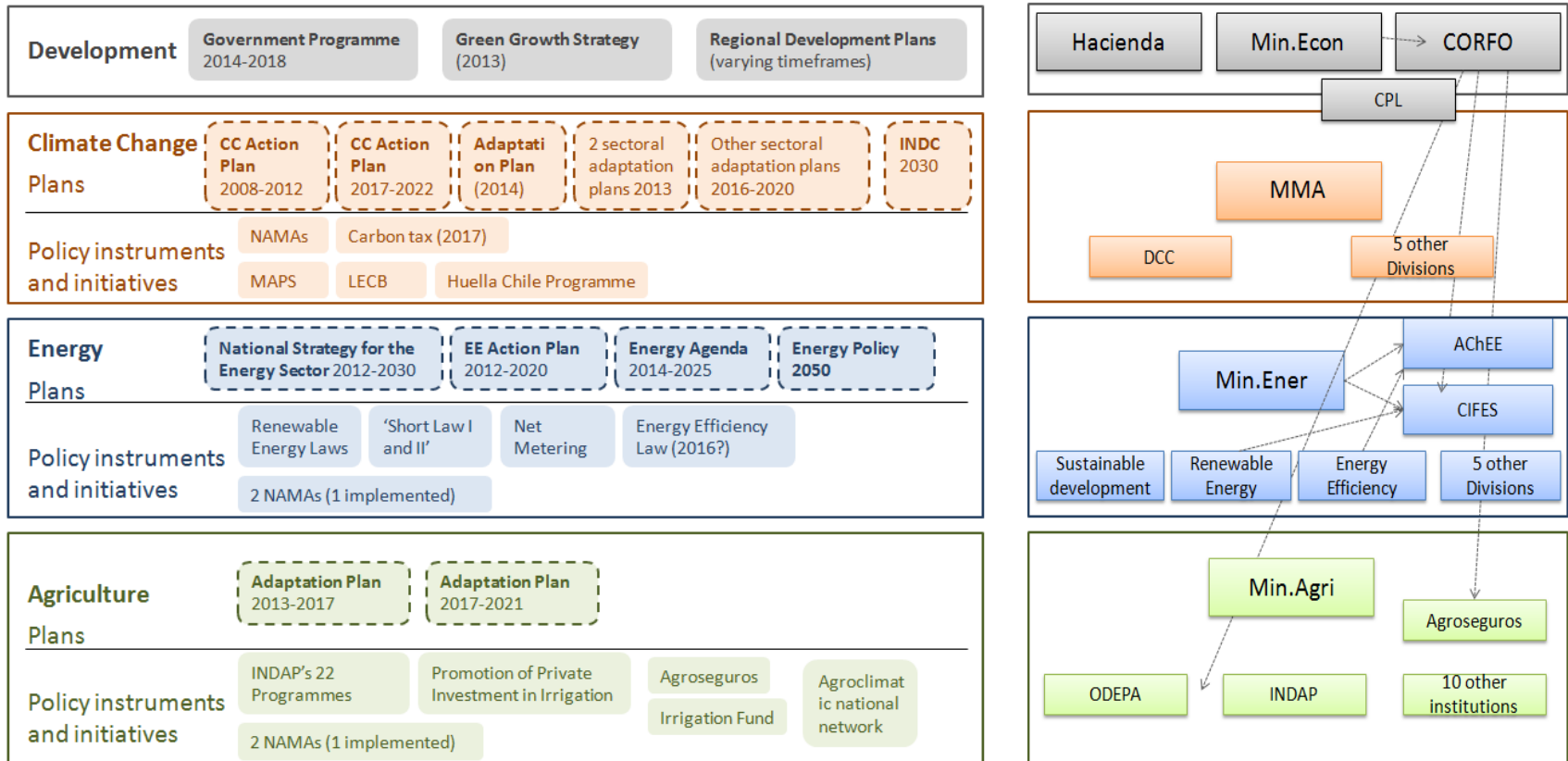
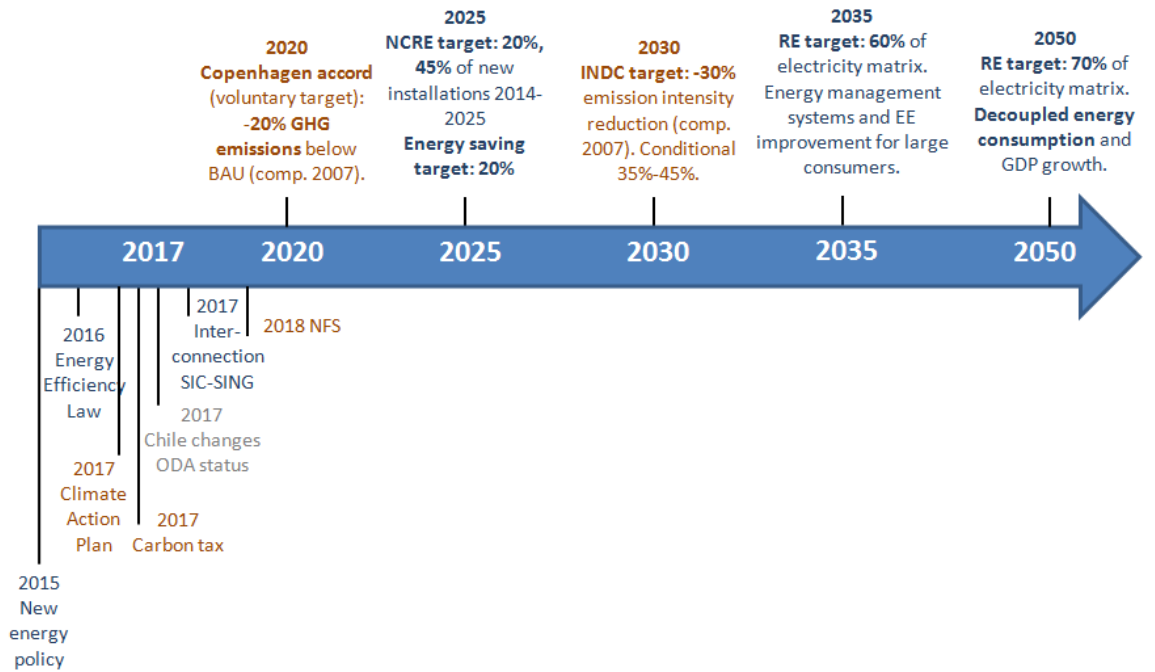


Figure 8 Chile's climate change mitigation targets, renewable energy and energy efficiency goals and key milestones.<sup>88</sup>

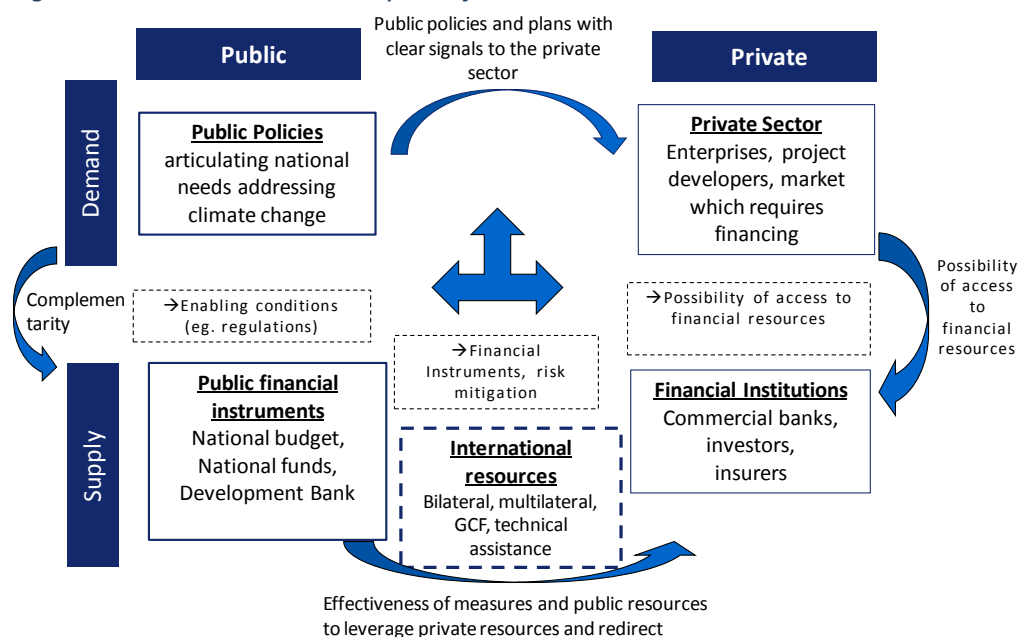


<sup>88</sup> Please note that the Energy Efficiency Law will be presented to Congress in 2016. It is not clear yet when it will be approved.

## 4. OVERVIEW OF FINANCE SECTOR AND RESOURCES IN CHILE

In understanding how to finance Chile’s INDC it is important to be able to identify where the various potential sources of finance are. Chile has a wide range of options available to it-including public and private finance, national and international sources. This chapter sets out where that capital is. In order to effectively mobilise finance resources it is important to consider the impact of the policy landscape on the ability of different finance providers to actively deploy funds to the projects/infrastructure activities that need to be financed to deliver the INDC. Figure 9 summarises these interactions.

Figure 9 Public and Private Ecosystem for Low Carbon Finance



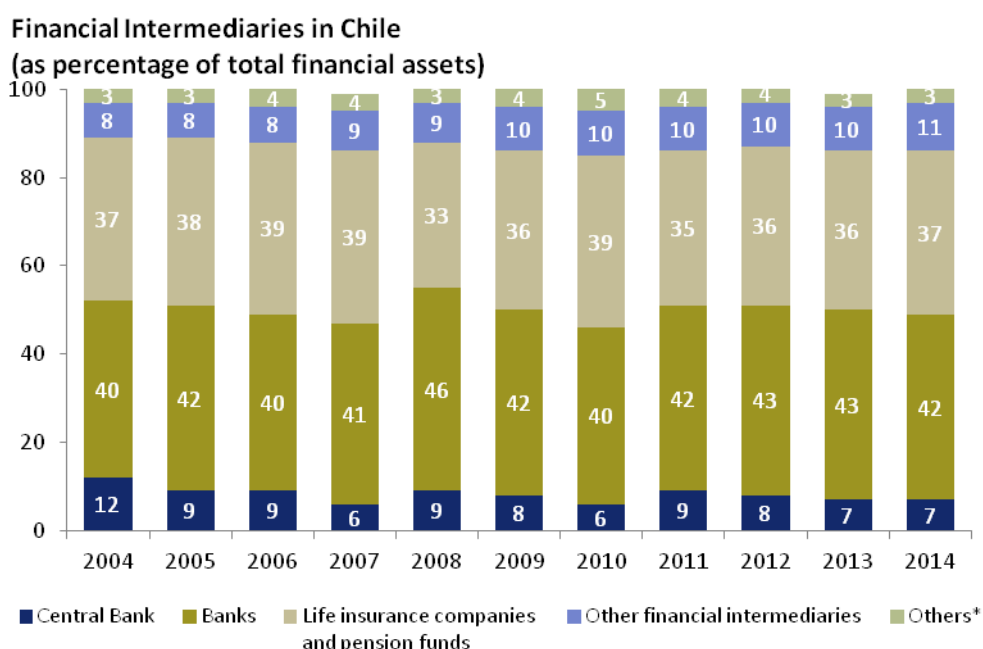
### 4.1 Introduction

Chile has one of the most well-developed private finance systems in Latin America. Over the past 10 years, banks and institutional investors (insurance companies and pension funds) have held around 79% of the total financial assets in the economy<sup>89</sup>, with a 42-37% split between banks and other financial intermediaries in 2014 (Figure 10).

<sup>89</sup> Central Bank of Chile 2015a.

Investment in clean energy in Chile has grown rapidly in recent years. Chile saw USD 8.5bn<sup>90</sup> invested for the period 2009-2015, equal to growth of 162% over 10 years. Since 2012, local banks have played a key role in driving this investment growth. They were responsible for financing USD 300m in 2012 (representing 15% of total committed investment in clean energy)<sup>91</sup>, which increased to USD 314m in 2013 (18% of total committed in clean energy)<sup>92</sup>. Investment by local actors, in 2012, was USD 891m. These data are sourced from the Bloomberg New Energy Finance database<sup>93</sup>, which provides an overview of approximately how much capital has been committed to clean energy investment and the role of local institutions in providing capital. It shows that in the past 3 years there has been a significant increase in the amount of investment in NCRE. This has been through a range of finance structures/asset classes including asset finance, corporate finance, venture capital and private equity (Figure 10).<sup>94</sup>

Figure 10 Assets under management by financial intermediaries in Chile



(\*)It includes public financial institutions, cooperatives supervised by SBIF, mutual funds, and equity investment, and financial auxiliaries

Source: Central Bank of Chile.

<sup>90</sup> All investment data for Chile appear aggregated among the sources we reviewed. As such it is not possible to say where the finance comes from (public private/international national).

<sup>91</sup> FOMIN- IDB Group and Bloomberg New Energy Finance 2013.

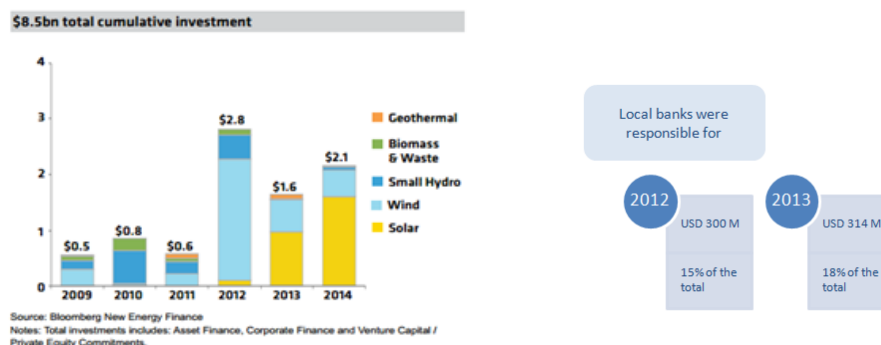
<sup>92</sup> FOMIN- IDB Group and Bloomberg New Energy Finance 2014.

<sup>93</sup> The data in the Bloomberg New Energy Finance database, while not exhaustive, is one of the two most comprehensive databases on clean energy investment globally.

<sup>94</sup> Climatescope ranks countries past, present, future ability to attract investment for clean energy. It employs Bloomberg Energy Finance as its data source which relies primarily on its own proprietary database; it tracks low carbon investments worldwide. The database contains detailed information on funds invested in clean energy projects and technologies, grant programs and grants, venture, private equity and corporate finance transactions, and project financing. For further information, see:

<http://global-climatescope.org/en/methodology/>.

Figure 11 NCRE investment in Chile by source



Source: Climatescope reports 2013; 2014; and 2015.

## 4.2 National Sources of Finance: role in financing Chile’s INDC

### 4.2a Overview of role of the private sector

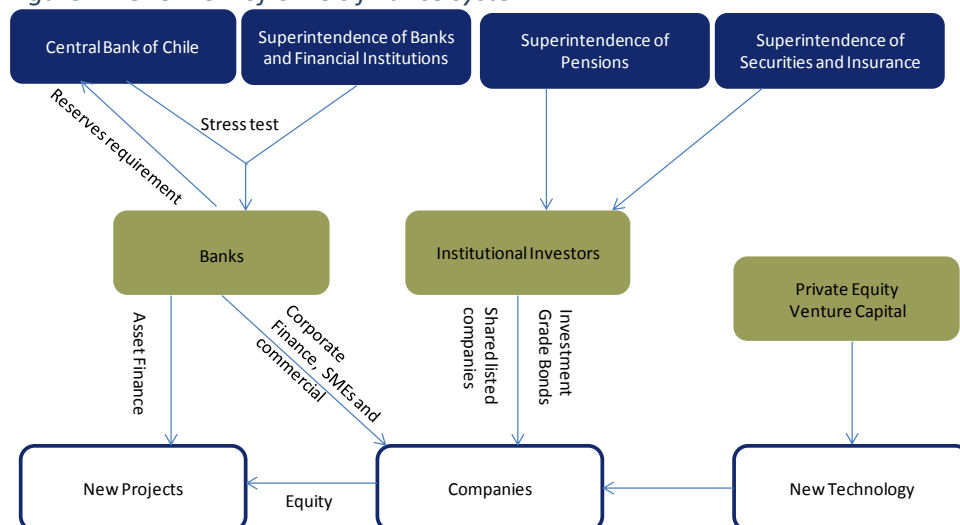
Developing and financing low carbon and climate-resilient infrastructure can be challenging as finance sources traditionally invested in fuel-based infrastructure needs to be re directed. This is especially the case for energy. While IEA modelling of global energy investment has previously shown that capital spending in the fossil fuel extraction and transportation sectors will reduce proportionately<sup>95</sup>, reducing the need for fossil fuels imports from abroad, in the short term significant upfront investment must be secured. A sharp ‘pulse’ of investment is required over the next 15 to 20 years. Current analysis suggests that this level of investment cannot be supported on the balance sheets of existing energy companies and utilities. It is also beyond the reach of public budgets.<sup>96</sup> Therefore, private investors will be crucial in financing INDCs.

Understanding and mapping where capital sits within the finance system as well as the risk appetite and return on investment needed by the institutions that deploy that capital is key to understanding how to develop an effective NFS. This chapter sets out an overview of where capital is held in Chile – with a focus on the banking system and institutional investors, notably pension funds.

<sup>95</sup> Holmes et al. 2012; IEA 2006; and FOMIN- IDB Group and Bloomberg New Energy Finance, 2015.

<sup>96</sup> UNFCCC 2007: recommended focusing on the role of the private sector investment as they constitute the largest share of financial flows (estimated at 86%).

Figure 12 Overview of Chile's finance system<sup>97</sup>



Source: Authors' depiction of the interconnection of different financial institutions in Chile.

#### 4.2b. Overview of the Chilean Banking System

Banks, along with private equity, have traditionally been the 'first movers' on clean energy financing – notably through project finance. The ability of banks to price and manage risk – which is critical in the construction phase of new projects – and to blend different sources of finance (public and private, for example) means they are important financial players in the development of any NFS. Banks can also help establish networks that can be used to identify and work with project developers to grow investment in clean energy.<sup>98</sup>

The Chilean banking system is especially strong<sup>99</sup> – as indicated by its solvency, liquidity and efficiency indicators - and the fact it has not experienced systemic banking crises since the 1980s.<sup>100</sup> While the sector consists of 24 banks in total (see Table 2), the majority of the capital is concentrated in 5 banks – Santander-Chile, Banco del Estado de Chile (state-owned), Banco de Chile, Banco de Credito e Inversiones, Corpbanca; and four of them are foreign bank branches.<sup>101</sup> There is one bank that is 100% state-owned: The State Bank of Chile, Banco del Estado de Chile o BancoEstado. For small-scale lending, its market share is estimated at 70%.<sup>102</sup> BancoEstado is subject to the same regulation and supervision as other banking entities operating in Chile. However, it is governed by its own law, the Organic Law of the Banco del Estado of Chile D.L. 2.079 of 1977, and, according to the law, may be

<sup>97</sup> This is an attempt to visualize how the system is connected, but it is not trying to depict every flow in the economy.

<sup>98</sup> Holmes et al. 2012.

<sup>99</sup> The financial system is supervised by the Superintendence of Banks and Financial Institutions (SBIF). Its oversight duties include stress tests; these are undertaken every six months by the Central Bank in coordination with the SBIF.

<sup>100</sup> Rojas-Suarez 2015.

<sup>101</sup> Banco de la Nación Argentina, Banco do Brasil, JP Morgan Chase Bank, and Bank of Tokyo-Mitsubishi UFJ. All of the branches conduct mainly corporate banking.

<sup>102</sup> OECD 2011.

granted advantages or exclusive rights.<sup>103</sup> BancoEstado is, however, not permitted to provide loans to state-owned institutions.

*Table 2 Overview of banks in Chile by market share*

<b>Banks</b>	<b>Market Share % total assets</b>
<b>Banco Santander-Chile</b>	17,02
<b>Banco del Estado de Chile (BancoEstado)</b>	15,99
<b>Banco de Chile</b>	15,37
<b>Banco de Credito e Inversiones</b>	14,13
<b>Corpbanca</b>	10,26
<b>Banco Bilbao Vizcaya Argentaria, Chile</b>	6,50
<b>Scotiabank Chile</b>	5,30
<b>Banco Itau Chile</b>	4,17
<b>Banco Security</b>	2,74
<b>Banco BICE</b>	2,68
<b>Banco Consorcio</b>	1,33
<b>Banco Falabella</b>	1,04
<b>Rabobank Chile</b>	0,59
<b>Banco International</b>	0,58
<b>HSBC Bank Chile</b>	0,57
<b>Deutsche Bank</b>	0,50
<b>Banco Ripley</b>	0,42
<b>JP Morgan Chase Bank, N.A</b>	0,28
<b>Banco Penta</b>	0,27
<b>The Bank of Tokyo-Mitsubishi UFJ, Ltd</b>	0,10
<b>Banco BTG Pactual Chile</b>	0,08
<b>Banco Paris</b>	0,05
<b>Banco do Brasil S.A</b>	0,03
<b>Banco de la Nacion Argentina</b>	0,01
<b>Total</b>	100

Source: SBIF, monthly finance report, December 2015

#### 4.2c. Role of private banks in providing finance to NCRE

Around one third of all banks operating in Chile<sup>104</sup> are financing renewable energy projects - including wind, solar and small hydro, accounting for USD 314m of total investment in 2013.<sup>105</sup> Local bank involvement has grown since 2008, when the NCRE Loan Programme<sup>106</sup> was launched. This programme aimed to kick-start renewable energy financing in Chile by providing ‘wholesale’ financing to local commercial banks, who in turn could act as intermediaries, providing concessional loans to renewable projects. In the first instance the Programme was run with only two banks, BICE and

<sup>103</sup> OECD 2011.

<sup>104</sup> Banco BICE, Consorcio, Itaú-Chile, Banco de Chile, Banco Santander, CORPBANCA and BBVA-Chile.

<sup>105</sup> FOMIN- IDB Group and Bloomberg New Energy Finance 2014.

<sup>106</sup> This was a loan scheme operational until 2011, offered by CORFO, through local commercial banks, with financial backing from KFW Bankengruppe and Hacienda. The average interest rate was 4.3% in USD, with an average tenor of 12 years. As a result, 15 renewable energy projects were financed for up to USD 140m of which 13 small-hydro, 1 biogas, 1 transmission line.

---

Banco de Chile, helping to kick-start the financing of RE projects in Chile.<sup>107</sup> Since then, appetite appears to be increasing, but bank participation in the sector appears much lower than in other OECD countries – and with a narrower project focus. For example, bank financing seems to be concentrated on large scale projects.<sup>108</sup> Looking at international growth in clean energy deployment, in 2014 much of the new installed capacity was distributed energy: USD 73.5bn which was an increase of 34% compared to 2013.<sup>109</sup> As such there is a case to be made for Government to work to widen the focus of the banks to look at smaller scale investments as part of its NFS. Furthermore, much of the concessional finance offered to private banks is done through direct relationships with DFIs (such as KfW Bankengruppe). While this makes sense in terms of getting the market established, looking toward the long-term a more strategic approach is needed. As part of moves to develop an NFS, consideration should be given to how DFIs can be involved in a more strategic discussion about targeted public finance offerings to the highest value areas.

Also of concern is the impact of Basel III regulations. This has had the effect of reducing the risk appetite of banks not just in Chile but across the globe – meaning governments will need to do more to promote confidence in lending to the clean energy sector. This can be achieved through clear sectoral targets (as Chile is in the process of developing) and robust policy support to improve risk adjusted returns to NCREs to which capital is not flowing at sufficient scale. It can also include – as has been done already through the CORFO initiative and is widely used in other countries – blended public-private finance instruments such as preferential loans, loan guarantees and credit enhancements to facilitate market development and mitigate risk in strategically important sectors. This makes the role of public banks including the DFIs especially important in ensuring growth in commercial bank finance for clean energy.<sup>110</sup>

#### 4.2d. Overview of pensions sector

Chile has the largest portfolio of pension assets under management in the Latin American region, representing 69.5% of GDP.<sup>111</sup> By 2050 assets under management could reach 90% of GDP.<sup>112</sup> Chile's pension system has been rated as having a sound

---

<sup>107</sup> This low uptake was for various reasons including unfamiliarity with the technology, lack of capacity to engage, the low priority placed on the sector because of the risk return profile and relatively small size of project and transaction costs.

<sup>108</sup> Source of information: Discussion at the workshop held in Chile, November 2015.

<sup>109</sup> REN21.

<sup>110</sup> CPI 2012.

<sup>111</sup> BBVA Research 2015.

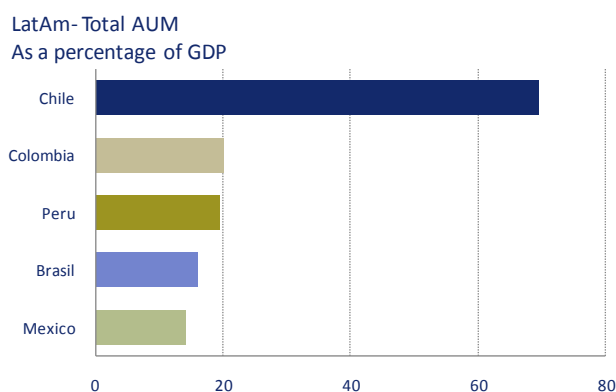
<sup>112</sup> CEPAL 2015a; CEPAL 2015b; and BBVA Research 2015.



structure in an international comparison<sup>113</sup>, and has a significant volume of resources, USD 168.3bn<sup>114</sup>, that could be invested in long-dated assets such as NCRE (Figure 11).

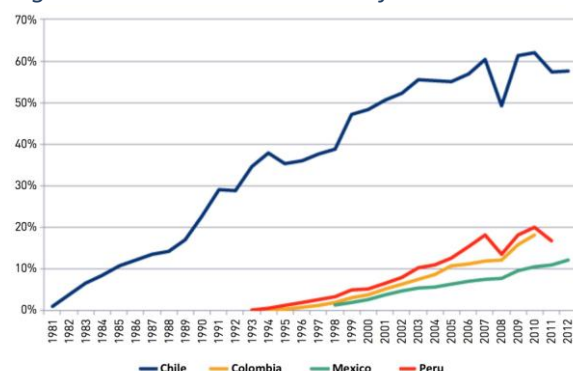
Chile's current system started operating in 1981, and is fully funded under a defined contribution system in which pensions are based on savings accumulated during a career which are managed by pension fund administrators (AFP) and licensed by the supervisory authority (The Superintendent of Pensions, SP).<sup>115</sup>

Figure 13 Resources in Chile's Pension System



Source: Tuesta 2015.

Figure 14 Pension Funds as % of GDP in 4 Latin-American countries



Source: Sura Asset Management 2013.

Over time the regulation governing pension funds has been liberalised. However, the funds are still subject to a broad range of quantitative portfolio limits, including limits

<sup>113</sup> "It won a B grade in 2013 Melbourne Mercer Global Pension Index, which means that it has a sound structure with many good features but still has some room for improvement. Just for comparison other countries that earned a B grade included Canada, Sweden, Switzerland, and the UK. It could be improved by raising the level of mandatory contributions to increase retiree benefits, requiring employers to make contributions, raising retirement ages and continuing to review the minimum pension for the poorest pensioners. Institutional Investors" Retrieved from:

<http://www.institutionalinvestor.com/Article/3356037/Chiles-Bachelet-Pushes-Pension-Reform-Threatening-Private-Funds.html?ArticleId=3356037&p=3>

<sup>114</sup> At the end of May 2014. Cervera, A. 2014.

<sup>115</sup> It is compulsory for all wage and salary workers and involves the mandatory payment of 10 per cent of the gross earnings as contributions into the private fund.

---

on issuers, risk and asset class.<sup>116</sup> Since 2002 a new law requires each AFP to offer four different types of funds, called simply Funds B, C, D and E. AFPs may also voluntarily offer a Fund A. The funds are differentiated by the proportion of their portfolio invested in variable income securities (such as equities) and fixed income (such as bank deposits, mortgages or government bonds that offer a low level of risk or variability), i.e. they vary by risk appetite.<sup>117</sup>

As Chile moves forward to scale up investment in NCRE (and, more widely, builds climate-resilient infrastructure to meet its climate goals and development needs) pension fund assets will be a key source of finance to access. These institutional investors - pension funds but also insurance companies – which have long term liabilities and a low risk appetite are well suited to invest in such assets. Such investments are attractive because they act to reduce some of the exposure to variables such as foreign exchange rates, while also offering protection against inflation, for example, with inflation-indexed rates.

Given the large upfront costs of financing a climate-resilient economy in Chile, pension funds offer a key source of capital to close the finance gap. They can alleviate the pressure on public balance sheets – and the involvement of private sector actors in financing of projects are generally agreed to improve the quality of infrastructure projects by bringing private sector rigour to financing decisions.

#### **4.2e. Public sources of finance - Chile's National Development Banks (NDBs)**

NDBs are government-backed, sponsored, or supported financial institutions that have a specific public policy mandate. NDBs can differ in terms of ownership structure, financial objectives, and policy objectives (special purpose or multi-functional), supervisory requirements and financial instruments.<sup>118</sup> Their operations are traditionally focused on those sectors of the economy associated with a higher degree of risk: infrastructure, rural sector and SMEs.<sup>119</sup> Climate change-related investment is a steadily growing investment theme for these banks. By 2014, NDBs globally had contributed more than half of total climate finance flows, mostly through concessional loans.<sup>120</sup>

Public banks have a key role to play in overcoming the investment gap – both in terms of building confidence in stable policy regimes through the alignment of public and private financial interests<sup>121</sup> – but also building capacity in low carbon investment. Their dual role is focused on complementing and catalyzing private sector players

---

<sup>116</sup> OECD 2014.

<sup>117</sup> Ibid.

<sup>118</sup> Smallridge and Olloqui 2011.

<sup>119</sup> Ibid.

<sup>120</sup> CPI 2015.

<sup>121</sup> It has posited that the last-minute decision in 2011 by the Spanish Government to retroactively reduce but also extend the solar PV tariff was driven by the fact the public bank ICO had invested in several projects and would have incurred losses in the same way the private sector banks would have done.

---

through their insights into local opportunities and risks and also their relationship with the local private finance sector.<sup>122</sup> These insights and relationships as well as their longer term perspective and access to donor ‘risk’ finance enables them to tolerate more risk compared to private sector actors. Furthermore, government guarantees (explicit or implicit) and the public policy focus of such institutions means they tend to have a lowered required return on capital<sup>123</sup> – as achievement of public policy relevant goals such as market development and social or environmental objectives constitute part of the return on investment.<sup>124</sup> This makes them key players (both as capital providers and sources of technical expertise and support) in the development of renewable energy in delivering climate-resilient economies.<sup>125</sup>

In Chile, the NDBs have played an important role in promoting and shaping economic growth<sup>126</sup> and increasing social financial inclusion. There are three public entities: CORFO, BancoEstado, and INDAP. The public policy aims of the banks have evolved over time. In recent years CORFO has taken the lead in financing infrastructure projects, while INDAP is increasing resilience of the agricultural sector. All three banks are described below.

**The Economy Development Agency– Corporacion de Fomento de la Produccion (CORFO)** - Created in 1939, CORFO is tasked with driving national development and growth and has an annual budget of USD 150m.<sup>127</sup> It has had an important role in laying the foundation for the industrialization and development of the Chilean economy<sup>128</sup>. Currently, CORFO’s objective is to improve the competitiveness of the country and diversification of the economy by encouraging investment, innovation and entrepreneurship.

CORFO has introduced several loan programmes which are linked to climate change mitigation. In 2005 it started with environmental loans, co-financed by Germany’s bilateral development bank, KfW, which provided long-term finance for companies and focused primarily on waste and at a later stage also on energy efficiency and NCRE.<sup>129</sup> CORFO has also set up a diverse range of instruments to support the development of the NCRE sector, including the Invest Chile Project, also co-financed by KfW. Effective since 2005, Invest Chile partially subsidised pre-feasibility and pre-investment studies for large-scale NCRE plants and provided credit facilities and low interest rates. In 2010 CORFO developed credit lines for small scale NCRE and energy efficiency for market development by providing technical assistance in identifying

---

<sup>122</sup> IDB 2013.

<sup>123</sup> For example the UK’s GIB has a social return of capital requirement of 3.5%; EIB is 4%.

<sup>124</sup> Amin et al 2014.

<sup>125</sup> IRENA 2012.

<sup>126</sup> CORFO 2016.

<sup>127</sup> Further information available at: [http://www.dipres.gob.cl/574/articles-137515\\_doc\\_pdf](http://www.dipres.gob.cl/574/articles-137515_doc_pdf) [last seen 25/02/2016]

<sup>128</sup> It created the basic industries in Chile, such as Empresa Nacional de Electricidad (ENDESA), la Empresa Nacional de Petroleo (Enap), la Compañía de Acero del Pacifico (Cap), y la Industria Azucarera Nacional (Iansa), among others. Retrieved from: [www.corfo.cl](http://www.corfo.cl).

<sup>129</sup> Source of information: Interview with CORFO.

---

project pipelines within commercial banks clients.<sup>130</sup> In 2012 the ‘Renewable Energy and Energy Efficiency Program’ was established with a CORFO-KfW Loan for EE and NCRE. Another component of the Program is around technical assistance for financial institutions and beneficiaries. CORFO is also working on a Solar Energy Development Program, focusing on concentrated CSP. It also collaborates with CIFES on a Self-Supply NCRE NAMA with a strong capacity building focus for both financial institutions and project developers.<sup>131</sup> It also has a credit line for commercial banks to refinance long term loans for NCRE of up to 20MW including energy efficiency and self supply schemes.

**INDAP – Instituto de Desarrollo Agropecuario** – Created in 1962 promotes small scale farming and has among its core functions the provision of access to finance for this sector. This has traditionally been via credit lines, subsidies and grants.<sup>132</sup> Its annual budget is over USD 400m which comes from its sponsoring Ministry - the Ministry of Agriculture – is used to support 22 programs with a focus on 3 key areas: capacity building, investment and training. It was INDAP that has involved in developing a pilot insurance program for small producers, recently focused on providing catastrophe insurance to these farmers<sup>133</sup>.

**BancoEstado** – This is a state-owned bank, created in 1953 and providing wholesale and retail banking services to large and medium size companies and government activities, as well as individuals. It has a particular emphasis on ensuring access to finance for small businesses and microenterprises. It is the only bank in Chile providing microfinance. Currently, it does not provide a financial products or services related to climate change.

Given that national development banks have been critical in promoting renewable energy investment and climate-proofing key sectors of the economy, including agriculture, there is a strong case to be made for putting them at the centre of the development of NFS. This point is reinforced by the Inter-American Development Bank (IDB), which has identified two main activities that NDBs could undertake to contribute to attract private investment (Figure 15). First is the Pre-investment phase: the focus is to increase the demand for climate finance through the provision of technical assistance to the project. Second is the investment phase: by providing the necessary incentives to mobilize the supply of climate-friendly investment from the private sector by offering financial instruments on adequate terms and conditions.

Given the inherent advantage of NDBs, efforts should be made to include them in policymaking – to ensure emergent policies are ‘bankable’ as well as developing mechanisms for attracting international sources for climate finance.<sup>134</sup>

---

<sup>130</sup> IRENA 2015b.

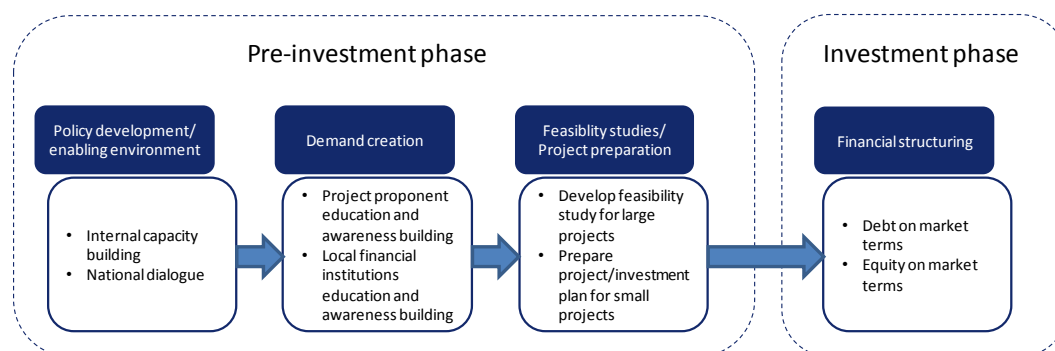
<sup>131</sup> CORFO 2015.

<sup>132</sup> CEPAL 2004.

<sup>133</sup> Ministerio de Agricultura 2015.

<sup>134</sup> Amin et al 2014. This was also one of the main design functions for the UK’s Green Investment Bank. Holmes and Mabe 2009.

Figure 15 NDB activities for attracting private investment



Source: IDB 2013.

## 4.3 International finance

### 4.3a. Multilateral Development Banks and Bilateral Development Banks (MDB - BDBs)

Like NDBs, MDBs and Bilateral Development Banks (BDBs) are important as finance providers but also for their technical capacity and expertise.<sup>135</sup> They are important in helping build the capacity of NDBs and local banks to mainstream climate-resilient financing.<sup>136</sup> In 2014 approximately USD 28.3bn in climate finance was provided by MDBs, including own and donor resources.<sup>137</sup> Many MDBs have targets for lending to climate action – and these targets were increased in 2015 ahead of the Paris climate conference.<sup>138</sup> As well as doing direct lending, the MDBs are implementing agencies of the international climate funds.<sup>139</sup>

In Chile the following institutions are the most active:

- World Bank, Multilateral Development Bank
- Inter-American Development Bank, Multilateral Development Bank
- Andean Development Corporation (CAF), Multilateral Development Bank
- International Finance Corporation (IFC), Multilateral Development Bank
- Bilateral Development Financial Institution - Kreditanstalt für Wiederaufbau (KfW), German Bilateral Development Bank

In Chile, the IDB is one of the largest MDBs contributing to climate finance. It is estimated that approximately USD 173.4m was approved in funds in 2014 (USD 165m

<sup>135</sup> Some of these institutions also provide financing instruments including equity investment, currency swaps, and other types of guarantees or insurance products

<sup>136</sup> WRI 2012 and World Bank 2014.

<sup>137</sup> World Bank 2014.

<sup>138</sup> For example, the ADB would more than double its annual climate financing, up to USD 6bn by 2020, EIB increased target to 35% target for climate lending in developing countries. (Joint Statement by the Multilateral Development Banks at Paris, COP21).

<sup>139</sup> According to Joint Report on Multilateral Development Banks' Climate Finance 2014, Latin America received 17% of the total climate finance commitments, after South Asia with 21%. MDBs reported that 83% of total climate finance in 2014 was committed through loans, 9% through grants, 5% through guarantees, 2% through equity, and 1% through other instruments.

---

in 2013). The IDB along with the World Bank Group and KfW Bankengruppe have focused their operations on financing NCRE feasibility studies with local private banks and public development banks and blending donor funds with public finance to provide low cost concessional finance and technical assistance.<sup>140</sup> The World Bank is currently financing a project called Market Instruments for Climate Change Mitigation which aims to provide technical assistance in the design and implementation of Monitoring, Reporting and Verification (MRV) frameworks.<sup>141</sup> KfW Bankengruppe is providing long-term enhanced loans valuing USD 71.5m for energy efficiency and NCRE projects<sup>142</sup> and USD 110m via CORFO which makes them available to local commercial banks for the first concentrated solar plant in the country.<sup>143</sup>

MDBs will also be important players in the development of an NFS for Chile. In addition to being a source of expertise and finance, key roles could include:<sup>144</sup>

- Providing knowledge of policy, technology and financial risks and solutions to overcome barriers to investment;
- Acting as an honest broker in dialogue between governments and private sector investors in the development of new approaches to financing climate-resilience;
- Helping develop new innovative risk-sharing finance instruments to blend public and private finance to target high public value investment.

#### 4.3b. International Climate Funds

The International Climate Funds tend to have a specific sectoral focus, such as mitigation, REDD+, and adaptation<sup>145</sup>. Most of them were created in the mid- 2000s. The exception is the Global Environment Facility which was created in 1991 as an association of international cooperation between 183 countries working in partnership with international institutions, civil society organizations civil and the private sector to address global environmental problems. These funds are multi-donor<sup>146</sup>, and some of these sources are linked to ODA. Chile is the third largest recipient of International Climate Funding in Latin America after Brazil and Mexico<sup>147</sup> by amount approved (see Figure 16).<sup>148</sup> Over the last five years, the most active funds in Chile have been GEF, CIF, Germany's International Climate Initiative and the Adaptation Fund, (see Annex IX for full details).

---

<sup>140</sup> This has been the case for the CSP project which is under review at the time of publication of this report.

<sup>141</sup> World Bank 2014.

<sup>142</sup> CORFO 2015.

<sup>143</sup> KfW 2014.

<sup>144</sup> Amin et al 2014.

<sup>145</sup> IDB 2012.

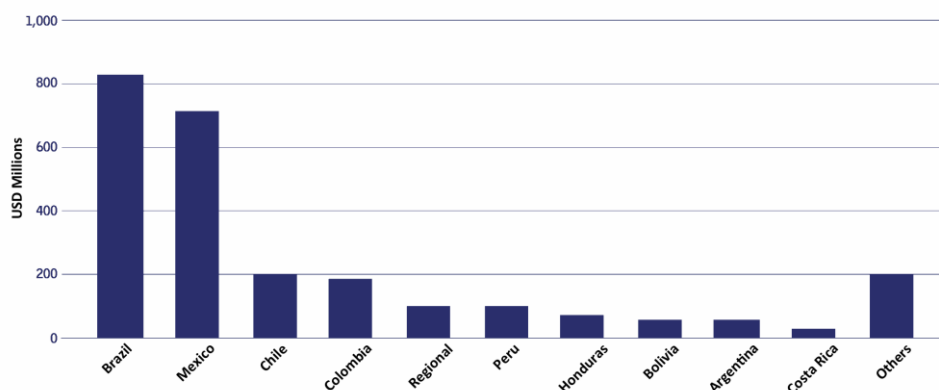
<sup>146</sup> Ibid.

<sup>147</sup> Ibid.

<sup>148</sup> Approved does not mean disbursed.

The total amount approved for Chile is approximately USD 202m between 2010 and 2015 (excluding projects completed).<sup>149</sup> The relevance of the funds in absolute terms is small compared to the total investment that Chile has received from 2009-2015.<sup>150</sup> In 2014 alone total investment in clean energy was USD 1.4bn.<sup>151</sup>

Figure 16 Top 10 countries by amount approved 2003-2015



Source: Climate Finance Regional Briefing: Latin America 2015  
<http://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/10057.pdf>

Despite their relatively small size compared to the total amounts invested in Chile, the climate funds are strategically important for a number of reasons, including for:

- Attracting private investment through enabling NDBs and MDBs to develop risk-sharing instruments.<sup>152</sup>
- Fostering learning and develop the technical capacity to deliver climate-resilient investment.<sup>153</sup>

However, due to the complexity of the institutional architecture and requirements of the funds they have not been fully utilized, especially in countries where there is not the adequate institutional capacity or skill sets to be able to access them (see Annex IX for full details).<sup>154</sup>

From 2017 it is expected that Chile will lose access to at least some of these funds, due to the fact that some countries contributions are linked to ODA. However, donor

<sup>149</sup> Further information available at: <http://www.climatefundsupdate.org/data>

<sup>150</sup> Frankfurt School-UNEP Centre/BNEF 2013.

<sup>151</sup> Ibid.

<sup>152</sup> For example, the Geothermal Risk Mitigation Program (Financial Instrument Component). Initiated in 2014, the Geothermal Risk Mitigation Program (MiRiG) is a partnership between the Government of Chile, Inter-American Development Bank, and Climate Investment Funds (CIF). CIF total investment for MiRiG is USD 75 million which is being undertaken for the purpose of assisting projects that are unable to advance without concessional risk mitigation support; CIF 2014; and for example, the EIB has developed a range of products such as equity funds, wholesale debt, project bond, among others.(EIB 2015).

<sup>153</sup> For example the EIB has developed several products focus on risk-sharing instruments and technical assistance to grow private financing of energy efficiency among private banks in Europe. Further information at: [http://www.eib.org/epcc/ee/documents/presentations\\_26\\_09\\_2013\\_ljubljana/eib\\_and\\_ee\\_ljubljana\\_sk\\_-26\\_09\\_2013.pdf](http://www.eib.org/epcc/ee/documents/presentations_26_09_2013_ljubljana/eib_and_ee_ljubljana_sk_-26_09_2013.pdf)

<sup>154</sup> Cepal 2015b.

---

countries will continue to provide finance to support climate-resilient investment in Chile via the Green Climate Fund. The Green Climate Fund will therefore be a key institution for supporting delivery of the NFS, and raising the ambition of Chile's INDC.

#### 4.3c. Green Climate Fund

The Green Climate Fund was established in 2010 under the framework of the UNFCCC with the aim of supporting low-emission and climate-resilient investments in developing countries. The Fund will help deliver on the commitment by developed countries to mobilize USD 100bn of public and private finance annually for climate action in developing countries by 2020. It has secured USD 10bn in finance since December 2014. The Fund finances low-emission (mitigation) and climate resilient (adaptation) projects and programs developed by the public and private sector to contribute to the sustainable development goals of countries. The GCF portfolio allocation is divided equally between adaptation and mitigation. GCF will aim for a floor of 50% of the adaptation allocation for particularly vulnerable countries, including Least Developed Countries, Small Island Developing States and African States.<sup>155</sup>

The GCF will be an important source of finance as Chile develops out its NFS – projects must align with its strategic impact areas identified under its Result Management Framework (RMF) – see Figure 17. Furthermore, the projects will be evaluated based on the fund's six investment criteria:<sup>156</sup> In this context Chile's NFS should ensure proposals are consistent with the GCF's investment criteria. Impact potential: Potential of the programme/project to contribute to the Fund's objectives to shift towards low emission and climate-resilient sustainable development.

1. Paradigm Shift: Degree to which the proposed activity can catalyse impact beyond a one-off project or programme investment.
2. Sustainable development potential: Wider benefits and priorities. Will the project/programme deliver meaningful environmental, social, and economic co-benefits and have a gender-sensitive development impact?
3. Country ownership: Beneficiary country ownership of and capacity to implement a funded project. How well does the project fit within the beneficiary country's existing policies, climate strategies and institutions?
4. Efficiency and effectiveness: Economic and, if appropriate, financial soundness of the project. For mitigation-specific projects, how cost-effective is it and how much co-financing will it bring?
5. Needs of the recipient: Vulnerability and financing needs of the beneficiary country. To what extent does the project address vulnerable groups, barriers to financing, and level of exposure to climate risks within the country?

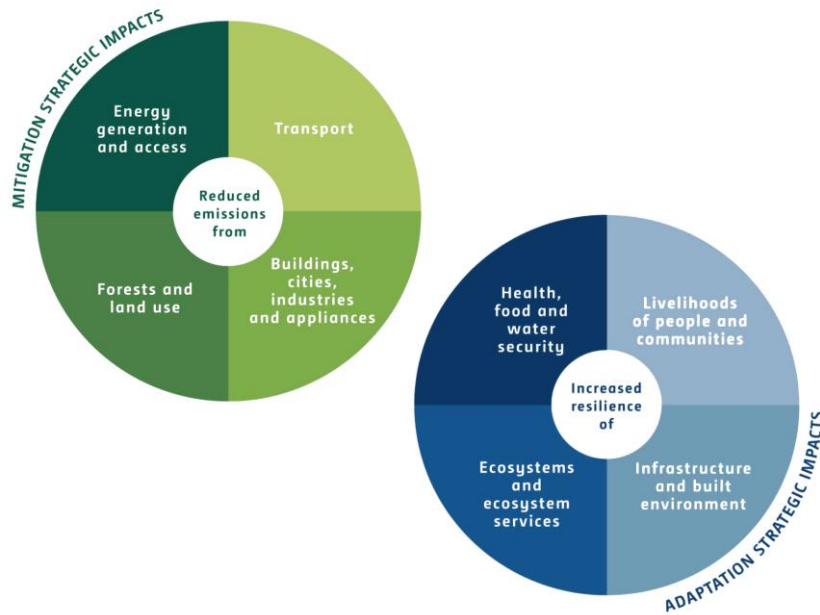
---

<sup>155</sup> Further information available at: <http://www.greenclimate.fund/ventures/funding#bold-ideas>

<sup>156</sup> GCF 2014.



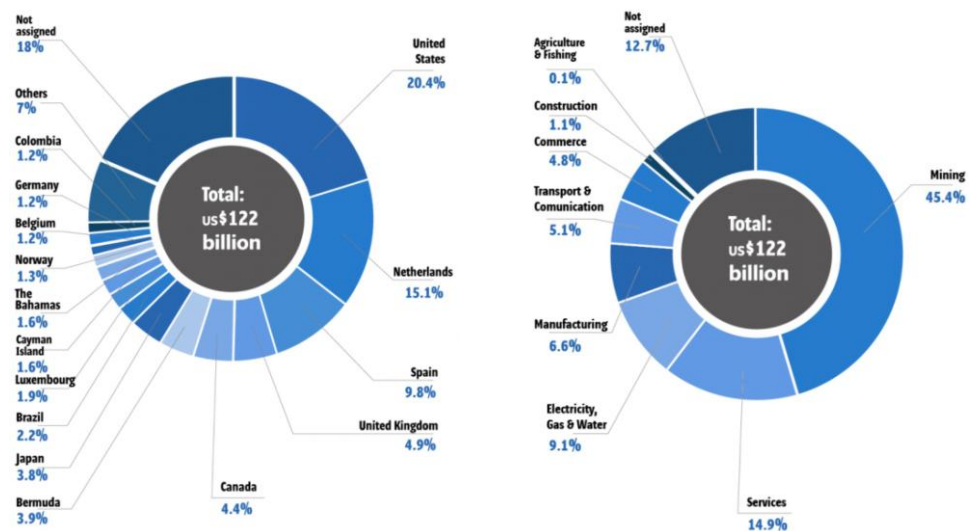
Figure 17 GCF Results Management Framework



#### 4.3d Foreign direct investment (FDI)

Chile is already doing very well with FDI. It is ranked as the 6<sup>th</sup> largest global recipient of FDI<sup>157</sup> out of emerging economies and the second largest in Latin America, behind Brazil and ahead of Mexico, in 2014. According to the Central Bank, more than USD 100bn of FDI was invested between 2009 and 2014 - of which the main sources of investment (by country of origin) were the United States (20.4%), Netherlands (15.1%), Spain (9.8%), United Kingdom (4.9%) and Canada (4.4%) see Figure 15.<sup>158</sup>

Figure 18 FDI Flows in Chile per country and sector 2009-2014.



Source: CIE statistics

<sup>157</sup> UNCTAD 2015.

<sup>158</sup> CIE 2015.

---

The sectors that have benefitted the most from FDI have been mining, services and electricity, gas and water. The Foreign Investment Committee (CIE) has said that USD 186m in new infrastructure is needed to deliver on the potential of NCRE in Chile. With the right risk-adjusted returns, FDI – along with domestic finance – will be an important source of capital to close this investment gap. The CIE also noted that to unlock such investment issues with the transmission grid will need to be resolved – a key policy issue for Chile to consider as it develops its NFS.

---

## 5. CHILE'S REAL ECONOMY OPPORTUNITIES AND CHALLENGES

Delivering the INDC will have real impacts in the real economy as it will change the way energy is delivered and used and the way that agriculture practices are undertaken. This section looks at how energy and agriculture sectors are already changing due to policy but also market forces and the changing climate. It then looks at how further government actions and clever use of public-private financial innovation as part of an NFS can further accelerate the changes in the real economy needed to deliver Chile's INDC.

As Chile moves to develop a NFS, it should of course be remembered that an economy-wide approach will be needed to facilitate its transition to a low-carbon and climate-resilient economy. For the purpose of this initial project, however, there is a focus on the electricity sector and in the agricultural sector – because these are the sectors in which the biggest potential both to reduce emissions and develop climate-resilience actually lie. This chapter summarises progress made to date in these sectors and identifies issues on which close attention should be focused when developing the NFS, both directly and indirectly related to addressing these sectoral challenges.

In this chapter a range of opportunities and challenges are set out. They include very high level strategic issues such as how to fully understand climate risk and plan for resilient infrastructure to very detailed actions needed to address market failures such as information gaps for energy efficiency. These issues emerged from both the desk-top based research and interviews with stakeholders. They are all included as they are all relevant to deliver an NFS. In chapter 6 we provide some guidance on how to manage the different levels of intervention needed from macro to micro.

### 5.1 Successes, challenges and opportunities in mitigating climate change

Chile, like many countries globally, faces a shortfall in infrastructure investment across the board. An estimated USD 90 trillion in infrastructure investment is needed globally by 2030, of which an estimated additional 5% of upfront investment is needed to deliver low rather than high carbon infrastructure. Integrating climate objectives into infrastructure decisions will increase resilience, avoid locking in carbon-intensive and polluting investments and lower the risk of future cost on constrained public budgets.<sup>159</sup> This is especially true of energy infrastructure. Setting up binding specific sectoral targets is a key way signal a shift infrastructure investment towards a climate-resilient pathway is required.

---

<sup>159</sup> Rydge et al 2015.

As described in Chapter 3, Chile has recently set up several specific renewable energy and energy efficiency targets. Table 3 summarises them – as well as progress to date. (The forecast amount of electricity requested by the government through auctions per annum is shown in Annex X).

*Table 3 Mitigation and adaptation targets and goals*

Targets and goals	Progress
<b>Renewable energy</b> <b>20% NCRE by 2025<sup>160</sup></b> <b>45% of new installations 2014-2025<sup>161</sup></b> <b>60% RE by 2035<sup>162</sup></b> <b>70% RE by 2050<sup>163</sup></b>	By the end of 2015, the obligations of Law 20.257 and Law 20/25 which require around 200 GWh of electricity generation met by NCRE, had been overachieved by x2. NCRE installed capacity corresponds to 11.5% of the electricity matrix by December 2015. <sup>164</sup> Chile is on a good track to reach the 20% target well before 2025. <sup>165</sup>
<b>Energy efficiency</b> <b>20% energy savings by 2025<sup>166</sup></b> <b>Energy management systems and EE improvement for large consumers by 2035<sup>167</sup></b> <b>Decoupled energy consumption and GDP growth BY 2050<sup>168</sup></b>	In 2014, 5% energy saving have been achieved through public policy measures established since 2008. <sup>169</sup> Energy intensity decreased by 15% between 2001 and 2011. <sup>170</sup>

It has been estimated that around USD 24.3bn needs to be invested between 2014 and 2023 in Chile’s energy infrastructure, mostly in electricity generation and distribution (for details of infrastructure investment estimates, please see Annex XII).<sup>171</sup> Growing demand for electricity; concerns about energy security; rising electricity prices (which at USD 151.33/MWh in 2013 were among the highest in the world<sup>172</sup>); and the need to reduce GHG emission have made the electricity sector a key target for attracting investment. As such it is a core part of the Government Programme and also a main focus area of Chile’s Foreign Investment Promotion Agency.<sup>173</sup> See Figure 19 for an overview of Chile’s electricity mix.

<sup>160</sup> Established through Law 20/25.

<sup>161</sup> Energy Agenda 2014-2018.

<sup>162</sup> Energy 2050. The target refers to all technologies, including large hydro. Energy 2050 states that main sources are supposed to be solar and wind, but does not specify exact percentage.

<sup>163</sup> Ibid.

<sup>164</sup> CIFES 2016.

<sup>165</sup> Bloomberg 2015.

<sup>166</sup> Energy Efficiency Action Plan 2012-2020.

<sup>167</sup> Energy 2050.

<sup>168</sup> Ibid.

<sup>169</sup> Source of information: Consultation with Ministerio de Energía/Division de Eficiencia Energetica.

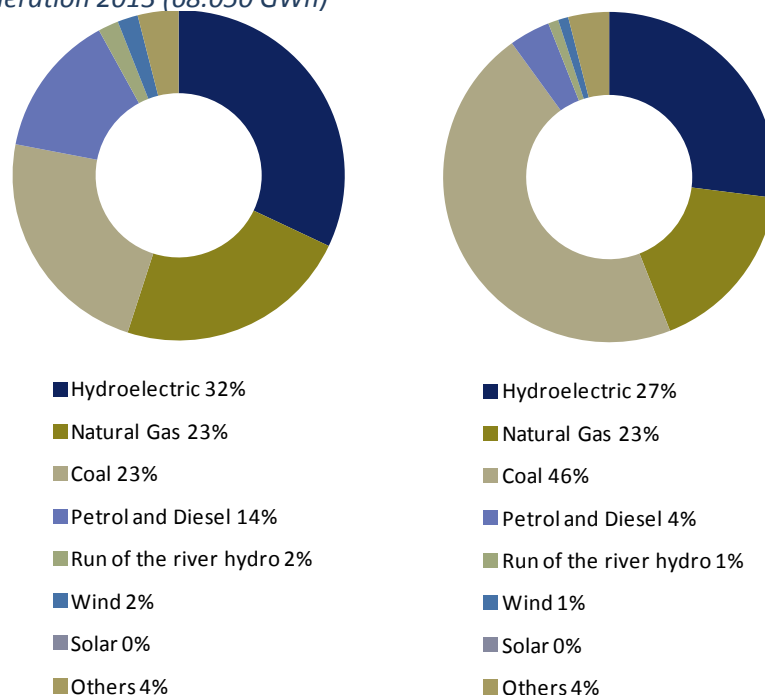
<sup>170</sup> CEPAL 2014.

<sup>171</sup> IEA 2009 and Cámara Chilena de la Construcción 2014.

<sup>172</sup> IASS Potsdam 2016.

<sup>173</sup> Government Program 2014-2018; and CIE Chile 2016.

Figure 19 Left: Installed power capacity (17,586 MW). Right: Power generation 2013 (68.050 GWh)



Source: Energy Agenda 2014-2018.

In Chile, renewable energy is classified as ‘conventional’ and ‘non-conventional’. For several decades, large-scale hydropower was Chile’s largest power source. For this reason it is classified as ‘conventional’. All other renewable sources – including small hydropower – are classified as ‘non-conventional’. In this context, it is worth briefly reviewing the history and current challenges of energy infrastructure and security challenges in Chile. In the 1990s droughts caused supply shortfalls making large-scale hydropower unreliable. It is expected that the increasing water scarcity caused by climate change will continue to limit its use. In response, Chile began to diversify its electricity mix by investing in a range of other renewable and non-renewable energy sources, notably natural gas. Argentina was for many years Chile’s largest gas supplier, delivering around 90% of Chile’s gas demand before the mid-2000s.<sup>174</sup> However, faced with domestic fuel shortages, Argentina suspended gas exports to Chile - which resulted in widespread electricity blackouts in Chile from the mid-2000s. In response Chile turned to other energy sources, notably coal. This however, reinforced the country’s dependence on imported fuels - with energy imports increasing from 48% to 76% of total primary energy consumption between 1990 and 2010 – increasing both prices and energy insecurity.<sup>175</sup>

<sup>174</sup> IEA 2009.

<sup>175</sup> Climate Investment Funds 2012.

---

## 5.1a Non-Conventional Renewable Energy

Since 2013, Chile has had a strong push to further diversify its sources of energy – this time through focusing on stimulating the deployment of NCRE (especially solar). Progress has been good (see Table 4). In the past two years Chile has become one of the top destinations for renewable energy investment, attracting large investors and project developers from the US and Europe.<sup>176</sup> World-class names include Abengoa, Acciona Energía, EDF énergies nouvelles, Enel Green Power, First Solar, Solarcentury and RES.<sup>177</sup> As a result, installed NCRE capacity grew from around 5.5% in 2013 to 11.5% in 2015 (while large hydro accounts for approximately 32% of total installed capacity). Installed NCRE capacity is at ~2,300 MW, with a further ~2,800 MW under construction – mainly solar-PV.<sup>178</sup> In 2015 Bloomberg – which ranks countries on a range of parameters including ‘Enabling Framework’; ‘Clean Energy Investment & Climate Financing’; ‘Low-Carbon Business & Clean Energy Value Chains’; and ‘GHG Management Activities’ – ranked Chile 3<sup>rd</sup> out of the 55 countries included in the index. Notably, Chile’s best performance was on GHG Management Activities, taking first place globally. This shows the value of robust climate change goals and efforts in ensuring investment flows in the electricity sector.

The rapid growth of NCRE in the electricity mix can be attributed partly to the low cost of solar and wind relative to fossil fuels and partly to the changes to the energy auctioning system, which enabled renewable energy technologies to compete on a level playing field with fossil fuel power plants (see Chapter 3). In October’s tender, solar PV power was offered at between USD 65 and USD 68/MWh; a concentrated solar power (CSP) plant with storage offered USD 97/MWh; and two wind farms bid at USD 79/MWh. Coal power was offered for USD 85/MWh in the same auction. As a result average bidding prices fell by 40% between 2013 and 2015 due to increased competition – and the renewable energy companies (rather than conventional generators) won all the contracts.<sup>179</sup>

The fact that some NCRE are cheaper than fossil fuels and can compete without subsidies (feed-in tariffs etc.) is a significant competitive advantage for Chile. One of the major challenges facing renewable energy investment in Europe is uncertainty over policy support – which creates uncertainty over whether investments will remain financially viable throughout their operational lifespan.<sup>180</sup> The reductions in feed-in tariff (FIT) in the UK, Spain and elsewhere have reduced country attractiveness. For example, retroactive cuts to the FIT in Spain saw investment ‘fall off a cliff’ in 2010, when investment decreased by over 50% compared to the year before.<sup>181</sup> Generally, policy uncertainty, e.g. governments withdrawing subsidies or support mechanisms, is

---

<sup>176</sup> Bloomberg 2015 and Ernest and Young 2015.

<sup>177</sup> ACERA 2016.

<sup>178</sup> CIFES 2016.

<sup>179</sup> Ministerio de Energía 2015b.

<sup>180</sup> IEA 2011.

<sup>181</sup> Davies and Holmes 2011.

considered one of the most significant risks to investment in renewables.<sup>182</sup> This supports Chile's competitive advantage in solar and wind, as unlike in European countries and the US, direct policy support is not needed.

However policy risk does need to be considered for new NCRE sectors that Chile is seeking to develop using 'hidden' forms of subsidy such as risk-sharing financial instruments. Other issues related to policy risk – such as administrative hurdles and grid access – should also be considered as part of the NFS. They are relevant to Chile as described below.

*Table 4 NCRE potential, installed capacity and capacity under construction in MW (as of January 2016)*

Technology	Available potential <sup>183</sup>	Installed capacity	Under construction
<b>Solar PV</b>	1,263,000	848	2,195
<b>Solar CSP</b>	549,000	0	110
<b>Wind</b>	38,000	904	409
<b>Geothermal</b>	3,350 <sup>184</sup>	0	48
<b>Small hydro</b>	13,000	417	54
<b>Biomass and Biogas</b>	n.a.	417 and 46	0

Sources: Ministerio de Energía and GIZ, 2014 (available potential) and CIFES, 2016 (installed capacity and capacity under construction).

**Wind** – Onshore wind is currently the largest NCRE installed capacity source (904 MW). In 2012 investment in wind grew from around USD 0.25bn to over USD 1.25bn, which then decreased again to around USD 0.75bn in 2013.<sup>185</sup> As can be seen in the map in Annex XII, the best locations to deploy on wind technology are not as extensive as for solar. Many are located in the south, far away from centres of power demand.

**Small hydro** (<20 MW<sup>186</sup>) – Around 13,000 MW of small hydro capacity have been identified in Chile. Of this 417 MW has been developed and a further 54 MW planned. The Government has planned to develop mini hydro projects with a total capacity of 500 MW in the foreseeable future. However, transmission line capacity is currently insufficient in areas where projects are planned<sup>187</sup>.

<sup>182</sup> REN21 2015; Frankfurt School, UNEP Centre and BNEF 2015; and Davies and Holmes 2011.

<sup>183</sup> Available potential = installable capacity.

<sup>184</sup> IEA 2009 states that the National Oil Company (ENAP) estimates a potential to produce 3,350 MW of electricity from geothermal in Chile. This estimation is from 2003 and it is currently being requested to update this number. Source of information: Consultation with Ministerio de Energía.

<sup>185</sup> Bloomberg 2015.

<sup>186</sup> CIFES 2016.

<sup>187</sup> Source of information: Interview with ACERA.

---

**Biomass and Biogas** – Wood is the main source of biomass power generation in Chile. Projects have developed mainly as part of the Clean Development Mechanism (CDM). Arauco, for instance has developed biomass CDM projects since 2006<sup>188</sup>. However, the decrease in Certified Emission Reduction (CER) has led to stagnation in biomass power projects. Biogas power generation is mainly based on waste<sup>189</sup>. Neither biomass nor biogas power generation projects are currently under construction as can be seen in Table 4.

**Solar PV and CSP** - While the largest NCRE installed capacity is in wind– solar PV in Chile is fast catching up (848 MW) and looks set to dominate the NCRE mix. This should not be a surprise since Chile has one of the highest irradiation levels in the world. Both solar PV and solar-CSP overall offers the largest development potential for Chile (see Table 4)<sup>190</sup>. Most of the currently installed capacity is based on power purchase agreements (PPAs), including with mining industry, to sell power on the spot market. However, the recent changes in auction regulation has also increased the participation of solar in the wholesale market, a trend that is likely to continue.<sup>191</sup> Chile's success in deploying solar PV will help increase investor interest in other NCRE sectors. This has already happened with solar CSP. Chile's first solar CSP facility recently began construction, and it is now receiving media attention globally.<sup>192</sup> The Cerro Dominador plant (110 MW) in the Atacama Desert is expected to provide baseload power for mines.<sup>193</sup>

The vast potential for and rapid growth of investment in solar makes it a strategically important core NCRE for Chile. As such it has been selected as a sector for which further analysis of opportunities and barriers to scaling up should be considered more closely. The other sector identified as being especially interesting is geothermal – this is on the basis of its currently under-exploited but nonetheless significant resource potential.

**Geothermal** - In the case of geothermal, the industry is still underdeveloped relative to its potential, 48 MW is in development compared to an estimated potential of 3,350 MW.<sup>194</sup> This is mainly due to the high investment cost in geothermal and also partly related to the lack of technical expertise within the country.<sup>195</sup> Unlike many other

---

<sup>188</sup> Source of information: Interview with Arauco.

<sup>189</sup> Source of information: Interview with ACERA.

<sup>190</sup> Ministerio de Energía and GIZ 2014.

<sup>191</sup> Bloomberg 2015.

<sup>192</sup> For example <http://www.theguardian.com/environment/2015/dec/22/desert-tower-raises-chiles-solar-power-ambition-to-new-heights>; [http://www.pv-magazine.com/news/details/beitrag/abengoas-210-mw-chile-solar-hybrid-complex-approved\\_100019595/#axzz41rZLiqEO](http://www.pv-magazine.com/news/details/beitrag/abengoas-210-mw-chile-solar-hybrid-complex-approved_100019595/#axzz41rZLiqEO)

<sup>193</sup> REN21 2015. Note: The project is declared as 'under construction' (Resolution Ex. No. 62/2016 that "Updates and Communicates Constructions in Progress"). However, the company developing the project, Abengoa, has been facing insolvency. Nevertheless on 10 March, Abengoa reached the basis of an agreement with its bank creditors and bondholders to refinance its debts and provide new loans.

<sup>194</sup> IEA 2009 states that ENAP estimates a potential to produce 3,350 MW of electricity from geothermal in Chile. This estimation is from 2003 and it is currently being requested to update this number. Source of information: Consultation with Ministerio de Energía.

<sup>195</sup> High upfront investment costs are a main barrier. For geothermal to be able to compete it would need to sell energy at \$ USD 120 MW/hr when the average price at the latest auction was \$USD 80 MW/hr according to the Ministry of Energy.



---

countries which make use of geothermal energy, Chile is not an oil producer – many of the technologies and skills needed for geothermal exploitation are the same as for oil exploitation. Chile also faces higher structural costs<sup>196</sup> compared to other countries due to the high altitude and remoteness of the location of the energy source and accessibility (steep terrains) resulting in even higher risks in resource exploration.<sup>197</sup> Furthermore, many geothermal land concessions and requests overlap with indigenous communities' territories, which results in many requests for exploitation to be subject to consultation in line with the International Labour Organisation (ILO) Convention.<sup>198</sup> Compared to many other countries, historically Chile's Government has not been very involved in supporting geothermal activities.<sup>199</sup> However, this is now changing through policy efforts and initiatives, including a shared risk facility (Geothermal Risk Mitigation Program - MiRig) with funds of around USD 75m from the Clean Technology Fund (CTF), which have started to be deployed in 2015.<sup>200</sup> Furthermore an agreement for technical assistance in geothermal energy is being developed between the World Bank and the Government of Chile, with an amount of USD 3.5m from the CTF, for a period of 4 years. There is also a resource transfer agreement between the Ministry of Energy and the Chilean National Geology and Mining Service, established in late 2015, to draw a low enthalpy map in regions with geothermal potential. The Ministry of Energy has also worked on amendments to the regulations of geothermal energy, and the amendment of Geothermal Concession Law 19,657.<sup>201</sup> The impacts of these efforts on geothermal development still need to be assessed as they are evolving.

## 5.1b. Challenges for the NCRE sector

While progress in deploying large scale NCRE is very good, there are some barriers to seeing the full potential of renewable deployed that should be considered as the NFS is developed. There have been several comprehensive studies of the barriers to scaling up NCRE deployment in Chile<sup>202</sup>. The reports provide a helpful starting point to understand the issues. However, the sector is evolving very rapidly – and in such circumstances, interviews with key stakeholders become an important source of information to identify where the highest value intervention points are.

E3G conducted extensive interviews with stakeholders (summarised in Annex XIII), the findings of which are set out in Table 5, with the headlines summarised below. Barriers and challenges have been divided into 'non-financial' and 'financial'. However it is important to note that many of the non-financial barriers cited act to create financial

---

<sup>196</sup> Costs which incur during resource exploration and development drilling.

<sup>197</sup> Source of information: Interview with IDB; and Reed 2013.

<sup>198</sup> Source of information: Consultation with Ministerio de Energía.

<sup>199</sup> Reed 2013; and Micale et al 2014.

<sup>200</sup> IRENA 2015b.

<sup>201</sup> Source of information: Consultation with Ministerio de Energía.

<sup>202</sup> GIZ 2014: Barriers identified through interviews with 11 stakeholders/experts; CIFES 2015: Barriers identified through workshop with 50 participants divided into grid-connected, distributed and size of project by MW generated. UAI 2015: Barriers identified through academic research interviews with 60 stakeholders/experts.

barriers. This is a finding that has been common in other countries in which E3G has worked.

*Table 5 Non-financial and financial barriers/challenges to further scaling up NCRE in Chile*

	Barrier / Challenge	Issues and considerations	
<b>Non-Financial Barriers</b> <sup>203</sup>	<b>Grid connection and expansion</b>	<ul style="list-style-type: none"> <li>• Lack of sufficient and adequate transmission lines/grid capacity.</li> <li>• Mismatch of grid infrastructure with newly constructed projects/projects under construction.</li> <li>• NCRE projects built cannot connect to the grid.<sup>204</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Currently the government addresses this issue by planning additional transmission lines and interconnection of Chile's two main grids (SIC and SING) by 2018. The Government's Transmission Law project will set out detailed plans for how further grid development and interconnection will be achieved.</li> <li>• To avoid NCRE investment momentum being lost, there would be value in stronger coordination between the government and project developers to align grid expansion activities with NCRE project development activities.</li> </ul>
	<b>Regulatory Framework</b>	<ul style="list-style-type: none"> <li>• Process of permits to construct projects - no differentiation between different project sizes or technologies.</li> <li>• High transaction cost for small projects.</li> </ul>	<ul style="list-style-type: none"> <li>• Consideration should be given to streamlining permit processes for smaller scale projects.</li> <li>• Consideration should be given to differential approaches to applying proposed environmental and social risk regulation for different technologies.</li> </ul>
	<b>Land Ownership and Communities</b>	<ul style="list-style-type: none"> <li>• In the northern regions of Chile there are problems related to land ownership and mining.</li> <li>• Across the country but particularly in the southern region there have been issues with local communities which have not been sufficiently consulted and considered for projects.</li> </ul>	<ul style="list-style-type: none"> <li>• There is a work program between the Ministries of Energy and National Assets in progress, which has been highly successful in promoting NCRE in property tax, under which solar and wind projects are being implemented. Furthermore a modification of the Electricity Services Law addresses the issue of land speculations by mining companies.</li> <li>• Consider role and situation of local communities and increase participation of local communities.</li> </ul>
	<b>Lack of domestic supply chain</b>	<ul style="list-style-type: none"> <li>• Technology is mainly being imported and there is a lack of skilled domestic technicians and consultants.</li> </ul>	<ul style="list-style-type: none"> <li>• Building up supply chain for strategically important technologies such as solar. This will be further considered below.</li> </ul>
	<b>Small-scale and</b>	<ul style="list-style-type: none"> <li>• Due to the smaller size of the technology and certain current</li> </ul>	<ul style="list-style-type: none"> <li>• NCRE self-supply NAMA<sup>205</sup> has been designed and is currently seeking support.<sup>206</sup></li> </ul>

<sup>203</sup> Source of information: Interview with ACERA; Geco Group; Barros y Errázuriz Abogados; discussions at workshop held in Chile, November 2015; and CIFES 2015; UAI 2015; and GIZ 2014.

<sup>204</sup> It is estimated there is a current delay of 6 months to connect to the SIC grid.

<sup>205</sup> The aim of the NAMA is to promote the integration of decentralised generation by creating financial conditions and technical support. A guarantee fund, supposed to be managed by CORFO, is one of the instruments of the financial component, which also provides subsidies for pre-investment studies and investment. The fund aims to reduce the interest rate of loans for self-supply NCRE projects, facilitating access to financing. CORFO 2015.

<sup>206</sup> UNFCCC 2016.

<p><b>distributed projects</b></p>	<p>requirements (see above) there is a higher transaction cost for small and distributed projects.</p> <ul style="list-style-type: none"> <li>Financial institutions may have little incentive to finance small projects due to (perceived) opportunity cost of capital.</li> </ul>	<ul style="list-style-type: none"> <li>Net metering law 20.571 has been implemented around 1 year ago. It led to installations of around 1.4 MW by December 2015.<sup>207</sup></li> <li>In order to ensure further access to finance, using public banks to crowd in financing should be considered.</li> <li>Focus on building strong pipeline and developing aggregation vehicles for refinancing via capital markets.</li> </ul>
<p><b>Lack of track record</b></p>	<ul style="list-style-type: none"> <li>Lack of track record in investments creates technology uncertainty; new technologies need to prove viability.</li> <li>This currently leads to higher cost of capital.</li> </ul>	<ul style="list-style-type: none"> <li>Government needs to consider targeted (policy or risk-sharing) support for emerging technologies to build pipeline of project and to help connect capital with projects.</li> <li>Many of these issues generally resolve over time as it has been the case with solar.</li> </ul>
<p><b>Long-term finance</b></p>	<ul style="list-style-type: none"> <li>Scale of infrastructure investment needed requires new sources of capital including institutional investors.</li> <li>Banks continue being important but new routes to channel capital become increasingly important (See Chapter 4).</li> </ul>	<ul style="list-style-type: none"> <li>New routes need to be explored to repay bank loans, e.g. via green bonds or regulation to support direct investment.</li> <li>This will be further considered in the next chapter.</li> </ul>
<p><b>Exchange rate risk</b></p>	<ul style="list-style-type: none"> <li>As most investors and project developers are foreign companies, most renewable energy project transactions are in US-Dollars in particular for large scale projects which sign PPAs in USD. However for small scale distribution companies this creates exchange rate risk: if the local currency depreciates it increases the risks that project revenues may not cover costs. Currently exchange rate changes are reflected in tariff adjustments.</li> <li>Most international resources like the GCF disburse their funding in foreign currencies. There is an exchange risk when transactions are related to concessional loans or contingency grants with</li> </ul>	<ul style="list-style-type: none"> <li>Two broad options exist for government to help mitigate exchange rate risk: (i) Offering government-sponsored foreign exchange hedging facilities which allow the government to influence the macroeconomic conditions that influence exchange rates; (ii) Encouraging domestic investment with local companies leading in partnership with overseas project developers and securing finance from domestic sources, including pension funds.</li> <li>Currency risk can also be mitigated through the use of international foreign exchange rate instruments like the one offered by Multilateral Investment Guarantee Agency (MIGA) from the World Bank<sup>209</sup>, of which Chile is a member or special purpose funds like the Currency Exchange Fund (TCX)<sup>210</sup>.</li> </ul>

Financial Barriers<sup>208</sup>

<sup>207</sup> Source of information: Consultation with Ministerio de Energía

<sup>208</sup> Source of information: Interview with ACERA; Banco Bice; discussions at workshop held in Chile, November 2015; and CIFES 2015; UAI 2015; GIZ 2014; and CORFO 2015.

<sup>209</sup> The World Bank Group 2015.

<sup>210</sup> TCX 2016.

<p>repayment terms.</p> <ul style="list-style-type: none"> <li>• CORFO is planning to offer special loans for NCRE via commercial banks through the Loan Programme for NCRE and EE in particular for medium to small scale projects. In the past there have been difficulties of special credit lines and instruments being offered by the financial sector.<sup>211</sup></li> </ul> <p><b>Lack of awareness of financial instruments</b></p>	<p>Awareness need to be created. CIFES and CORFO are currently addressing this through the before mentioned Self-Supply NCRE NAMA.<sup>212</sup></p>
--	--

Of the key issues identified as being potential barriers to further progress, including grid connection and expansion, several are already starting to be addressed by the Government. **Resolving grid access issues – as has been observed in many other countries, including the UK - will be a priority to ensure the NCRE investment potential can be realised via the NFS and full and timely use made of international sources of public finance to support development of a climate-resilient economy. Dialogue with industry players including NCRE developers and potential financiers to understand how to address barriers to deploying finance – particularly for smaller investments - should also be explored.**

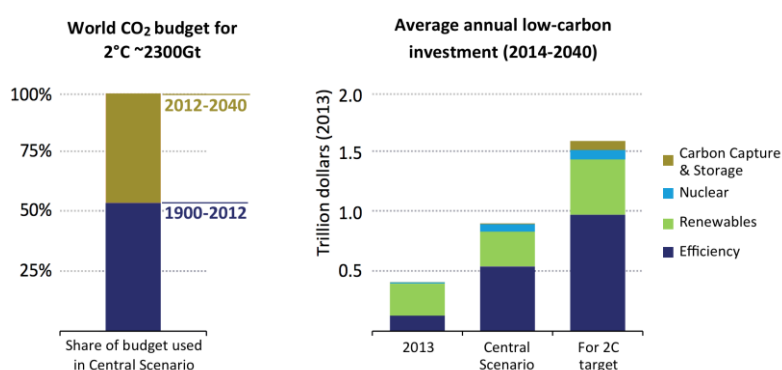
<sup>211</sup> Interview with CORFO

<sup>212</sup> CORFO 2015.

## 5.1c. Energy Efficiency

Globally it is estimated that two-thirds of energy-related investment should be in energy efficiency by 2040 in order to avoid high carbon lock-in and asset stranding (see Figure 20).<sup>213</sup> It is a common theme throughout the world that energy efficiency investment levels are suboptimal compared to the volume needed.<sup>214</sup> Energy efficiency, more than any other sector, requires a strong government push to drive things forward.<sup>215</sup>

Figure 20 Energy Efficiency under 2°C scenario



Source: World Energy Outlook, 2014

In recent years Chile has made efforts to reduce energy intensity which has decreased 5% between 2008 and 2014<sup>216</sup> (measured annually). However, Energy 2050 highlights that despite this progress, there is still much room for improvement.<sup>217</sup>

Part of the urgency is due to the aforementioned rising energy prices as well as climate change considerations. According to the latest available figures, energy use (final energy) increased 5% from 315.671 to 331.934 GWh in 2012. As shown in Figure 21, most of the energy use is in industry and mining, followed by transport and then buildings.<sup>218</sup> However, looking at electricity consumption on its own the industry and mining sector is the highest consumer in the economy (64%).<sup>219</sup>

<sup>213</sup> IEA 2011.

<sup>214</sup> Amon and Holmes 2016.

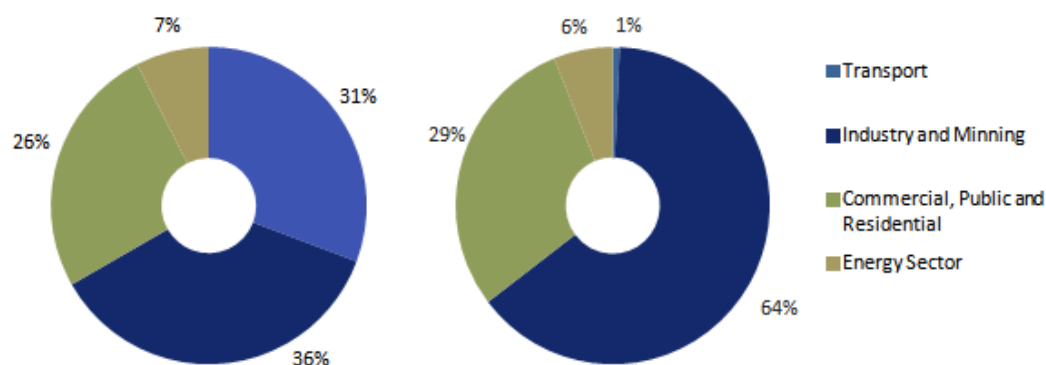
<sup>215</sup> IEA 2007; Holmes and Mohanty 2012; and EFIG 2015.

<sup>216</sup> Source of information: Consultation with Ministerio de Energía/División de Eficiencia Energética.

<sup>217</sup> In Chile, the decoupling (of energy use and GDP growth) has been higher in recent years due to efficiency measures introduced in the sector, as well as increases in energy prices that have encouraged a more rational consumption; and Energy 2050.

<sup>218</sup> Within the mining and industry category, 82% of energy consumption occurs within three subsectors - copper mining (33%), various industries (27%) and pulp and paper (23%). Within transport the largest share of consumption is in land transportation (81%), followed by maritime (11%), air (7%) and rail (1%). It is important to note that within the commercial, public and

Figure 21 Energy<sup>220</sup> and electricity consumption in Chile (2012) (Total energy consumption left; electricity consumption right).



Source: Balance de Energía, 2012.

There have been several recent policy efforts, as set out in Chapter 3, to improve energy efficiency in Chile.

- In the industry and mining sectors standards based on ISO 50001 energy system standards, which are voluntary, have been implemented and also support to the development to combined heat and power plants.
- In industry a voluntary energy efficiency label has been introduced. This is only awarded to companies that sign up and therefore need to submit efficiency data annually.
- In buildings there is an initiative to improve the energy efficiency of existing building that were built without energy efficiency standards; and minimum Energy Performance Standards have been introduced for light bulbs and refrigerators in the residential sub-sector.

As with other energy efficiency standards internationally, there is a trend to build on initial voluntary initiatives to level the playing field by enacting policies that make standards obligatory for certain industries or types of technologies or appliances.<sup>221</sup> Currently Chile is going through a similar process as part of the development of its Energy Efficiency Law. It is designed to support delivery of the Energy Efficiency Action Plan 2012-2020 and is an ongoing process. One elements of the law will be to introduce compulsory management systems for large energy consumers, so that

residential subsectors, the latter represents 80% of the total consumption, follow by the commercial (16%) and public sector (4%).(Balance de Energía 2012).

<sup>219</sup> Within the mining and industry category, 90% of electricity consumption occurs in three subsectors - copper mining (50%), various industries (23%) and pulp and paper (16%). Within commercial, public and residential subsectors, the latter represents 52% of the total consumption, follow by the commercial (37%) and public sector (10%).(Balance de Energía 2012)

<sup>220</sup> It includes all sources of energy use in the economy: fuel, coal, gas, solar, biogas, methane, wind, mineral coke, and electricity.

<sup>221</sup> For example, the EU energy efficiency label.

---

audits could be carried out annually.<sup>222</sup> This could allow measuring performance and comparing it within the industry standard. There is significant further potential for increasing energy efficiency across several sectors of the Chilean economy. As noted above mining, industry and transport are particularly heavy energy users, but residential buildings are also important, especially when looking at electricity consumption, within ongoing and urbanisation trends. Given the economic importance of the mining sector to the Chilean economy, there is a focus here on the challenges and opportunities to improving the efficiency of this sector.

### 5.1d. Challenges for Energy Efficiency

Mining represents 57% of total exports. In 2014, electricity consumption represented 8% of total operational costs. Without action being taken, it has been forecast that electricity consumption for the mining sector will increase by 53% by 2026.<sup>223</sup> This is due to a range of factors including aging mines; declining ore grades that require more energy and water, (as water needs to be shipped from coastal areas, and be desalinated which is a very energy intensive process). This in turn will translate into higher costs for the sector.<sup>224</sup> It is estimated that the process (desalination and impulsion pumps) will require 5.6 times more energy consumption for the period 2015-2026 than it is current used.<sup>225</sup>

In Europe extensive work has been done to try to broker further discussion between the finance and the industry sector to discover what more can be done to scale up industrial energy efficiency investment.<sup>226</sup> This has included extensive surveys of attitudes towards energy efficiency – and how investments are viewed in company Board level discussions. What emerges is that key incentives to invest in energy efficiency are rising energy prices, but on its own rising energy prices are not enough because in addition a number of other barriers pervade. These include energy management systems/ISO 50001 are not broadly implemented in the industry; energy efficiency is often not a topic at board level, there is not clear data and transparency in monitoring and measuring for energy savings against a baseline, and financial institutions only focus on project payback periods rather than the value over the useful lifetime. Some of this could be overcome by increasing awareness for negotiating long term agreements or providing tax deductions, exemptions or concessional loans, which are examples of instruments that have been implemented in other countries, such as Germany, Sweden and Denmark<sup>227</sup>. In addition providing regulatory stability, sharing information and technical expertise, as well as increasing training and educational programs could be other ways of facilitating the uptake of the market. **What emerges from this analysis is that a stronger government role may be needed in driving this investment forward – and that this is something which would**

---

<sup>222</sup> Source of Information: Consultation with Ministerio de Energía/Division de Eficiencia Energetica.

<sup>223</sup> Portal Minero 2016.

<sup>224</sup> The economist 2016.

<sup>225</sup> Portal Minero 2016.

<sup>226</sup> EEFIG 2015

<sup>227</sup> Ibid

---

be considered as the NFS is developed. Emergent conclusions in a European context have been tax relief, voluntary performance standards linked to tax rebates, technical assistance offers, regulating for higher efficiency in new plants, and these should be explored in dialogue with industry as the NFS is developed



Table 6 Non-financial and financial barriers/challenges as well as consideration related to EE in Chile<sup>228</sup>

	Barrier / Challenge	Issues and considerations
<b>Non Financial Barriers<sup>229</sup></b>	<b>Insufficient/ inaccurate information</b> <ul style="list-style-type: none"> <li>• Imperfect (insufficient and/or incorrect) information can cause firms to make suboptimal investments in energy efficiency. This is a common barrier to investment that applies to SMEs as well as large energy intensive companies.</li> <li>• For SMEs, but also (to an extent) large energy intensive industry, there is a lack of awareness of sources of funding for retrofits beyond the company balance sheet</li> </ul>	<ul style="list-style-type: none"> <li>• Chile has introduced labelling for light bulbs and refrigerators in the residential sub-sector. Use of energy efficiency labels on a range of key products and materials can help reduce information asymmetry. This approach has been used in many countries – with interventions targeted to the technologies offering the greatest energy saving potential e.g. the EU’s Ecodesign and energy Labelling initiatives.</li> <li>• AChEE is working on increasing awareness to promote energy efficiency technologies and benefits through campaigns and marketing.</li> <li>• Use of marketing campaigns to promote sources of financing for energy efficiency. This can be done through government-led marketing or marketing via third party finance providers.</li> </ul>
	<b>Early stage of market development</b> <ul style="list-style-type: none"> <li>• Lack of track record in investments creates technology uncertainty and means there are little data to demonstrate energy efficiency really does pay for itself. This is particularly an issue for SMEs.</li> <li>• Energy efficiency retrofits for industry commonly require complex engineering solutions to be developed by specialist providers. There is a currently a skills shortage in this area.</li> </ul>	<ul style="list-style-type: none"> <li>• ESCO, using Energy Performance Contracts to apportion and manage risk, are likely to be an important provider of engineering and finance solutions. It’s a nascent industry in Chile<sup>230</sup>, and its potential is estimated to be USD 250m annually, which represents 0.12% of the GDP, in 2014<sup>231</sup>.</li> <li>• Building up a database on how energy efficiency investments have performed can help build track record and confidence. The Investor Confidence Project in the US and EU aim to do this<sup>232</sup>.</li> <li>• Dedicated skills training programme can help build capacity to support development of the ESCO market.</li> </ul>

<sup>228</sup> Note there is an extensive literature on barriers to energy efficiency so the full list is not repeated here. Instead there is a focus the most pressing ones compared to current Government priorities

<sup>229</sup> Joint workshop of the IDB, KfW Bankengruppe and Nafin, 2012; UNEP-FI, 2015; CEPAL, 2015; and IEA, 2009.

<sup>230</sup> Source of information: Consultation with Director of AChEE, Diego Lizana.

<sup>231</sup> Cepal 2015.

<sup>232</sup> Example of this can be found at: <http://www.eepformance.org/>

<p><b>Commercial considerations</b></p>	<ul style="list-style-type: none"> <li>• The perceived a lack of a business case to deploy capital to non-core business activity further compounds poor uptake.</li> <li>• Long payback times for deep retrofits mean that management may prioritize other projects with a shorter term pay off.</li> <li>• Concern about business interruption risks i.e. concern that retrofitting will require operations to be halted and related uncertainty about the timeframe under which operations can be restarted.</li> <li>• Lack of financial resources inside SMEs to purchase external consultancy support (e.g. Energy Audits) to develop energy efficiency solutions for financing and lack of trust in current market providers.</li> </ul>	<ul style="list-style-type: none"> <li>• Rising energy prices will strengthen the business case, but this can be accelerated through promoting greater understanding of technology and financing solutions. Use of energy audits and also regulation to require energy performance improvements or require best available technology to be deployed has also proven a very effective route to stimulating investment. Examples include technical assistance offers to develop investment plans and also networking opportunities with other who trying to reduce the energy use, like in Canada.</li> <li>• Using grants and/or preferential loan facilities too can help increase the depth of energy efficiency retrofits and also raise awareness of energy efficiency investment opportunities at Board level. Examples include tax deductions, exemptions, and soft loans –in Germany, Sweden and Denmark<sup>233</sup>.</li> <li>• Provision of technical assistance to SMEs to enable energy audits to be undertaken can help stimulate investment.</li> <li>• Offering free energy audits and loan facilities as an ‘add on’ when a BAU corporate loan request is made. This is the approach developed by the European Bank of Reconstruction and Development.</li> </ul>
<p><b>Financial Barriers<sup>234</sup></b></p> <p><b>Uncertainty of revenue stream</b></p>	<ul style="list-style-type: none"> <li>• Energy savings are not seen as traditional “receivables”, are seen as risky and as result the cost of loans is pushed up.</li> <li>• Perceived high risk means the cost of capital is too high to make the investment commercially viable for the end user.</li> </ul>	<ul style="list-style-type: none"> <li>• Promoting the use of Energy Performance Contracts as a means to generate certain energy savings to cover investment costs can reduce the perception of risk.</li> <li>• Partial loan guarantee facilities can also help lower risk and therefore low cost of loans to end users. This has been done by European Bank of Reconstruction and Development for a range of energy efficiency finance products<sup>235</sup>.</li> </ul>

<sup>233</sup> EFIG 2015.

<sup>234</sup> Joint workshop of the IDB, KfW Bankengruppe and Nafin, 2012; UNEP-FI, 2015; CEPAL, 2015; and IEA, 2009.

<sup>235</sup> Further information at: <http://www.ebrd.com/downloads/sector/eccc/seff-bulgaria.pdf>

<p><b>Perceived as high risk investment</b></p> <ul style="list-style-type: none"> <li>• Lack of understanding by financial institutions of the potential of the ESCO model to develop solutions and manage risk means financial institutions can be sceptical about the business case for developing financing solutions</li> <li>• Competition for funds internally and the low level of energy efficiency market development means it is difficult to make the case internally to develop new product lines</li> <li>• Project size too small and the transaction costs associated with putting deals together are too high to be attractive for large banks and institutional investors.</li> </ul>	<ul style="list-style-type: none"> <li>• Working with financial institutions to help them understand the market potential.</li> <li>• Putting in place regulation to drive demand and/or public funds for technical assistance can stimulate financial product development</li> <li>• Use of public funds to provide partial loan guarantees can help lower risk and increase the prospect of new loan facilities being developed and approved</li> <li>• Means to aggregate and refinance loans e.g. in the bond market will be important. Two possible structures are for public banks to on-lend to private sector banks or for banks to set up SPVs in which loans are warehoused and the refinanced to the bond market.</li> </ul>
---	---

---

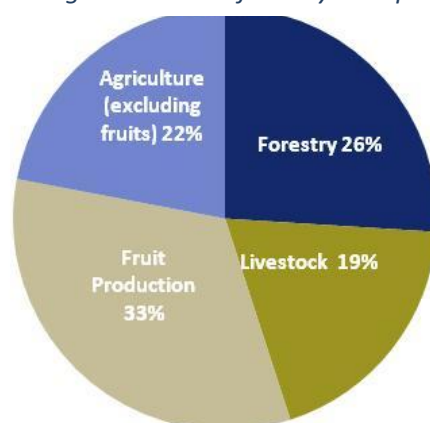
## 5.2 Successes, challenges and opportunities in adapting to climate change

According to the latest findings of the Intergovernmental Panel on Climate Change (IPCC), Latin America as a region is already being adversely impacted by climate change including unusual extreme weather events, and climate models predict that this trend will worsen in the future. Chile is no exception. As described in Chapter 3, the country has seen decreases in precipitation over the past several decades and rapid glacier retreat in the southern region. The rise in average temperature and decrease in rainfall is of particular concern for areas that rely on extensive agriculture irrigation and hydropower. Temperature increases and water shortages could reduce yields for a range of crops, including fruits, vines, and radiata pine. Snowmelt runoff from glaciers also poses significant adaptation problems for urban areas and infrastructure. This section focuses firstly on the agricultural sector and secondly on broader issues of climate risk in the economy, particularly related to infrastructure.

### 5.2a Agriculture

In Chile, agriculture is economically important both from the point of view of GDP and employment. It accounts for 4% of GDP (approx. 8.5% including the sector's whole value chain) and is the main source of revenue in many regions of the country. Agriculture also accounts for around 18% of Chile's exports. Of the total produce 58% are exported – mainly fresh fruit. Please see below a pie chart of the participation of agricultural activities within the agricultural GDP:<sup>236</sup>

*Figure 22 Gross agriculture and forestry GDP participation (2008)*



Source: ODEPA 2013b.

There have been general successes in the agricultural sector which relate mainly to productivity growth and exports. Over the past 20 years, agriculture has been one of the sectors of the Chilean economy with highest productivity growth.<sup>237</sup> The

---

<sup>236</sup> Government Program 2014-2018; and ODEPA 2013.

<sup>237</sup> ODEPA 2013.

---

government's support for participation in international markets has helped increasing exports by over 80% between 2005 and 2015 to reach a total value of almost USD 15bn in that year.<sup>238</sup> Furthermore, Chile recognised the potential of exporting organic wine and certain sustainability practices have already been developed for vineyards.<sup>239</sup> This presents learning opportunities for the agricultural sector.

However, certain challenges remain related to the sector's socio-economic structure: 93% of the farmland is owned by 7.6% of landowners with property of 100 ha or larger. The rest is owned by farmers operating land in the range of 20 ha (73.4%) and 20-100 ha (19%).<sup>240</sup> Because small farmers are particularly vulnerable to climate change, which compounds the inequality in access to resources, reducing vulnerability and increasing resilience is one of the Government's main policy priorities. Generally, smallholders are essential for food security as they provide over 80% of the food consumed in a large part of the emerging and developing world.<sup>241</sup> With temperature rises, changes in precipitation patterns and extreme weather events already occurring across the region, smallholders' crops and livestock are particularly at risk and may also be affected by second or third order impacts from pests and diseases.<sup>242</sup>

Agricultural productivity in Chile is already affected by climate risks and changes in climate patterns. Climate change impacts can be divided into two categories: (i) constant changes in climatic patterns, such as the shift of climatic zones towards the south of the country; (ii) increased extreme weather events such as droughts and floods. While the first category will require Chile's agricultural sector to gradually adapt and increase its resilience in a structural way, the second category requires immediate action to avert economic and social impacts of losses.

Chile's main climate change vulnerabilities and related needs for adaptation and resilience include the following.

**Decreased water availability** - There is a need for sustainable irrigation and water management (including in regions which did not need irrigation before and lack respective technologies) and this will increase in the years to come.<sup>243</sup> This in turn necessitates access to loans for new irrigation technology. Some of the main challenges related to financing include the lack of access to bank finance for individual small-scale farmers; and the lack of cooperatives and associations to work together to manage water access.<sup>244</sup> There is a law to promote irrigation, ensuring a subsidy is available to help finance irrigation systems. However, the subsidy is only granted after the work has been completed. If access to finance is not resolved, the subsidy – and the investment – cannot go ahead.<sup>245</sup> CIFES is promoting NCRE-powered irrigation

---

<sup>238</sup> Own calculation based on ODEPA 2016.

<sup>239</sup> I+D Consorcio Vinos de Chile 2016.

<sup>240</sup> ODEPA 2014.

<sup>241</sup> IFAD 2013.

<sup>242</sup> Ibid.

<sup>243</sup> Government Program 2014-2018.

<sup>244</sup> Source of information: Interview with Minagri/ODEPA; and PUC; and Government Program 2014-2018.

<sup>245</sup> Source of information: Interview with Minagri/ODEPA; and PUC.

---

technologies in small-scale agriculture, but again solutions to ensure upfront finance can be accessed must be addressed.<sup>246</sup>

**Increased extreme weather events, including floods and droughts** - There is a growing need to manage climate risk, as extreme climate change related weather events can have impacts on harvest, soil and crops and cause losses with severe social and economic effects.<sup>247</sup> A key component of a risk management strategy includes ensuring access to insurance against losses. Issues related to access to adequate insurance instruments for small farmers is a global concern, which has also gained increasing attention in Chile. This is reflected by the creation of a new Department of Integral Risk Management to Address Climate Emergency, by Minagri, “...to give an holistic approach to the problem of increased risk in productivity in the sector...”.<sup>248</sup> A new pilot program in emergency and catastrophe insurance starts this year, aiming to support smallholders and stabilize the fiscal budget to attend catastrophic emergencies.<sup>249</sup>

1. Chile’s subsidised Agrosegueros’ Agricultural Insurance, one of the few instruments of cooperation between private and public sector, currently only covers 10% of the potential population. This is partly due to the high cost for small farmers.<sup>250</sup> In addition, there has been a recent increase of more than 13% of the premium in 2015, with the same cost to the state in terms of subsidies as in 2014.<sup>251</sup> Chile needs to consider both best practices for ensuring an integrated response by the public sector on climate risk, and the role of private insurance and re-insurance providers in insuring not only commercial farmers but also small and medium sized producers. There are international examples of innovative financial instruments such as index based insurance, where insurance payouts are based on deviations from an index for asset and investment losses. This has been particularly predominant in places with a large proportion of smallholders, for example in Senegal and Ethiopia the Rural Resilience Initiative (R4) which offers weather index insurance (WII), a financial product based on an index highly correlated to local yields.<sup>1</sup> Also, in the region in Mexico, for example, with the CADENA program. More affordable solutions need to be found as the NFS is developed.

## 5.2b Managing climate risk in the broader economy

In addition to the impacts it will have on the agricultural sector, climate change also poses risks to the wider economy and infrastructure. Climate induced and other natural disasters caused average economic losses globally of around USD 190bn annually in the last decade, with average insured losses accounting for less than half that total (USD 60bn).<sup>252</sup> Governments often end up paying to remediate uninsured

---

<sup>246</sup> Source of information: Interview with CIFES.

<sup>247</sup> ODEPA 2013b.

<sup>248</sup> INDAP 2015, paragraph 3. Translated by the author. Original text: “...enfrentar de manera integral... el problema del riesgo creciente en la actividad productiva en el sector agrícola”.

<sup>249</sup> This program is financed by Cooperation Fund Chile-Mexico. INDAP 2015.

<sup>250</sup> Source of information: Interview with Minagri/ODEPA; and PUC.

<sup>251</sup> Agrosegueros 2016b.

<sup>252</sup> UNEP 2015.

---

damages. Given that natural disasters are likely to increase with climate change, new financing mechanisms will be needed to assist with disaster response and recovery. Failure to do this whilst relying instead on ad hoc budget reassignment in the event of a disaster is fiscally unsustainable and can also result in considerable delays in post-disaster recovery. This in turn potentially intensifies the human and economic consequences of an event<sup>253</sup> as governments may be compelled to draw resources from social programs that then hinder long-term growth and development.

Between 1980 and 2015 Chile experienced around 70 natural disasters, mostly geological.<sup>254</sup> While early alert response for disasters has been good and has helped minimize losses, recovery is still an area where further work is required. From 2000 to 2009, there was on average a natural disaster every two years, with a cumulative economic cost of over USD 1bn. In 2010, the catastrophe of the year<sup>255</sup> resulted in a loss of about USD 30bn, equivalent to 18% of GDP.<sup>256</sup>

In 2015 alone there were six natural disasters from floods, tidal waves, earthquakes and tsunamis which required approximately of USD 72.6m in recovery costs. In 2016, there is a budget of USD 85.2m to cover emergency and reconstruction in case of catastrophe.<sup>257</sup> The approach to post-disaster recovery has been ad-hoc. This has increased concerns about the frequency and the fiscal burden of post-disaster response. Recently, the Chamber of Deputies approved a resolution asking to the Executive to create a Fund for National Disasters which could provide dedicated resources to cope with disasters and catastrophes affecting the country.<sup>258</sup> This would also allow advanced budgetary planning, which may include among other items: emergency plans, early warnings and disaster control, programs to improve coordination in the construction and delivery of benefits, subsidies and aid to people affected<sup>1</sup>. This is a great opportunity, and it is important to ensure the fund is well-designed and incorporates not only post-disaster relief but also ex-ante infrastructure planning. **A key element of developing an NFS should therefore be to develop longer-term risk management strategies and instruments to increase resilience and adaptive climate-resilient infrastructure.**

---

<sup>253</sup> World Bank et al 2012

<sup>254</sup> Servicio Nacional de Geología y Minería, Ministerio de Minería 2015.

<sup>255</sup> On the 27<sup>th</sup> February there was an earthquake of 8.8 on the *Richter* scale

<sup>256</sup> Brain, I 2012.

<sup>257</sup> Ministerio de Obras Publicas 2016.

<sup>258</sup> Cámara de Diputados de Chile 2016.

---

## 6. CONCLUSIONS ON MOVING FORWARD TO DEVELOP A NATIONAL FINANCE STRATEGY FOR CHILE

In 2015 Chile set itself a target to reduce GHGs by 30% per unit GDP by 2030. This is enshrined in its INDC. A National Financing Strategy (NFS) is needed to enable Chile to meet its INDC through implementing its Climate Change Action Plan and meeting its targets both for mitigation but also adaptation by 2030. The Government has committed to putting this NFS for climate change in place by 2018 and is just at the beginning of considering how to develop it. In the first instance there needs to be an agreement on what the framework for the NFS should look like – with a shared understanding of what needs to be financed, over what timeline, where the financing should come from and how it can be delivered. This document aims to provide supporting material to enable an NFS for climate change to be developed. It includes details of the policy context in relation to agriculture and non-conventional renewable energy – targets, policies and institutions; an overview of the public and private, national and international sources of finance for Chile; an overview of successes, challenges and opportunities with climate change mitigation in relation to energy; an overview of challenges and opportunities to adapt to climate change in the agricultural sector; and managing climate risk in the broader economy. We now provide thoughts on how to move forward with a process to deliver an NFS for Chile. There is a focus on both short-term actions and more strategic medium and long-term considerations.

### 6.1 Chile is not alone

Shifting Chile's economy onto a climate-resilient pathway is an ambitious task that will require a significant upfront 'pulse' of investment. Even today the level of investment in infrastructure is still low at less than 3% on average during 2008-2013.<sup>259</sup> This is far less than the 5% of GDP that studies have recommended is needed to close the infrastructure gap.<sup>260</sup> It is estimated that for 2014-2023, Chile needs to see USD 112.6bn invested, of which energy investment in infrastructure is estimated at USD 24.3bn.<sup>261</sup> The Government is clear that the investment needs cannot be met by the public sector alone. Companies and banks will need to play a role – but so too will institutional investors such as Chile's pensions sector. To achieve this, new financial products and mechanisms for shifting liabilities off balance sheet and recycling this capital for pension fund investment will be needed. Achieving the necessary scale and pace of investment needed will require a strong and credible political commitment

---

<sup>259</sup> Serebrisky et al. 2015.

<sup>260</sup> Ibid.

<sup>261</sup> Chilean Construction Chamber 2014. For more details see Annex XI.



---

from the Chilean Government to build investors' confidence in the long-term sustainability of policy frameworks, underpinned by a dynamic and coordinated national policy and financing strategy.

Going forward a clear framework is needed for the NFS development process. This should be focused on answering three obvious – but critically important - questions:

- What overall objectives need to be delivered?
- Who needs to be involved in achieving them?
- How will decision-making processes move forward?

For Chile, the overall objective is clear, as it is set out in the INDC – but some work still needs to be done to clarify and coordinate sectoral priorities. Key stakeholders have been identified through this work – and have signalled their willingness to work together to develop an NFS. The next step is to determine how the decision making will move forward.

## 6.2 Developing an NFS and moving decision making process forward in the short term

We set out five steps the Government can consider as short term actions to develop its NFS.

### *Step one. Identify sectoral priorities and facilitate institutional coordination*

Chile has developed a comprehensive set of plans, initiatives and targets setting out how it will address climate change. It has also created an extensive institutional framework for developing and delivering these plans; as such, the integration of policy efforts to ensure coherence should be a core theme of the process of developing the NFS. This forms a sound basis for starting to move from planning to implementation. The development of a new Climate Action Plan (PANCC) also marks a clear shift towards delivery of policy outcomes. In addition the growing engagement of Hacienda with the design of climate change policy indicates the Government's awareness of the implications of climate change for the whole economy – and the importance of mobilising finance for climate change actions to shift finance flows towards low-carbon and resilient development. However, at this crucial stage of further developing and enhancing public policy delivery, especially in the energy sector, there is a need to ensure coherence amongst all policy efforts related to climate change. In this way clashing policy objectives<sup>262</sup> and conflict created by areas of responsibility that are not clearly delineated can be avoided - and some progress with delivery ensured.<sup>263</sup>

---

<sup>262</sup> For instance, the new carbon tax has had unintended negative effects on the level of effectiveness of other policy instruments, such as the energy efficiency law because it has resulted in the industrial sector being reluctant to accept the law saying it will be too costly to implement on top of the carbon tax. Source of information: Discussions at the workshop held in Chile, November 2015.

<sup>263</sup> This has been an issue with energy efficiency policy in a number of countries. For example, in Spain four government departments are involved in designing and implemented policy. Distributed responsibility has created inertia and slowed progress in implementation of buildings-related investment programmes. Davies and Holmes 2011.

---

Coherence is key to ensuring both clarity of public policy aims and building investor confidence in Chile's efforts to build a climate-resilient economy. Delivering an overarching policy framework setting out the role of different sectors in meeting overarching climate-resilience goals will be the first step.<sup>264</sup> Chile's climate change law (which is currently being considered) could act as a cohesive top-down 'umbrella' framework to achieve this. The PANCC also provides an opportunity to streamline and further coordinate climate change policy objectives across the relevant sectors of the economy.<sup>265</sup> What emerges from these initiatives should be a clear attempt to communicate the Government's overall aims and objectives for its economy and its NFS. This, in turn, is important in signalling potential market size to private sector investors (national and international). It can also ensure Chile can engage in a proactive and strategic dialogue with international institutions that provide financial and technical resources such as multilateral development banks, World Bank, bilateral, South-South and international cooperation, the IDB and GCF. These will be important finance providers as Chile seeks to develop financing solutions for higher risk investments with high social/economic values that are traditionally less attractive to the private sector. They will also be important in ensuring increased levels of efficient use of those resources given the change in Chile's ODA status in 2017.

Good institutional coordination will also be important. As can be seen from Figure 6 in Chapter 3 many different ministries are involved in climate change policy making and delivery in Chile. This is quite right – but also underlines the importance that, with so many government departments, stakeholders involved, it is clear where lines of responsibility lie and how coordination will be managed on a strategic but also day-to-day basis.

### *Step two. Identify and set up working groups for priority areas*

Complex problems can be best addressed by bringing key experts and stakeholders together to develop effective solutions. Working groups are a well-tested method for bringing such individuals and organisations together. Dialogue and consensus building between government, institutions and core stakeholders can ensure a broad

---

<sup>264</sup> Examples include in the UK, The Climate Change Act (2008), which established a 2050 emission reduction target and cap on the amount of greenhouse gases emitted in the UK over a five-year period. An Independent advisory body, The Committee on Climate Change, was set to measure progress on emission targets. In Mexico, the Climate Change Law (2012) established emission targets for 2020 and 2050 with an institutional framework including Mexico's National Institute of Ecology and Climate Change (INECC) in charge of generating scientific and technical information, entitled to make recommendations on climate change policies across government. In Colombia the National Climate Change System (SISCLIMA, 2011) was introduced to align climate change policy with economic and finance planning. As part of SISCLIMA the Finance Committee was established in 2013 to generate policy recommendations to scale up climate finance, the committee is integrated by representatives from the Government, development banks, private finance institutions and international cooperation.

<sup>265</sup> Source of information: Interview with Ministerio de Medio Ambiente/Dept. de Cambio Climatico.

---

understanding of national climate objectives so that financing solutions can be developed. Data gaps requiring further research to inform decision making can also be identified through this route.<sup>266</sup> Dialogue should include a wide range of stakeholders (targeted as appropriate to the issue at hand) from key government departments, business, investment and commercial institutions, long term investors, microfinance and national and international development institutions. An inclusive approach offers a number of benefits including allowing capacity building to understand issues and opportunities and dynamism in solving problems.

Through this work we have identified a three priority areas that the NFS should focus on in the short term. The suggested areas are: energy; climate resilience for agriculture and infrastructure; getting to scale on finance. Below are suggestions for key issues to be discussed for each priority area and the stakeholders likely to be willing and able to engage in NFS-related dialogue.

### ***Priority area 1: Energy***

***Ensuring the relation of new transmission and distribution grid matters both demand and NCRE supply and that project momentum is maintained***<sup>267</sup> **Stakeholders:** Technical experts from the Energy 2050 working groups, including stakeholders from different sectors including public and private financiers<sup>268</sup>.

***Expanding and diversifying NCRE.*** **Stakeholders:** Ministry of Energy, CIFES, CORFO, academia, civil society, key industry representatives – both from companies and trade associations, such as ACERA– as well as the finance and investment sectors. Actors involved in the NCRE working group of the Energy 2050 process.

***Promoting energy efficiency.*** **Stakeholders:** Ministry of Energy, Division of Energy Efficiency, AChEE, CORFO, key industry representatives – both from companies and trade associations, such as ANESCO (ESCO association), equipment manufacturers, international experts as well as the finance and investment sectors.

### ***Priority area 2: Climate resilience for agriculture and infrastructure***

***Meeting agricultural adaptation and resilience needs.*** **Stakeholders:** Minagri (Agroseguros, INDAP, ODEPA, Department of Integral Risk Management), local government, insurance companies, commercial banks, representatives from the agricultural sector, academia, civil society, international experts such as CGIAR<sup>269</sup> and

---

<sup>266</sup> For example two key data gaps identified from this work were: data on the investment needed in NCRE and energy efficiency to meet Chile's forthcoming goals. Also missing were disaggregated data on: who is investing in the Chilean economy (domestic and international, public and private finance sources); where Chile's financial assets are held across financial institutions; and detailed data on current sources of finance for the priority sectors identified.

<sup>267</sup> This was not an area that was included directly in the research. However, this was a significant issue that became obvious both from the desk-based research and from stakeholder dialogue. As such we have mentioned it as an area to pursue as part of the NFS.

<sup>268</sup> Established to discuss a new regulatory framework of power transmission. The group was led by the National Energy Commission (Comisión Nacional de Energía – CNE), supported by the Catholic University of Chile. It included 273 technical experts from public and private sector as well as academia. Here were also public-private working tables on a new independent electricity system coordinator and on a new planning and pricing process of transmission systems. Ministerio de Energía 2015a.

<sup>269</sup> Global partnership addressing agricultural research for development. Specific focus on climate-smart agriculture.

World Bank<sup>270</sup> who can show how cooperative approach and insurance instruments have worked elsewhere.

**Managing natural disaster and climate-related risks. Stakeholders:** Hacienda, Ministry of Environment, Ministry of Public Works, Servicio Nacional de Geología y Minería (Sernageomin), Ministry of Housing, Ministry of Health, ONEMI – Ministry of internal affairs and public security, MDBs, international re-insurers, international experts (including government and commercial experts on managing risk).

**Priority area 3: Getting to scale on finance**

**Scaling up finance – connecting institutional investors to infrastructure investment.**

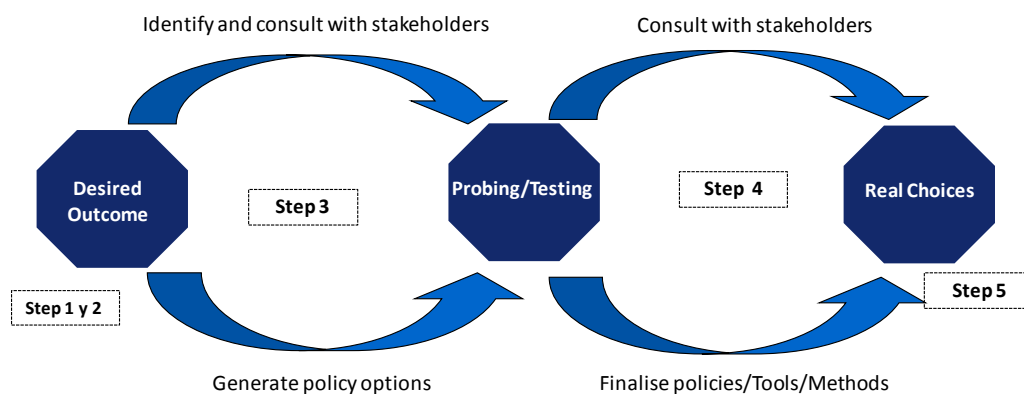
**Stakeholders:** Hacienda, Ministry of Public Works, Ministry of Housing, Ministry of Energy, MDBs, Chile’s Pension Funds, Superintendence of Banks, Central Bank, Chilean Chamber of Construction.

**Addressing the aggregation challenge. Stakeholders:** Hacienda, Ministry of Public Works, Ministry of Housing, Ministry of Energy, NPBs, MDBs, private banks, Chile’s Pension Funds, energy investors.

**Step three. Develop and then test core propositions around key priority areas to build the NFS**

Based on the analysis undertaken (desk-top research, interviews with stakeholders and international experience), the following areas of focus for policy dialogue are suggested – as a means to develop core propositions that can be used to build the NFS. Figure 20 provides an overview of how propositions can be developed and tested with stakeholders. It covers both steps 3 and 4 of the process described here.

Figure 23 Developing stakeholder-endorsed policy development processes



<sup>270</sup> The World Bank has a Disaster Risk Financing & Insurance Programme. The Programme aims at supporting governments to implement comprehensive financial protection strategies. It brings together sovereign disaster risk financing, agricultural insurance, property catastrophe risk insurance and scalable social protection programs.

---

## **Priority area 1. Energy**

**Proposition 1: Ensuring the relation of new transmission and distribution grid matters both demand and NCRE supply and that project momentum is maintained.**

**Possible policy solutions to consider:** NCRE and grid development coordination. Although some major transmission projects have already received environmental approval, transmission lines generally take a long time to build, can be subject to planning and construction delays<sup>271</sup>. Ongoing long term energy planning to guide development of electric transmission infrastructure will be crucial<sup>272</sup>. During the Energy 2050 process, an extensive multi-stakeholder process developed recommendations both on the planning and institutional oversight of transmission lines. Ongoing dialogue with these stakeholders to demonstrate progress on addressing grid constraints will be crucial.

**Proposition 2: Expanding and diversifying NCRE.**

**Possible policy solutions to consider:** (i) Setting targets both for established NCRE technologies and those that are not so well developed: Signalling market size to potential investors will help further build market confidence. This will also assist with the grid planning process and vice versa. This could be done by building on the Energy 2050 work<sup>273</sup>. (ii) Supporting the development of local supply chains for NCRE technology: With a vast domestic market potential, Chile should consider the potential for local factories in Chile; for skills training to expand the domestic workforce; R&D focused on breakthrough technology such as CSP Solar and geothermal potential. Chile could consider replicating the solar industry strategy<sup>274</sup> for geothermal and wave energy. This would help diversify Chile's economic revenues and reduce its dependency on commodity exports<sup>275</sup>. (iii) Ensuring access to long-term finance: Given the restricted access to long-term bank finance, it will become increasingly important for Chile, as for many other countries with infrastructure financing gaps, to open up opportunities to connect long-term energy infrastructure finance opportunities (in NCRE, grid and in energy efficiency) to institutional investors. Options are discussed later.

---

<sup>271</sup> Andrew Baker 2016.

<sup>272</sup> Energia 2050.

<sup>273</sup> Other countries have started to do this – for example by setting sectoral targets (e.g. Spain had set specific targets on installed capacity per technology) or by broadly setting out a view of how much of each type of technology they would expect to see deployed onto the energy system in coming decades (e.g. the UK calculated expected deployment levels and costs of renewable energy technologies to 2020, considering factors such as technology cost, build rates, and the policy framework).

<sup>274</sup> Chile has already started to develop the foundations to accelerate growth of the domestic solar industry. The solar industry strategy aims to have solar as main power source by 2025; and develop a solar industry with technological capabilities, contributing to the diversification of Chile's productive capacities. As part of this strategy, a Fraunhofer Institute has opened a spin-off in Chile. It has amongst its objectives the promotion of transfer of knowledge, know-how, and research results to local industries as well as training and development of experts.

<sup>275</sup> From the late 1990s to 2011, German manufacturers dominated the solar PV market. As the market grew so other suppliers – notably Chinese companies – entered and undercut the local suppliers with lower cost products (China/Taiwan now account for around 70% of global PV module production). This has helped significantly reduce costs globally.

---

**Proposition 3: Promoting energy efficiency.**

**Possible policy issues to consider:** (i) Setting short, medium and long term targets to accelerate the uptake of energy efficiency measures – backed by regulation or using incentives to drive investment.<sup>276</sup> (ii) Increasing institutional capacity (an enhanced role for ACHEE could be considered – or even a new delivery agency) to raise awareness and promote energy efficiency, create a hub of technical expertise and advice both to industry and business on undertaking and financing energy efficiency improvements.<sup>277</sup> (iii) Translating the national Energy Efficiency Law into departmental or provincial policy to mobilise SMEs and households to undertake energy efficiency improvements. Options for complementing this with regulation, incentives and advertising to drive uptake at a local level should also be considered.<sup>278</sup> (iv) Consideration of financing solutions such as on-bill financing to enhance access to finance – especially for householders and SMEs and delivery institutions to ensure high quality energy efficiency retrofits would be beneficial. (v) Strengthening the role of Energy Service Companies (ESCOs)<sup>279</sup> by using schemes of shared savings, wherein savings in projects are used to pay back the project debt.<sup>280</sup> There are different models to be considered in the context of Chile, for example Mexico’s model places risk to the ESCO by issuing the credit to it and not the end user;<sup>281</sup> in Colombia the model includes the use of insurance policies to ensure performance indicators are met associated with energy savings.<sup>282</sup>

**Priority area 2. Climate-resilience for agriculture and infrastructure**

**Proposition 1: Meeting agricultural adaptation and resilience needs.**

**Possible policy solutions to consider:** Several public policy initiatives already exist to support small-scale farmers, including new initiatives on managing climate risk. (i) Role of public sector in facilitating insurance market development: The role of the Government will be essential in different areas ranging from data provision to understand risks, to creating the conditions under which the market can innovate and provide new insurance products. Chile is already considering the development of a vulnerability map which could be used to better understand climate risks and, from

---

<sup>276</sup> Holmes and Mohanty 2012; and Holmes and Bergamaschi 2015.

<sup>277</sup> ACHEE is the key Chilean institution in charge of implementing Energy Efficiency programs. It works closely with business and financial institutions and so, given resources and capacity, could assist in increasing the uptake of the credit lines promoted by CORFO. Examples of this type of approach include introducing mandatory energy management systems and targets to reduce consumption; effective monitoring and evaluation of the targets could give confidence to investors; tax relief – encourage business to invest in energy saving plant, and its cost could be written off against taxable profits on the year of purchase. ACHEE, is a public-private partnership, and could act as a key player to promote ESCO financing.

<sup>278</sup> The need to scale up energy efficiency investment is a challenge everywhere. Given the unique situation Chile faces it should consider a review of the tools being used elsewhere to promote investment and how they can be applied in the domestic context to improve the competitiveness of strategically important sectors such as industry and mining.

<sup>279</sup> Energy savings companies are providers of a broad range of energy solutions to energy end-users. They can finance or assist in arranging financing for the operation of an energy system by providing a savings guarantee

<sup>280</sup> European Commission 2016.

<sup>281</sup> IDB, NAFIN and KFW 2012.

<sup>282</sup> IDB 2011, the model is developed with Bancoldex, development bank, the contract establishes performance indicators and the insurance policy is used in case of breach of contract. There is also a neutral entity which evaluates ESCO’s technical capacity and the performance of the energy efficiency upgrades relative to the contract, and settles any differences between the ESCO and its clients.

---

there, develop new targeted insurance products.<sup>283</sup> It will be important to ensure the participation of local governments in the process, as they will be important in helping reach small farmers. This is needed both for data collection and to facilitate timely payouts in the event of a disaster. ii) Developing new insurance products: Here the focus should be on using high quality granular data to understand and price risk accurately, in doing so keeping costs down. Innovative approaches such as weather index insurance can do this.<sup>284</sup> A good example is the CADENA-Program in Mexico, designed to provide compensation to smallholder farmers to enable them to get back to farming after a catastrophic event. It has two components: 1. The Catastrophe Agricultural Insurance (SAC)<sup>285</sup> for farmers, livestock producers, aquaculture farmers and fishermen. The State Government acquires the insurance on behalf of the farmers, but a large proportion is subsidized by the Federal Government (75%-90% of the costs premiums); and 2. Direct support<sup>286</sup>, in areas where SAC is not provided, in this case the compensation for losses to the States is around 50%, the other 50% of the costs has to be paid by the State.<sup>287</sup> This could help improve both the productivity and credit ratings of small farmers. For middle-income farmers, requiring insurance to be taken out alongside loans<sup>288</sup> will facilitate access to finance as losses from weather-related events are minimised.<sup>289</sup>

***Proposition 2: Managing natural disaster and climate-related risks.***

**Possible policy solutions to consider:** Concerted efforts are needed to adapt to climate change risks, promoting both stronger disaster planning and post-disaster recovery. Public policy plays a central role in the provision of climate-resilient infrastructure. It can help ensure infrastructure is built to the highest adaptation standards to minimize future losses from climate change-related events. It can also ensure, in the event of a disaster, that compensation is paid out swiftly to accelerate post-disaster recovery. (i) Minimising the impact of climate change-related events.<sup>290</sup> All new infrastructure should be built to be consistent both with climate change goals and to be resilient to extreme weather events (and wider disasters).<sup>291</sup> Climate change

---

<sup>283</sup> Source of information: Interview with Ministerio de Agricultura/ODEPA.

<sup>284</sup> Index Based Insurance: Payouts are triggered by fluctuations in an index, e.g rainfall, which has been pre-specified at a certain threshold that is correlated to local yields; and not on the actual yields. This reduces the need for on-site inspection, which in turn reduce costs and speeds up pay-outs. As it is an independent verifiable index, insurance companies can transfer the risk to reinsurers. Example of this could be CADENA-Program in Mexico, which uses a Macro-Level Parametric and Index Crop and Livestock Insurance Programs, or the Rural Resilience Initiative (R4) in Senegal and Ethiopia, which offers a weather index insurance (WII), a financial product based on an index highly correlated to local yields.

<sup>285</sup> The insurance is issued by Agroasemex and three private companies, and all of them are reinsured in the international market.

<sup>286</sup> This support covers those States that have not acquired the insurance and/or where crop insurance does not cover against some damages.

<sup>287</sup> By only covering the 50% of the losses, States Government are incentivise to purchase the insurance, as they will get financing for the costs of the premiums up to 90% depending on the area to be insured.

<sup>288</sup> World Bank, GFFDR, USAID, UK Ministry of Foreign Affairs 2015.

<sup>289</sup> Options could include index based insurance, where insurance pay-outs are based on deviations from an index for asset and investment losses. One example is the Rural Resilience Initiative (R4) in Senegal and Ethiopia which offers weather index insurance (WII), a financial product based on an index highly correlated to local yields.

<sup>290</sup> The Ministry of Housing and Public Works could take the lead by ensuring that climate risks are factored into infrastructure decision-making by strengthening ministerial capacity. The World Bank could provide advisory services in this respect.

<sup>291</sup> In Bangladesh a new dedicated unit, Climate Resilient Local Infrastructure Centre (CRoLIC) will be in charge of developing and modernizing infrastructure standards, with an emphasis on climate resilience. It is going to be created within the largest institution, Local Government Engineering Department, entrusted for planning and implementation of local-level rural, urban and small scale water resources infrastructure development. This is one of the projects approved last year by the GCF.

---

is sharply increasing flooding, storm and drought risks across the globe. As Superstorm Sandy showed, the greatest impacts of increasingly extreme weather come from cascading failures across water, power, telecoms and transport networks. In New York, power outages led to failures in other infrastructure systems such as rail lines, wireless and Internet infrastructure and refineries, ultimately costing over USD 50bn in damage. This is a new area – and Chile should consider how other governments are addressing climate change in infrastructure planning both at a national and regional level.<sup>292</sup> In addition, the countries plans, policies and projects should factor in resilience to the climate change risks that may occur during their lifetimes.<sup>293</sup> These principles should be applied at national and local level.<sup>294</sup> ii) Response to climate change events and wider disaster risk management.<sup>295</sup> There would be value in engaging stakeholders in the development of the proposed National Catastrophe Disaster Fund. This will help ensure what emerges is both fit-for-purpose and appropriately funded. Important considerations include what catastrophes are covered by the fund, the level of funding provided and how the fund is financed.<sup>296</sup> As part of the funds remit consideration should be given to whether it helps finance the additional cost on ensuring new infrastructure is climate-resilient. For infrequent but very extreme events causing very significant amounts of damage, the private sector is likely to be a more cost-effective finance provider. Catastrophe of ‘Cat’ bonds<sup>297</sup> such as those put in place by the Government of Mexico<sup>298</sup> are growing in use across the globe. The Mexican product was developed by FONDEN and developed using technical assistance from the World Bank MultiCat Program<sup>299</sup>. The Government could also consider developing are risk insurance pools that enable climate risk to be spread across a wide range of policy holders, an example being The Extreme Climate Facility under the Africa Risk Capacity (ARC). This is a regional initiative that draws on public and private sources to provide financial support to eligible African countries<sup>300</sup> to help them build their climate resilience and be financially prepared to undertake greater adaptation measures should extreme weather event frequency and intensity increase in their region.

---

<sup>292</sup> The UK government has already recognised that more integrated infrastructure planning will be needed to ensure the UK maintains essential resilience but has yet to move beyond early research in this area. <http://www.icif.ac.uk/networks/123/item.html?id=253>

<sup>293</sup> New Climate Economy 2014.

<sup>294</sup> Example of this could be introducing building codes for energy efficiency not only for new buildings but also for existing ones and having a dedicated unit that could ensure that infrastructure is planned and built at the highest standards.

<sup>295</sup> The World Bank could provide advisory services in this respect. In addition, using the Mexico-Chile Joint Cooperation Fund could be valuable to draw from Mexico’s experience, for example in the case of the pilot programme on Agriculture Insurance for small farmers.

<sup>296</sup> For example, a legislation enshrining the fund could stipulate the finance is provided on an annual basis at the start of the fiscal year to ensure any insurance payouts after an event can be timely fashion.

<sup>297</sup> These provide pay outs when natural or climate-related disasters like hurricanes occur transferring the risk to international re-insurers.

<sup>298</sup> World Bank, 2016.

<sup>299</sup> It was the first country in using this program at the World Bank.

<sup>300</sup> Participating countries can be members of the African Union and are required to have robust adaptation plans in place as well as clear strategies for using the funds before any money is released.



---

### ***Priority area 3: Getting to scale on finance***

#### **Proposition 1: Scaling up finance – connecting institutional investors to infrastructure investment.**

**Possible policy solutions to consider:** (i) Regulatory reform to enable more direct investment by institutional investors in infrastructure: Connecting institutional investors capital to projects is not straightforward. Institutional investors have different risk-reward requirements to banks and companies; prefer to finance projects that are operational (rather than finance construction); prudential regulation can preclude investment in illiquid assets such as infrastructure; and, depending on the size of the infrastructure project and assets under management within individual institutions, an intermediary may be needed to match capital to projects. Solutions to these issues have or are being developed in the EU, South Africa and the UK that could inform dialogue and solution development in Chile.<sup>301</sup> (ii) Development of the green bond market: Green bonds ensure a traceable relationship between financing the projects they fund. They are a straightforward way for institutional investors to become comfortable with green investment. Although they still only represent a small part of all bonds issued at the moment (<1%) there has been an exponential increase since 2013. By the end of 2015, total issuance for the year was close to USD 60bn, a threefold increase on 2013 levels. The market has been further reinforced over the past few years by an increasing diversification of issuers, with corporate issuers substantively increasing their issuances – to over 50% of total volume by end June 2015.<sup>302</sup> This market is currently mostly unregulated – although Green Bond Principles<sup>303</sup> have been developed for issuers and Climate Bond and Green Bond Standards have been developed as screening tools to ensure integrity in use of proceeds.<sup>304</sup> However, in December 2015 China introduced national green bond standards, which regulate how green bond proceeds can be used. Robust disclosures are required. India has released a draft of its own national green bonds standards and other countries including Mexico are expected to follow suit. Chile too could consider this.

#### ***Proposition 2: Addressing the aggregation challenge***

**Possible policy solutions to consider:** (i) Creating the project pipeline: Consideration of how energy efficiency policy frameworks can best be designed to ensure large enough ‘pipelines’ of projects are developed to be of interest to the long-term investment community. (ii) Facilitating aggregation: Consider options for legal documentation (contracts) underpinning the project pipelines to be as consistent as

---

<sup>301</sup> For example in the EU Solvency II Regulations and related Pensions Regulations are being redefined as part of the EU’s Capital Markets Union Initiative. In the UK the Pensions Infrastructure Platform is acting to broker direct investment by relatively small institutional investors into core UK infrastructure. South Africa largest Pension Funds, Government Employees Pension Funds managed by Public Investment Corporation, invested USD 1.8bn in 2 CSP projects last year. This was possible as it is required that pension trustees to consider sustainability factors (Pension Act, Regulation 28), and the Code for Responsible Investing in South Africa (CRISA). In Mexico, state-owned development bank, Nacional Financiera S.N.C (Nafin) has also issued the first green bond in Mexico for USD 500 million, and also the first green bond in Latin America to receive internationally recognised Climate Bonds Certification. The bond was five times oversubscribed.

<sup>302</sup> Natixis Global Market Research 2015.

<sup>303</sup> Further information available at: <http://www.icmagroup.org/Regulatory-Policy-and-Market-Practice/green-bonds/green-bond-principles/>.

<sup>304</sup> Further information available at: <http://www.climatebonds.net/standards/standards-V2.0>.

---

possible ('boilerplated') to facilitate aggregation. (iii) Aggregation platforms: Consideration of the role of public banks and MDBs/GCF in facilitating aggregation and/or securitisation of bundled investments to the bond market, for example as asset-backed green bonds.

***Step four: Seek wider feedback on emerging policy propositions***

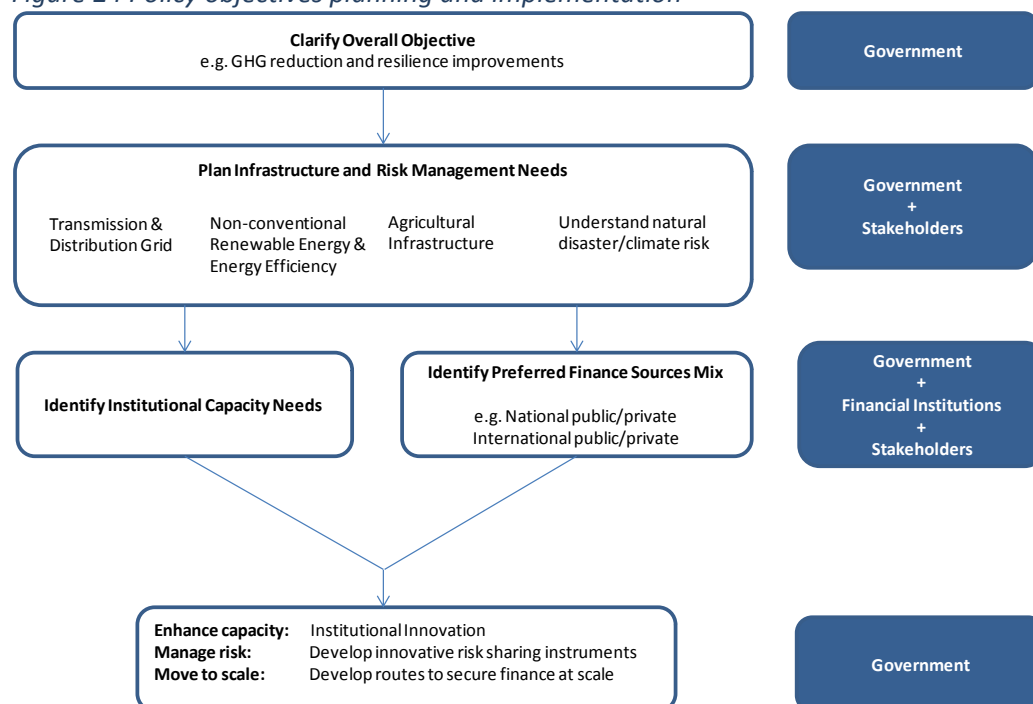
Once key policy propositions have been developed, it is considered good practice to then consult with a wider stakeholder community. Public consultation is a regulatory process by which the public's input on matters affecting them is sought. Its main goals are to improve the efficiency, transparency and public involvement in large-scale projects or laws and policies. Feedback provided can then be considered by the Government as policy proposals are finalised.

***Step five: Finalise policy proposals, draw together in a single document setting out the NFS plan and develop legislation as needed***

Once policy proposals are finalised, the final step will involve taking the recommendations emerging from the NFS development process and work to implement them. This could take the form, for example, of the publication of a White Paper on unlocking long-term finance for building a climate-resilient Chile – with a set of regulatory and fiscal reforms to enable direct investment by domestic pension funds in NCRE and grid infrastructure or a White Paper on building a resilient agricultural sector that includes details of proposal to develop cooperative water sharing rights, a plan for investment backed by new public-private risk-sharing instruments developed with the GCF/MDBs/national public banks, and a new skills training programme using technical expertise from institutions such as CIFES.

From this process and clear “story”, the optimal mixture of institutional innovation/reform; policy initiatives and regulation; and financing instruments can be identified and delivered to achieve the overall policy objectives. Figure 21 shows how the macro and micro level issues fit together and the role of Government and wider stakeholders in developing effective choices and solutions.

Figure 24 Policy objectives planning and implementation

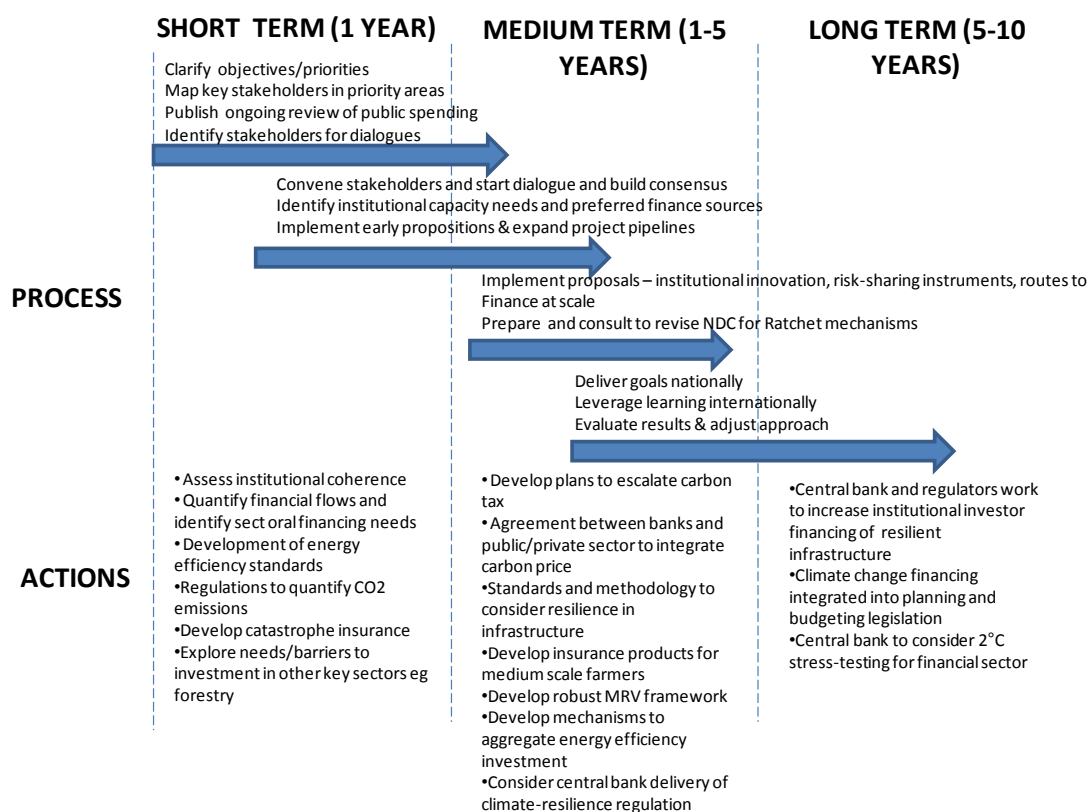


While the steps above are set out in a linear fashion, the work can be undertaken in a more dynamic way. For example, where detailed analysis and consultation are needed because issues are complex (as is the case with ensuring grid planning and access, including charging, is optimised for NCRE development) processes may need to be slower to ensure effective solutions emerge. Work can be swifter where issues are more generic in nature and so international solutions can be used to guide strategy (as with developing the green bond market, linking pension fund capital to projects and creating catastrophe insurance products).

### 6.3 Medium and long term actions towards an NFS

Medium and long term actions should focus on implementing propositions so that the overall NFS goals can be delivered. In this way Chile’s obligation to deliver its NFS and its INDC goals can be fulfilled. Figure 22 a set out short, medium and long term.

Figure 25 Short, medium and long term actions towards an NFS



What is clear from this work is that the opportunities and the challenges facing Chile regarding increasing investment in NCRE and energy efficiency and in improving the resilience of the agricultural sector are similar to those facing many other countries. Efficient decarbonisation of the Chilean economy (to meet some of goals of the forthcoming PANCC and deliver GHG reductions in line with the Paris Agreement) will mitigate the draining effect of increasing fossil fuel costs, promote security, competitiveness, investment and growth. Catalysing investment in sustainable agriculture and developing instruments and institutions capable of mitigating the worst effects of climate-related and wider natural disasters will do the same as they insulate the economy from event-related economic shocks.

Across the globe new innovations are pointing the way to how this can be best achieved through ‘greening finance’<sup>305</sup>. Chile is now in a position to learn from this, use the insights to promote forward-looking dialogue with stakeholders and key national and international institutions, and develop an NFS that will enable Chile to build an inclusive, prosperous and climate-resilient economy.

<sup>305</sup> UNEP-FI 2015.

## 7. ANNEXES

### Annex I. Institutions interviewed by sector and topic<sup>306</sup>

Sector	Topic	Institution interviewed	People
<b>Government</b>	Climate Change Planning, Planning for climate change, National Action Plan for Climate Change	Ministry of Environment – Department of Climate Change / Adaptation	Felipe Osses Maritza Jadrijevic
	Initiatives related to the flow of resources for climate change from the public Budget and the private sector	Ministry of Environment and Ministry of Housing - Low Emission Capacity Building (LECB) and Climate Public Expenditure und Institutional Review (CPEIR) Project	Sophie Siemens Maricel Gibbs Leonel Tapia
	Planning for the electricity sector and non-conventional renewable energies sector – Energía 2050	Ministry of Energy – Secretariat of Energy 2050	Annie Dufey
	Current situation and renewable energy financing challenges	Chilean Energy Efficiency Agency (AChEE) <sup>307</sup>	Diego Lizana
	Current situation and renewable energy financing challenges	National Centre for Innovation and Promotion of Sustainable Energy (CIFES)	Tomás Baeza
	Current situation and financing challenges for small-scale farming adaptation to climate change	Ministry of Agriculture - Office of Agricultural Studies and Policies (ODEPA) – (ODEPA)	Angelina Espinoza
<b>International cooperation</b>	Technical assistance for bank projects in renewable energies and energy efficiency	German Corporation for International Cooperation (GIZ) – Energy Efficiency and Renewable Energies Program	Stephan Remler
	Technical assistance for bank projects in renewable energies and energy efficiency		

<sup>306</sup> Most interviews were conducted during the mission to Chile (24/08 - 02/09 2015). The interviews with CAF and BID took place via phone calls close to the same time period. The interview with Carbon Trust took place in London.

<sup>307</sup> Apart from the interview, we had a consultation via phone call with Diego Lizana, Executive Director of AChEE, on 25<sup>th</sup> January 2016. This was due to the fact that it had been decided to include more information on energy efficiency at a later stage of the project as financing needs and challenges were identified.

<b>Private sector</b>	Role of insurance in climate change	Marsh – Insurance broker	Andrés Alcalde Brian Heaphy
	Role of large corporations in generating renewable energies	Colbún – Electric energy generation company	Cristián Mosella Miguel Alarcón
	Role of large corporations in generating renewable energies	Chilean Association of Renewable Energy Sources (ACERA)	Carlos Finat
	Current situation and challenges in renewable energy financing	Chilean Association of Solar Energy (ACESOL)	Andres Bogolasky
	Private companies, their position and actions facing climate change	Arauco Generación - Bioenergy	Christian Patrickson
		Corporates Leaders Group – Business Leaders for Climate Change	Javiera Alvarado
	Integration of local communities in renewable energy projects	Geco Group - Sustainability consultant, Project Management and Inclusive Businesses.	Carlos Abogabir
	Energy efficiency in housing and industry	Carbon Trust	Daniel Perdómo
<b>Sector Financial</b>	National development finance institutions and their role in climate financing in Chile	Chilean Economic Development Agency (CORFO)	Manuel Martínez Jillian van der Gaag
		Multilateral development financing institutions and their role in climate financing in Chile	Andean Development Corporation (CAF)
	Multilateral development financing institutions and their role in climate financing in Chile	Interamerican Development Bank (IDB)	Claudio Alatorre Christoph Tagwerker
	Current situation and	Barros y Errázuriz Abogados	Mara Angelini

---

	challenges in renewable energy financing		Fernando Garrido
	Private Banks and financing of non-conventional renewable energies, energy efficiency and adaptation projects	Banco Bice	Rodrigo Violic
<b>Academic research</b>	Current situation and financing challenges for small-scale farming adaptation to climate change	Universidad Católica de Chile – Department de Agricultural Economy	Oscar Melo

## Annex II. Stakeholder Group

Sector	Institution	Person and Job Title
<b>Government</b>	Ministry of Energy	Nicola Borregaard – Head of Sustainability Division
	National Council for Clean Production (CPL)	Juan Ladrón de Guevara – Executive Director
	Centre for Innovation and Support for Sustainable energy (CIFES)	Viviana Huerta - Projects Coordinator of Project Management Division
		Tomás Baeza – Projects Developer of Project Management Division
	CORFO	Manuel Martínez – Head of Studies and Design
Ministry of Agriculture	Angelina Espinoza – Specialist in Climate Change	
<b>Private</b>	ACERA	Carlos Finat – Executive Director
	Association of Electricity Generators of Chile	Claudio Seebach – Executive Vice President
		Jorge Gómez - Environmental Consultant
<b>Financial</b>	Banco Bice	Rodrigo Violic – Corporate Business Manager



### Annex III. Workshop participants

Persona	Institution	Cargo
Catherine Taylor	British Embassy	Director of Economic Affairs and Sustainable Development
Felipe Osses	Ministry of Environment	Specialist in Negotiation and Climate Financing
Sophie Siemens	Ministry of Environment	Coordinator of LECB Project
Marcela Palominos	Ministry of Finance	Coordinator of Sustainable Economic Growth Area and Human Resource Management
Sofía Aroca	Ministry of Finance	Economic Advisor
Leonel Tapia	Ministry of Finance	Green Fund Consultant
Gabriela Moya	E3G	Senior Policy Adviser
Paula Rolffs	E3G	Researcher
Cristian Retamal	E3G	Country Partner
Carlos Finat	ACERA	Executive Director
Jorge Gómez	Association of Electricity Generators of Chile	Environment Advisor
Laila Ellis	AngloAmerican	Risk Manager
Christian Patrickson	Arauco	Deputy Manager of Development
Miguel Maldonado	Aon Corredores de Seguros	Accounts Manager
Mauricio Mitrovic	Aon Corredores de Seguros	Accounts Manager
Jimmy Llantén	Willis Corredores de Seguros	Deputy Manager of Agriculture and Livestock
Rodrigo Violic	Banco Bice	Business Manager
Anne Muller	Banco Itaú	Deputy Manager of Sustainability
Sol Meckievi	CR2	
Carlos Benavides	Universidad de Chile	Researcher, Energy Centre
Allan Beltran	CEPAL	Sustainable Development and Human Settlements Division
Jose Luis Samaniego	CEPAL	Director of Sustainable Development and Human Settlements Division
Heloisa Schneider	CEPAL	Sustainability and Climate Change Advisor, Sustainable Development

---

		and Human Settlements Division
Jana Janssen	GIZ	Assistant to Director
Maya Hirsch	GIZ	Advisor
Antonio Yaksic	Agro Seguros	Head of Sub Department of Information
Manuel Martínez	CORFO	Head of Studies and Design
Ambrosio Yobánolo	CPL	Management Control of NAMA
Ismael Díaz	CPL	Studies and Statistics
Viviana Huerta	CIFES	Coordinator
Gonzalo Guaiquil	Ministry of Foreign Affairs, Climate Change and Sustainable Development Office	Third Secretary
Juan Pedro Searle	Ministry of Energy	Head of Climate Change
Pablo Salgado	Ministry of Transport and Telecommunications	Advisor
Francisco Pinto	Ministry of Environment	Economist

---

## Annex IV. Detailed methodology for data collection and analysis

### Step 1: Initial background analysis

#### *Information sources*

Websites, news articles, online seminar presentations.

- Verify information through other desk-top sources e.g., official reports;
- Test validity of information through interviews with relevant stakeholders. E.g. is the information representative, does it reflect Chile's context, is it up to date?

Study from an international recognised source (World Bank, etc.)

- Use as valid background source.
- Identify information gaps to formulate key questions for interviewees.
- Conduct interviews.

Policy documents. Is the policy document updated regularly? If yes Action check with government stakeholder current status.

### Step 2: Revise analysis following stakeholder engagement

#### *Information source*

Stakeholder group documents and comments.

- Did stakeholders point out any relevant reports or internal documents to include in the analysis? If yes, incorporate.
- Did the stakeholder group provide recommendations for contacting other particular stakeholders to test findings? If yes, conduct interview.

Policy documents and current status.

- Have there been changes in the policy landscape or trends since the beginning of the project, or are there other relevant developments expected by the end of the project? If yes contact key stakeholder if information not publicly available. Update most recent information publicly available.

### Step 3: Complement analysis with international experiences and test findings

#### *Information Source*

Documents and reports.

- Identify key relevant international experiences. Is the information provided by that source detailed enough for the analysis? If not (most cases) are there other information sources publicly available such as workshop seminars and minutes? If yes incorporate in the analysis and interview relevant international stakeholders to validate information. If no, engage, interview and obtain relevant info from international stakeholders.

Workshop and seminars

### Step 4: Final analysis and policy recommendations

Findings were presented at the stakeholder workshop. Additional inputs for analysis were gathered through discussions at workshop with wider set of stakeholders. Key recurring themes were identified for the final policy report as well as possible options going forward for the NFS. Further contact with stakeholders and international experts to ensure latest policy developments are reflected and diagrams are accurate.

## Annex V. Ministry of Agriculture (Minagri): list of institutions

ODEPA	The Office of Agricultural Studies and Policies is responsible for providing regional, national and international information so that the various stakeholders involved in agricultural and forestry adopt their decisions.
INDAP	The National Institute for Agricultural Development aims to promote economic, social and technological development of small farmers and peasants in order to help increase their businesses, organizational and commercial capacity, as well as their integration into rural development process while optimizing their use of productive resources
Agroseguros	Agroseguros, it is an entity created by CORFO in 2000, with the aim of developing and promoting Agro Insurance products, and manage a state subsidy for co-pay premiums of agricultural insurance. The resources for the payment of subsidies and operating expenses of the Committee, come from the Ministry of Agriculture budget and are transferred annually to CORFO through a Funds Transfer Agreement.
<b>Department of Integrated Risk Management</b>	This year, the Department of Integral Risk Management to Address Climate Emergency is being created, which will be specialised in risk management to address problems of climate disasters in agriculture with a particular focus on smallholders. The Department will have three sub-departments, which will be responsible for (i) preparing reports and studies, prevention and monitoring; (ii) develop and promote risk management tools; and (iii) attention to natural disasters.
SAG	The Agriculture and Livestock Service is responsible for supporting the development of agriculture, forestry and livestock, through the protection and improvement of the health of animals and plants.
CONAF	The National Forestry Corporation is a private entity under the Ministry of Agriculture, whose main task is to manage forest policy in Chile and promote the development of the sector
CNR	National Irrigation Commission aims to ensure the increase and improvement of the irrigated area of the country through the formulation, implementation and monitoring of a National Irrigation Policy to generate studies, programs, projects and promotion of irrigation and drainage, which contributes to the efficient use of water in irrigation, that tends to improve the safety of irrigation and contribution to the development of domestic agriculture, in an inclusive, participatory, sustainable and equitable framework for farmers and irrigation organizations.
INIA	The Agricultural Research Institute, INIA, is the leading research institution in the industry of Chile. It is a private, non-profit organization under the Ministry of Agriculture.
FIA	The Foundation for Agrarian Innovation's mission is to foster a culture of innovation in the agricultural, food and forestry sector, promoting and coordinating innovation initiatives that help improve the living conditions of women farmers and farmers in all regions of the country.
INFOR	The Forestry Institute's objective is to create and transfer scientific and technological knowledge for sustainable use of forest resources and ecosystems, development of products and related services; as well as generate information relevant to the forestry sector in the economic, social and environmental fields.
CIREN	The Information Center of Natural Resources, CIREN, is a technological institute and support service to the Ministry of Agriculture, which provides information on Chile's renewable natural resources. CIREN has the largest

---

	database of soil, water resources, climate, fruit and forestry, and land use information in the country.
FUCOA	The Agricultural Communication, Training and Culture Foundation, FUCOA, is a private non-profit foundation under the Ministry of Agriculture. It delivers communicational support in the dissemination of its services for the development of the agrifood and forestry industry in Chile.
ACHIPIA	The role of the Agency is to formulate the National Policy for Food Safety and Quality and lead their implementation plans, programs and other measures developed by public agencies, serving as a coordinator and articulator between them, the food industry, the scientific community, food producers and consumers.

---

## Annex VI. Climate change related plans, policies and initiatives

**Government Programme** - With regard to climate change, the overarching Government Programme highlights the need to integrate policies across mitigation, adaptation and capacity building. The Programme also emphasizes Chile's need to move towards a low-emission economy. The program sees energy, and more precisely power generation and supply, as a fundamental pillar of economic development and places a priority on the need to work to address concerns about energy security and rising electricity prices. In terms of agriculture, the Programme puts an emphasis on combating inequality in the sector. The Program aims to reduce the barriers to small farmers and family farming in accessing financing and investment, and support the use of improved production technologies. It also mentions the problem of debts of small farmers affected by extreme weather events like droughts, floods and frost. Therefore, improving water management for efficient irrigation is a priority for the government.<sup>308</sup>

**Green Growth Strategy** - In 2013, Chile published a green growth strategy, complying with the requirements of the OECD after acceding to the OECD in 2010. The strategy seeks to promote decoupling economic growth from rising GHG emissions and as such it has a strong focus on protecting the environment, creating green jobs and delivering social equity. The strategy proposes a range of aims, including: enhancing environmental management tools; enabling new instruments; applying best international regulatory practices and efficiency standards; and encouraging the creation of a national market for environmental goods and services. The aims are supposed to be met through a range of actions, including: promoting the creation of green jobs; and studying the reformulation of a specific fuel tax.<sup>309</sup>

**PANCC 2008-2012** - The main objective of the PANCC was to generate the information required to set national and sectoral long-term plans for climate change mitigation and adaptation. The PANCC includes three priority areas – adaptation, mitigation and capacity building. Under these it established 22 areas of action (for example 'Determination of impacts and adaptation to climate change') and 103 specific and detailed actions (for example under the above mentioned area, the assessment of the effects of climate change at different stages of the hydrological cycle is proposed), with timelines and responsibilities for delivery that involve 13 ministries and 32 national organizations.<sup>310</sup>

**PANCC 2017-2022** - The new PANCC (to be approved and published in 2016) will take a more integrated approach to looking at how adaptation, mitigation and capacity building can be embedded across the board in terms of delivering a low carbon economy in Chile, as well as the country's NDC in particular. This will comprise actions

---

<sup>308</sup> Gobierno de Chile 2014a. Further information available at:

<http://www.onar.gob.cl/wp-content/uploads/2014/05/ProgramaMB.pdf>.

<sup>309</sup> Gobierno de Chile 2013b. Further information available at: [http://www.mma.gob.cl/1304/articles-55866\\_Estrategia\\_Nacional\\_Crecimiento\\_Verde.pdf](http://www.mma.gob.cl/1304/articles-55866_Estrategia_Nacional_Crecimiento_Verde.pdf).

<sup>310</sup> Gobierno de Chile 2008. Further information available at: [http://www.mma.gob.cl/1304/articles-49744\\_plan\\_01.pdf](http://www.mma.gob.cl/1304/articles-49744_plan_01.pdf).

---

that need to be taken by the Government, concerning norms and regulations, but also actions which will require private sector involvement, such as the adoption of low-carbon technologies. There will be a special emphasis on how action lines will be financed and delivered.

Compared to the previous PANCC, one of the main changes will be the use of monitoring indicators and the realization of a first assessment of the costs of implementing the plan. Hence, new measures within the new plan will be focused on the implementation of actions rather than simply the generation of information. There will also be a stronger focus on the stakeholders who would deliver the action lines. Furthermore, there will be a strong focus on monitoring, reporting and verification (MRV) to comply with requirements of the UNFCCC in delivering robust MRV for GHG emission reduction and also to develop emission reduction scenarios and to track national and international public finance flows.

The Action Plan is being developed by the MMA as the coordinating entity, in collaboration with focal points of all ministries to assure its alignment with sectoral plans and policies. It also builds on information and data developed by Energy 2050 and the MAPS process. There will be a sub-chapter on Chile's National Finance Strategy. The new PANCC is supposed to be one of the instruments that will provide more details on the implementation of the country's NDC. Hence the implementation of the new PANCC will also facilitate the achievement of the country's NDC.<sup>311</sup>

**Adaptation Plan** - The Adaptation Plan has the objectives of setting the framework for adaptation in Chile; establishing the institutional framework under which the Plan operates; establishing and updating the sectors requiring adaptation plans and establishing criteria and guidelines for their development and implementation; and defining cross cutting actions for adaptation to climate change.<sup>312</sup> As such, the Adaptation Plan mainly sets out guidance for the public sector institutions as they establish sectoral plans and work to implement those plans.

### Policy instruments and initiatives (linked to climate change finance)

Along with national plans described above, there are also a number of initiatives that are linked to the objectives of public policy on climate change. The most important are:

**NAMAs** - In 2010, the MMA started a process to identify NAMAs in collaboration with different Ministries representing Chile's main emission sectors. There are currently 6 NAMAS under development and 2 in implementation (for a full list please see Annex VII). NAMAs allow countries to demonstrate and test the challenges, opportunities and resources needed for transforming key sectors and build the basis for the long term transition to low-emission climate-resilient development.<sup>313</sup>

---

<sup>311</sup> Source of information: Interview with Ministerio de Ambiente /Departamento de Cambio Climatico.

<sup>312</sup> Ministerio de Medio Ambiente 2014. Further information available at: <http://portal.mma.gob.cl/wp-content/uploads/2014/12/PAN-web2.pdf>.

<sup>313</sup> Naidoo et al. 2014.

---

**Carbon Tax** - A carbon tax was enacted in September 2014 (Law 20780 of Tax Reform). The yearly tax of USD 5/tCO<sub>2</sub> applies to emissions from power plants of 50MW or more starting in 2017.

**MAPS Chile Project** - Government initiative led by the MMA provides evidence, projections and options for reducing GHG emissions in the country, through a process of research and multi-stakeholder participation and that has been running between 2012 and 2015. The project is relevant for climate finance as mitigation measures are proposed which, in case they are being implemented, need to determine their cost and possible sources of finance.

**Low Emission Capacity Building (LECB) Chile Project** - Capacity building program led by UNDP. The project aims to foster and build capacity of the public and private sectors in the measurement and mitigation of GHG emissions through nationally appropriate actions so as to achieve low-carbon development and improving public policies that address climate change. As part of the project, Chile undertakes an assessment of public and private investment that has gone towards climate change related activities and projects. To assess public spending and institutional structure the Climate Public Expenditure and Institutional Review (CPEIR) methodology.

Several of these initiatives are supported through bilateral technical or financial assistance (see Annex VI for a list of institutions that provide technical assistance on climate change).

#### Electricity sector plans

**Energy Agenda** - The 2014-2018 Energy Agenda is linked to the Government Programme and, as mentioned above, it emphasizes the need of a “Paradigm Shift” in the energy sector and a more active state role. The Agenda seeks to lift the barriers to NCREs and sets up a target of 45% of electricity generation capacity to be installed between 2014 and 2025; as well as to promote energy efficiency, setting an energy saving target of 20% by 2025.<sup>314</sup>

**Energy 2050** - The Government Programme and the Energy Agenda launched a participatory planning process for development of a long-term energy policy - Energy 2050. The goal is to build a shared vision for the future energy policy and development of energy technology with social and political validation. The new energy policy was launched by the end of 2015. It includes visions and long-term goals for 2050 as well as specific targets and milestones for 2035 based on 4 pillars: security and quality of supply, energy as engine of development, compatibility with the environment and energy efficiency and education. It sets a long-term target for renewable energy of at least 70% by 2050; decoupling of energy consumption and economic growth; energy efficiency standards in buildings and consumer products by 2050. Energy 2050 also sets out policy instruments; assignation of public and private finance for specific areas; programmes; standards; and regulatory frameworks, which should be implemented

---

<sup>314</sup> Agenda de Energia 2014.



---

over different timeframes until 2030 in order to achieve the 2035 and 2050 goals. Delivery of Energy 2050 goals needs to be a core element of the NFS.

### **Policy instruments and initiatives related to climate change (electricity sector)**

**Renewable energy** - Law 19,940 (Short Law I) of 2004 facilitated non-discriminatory grid access, exemption from major transmission charges and the right to sell at spot or nodal price for renewable energy producers with installed capacity under 9MW. Since 2005, Law 20,018 (Short Law II) requires electricity distribution companies to source power for regulated markets through non-discriminatory auctions and allows renewable energy producers to sign long-term power-purchase-agreements (PPAs) with distribution companies. In 2008, Law 20,257 (Non-Conventional Renewable Energy Law) made it mandatory for power companies that sell directly to end customers to incorporate 10% NCRE in their electricity sales in 2024. In 2013, Law 20/25 increased this quota to reach 20% by 2025. Law 20/25 also introduces the obligation of the Ministry to conduct annual public procurement of energy blocks from NCRE generation. This new regulation aims to reduce entry barriers for NCRE to increase the competitiveness of the sector. Furthermore, a net metering law (Law 20,571) entered into force in October 2014, applying to renewable energy and cogeneration systems of up to 100kW. The producer has a right to inject the electricity surplus into the electricity distribution grid and receive a payment equal to the regulated price per kWh plus avoided transmission losses, which are deducted from the electricity bill.<sup>315</sup> At the end of 2014, the procurement regulations of Decree No. 4 of 2008, which is the regulation on auctions for supply of energy to meet the consumption of regulated customers of the concessionaires of public service of electricity distribution was modified, enabling the competitiveness of NCRE in auctions. This facilitates the participation of technologies whose production depends on the time of day, i.e. solar energy, without the need for buying electricity in the spot market when electricity cannot be generated.<sup>316</sup>

**Energy efficiency** - Chile creates its first National Energy Efficiency Programme in 2005. The key driver milestone was the need to reduce Chile's dependence on external energy suppliers. In 2012, the Chilean Government announced Energy Efficiency Action Plan 2012-2020, which aims to achieve a 12% reduction in energy demand relative to the 'business as usual' projections for energy use in 2020 and 20% by 2025. This goal is overseen by an inter-ministerial Commission for Development of Energy Efficiency Policies, which periodically reports directly to the President of Chile on the country's energy efficiency improvements.<sup>317</sup> The Action Plan is underway with a focus on developing energy efficiency standards in the construction sector; new energy efficiency standards and energy labels in the transport sector; and promotion of energy efficiency technologies such as cogeneration in the industry sector. In 2016, a new Energy Efficiency Law will be presented to Congress which will support the delivery of the Action Plan as well as giving it continuity to the policies.<sup>318</sup>

---

<sup>315</sup> IRENA 2015b.

<sup>316</sup> Biblioteca Nacional del Congreso de Chile 2015.

<sup>317</sup> Estrategia Nacional de Energía 2012-2030

<sup>318</sup> Source of information: Interview with AChEE.

---

## Annex VII. Technical assistance / international cooperation<sup>319</sup>

- British Embassy
- Swiss Agency for Development and Cooperation
- Environment Canada
- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) - German Corporation for International Cooperation
- LEDS LAC. Regional Platform Resilient and Low Emission Development Strategies.
- European Commission
- Government of The Republic of Korea
- Government of New Zealand
- Government of the Kingdom of Denmark
- Australian Government
- United Nations Development Program (UNDP)
- UN -Food and Agriculture Organization (FAO)
- International Union for Conservation of Nature (IUCN)
- Economic Commission for Latin America and the Caribbean (CEPAL)
- Andean Development Corporation (CAF)

---

<sup>319</sup>319 Source: Chile's first Biennial update report. This list includes Government and Institutions that provided technical cooperation for the period 2011-2014.

## Annex VIII. Chile's NAMAs

NAMA	Status	Sector	Sub-sector	Objective
Expanding self supply renewable energy systems in Chile	Implementation	Energy	Renewable energy (unspecified)	The objective of the NAMA is to reduce emissions by fostering self-supply renewable energy projects and contribute to the long-term development of the renewable energy industry in Chile. The NAMA will achieve the objectives through a comprehensive programme of measures to remove barriers and incentivize SSRE investments with three components: a financial component, a technical support component and an outreach component.
CSP NAMA	Implementation	Energy	Renewable energy (solar)	The objective is to construct a single CSP plant with an approximate capacity of 50MW in the north of Chile
E-mobility readiness plan	Under development	Transport		The E-mobility Readiness Plan is designed to promote the introduction of grid-enabled electric vehicles in Chile on a large scale, leading to a target of 70,000 electric vehicles by the year 2020. The plan foresees the implementation of a set of activities to target barriers and provide incentives to achieve the overall target.
National Program for Catalyzing Industrial and Commercial Organic Waste Management in Chile	Under development	Waste		The objective of this NAMA is to catalyse the installation of the first facilities for industrial and commercial organic waste management in Chile (it does not include household organic waste).
Forestry NAMA	Under development	Forestry		This NAMA aims to advance the implementation of the country's Platform for the Generation and Trading of Forest Carbon Credits (PBCCh).
Santiago Transportation Green Zone	Under development	Transport		Low emission vehicles (taxis and Transantiago), bicycle promotion, transit management
Price	Under development	Energy	Renewable energy	Revolving fund to insure renewable energy projects against spot market price fluctuation

stabilization fund for renewable energy			(unspecified)	
Off-grid non-conventional renewable energy	Under development		Renewable energy (solar, biomass, geothermal)	Incentive program for off-grid implementation of non-conventional renewable energy in industry and commercial sector
Programme for Energy Efficiency in the Transport Sector in Chile	Feasibility study	Transport	n.a.	n.a.

Source: NAMA Databas

## Annex IX. Climate change related policies in agriculture

Strategy, policy, programs, actions	Institution	Mitigation/ adaptation
National Action Plan for CC 2008-2012 (Resolution)	MMA – DCC Sectorial commitments	Direct, mitigation/ adaptation
CC Adaptation Plan Agro-Forestry Sector 2013-2017 (Resolution)	MINAGRI	Direct, adaptation
NAMA “Design and Implementation of the National Strategy for Climate Change and Vegetation Resources (ENCCRV)”	CONAF	Direct, mitigation/ adaptation
NAMA “Carbon Sequestration through Sustainable Land Management” (in elaboration)	INIA and SAG	Direct, mitigation
Information for Decision Making: Fruit Crop Record and Continuous Inter-censal Statistics	ODEPA/CIREN and ODEPA/INE	Indirect, mitigation y adaptation
Law 20.412. Establishes an Incentive-based Sustainable Agro-environmental System for Farm lands (SIRSD-S). (2010-2024).	SAG e INDAP	Indirect, mitigation
Urban Tree Planting programs.	CONAF	Indirect, mitigation.
Law 20.283 on Native Woodland Recovery and Forestry Development. 2008-2022	CONAF	Indirect, mitigation
Program for protected wilderness area	CONAF	Indirect, mitigation
DFL 701 on Forestry Development, modified by Law 20.488 (prolongs the benefits to 2013)	CONAF	Indirect, mitigation
Law 18.450 on Promoting Private investment in Irrigation and Drainage Works. Modified by Law 20.283. Prolongs benefits to 2022.	CNR	Indirect, adaptation
Irrigation System Revolving Fund (works for connections)	INDAP	Indirect, adaptation
Productive Development Programs, including: Inter Farmland Irrigation and Drainage Program (PRI); Associative Irrigation program (PRA); Investment Development Program (PDI)	INDAP	Indirect, adaptation
Financial Assistance Programs, including: Support Programs for Contracting Agriculture Insurance; Short and Long Term Credit linked to investment	INDAP	Indirect, adaptation
Lines of research funding – Promoting research, innovation and competitiveness in the food and forestry Industry.	FIA	Indirect, adaptation

---

<b>Plan to stimulate rainfall</b>	INIA	Indirect, adaptation
<b>Rainwater Harvesting for Productive Use Program</b>	INIA	Indirect, adaptation
<b>National Agro-climatic Network</b>	Sub secretary	Direct, adaptation
<b>Agricultural Insurance (AGROSEGUROS)</b>	Undersecretary/CORFO	Indirect, adaptation
<b>Agricultural Emergencies</b>	Undersecretary /CORFO	Indirect, adaptation

Source: Proyecto 'Gasto Climático'. Análisis de Políticas Públicas e Institucionalidad de Cambio Climático. Presentation by Maricel Gibbs, September 2015.<sup>320</sup>

---

<sup>320</sup> The completeness of this list has been checked by Angelina Espinoza, Minagri/ODEPA and some further policies have been added according to her comments.

## Annex X. Use of International Climate Funds in Chile

Fund	Name of Project	Approved year	Funding Approved (USD millions)
<b>Adaptation Fund (AF)</b>	Enhancing Resilience of Climate Change of the small agriculture in Chilean region of O' Higgins	2015	10.0
<b>Clean Technology Fund (CTF)</b>	Technical Assistance for Sustainable Geothermal Development Project	2015	2.9
<b>Clean Technology Fund (CTF)</b>	Energy Efficiency and Self-Supply Renewable Energy Program (PEEERA)	2015	25.3
<b>Clean Technology Fund (CTF)</b>	Geothermal Risk Mitigation Program	2014	73.7
<b>Special Climate Change Fund (SCCF)</b>	Strengthening the Adaptive Capacity to Climate Change in the Fisheries and Aquaculture Sector	2014	2.6
<b>Clean Technology Fund (CTF)</b>	Large-Scale Photo-Voltaic Program (LSPVP)	2013	25.0
<b>Forest Carbon Partnership Facility (FCPF)</b>	Readiness preparation grant	2013	3.8
<b>Germany's International Climate Initiative</b>	Information matters: Capacity development for ambitious reporting and facilitation of international mutual learning through peer-to-peer exchange	2013	4.2
<b>Partnership for Market Readiness</b>	PMR Program Chile	2013	3.0
<b>Clean Technology Fund (CTF)</b>	Concentrated Solar Power Project	2012	66.7
<b>Germany's International Climate Initiative</b>	National Programme for Promoting Solar Energy	2012	3.9
<b>Germany's International Climate Initiative</b>	Development of Nationally Appropriate Mitigation Actions (NAMAs)	2012	0.4
<b>Clean Technology Fund (CTF)</b>	Renewable Energy Self-Supply and Energy Efficiency (RESEE) Program	2012	24.7
<b>Partnership for Market Readiness</b>	Market Readiness Proposal MRP	2011	0.4
<b>Germany's International Climate Initiative</b>	Energy efficiency and combined heat and power generation in public hospitals	2010	3.0
<b>Germany's International Climate Initiative</b>	Extension Strategy for Grid Connected Renewables	2009	4.4
<b>Germany's International Climate Initiative</b>	Developing a Climate Adaptation Strategy for Santiago de Chile and a Network of Megacities	2009	2.0
<b>Total</b>			<b>255.8</b>

Source: [www.climatefundsupdate.org/data](http://www.climatefundsupdate.org/data)



E3G

## Annex XI. Forecasted amount of electricity requested via auctions

<b>Projected electricity sales</b>				
	<b>SING [GWh]</b>	<b>SIC [GWh]</b>	<b>SING Variation [%]</b>	<b>SIC Variation [%]</b>
<b>2014</b>	16,591	50,973	5.9%	5.6%
<b>2015</b>	17,695	53,543	6.7%	5.0%
<b>2016</b>	18,832	56,074	6.4%	4.7%
<b>2017</b>	20,009	58,553	6.3%	4.4%
<b>2018</b>	21,248	61,062	6.2%	4.3%
<b>2019</b>	22,509	63,638	5.9%	4.2%
<b>2020</b>	23,831	66,241	5.9%	4.1%
<b>2021</b>	25,211	68,896	5.8%	4.0%
<b>2022</b>	26,640	71,579	5.7%	3.9%
<b>2023</b>	28,130	74,289	5.6%	3.8%
<b>2024</b>	29,626	77,079	5.3%	3.8%
<b>2025</b>	31,127	79,867	5.1%	3.6%

Source: Energy Agenda 2014-2018.



## Annex XII. Infrastructure investment estimates

Figure 26 – Investment required in the energy sector 2013 - 2023

**TABLA 28. Resumen de la inversión requerida 2013-2023**

Sistema	Inversión (MM US\$)			Total
	Generación	Transmisión	Distribución	
SIC	15.317	1.415	1.644	18.376
SING	4.535	259	380	5.174
Interconexión		767		767
<b>Total</b>	<b>19.852</b>	<b>2.441</b>	<b>2.023</b>	<b>24.316</b>

Fuente: Elaboración propia.

Figure 27 – Total investment required in infrastructure between 2014-2018 and 2014-2023

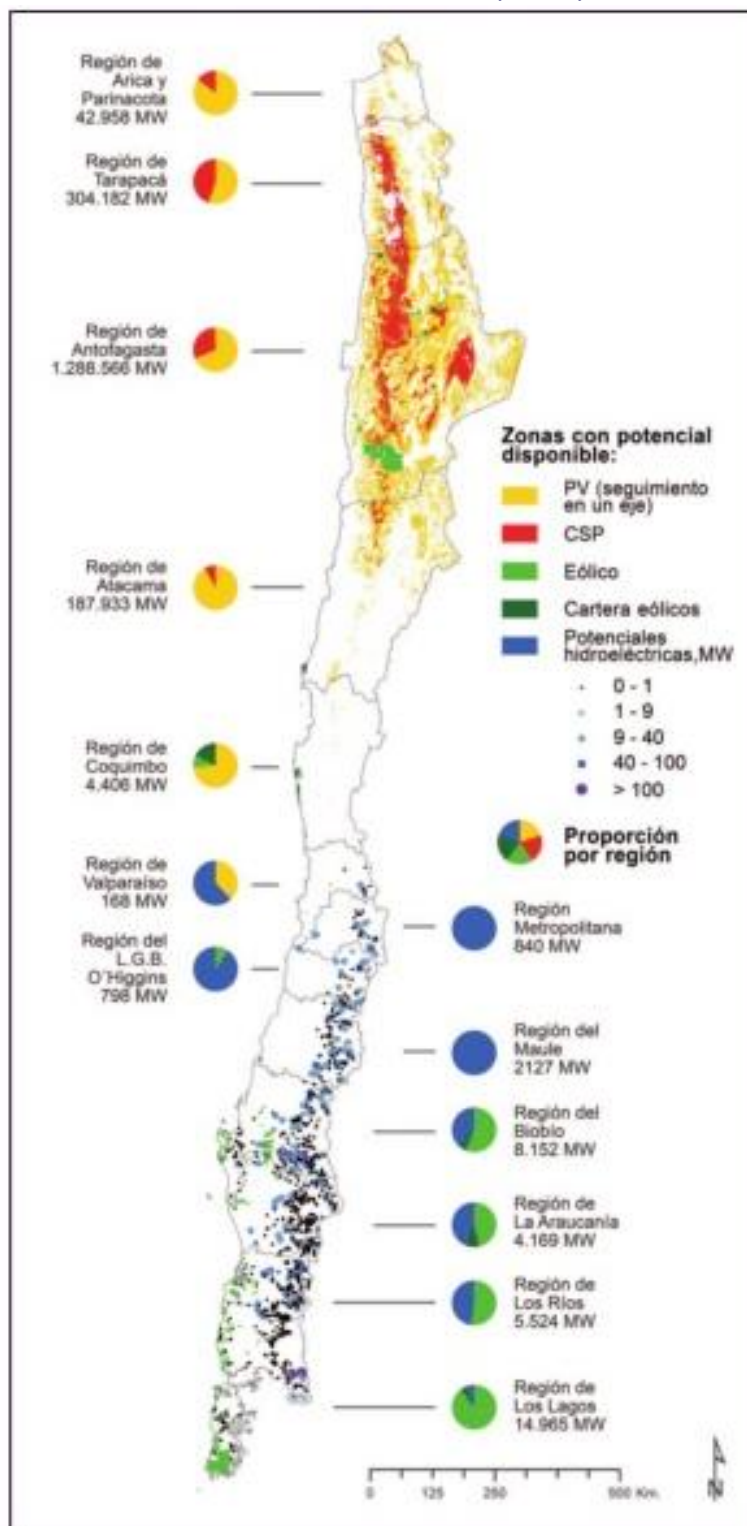
**FINANCIAMIENTO REQUERIMIENTOS DE INVERSIÓN (MILLONES DE DÓLARES)**

Sector	Inversión (MM US\$)	Inversión (MM US\$)	Porcentaje	
			2014-2018	2014-2023
<b>PÚBLICO</b>	<b>31.454</b>	<b>64.473</b>	<b>54%</b>	<b>57%</b>
<b>Aporte fiscal directo</b>	<b>25.842</b>	<b>56.461</b>	<b>44%</b>	<b>50%</b>
Vialidad y transporte urbano <sup>1</sup>	11.847	18.848	20%	17%
Vialidad interurbana	10.345	25.863	18%	23%
Recursos hídricos	3.650	11.750	6%	10%
<b>PRIVADO</b>	<b>26.661</b>	<b>48.115</b>	<b>46%</b>	<b>43%</b>
<b>Concesiones <sup>2</sup></b>	<b>5.612</b>	<b>8.012</b>	<b>10%</b>	<b>7%</b>
Aeropuertos	1.402	1.652	2%	1%
Hospitalaria	3.601	5.473	6%	5%
Penitenciaria	609	887	1%	1%
<b>Empresas</b>				
Energía	11.475	24.316	20%	22%
Puertos	2.645	5.336	5%	5%
Ferrocarriles (transporte interurbano y carga) <sup>3</sup>	2.614	4.981	4%	4%
Transporte urbano Metro/EFE <sup>4</sup>	9.927	13.482	17%	12%
<b>Total</b>	<b>58.115</b>	<b>112.588</b>	<b>100%</b>	<b>100%</b>

Fuente: CChC  
Notas:  
1. Los requerimientos de inversión en vialidad urbana se desagregaron en aquellos a financiar vía presupuesto público de aquellos a materializar vía empresas, aunque el Estado tenga participación accionaria en ellas.  
2. Las inversiones a materializar mediante el mecanismo de concesiones tienen un potencial mayor al preliminarmente estimado, ya que no se incluyen futuras concesiones de vialidad urbana o interurbanas.  
3. Considera empresas privadas y EFE en lo que respecta a tramos interurbanos.  
4. Considera los requerimientos urbanos de Metro y EFE, los que en el análisis sectorial forman parte de las estimaciones de vialidad urbana.

Source: Ministerio de Energía (2014) *Agenda de Energía. Un Desafío País, Progreso para Todos*. Gobierno de Chile, Santiago de Chile.

## Annex XIII. Potential of solar PV, CSP, wind and hydro in Chile



Source: Ministerio de Energía and GIZ (2014) *Energías Renovables en Chile. El potencial eólico, solar e hidroeléctrico de Arica a Chiloé.*

---

## Annex XIV. Actors consulted for final report

---

Name	Institution
Angelina Espinoza	Ministerio de Agricultura, Oficina de Estudios y Políticas Agrarias (ODEPA)
Diego Lizana	Agencia Chilena de Eficiencia Energética (AChEE)
Hernán Sepulveda	Ministerio de Energía, División Eficiencia Energética
Juan Pedro Searle	Ministerio de Energía, División Desarrollo Sustentable
Luciano González	Ministerio de Energía, División Energías Renovables
Marcel Silva	Ministerio de Energía, División de Energías Renovables
Rubén Muñoz	Ministerio de Energía, Unidad Geoterma
Viviana Huerta	Centro Nacional para la Innovación y Fomento de las Energías Sustentables (CIFES)
Ximena Ubilla	Ministerio de Energía,

---

---

## 8. REFERENCIAS

ACERA (2016). Nuestros Asociados. Online available at <http://www.acera.cl/socios/> [last seen 16/02/2016].

AChEE (2014). Agencia Chilena de Eficiencia Energetica, Introduccion. Online available at: <http://www.acee.cl/sites/default/files/noticias/documentos/Fondo%20de%20Garant%C3%ADa%20de%20Eficiencia%20Energ%C3%A9tica%20AChEE.pdf> [last seen: 26/02/2016]

African Risk Capacity (2016). Fact Sheet: Extreme Climate Facility (XCF).

APIE- Agencia de Promoción de las Inversión Extranjera. Estadísticas 2009-2014. Online available at: <http://www.ciechile.gob.cl/es/inversion-en-chile/estadisticas/> [last seen: 03/03/2016]

Agroseguros (2015). Minagri Crea Nuevo Departamento para Gestionar Integralmente los Riesgos en el Agro. Boletín N° 5, December 2015.

Agroseguros (2016a). Seguros Agrícolas. Online available at <http://www.agroseguros.gob.cl/seguros-agricolas/> [last seen 17/02/2016].

Agroseguros (2016b). Se discutió sobre las coberturas del Seguro Agrícola y se dio a conocer la Nueva Institucionalidad para la Gestión de Riesgos. Online available at: <http://www.agroseguros.gob.cl/se-discutio-sobre-las-coberturas-del-seguro-agricola-y-se-dio-a-conocer-la-nueva-institucionalidad-para-la-gestion-de-riesgos/> [last seen 26/02/2016].

Amin, Amal-Lee, Shin Wei Ng and Ingrid Holmes (2014). China's Low Carbon Finance and Investment Pathway. E3G Policy Paper. E3G, London.

Amin, Amal-Lee, Taylor Dimsdale and Marcela Jaramillo (2014). Designing Smart Green Finance Incentive Schemes. The role of the public sector and development banks . E3G, London.

Amon, Ada and Ingrid Holmes (2016). Energy Efficiency as Infrastructure: A global view (forthcoming). E3G, London.

Baker, Andrew. "Chile ERNC firms concerned over transmission projects". BN Americas, January 14, 2016.

Banco Central de Chile (2015a). Informe de Estabilidad Financiera, I-2015. Santiago de Chile, Chile.

---

Banco Central de Chile (2015b). Informe de Política Monetaria. Santiago de Chile, Chile.

Bergamaschi, Luca, Jonathan Gaventa and Ingrid Holmes (2015). Making the Investment Plan Work for Europe. Mobilising Investment for Europe's Climate and Energy Union. Briefing Paper, April 2015.

Balance de Energía 2012. Ministerio de Energía, Gobierno de Chile. Online available at:  
[http://antiguo.minenergia.cl/minwww/opencms/14\\_portal\\_informacion/06\\_Estadisticas/Balances\\_Energ.html](http://antiguo.minenergia.cl/minwww/opencms/14_portal_informacion/06_Estadisticas/Balances_Energ.html) [last seen 20/01/2016]

Biblioteca Nacional del Congreso de Chile (2015) Resúmenes de leyes. Ley N° 20.805, publicada el 29-01-2015. Cambios a la ley General de Servicios Eléctricos. Online available at <http://www.bcn.cl/resumenes-de-leyes?b=20.805&btx=&o=1&n=1&i=10&t> [last seen 02/02/2016].

Bloomberg New Energy Finance (2016) Clean Energy Investment: Q4 2015 Factpack. Bloomberg.

Bloomberg New Energy Finance (2015) Climatescope. Bloomberg.

Bloomberg New Energy Finance (2014) Climatescope. Bloomberg.

Bloomberg New Energy Finance (2013) Climatescope. Bloomberg.

Brain, I. and Mora, P. (2012). Emergencia y Reconstrucción: el antes y después del terremoto y tsunami del 27-F en Chile. Aprendizajes en materia habitacional, urbana y de seguros. Pontificia Universidad Católica de Chile.

Business Green (2016) City of London launches new Green Finance Initiative as it bids to cement position as climate finance capital. Online available at:  
<http://www.businessgreen.com/bg/news/2442004/city-of-london-launches-new-green-finance-initiative-as-it-bids-to-cement-position-as-climate-finance-capital> [last seen 18/02/2016].

Camara de Diputados de Chile (2016). Propuesta de Resolución 477, aprobada. Online available at:  
[https://www.camara.cl/trabajamos/presolucion\\_detalle.aspx?prmID=4239](https://www.camara.cl/trabajamos/presolucion_detalle.aspx?prmID=4239) [last seen 22/03/2016].

CChC (2014). Infraestructura crítica para el desarrollo. Bases para un Chile integrado. Estimaciones 2014-2018 y 2014-2023. Cámara Chilena de la Construcción, Santiago de Chile.

CEPAL (2004). Opciones de la banca de desarrollo en Chile: el "convidado de piedra" del sistema financiero chileno. CEPAL, Santiago de Chile.

---

---

CEPAL (2014). Informe Nacional de Monitoreo de la Eficiencia Energética de la República de Chile. CEPAL, Santiago de Chile.

CEPAL (2015a). Financiamiento para el cambio climático en América Latina y el Caribe en 2013. CEPAL, Santiago de Chile.

CEPAL (2015b). Financiamiento para el cambio climático en América Latina y el Caribe en 2014. CEPAL, Santiago de Chile.

Cervera, A. (2014). Chile: Pension fund snapshot as of May 2014. Credit Suisse, Economics Research.

CIFES (2016) Reporte CIFES, enero 2016. Gobierno de Chile, Santiago de Chile.  
Climate Change Capital and E3G (2009) Accelerating Green Infrastructure Financing: Outline proposals for UK green bonds and infrastructure bank. Briefing note, March 2009.

Climate Investment Funds (2012) Clean Technology Fund Investment Plan for Chile. CIF, Washington D.C.

Climate Investment Funds (2014). Geothermal Risk Mitigation Program (Financial Instrument Component). Online available at: <https://www-cif.climateinvestmentfunds.org/projects/geothermal-risk-mitigation-program-financial-instrument-component> [last seen 25/02/2016]

Climate Investment Funds (2015). Table of Funds. Online available at: <http://www.climatefundsupdate.org/data> [last seen 05/02/2016]

Coviello, M., and Alfonso Blanco (2015). Empresas de servicios energéticos en América Latina. CEPAL, Santiago de Chile.

CORFO (2015). Mecanismos de Mercado que Facilitan el Financiamiento de Proyectos de Mitigación al Cambio Climático. Minuta CORFO.

CORFO (2016a). Importante convenio fomentará sustentabilidad en el sector agrícola. Online available at: <http://www.corfo.cl/sala-de-prensa/noticias/2015/diciembre-2015/importante-convenio-fomentara-sustentabilidad-en-el-sector-agricola> [last seen 19/02/2016].

CORFO (2016b). Historia de Corfo. Online available at: <http://www.corfo.cl/sobre-corfo/historia-de-corfo/historia-de-corfo>

CPI (2012). Effective Green Financing: What have we learned so far?. Climate Policy Initiative.

CPI (2015). Global Landscape of Climate Finance 2015. Climate Policy Initiative.

---

Davies, Susan and Ingrid Holmes (2011). European Perspectives on the Challenges of Financing Low Carbon Investment: Estonia. E3G, London UK

EIB (2013). Energy Lending Criteria. EIB and Energy: Delivering Growth, Security and Sustainability - EIB's Screening and Assessment Criteria for Energy Projects. European Investment Bank, Luxembourg.

EIB (2015). Innovative climate finance product. European Investment Bank, Luxembourg.

EIB (2016). Priorities Climate. Online available at: <http://www.eib.org/projects/priorities/climate-action/index.html> [last seen 18/02/2016].

El Universal, 2015. Emite Nafin bono verde mexicano por USD 500 m. Online available at: <http://www.eluniversal.com.mx/articulo/cartera/finanzas/2015/10/29/emite-nafin-bono-verde-mexicano-por-500-mdd> [last seen 03/03/2016]

Energy Efficiency Financial Institutions Group (2015). Boosting Finance in Energy Efficiency Investments in Buildings, Industry and SMEs.

Ernst and Young (2015). Renewable energy country attractiveness index. Issue 45, September 2015.

European Commission (2015). Communication From The Commission To The European Parliament, The Council, The European Economic And Social Committee And The Committee Of The Regions. Action Plan on Building a Capital Markets Union. European Commission, Brussels.

Eyraud, Luc (2015). End of the Supercycle and Growth of Commodity Producers: The Case of Chile. IMF Working Paper.

FOMIN- IDB Group and Bloomberg New Energy Finance (2012). Climate Scope. Assessing the Climate for Climate Investing in América Latina and the Caribbean.

FOMIN- IDB Group and Bloomberg New Energy Finance (2013). Climate Scope. Assessing the Climate for Climate Investing in América Latina and the Caribbean.

FOMIN- IDB Group and Bloomberg New Energy Finance (2014). Climate Scope. Assessing the Climate for Climate Investing in América Latina and the Caribbean.

FOMIN- IDB Group and Bloomberg New Energy Finance (2015) Climate Scope. Assessing the Climate for Climate Investing in América Latina and the Caribbean.

Frankfurt School, UNEP Centre and BNEF (2015) Global Trends in Renewable Energy Investment 2015. Frankfurt School of Finance & Management, Frankfurt.

---

GCF (2014). Investment Framework. GCF/B.07/06. Green Climate Fund, Songdo/Korea.  
Gobierno de Chile (2012). Estrategia Nacional de Energía 2012-2030. Gobierno de Chile, Santiago de Chile.

Gobierno de Chile (2013b). Estrategia Nacional de Crecimiento Verde. Gobierno de Chile, Santiago de Chile.

Gobierno de Chile (2014a). Programa de Gobierno 2014-2018. Gobierno de Chile, Santiago de Chile.

Gobierno de Chile (2014b). Anteproyecto de Contribución Nacional Tentativa (INDC) en el Contexto del Tratado Climático 2015 a ser finalizado en la Vigésimo Primera Conferencia de las Partes (COP21) de la Convención Marco de Naciones Unidas sobre Cambio Climático. Gobierno de Chile, Santiago de Chile.

Gobierno de Chile (2015). Contribución Nacional Tentativa de Chile (INDC) para el Acuerdo Climático París 2015. Gobierno de Chile, Santiago de Chile.

Gobierno Regional del Libertador General Bernardo O'Higgins (2011). Estrategia Regional de Desarrollo. División de Planificación y Ordenamiento Territorial, Gobierno Regional del Libertador General Bernardo O'Higgins.

Gobierno Regional Metropolitano de Santiago and UNDP (2012). Estrategia Regional de Desarrollo 2012 – 2021. Región Metropolitana de Santiago. Gobierno Regional Metropolitano de Santiago, Santiago de Chile.

Green Climate Fund (2015). Consideration of funding proposals – Addendum Funding proposal package for FP004. Meeting of the Board, GCF/B.11/04/Add.04. Livingstone, Republic of Zambia.

Green Climate Fund (2015). Consideration of funding proposals – Addendum Funding proposal package for FP004. Meeting of the Board, GCF/B.11/04/Add.06. Livingstone, Republic of Zambia.

Green Investment Bank (2016). What we do. Online available at: <http://www.greeninvestmentbank.com/what-we-do/> [last seen 18/02/2016].

Holmes, Ingrid and Luca Bergamaschi (2015). Options for a 2030 Energy Efficiency Target. E3G, London.

Holmes, Ingrid, Jonathan Gaventa, Nick Mabey and Shane Tomlinson (2012). Financing the Decarbonisation of European Infrastructure. 30 percent and beyond. E3G, London.

Holmes, Ingrid, and Nick Mabey (2010). Accelerating the transition to a low carbon economy. The case for a Green Infrastructure Bank. E3G, London.



---

Holmes, Ingrid and Rohan Mohanty (2012). The Macroeconomics Benefits of Energy Efficiency. The case for public action. E3G, London.

IASS Potsdam (2015). The Global Context of the German Energiewende: Energy Transition Profile – Chile.

IDB, KfW and NAFIN (2012). Financial Instruments to Promote Energy Efficiency: The experience from Local Financial Institutions in América Latina and the Caribbean. Joint Workshop October 2012, Mexico City.

IEA (2009). Chile Energy Policy Review. OECD/IEA, Paris.

IEA (2015). Energy and Climate Change. World Energy Outlook. Special Briefing for COP21. International Energy Agency, Paris.

IFAD and UNEP (2013). Smallholders, food security, and the environment.

IMF (2015). Regional Economic Outlook. Western Hemisphere Northern Spring, Southern Chills. IMF, World Economic and Financial Surveys.

INDAP (2016). Minagri crea Departamento de Gestión Integral de los Riesgos para hacer frente a Emergencias Climáticas. Online available at: <http://www.indap.gob.cl/noticia/minagri-crea-departamento-de-gestion-integral-de-los-riesgos-para-hacer-frente-emergencias> [last seen 17/02/2016].

International Fund for Agricultural Development (2013). Smallholders, food security, and the environment.

IRENA(2012). Financial Mechanism and Investment Frameworks for Renewable in Developing Countries. IRENA, Abu Dhabi.

IRENA (2015a). Renewable Energy in América Latina 2015: An Overview of Policies. IRENA, Abu Dhabi.

IRENA (2015b). Renewable Energy Policy Brief. Chile. IRENA, Abu Dhabi.

KfW (2014). KfW supporting expansion of solar energy in Chile. Online available at: [https://www.kfw.de/KfW-Group/Newsroom/Aktuelles/Pressemitteilungen/Pressemitteilungen-Details\\_252416.html](https://www.kfw.de/KfW-Group/Newsroom/Aktuelles/Pressemitteilungen/Pressemitteilungen-Details_252416.html) [last seen 25/02/2016]

Mabey, Nick, Tom Burke, Liz Gallagher, Camilla Born and Bryn Kewley (2015). Judging COP21 Outcome & What's next for Climate Action. Commentary. E3G, London

Micale, Valerio, Pradaig Oliver and Fiona Messent (2014). The Role of Public Finance in Deploying Geothermal: Background Paper. CPI, San Giorgio Group Report.

Ministerio de Agricultura (2016). Lineamientos Estratégicos. Online available at:

---

[http://www.minagri.gob.cl/institucion/institucional/lineamientos\\_estrategicos/](http://www.minagri.gob.cl/institucion/institucional/lineamientos_estrategicos/) [last seen 19/02/2016].

Ministerio de Energía (2014) Agenda de Energía. Un Desafío País, Progreso para Todos. Gobierno de Chile, Santiago de Chile.

Ministerio de Energía (2015a) Energía 2050. Política Energética de Chile. Gobierno de Chile, Santiago de Chile.

Ministerio de Energía (2015b) Gobierno destaca histórico resultado de Licitación de Suministro de energía eléctrica para clientes regulados. Online available at: <http://www.gob.cl/2015/10/27/gobierno-destaca-historico-resultado-de-licitacion-de-suministro-de-energia-electrica-para-clientes-regulados/> [last seen 10/02/2016].

Ministerio de Energía (2015c) Geothermal Energy in Chile. Third geothermal dialogue. Online available at: <http://climatepolicyinitiative.org/wp-content/uploads/2015/07/SANTANA-Geothermal-Energy-in-Chile.pdf> [last seen 25/02/2016].

Ministerio de Energía and GIZ (2014). Energías Renovables en Chile. El potencial eólico, solar e hidroeléctrico de Arica a Chiloé. Gobierno de Chile, Santiago de Chile.

Ministerio del Medio Ambiente and GIZ (2013). Plan de Adaptación al Cambio Climático del Sector Silvoagropecuario. Gobierno de Chile, Santiago de Chile.

Ministerio de Medio Ambiente (2014). Primer Informe Bienal de Actualización de Chile ante la Convención Marco de las Naciones Unidas sobre el Cambio Climático. Gobierno de Chile, Santiago de Chile.

Ministerio Secretaría General de la Presidencia (2010). Ley 20417. Crea el Ministerio, el Servicio de Evaluación Ambiental y la Superintendencia del Medio Ambiente. Gobierno de Chile, Santiago de Chile.

Ministerio de Obras Públicas (2016). Ministro Undurraga anunció presupuesto de USD 2,3 billones para Obras Públicas en 2016. Comunicado de Prensa. Online available at: <http://www.mop.cl/Prensa/Paginas/DetalleNoticiaSecundaiaMp.aspx?item=2045> [last seen 26/02/2016]

Mirova (2015). Investing for a Low Carbon Economy. Special issue COP21. Groupe BPCE, Paris.

Naidoo, Chantal, Amal-Lee Amin, Taylor Dimsdale and Marcela Jaramillo (2014). Strategic national approaches to climate finance. Report on scoping work in Peru, Chile and Colombia on national climate finance pathways and strategies. E3G, London.

ODEPA (2013a). Estudio: “Cambio Climático Impacto en la Agricultura Heladas y Sequía”. Gobierno de Chile, Santiago de Chile.

---

ODEPA (2013b). Panorama de la Agricultura Chilena 2013. Gobierno de Chile, Santiago de Chile.

ODEPA (2016) Estadísticas comercio exterior. Online available at: <http://www.odepa.cl/estadisticas/comercio-exterior/> [last seen 01/03/2016].

OECD (2011). Chile Review of the Financial System.

OECD (2014). “Financing infrastructure—International Trends.” OECD Journal: Financial Market Trends 2014 (1): 123–38.

OECD (2014). Annual Survey of Investment Regulation of Pension Funds Survey of Investment.

OECD (2015) DAC List of ODA Recipients.

Opazo, L., Claudio Raddatz and Sergio L. Schmukler (2014). Institutional Investors and Long-Term Investment. Evidence from Chile. World Bank Group. Development Research Group. Macroeconomics and Growth Team.

Pollitt, Michael (2004) Electricity Reform in Chile Lessons for Developing Countries. Center for Energy and Environmental Policy Research, Sloan School of Management.

Portal minero (2016). “Cochilco prevé un alza de 53% en consumo de energía en la minería al 2026”. January 13, 2016.

Reed, Andrew (2013). Energy under the Andes: Benefits, Barriers to Development, and Relevant Policy Alternatives for Chile’s Untapped Geothermal Resources. University of Pittsburgh.

Regulation (EU) 2015/1017 of The European Parliament and of The Council of 25 June 2015 on the European Fund for Strategic Investments, the European Investment Advisory Hub and the European Investment Project Portal and amending Regulations (EU) No 1291/2013 and (EU) No 1316/2013 — the European Fund for Strategic Investments. Online available at:

<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015R1017&from=EN>. [last seen 22/03/2016]

REN21 (2015). Renewables 2015 Global Status Report. REN21, Paris.

Rydge, James, Michael Jacobs and Ilmi Granoff (2015). Ensuring new infrastructure is climate-smart. The New Climate Economy, Working Paper.

Rojas-Suarez, Liliana (2015). Basel III in Chile: Advantages, Disadvantages, and Challenges for Implementing the New Bank Capital Standard. CGD Policy Paper 061. Washington DC: Center for Global Development.

---

Santoro, Marika (2015). Long-term Gain, Short-Term Pain: Assessing the Potential Impact of Structural Reforms in Chile. Working Paper, IMF.

Serebrisky, T., Ancor, Suarez-Aleman, Diego, Margot and Maria Cecilia Ramirez. (2015). Financing Infrastructure in América Latina and the Caribbean: How, How much, and by Whom? IDB, Washington DC, USA.

Servicio Nacional de Geología y Minería, Ministerio de Minería (2015). “Chile registra al menos 70 desastres de origen geológico entre 1980 y 2015”. Gobierno de Chile. Online available at: <http://www.sernageomin.cl/detalle-noticia.php?idNoticia=227> [last seen 18/02/2016]

Sistema AAFP (2015). Información sobre el sistema AFP. Online available at: <http://www.aafp.cl/el-sistema/el-sistema-afp/> [last seen 03/03/2016]

Smallridge, Diana and Fernando De Ollouqui (2011). A Health Diagnostic Tool for Public Development Banks. Inter-American Development Bank. Washington, D.C., U.S.A  
The Economist (2016). Mining in América Latina: From conflict to co-operation. Online available at: <http://www.economist.com/news/americas/21690100-big-miners-have-better-record-their-critics-claim-it-up-governments-balance> [last seen: 03/03/2016]

Tuesta, David (2015). Infrastructure investment in América Latina Pension funds, capital markets and financial regimes. BBVA Research. Online available at: <https://www.bbvarsearch.com/wp-content/uploads/2015/11/World-Bank-Cape-Town.pdf> [last seen: 22/03/2016]

UN General Assembly (2015). Transforming our world: the 2030 Agenda for Sustainable Development. Resolution adopted by the General Assembly on 25 September 2015, A/RES/70/1.

UNEP-FI (2015). The Financial System We Need. Aligning the Financial System with Sustainable Development. The UNEP Inquiry Report. UNEP, Nairobi.

UNEP (2015). G7 Countries, Top Insurers Team Up for Climate Change Resilience. Online available at: <http://www.unep.org/newscentre/Default.aspx?DocumentID=26802&ArticleID=35014#sthash.QVKIhpOd.RyhUrjW1.dpuf> [last seen 30/03/2016]

Universidad de Chile, Poch SA, Adapt-Chile (2015). Propuesta de estructura y contenidos para PANCC 2016-2021. Licitación N° 608897-101-LE14 del Ministerio del Medio Ambiente “Definición de elementos PANCC 2015-2020”.

CMNUCC(2015a). Synthesis report on the aggregate effect of the intended nationally determined contributions. Note by the secretariat. CP/2015/7

CMNUCC(2015b). Adoption of the Paris Agreement. CP/2015/L.9.

---

CMNUCC(2016). NAMAs seeking support for implementation. NS-8 - Expanding self-supply renewable energy systems (SSRES) in Chile. Online available at: [http://www4.unfccc.int/sites/nama/\\_layouts/un/fccc/nama/NamaSeekingSupportForImplementation.aspx?ID=8&viewOnly=1](http://www4.unfccc.int/sites/nama/_layouts/un/fccc/nama/NamaSeekingSupportForImplementation.aspx?ID=8&viewOnly=1) [last seen 26/02/2016].

UNCTAD 2015. World Investment Report 2015: Reforming International Investment Governance. New York and Geneva, 2015.

Veys, Alex (2010). The Sterling Bond Markets and Low Carbon or Green Bonds. A report to E3G. E3G, London.

World Bank Group, GFDRR, Secretaria de Gobernacion de Mexico, Secretaria de Hacienda y Credito Publico de Mexico. (2012). FONDEN: Mexico's Natural Disaster Fund– A Review.

World Bank (2014). Chile - Partnership for Market Readiness (PMR) Project. Online available at: <http://documents.worldbank.org/curated/en/2014/04/19538517/chile-partnership-market-readiness-pmr-project> [last seen 25/02/2016]

World Bank (2014). Joint Report on Multilateral Development Banks' Climate Finance. African Development Bank (AFBD), the Asian Development Bank (ADB), European Bank for Reconstruction and Development (EBRD), European Investment Bank (EIB), Inter-American Development Bank (IADB), World Bank Group.

World Bank (2015). Global Long Term Finance. Global Financial Development. Washington, DC. USA.

World Bank (2016). Mexico Launches Second Catastrophe Bond to Provide Coverage Against Earthquakes and Hurricanes. Online available at: [http://treasury.worldbank.org/bdm/htm/Financing\\_Noteworthy/Mexico\\_Launches\\_Second\\_Catatrophe\\_Bond\\_Oct2012.html](http://treasury.worldbank.org/bdm/htm/Financing_Noteworthy/Mexico_Launches_Second_Catatrophe_Bond_Oct2012.html) [last seen 02/03/2016].

The World Bank Group, GFDRR, US Ministerio de Foreign Affairs and USAID (2015). The Role of the Public Sector in Agricultural Insurance PPPs. The public sector: A fundamental pillar in agricultural insurance.

WRI (2012). Public Financing Instruments to Leverage Private Capital for Climate-Relevant Investment: Focus on Multilateral Agencies. Working Paper December 2012.  
World Food Programme (2016). The R4 Rural Resilience Initiative.