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SOCIEDAD CIVIL POR LA ACCIÓN CLIMÁTICA

Analysis of Chile's Nationally Determined Contribution (NDC) and Proposals from the Civil Society for Climate Action

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Presentation

This book is the result of a joint effort of representatives of *Sociedad Civil por la Acción Climática*, aimed at consolidating a vision that guides our transition towards climate sustainability. The book is divided into two parts. The first part of the book analyzes cross-cutting societal dimensions on which climate change and sustainability measures should be based, such as human rights, gender, socio-environmental emergencies and the economy. The second part deals with proposals and transitions that are essential to move towards sustainability in different areas, such as water, land use, agriculture, energy, cities and transport, household waste, industrial processes and product use and oceans.

First Part

1 Human rights and Indigenous peoples

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I. Introduction

Climate change impact on human rights has been widely documented in many UN resolutions[1]. Such reports acknowledge that climate change impact is unevenly distributed, disproportionately affecting the poorest and most vulnerable regions and countries, preventing the fulfillment and enjoyment of human rights[2].

Additionally, there might be impacts linked to government measures to combat climate change. For instance, the production of agro fuels, which has put at risk the right to food of the most vulnerable people, by contributing to food price increases[3]. Another example is the extraction of lithium from salt flats to produce batteries and store renewable energies, which is already affecting the territories of indigenous communities in Chile, Argentina and Bolivia[4].

In this regard, the Preamble of the Paris Agreement states that, "*Parties should, when taking action to address climate change, respect, promote and consider their respective obligations on human rights, the right to health, the rights of indigenous peoples, local communities, migrants, children, persons with*

1 *Asamblea General de las Naciones Unidas, Consejo de Derechos Humanos. 2009. Informe de la Oficina del Alto Comisionado de las Naciones Unidas para los Derechos Humanos sobre la relación entre el cambio climático y los derechos humanos. A/HRC/10/61 de 2009, A/HRC/10/4 de 2009 y A/HRC/20/25 de 2014.*

2 *Ibid., Resolución 10/61, pp. 5 and 8.*

3 *Ibid., Resolución 10/61, p. 22.*

4 *Horvath E & A Romero. 2019. En riesgo, los medios de vida de los pueblos indígenas en la lucha por el litio, el nuevo "oro blanco". Bussiness and Human Rights. Available on: https://www.business-humanrights.org/es/blog-en-riesgo-los-medios-de-vida-de-los-pueblos-ind%C3%ADgenas-en-la-lucha-por-el-litio-el-nuevo-%E2%80%9Coro-blanco%E2%80%9D. Retrieved: June 1st, 2020.*

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*disabilities and people in vulnerable situations and the right to develop*ment, *as well as gender equality, empowerment of women and intergenerational equity*"[5].

With this reference, States are reminded of their obligations under the human right treaties ratified by them[6]. In other words, when developing measures to address climate change, States should ask themselves how to implement these actions in line with their human rights obligations. This human rights perspective must be present throughout the life cycle of climate policies[7], in their preparation, implementation and reporting stages.

This section proposes the effective and specific inclusion of the human rights perspective in our climate policies, to promote coherence, legitimacy and sustainability in their results[8].

II. Including a human rights perspective in the NDCs

Climate policies should include different aspects of human rights, noteworthy among which are[9]:

i. Respect for economic and social rights: One of the many impacts of climate change is the risk to the right to housing, food, water and health[10]. For instance, in terms of access to water, projections indicate that renewable surface water and groundwater resources will be significantly reduced in most subtropical dry regions, thus intensifying inter-sectoral competition for water[11]. Regarding food security, projections indicate that "*(a)ll aspects of food security are potentially affected by climate change, including access to food, the use thereof and the stability of its prices*"[12]. Additionally, maintaining the productivity of fisheries in sensitive regions will be made difficult. As for the right to health, climate change is expected to "*increase poor health in many regions, especially in developing and low-income countries*"[13]. Finally, concerning the right to housing, the report warns that climate change will increase the number of displaced people in the world, due to rising sea levels in coastal areas, droughts, fires and extreme weather events,

5 *Acuerdo de París de la Convención Marco de las Naciones Unidas sobre el Cambio Climático, Conferencia de las Partes N°21, París.*

6 *Savaresi, A. 2019. The Paris Agreement: a new beginning? Journal of Energy & Natural Resources Law 34 (1): 16-26.*

7 *Mary Robinson Foundation. Climate Justice. 2016. Incorporating Human Rights into Climate Action. Version 2. Dublin, Ireland. 16 pp.*

8 *Knox J. 2016. Report of the Special Rapporteur on the issue of human rights obligations relating to the enjoyment of a safe, clean, healthy and sustainable environment. Report to the 31nd session of the UN Human Rights Council (A/HRC/31/52). pp. 7-13.*

9 *Gender equity is not mentioned in this section, as this aspect will be dealt with extensively in the next chapter of this book.*

10 *IPCC. 2014. Cambio Climático 2014: Impactos, adaptación y vulnerabilidad. Conclusiones de nivel superior del Resumen para responsables de políticas de la contribución del Grupo de trabajo II al Quinto Informe de Evaluación. Available on: https://www.ipcc.ch/site/assets/uploads/2018/03/WGIIAR5_SPM_Top_Level_Findings_es-1.pdf. Retrieved: June 1st, 2020.*

11 *Ibid. p. 2.*

12 *Ibid. p. 3.*

13 *Idem.*

among others. In light of these risks, it is the duty of Chile to respect and protect human rights when developing the NDCs and climate policies. For this, they must first determine how climate change will impact human rights, and then propose active measures to prevent or mitigate each of those impacts. Safeguards to prevent any mitigation or adaptation measures taken from affecting the human rights of vulnerable sectors of the population should also be proposed[14].

ii. Participation and access to information in climate change decisions: The Paris Agreement commits states to promote and have transparency and public participation frameworks to implement their climate obligations and actions[15]. Specifically, the Paris Agreement states that the NDCs should be developed in an "enhanced" transparency framework. In addition to this, the Paris Agreement emphasizes that action on adaptation must be based on a "*gender-responsive, participatory and fully transparent approach*" (Article 7.5). Therefore, there is also the need to ensure the effective implementation of procedural human rights of access to information and participation, as a basic guarantee framework for climate change decision-making, especially regarding the measures and commitments of the NDCs and the adaptation plans, and to ensure their effective implementation and execution over time[16].

iii. Indigenous peoples' rights: According to the ILO[17], indigenous peoples are particularly vulnerable to the effects of climate change. Firstly, about 15% of the world's poor population belongs to indigenous peoples. They are thus of the world's most vulnerable segment of population in terms of social, economic and environmental vulnerability. Secondly, indigenous peoples' economic, social and cultural activities depend on renewable natural resources increasingly exposed to climate variability and climate extremes. About 70 million indigenous persons depend on forests for their livelihood needs[18]. Thirdly, indigenous peoples live in geographic regions and ecosystems that are highly vulnerable to climate change, such as polar regions, tropical rain forests, high mountains, small islands, coastal regions, and arid and semi-arid lands, among others. Fourthly, this extreme vulnerability and exposure to climate change might force indigenous people to migrate to cities, leading to the loss of their traditional activities. Finally, the lack of recognition of indigenous peoples, their rights and institutions imply a lack of public mechanisms to consult with them in decision-making processes on these matters. In fact, many renewable energy projects and climate action plans are implemented on their lands without including and consulting with of indigenous peoples. This has been the case with the biofuel plantations, the construction of wind power projects and hydroelectric power plants[19]. On the other hand,

14 *Op. cit. Mary Robinson Foundation 2016. p.14.*

15 *Articles 4.3, 6.2, 7.5, 12 and 13 of the Paris Agreement.*

16 *Consejo de Derechos Humanos, ONU, Resoluciones 10/4 de 2009 y 26/25 de 2014.*

17 *Organización Internacional del Trabajo (OIT). 2018. Los pueblos indígenas y el cambio climático: De víctimas a agentes del cambio por medio del trabajo decente. Oficina Internacional del Trabajo, Ginebra. Servicio de Género, Igualdad y Diversidad. Programa de empleos verdes. 47 pp.*

18 *United Nations University. 2012. Climate Change Mitigation with Local Communities and Indigenous Peoples: Practices, Lessons Learned and Prospects. Proceedings of the Expert Workshop Climate Change Mitigation with Local Communities and Indigenous People.26-28 March, 2012, Carins, Australia. Meeting Report. 60 pp.*

19 *IWGIA. 2019. Acción Climática: Los pueblos indígenas de todo el mundo se enfrentan a las consecuencias del cambio climático. Por lo tanto, los pueblos indígenas deben ser escuchados e incluidos en la acción climática global,*

many local communities and indigenous peoples are involved in climate change solutions, such as the conservation of important ecosystems and carbon sinks such as forests and wetlands. In addition to this, their traditional knowledge is of great value in climate change adaptation[20]. For this reason, the recognition and participation of indigenous peoples in the fight against climate change in Chile is essential[21]. In this regard, the omission of the indigenous consultation procedure in the course of processing the bill of the Framework Law on Climate Change is particularly serious as, according to ILO Convention No. 169, it should be carried out whenever legislative or administrative measures affect them directly[22]. Any regulation, policy and plan concerning climate change must include the genuine participation of indigenous peoples. This is why the NDCs are a real opportunity to include their needs and knowledge in climate action.

iv. Just transition to clean energies: Greening the economy can improve our ability to manage natural resources sustainably, increase energy efficiency, reduce waste and build resilience[23]. It can also act as driver for growth and a net generator of decent and green jobs, thus contributing to poverty eradication and social inclusion. However, in this transition, the world of work might face some challenges, such as economic restructuring leading to the displacement of workers and job losses. Moreover, businesses and workplaces will be required to adapt to the impact of climate change in order to prevent the loss of resources and livelihoods, and involuntary migration[24]. To address these issues, the ILO recommends the creation of policies providing a framework of just transition for all, in order to promote the creation of more decent jobs, anticipate the impact of climate change on employment and promote adequate social protection against job loss and displacements[25]. Additionally, a just transition to a low-carbon economy should include putting an end to and repair the so-called "sacrifice zones"[26] in Chile, where energy generation has been based on fossil fuel burning, considering the ecological restoration of these territories, and the health of the affected communities.

v. Climate migration and displacement: Climate change impacts are widely recorded[27]. Evidence shows dangerous levels of sea level rise, drought and other major variations in certain habitats[28]. When such alterations are too severe and adaptation measures are insufficient or

nacional y local. Available on https://www.iwgia.org/es/enfoques/accion-climatica. Retrieved: June 1st, 2020.

20 *World Resources Institute (WRI). 2014. Securing Rights, Combating Climate Change: How Strengthening Community Forest Rights Mitigates Climate Change. Washington, USA. 64 pp.*

21 *Op. cit. OIT. 2018, p. 2.*

22 *Organización Internacional del Trabajo (OIT). 189. Convenio (N. 169) sobre pueblos indígenas y tribales en países independientes, 27 Junio 1989, C169. Available on: https://www.refworld.org.es/docid/50ab8efa2.html. Retrieved: June 1st, 2020.*

23 *Organización Internacional del Trabajo (OIT). 2015. Directrices de política para una transición justa hacia economías y sociedades ambientalmente sostenibles para todos. Ginebra. Suiza. 47 pp.*

24 *Ibid. p. 6.*

25 *Idem.*

26 *El Desconcierto. 2018. Las 6 comunas que concentran las 28 termoeléctricas a carbón en Chile. Published on 10.03.2018. Available on: https://www.eldesconcierto.cl/2018/10/03/zonas-de-sacrificio-las-6-comunas-que-concentran-las-28-termoelectricas-a-carbon-en-chile/ Retrieved: June 1st, 2020.*

27 *Reports of the IPCC.*

28 *Idem.*

improperly implemented, the inhabitants of these places are forced to flee[29]. Migration caused by climate change is already happening and it is expected to increase rapidly[30]. According to the Food and Agriculture Organization of the United Nations, between 2008 and 2015, an average of 26 million people have been displaced nationally or internationally due to climate disasters every year, and there is ample evidence that this will increase in the future. Droughts are more intense and are the cause of the first reported cases of climate change migration in Chile[31]. The problem of the sea level rise is also a cause for migration in different parts of the world, especially in small island states or those with long coastlines, such as Chile. The displacement of population in these circumstances puts essential human rights at risk. In light of this, NDCs should not only focus on mitigation and adaptation, but they should also address the current and future consequences of climate change that are beyond any scope of adaptation. The Paris Agreement recognizes these circumstances as Loss and Damage, within which climate change migration emerges as one of the most serious. States must provide a proper framework to protect migrants from climate change, regardless of whether they take place within or outside national territory.

III. Update of Chile's NDCs

Although the update of Chile's NDC, presented in April 2020, does not expressly recognize the link between climate change and human rights, it does include different references to the social implications of the measures taken by it.

Firstly, it adds a new chapter titled "Social pillar of just transition and sustainable development", which emphasizes "*the intrinsic relationship that climate actions, their responses and impacts have on equitable access to sustainable development and poverty eradication*"[32].

The social pillar seeks to maximize synergies between 2030 Agenda, the Sustainable Development Goals and the Paris Agreement goals, and also the potential negative impacts of policies adopted to combat climate change in the most vulnerable groups[33]. To this end, eight cross-cutting criteria are established and should be considered for the design, implementation and monitoring of each NDC commitment[34]:

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29 *Sometimes, these groups cannot migrate, even if they need to. This phenomenon is described as "trapped populations". UNFCC. 2016. Human Mobility and the Paris Agreement. Bonn, Germany. Available on: https://unfccc.int/news/human-mobility-and-the-paris-agreement. Retrieved: June 1st, 2020.*

30 *Doelle M. 2017. The Paris Climate Agreement-Assessment of Strengths and Weaknesses. In: Klein D, MP Carazo, M Doelle, J Bulmer & A Higham. The Paris Agreement on Climate Change: Analysis and Commentary, (p. 375-388). Oxford University Press.*

31 *Organización Internacional para las Migraciones (OIM). 2017. Migraciones, ambiente y cambio climático. Estudios de caso en América del Sur. Cuadernos Migratorios N°8.Salvador, R & G Priotto.185 pp. Available on: https://chile.iom.int/es/news/migraciones-ambiente-y-cambio-clim%C3%A1tico-estudios-de-caso-en-am%C3%A9rica-del-sur. Retrieved: June 1st, 2020.*

32 *Government of Chile. 2020. Chile's Nationally Determined Contribution (NDC). 2020 Update. 97 pp.*

33 *Ibid., pp. 23-24.*

34 *Ibid., Pp. 25-26.*

1) Synergy with the Sustainable Development Goals (SDGs), so that each commitment submitted contributes to the fulfillment of one or more of these, mentioning throughout the document the specific SDG to which each measure relates;

2) Just transition, which are measures to "*anticipate the social implications of the shift to a low-carbon economy and the increasing physical impacts of climate change*"[35];

3) Water security to promote access to water for health, subsistence, socio-economic development and the conservation of ecosystems;

4) Gender equity and equality to consider a fair allocation of burdens, costs and benefits in the design and implementation of this NDC;

5) Cost-efficiency, prioritizing those measures that, while effective for climate change mitigation and adaptation, involve the lowest economic, environmental and social costs;

6) Nature-based solutions, understood as actions aimed at protecting, sustainably managing and restoring natural or modified ecosystems;

7) Considering different "types of knowledge", such as available scientific evidence, traditional knowledge, indigenous peoples' knowledge and local knowledge systems; and

8) Active participation in the design of instruments and measures arising from the implementation of this NDC.

It is worth highlighting the specific contribution of this chapter, on the development by 2021 of a "Just Transition Strategy", which protects the rights of the most vulnerable people in decarbonizing the energy matrix and includes active citizen participation in its design and implementation.

Then, the chapter on mitigation recognizes that neutrality by 2050 and the net reduction target by 2030 is a goal involving "*economic, social and environmental implications*"[36]. An example of this are the mechanisms set out in Article 6 of the Paris Agreement, which the NDC mentions as a possible way of implementing these mitigation goals in a "cost-effective" manner, such as the international transfer of mitigation results or market mechanisms.

To this end, the NDC is committed to creating a public-private committee to determine a specific policy for the use of these mechanisms, "*taking into account clear guidelines that preserve environmental integrity, avoid double-counting and promote sustainable development*"[37]. Nonetheless, the implementation of these mechanisms should also take into account safeguards to ensure social integrity and human rights, which is crucial according to the experience of the different communities affected by this type of projects[38].

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35 *The NDC takes the concept of "just transition" from the UN Principles for Responsible Investment (PRI).*

36 *Op. Cit. Government of Chile. 2020. p. 32.*

37 *Ibid., p. 34.*

38 *CIEL. 2019. Integrating Human Rights in the Modalities Related to Carbon Markets Established under Article 6 of the Paris Agreement. Climate Governance Note 2019/5. 4 pp. Available on: https://www.ciel.org/wp- content/uploads/2019/09/BriefingNote_RightsInArticle6.pdf. Retrieved: June 1st, 2020.*

One of the measures incorporated in this update and directly related to the quality of life of people living in highly polluted areas, also called "sacrifice zones" in Chile, where human rights are violated on a daily basis, are the actions to mitigate short-lived climate pollutants. This field is moving towards making a specific contribution and reducing by 25% the total black carbon emissions by 2030 compared to 2016. This is one of the main short-lived pollutants and its reduction, as the NDC itself points out, "*generates significant co-benefits in terms of air quality improvement, reducing the impact on people's health*". The NDC proposes to meet this goal through national and air quality monitoring, policies such as "*new air pollution abatement plans; regulating the public and private transport system; working with communities to improve household energy efficiency; and creating quality and emission standards for the major industrial sources of pollutants*"[39].

Regarding forests, Chile has set a specific unconditional mitigation goal for the LULUCF sector in the integration pillar, which includes the sustainable management and recovery of 200,000 hectares of native forest by 2030, the afforestation of another 200,000 hectares of forest (only 70,000 of which will be native forest) and a 25% reduction of emissions from native forest degradation and deforestation by 2030[40]. However, nothing is said about the indigenous peoples living in these territories and forests, and how these measures will affect them. Neither does it mention the contribution of indigenous peoples and local communities to oceans and the role they play, for example, in the protection of marine protected areas in Chile[41].

The chapter on adaptation shows the greatest progress in recognizing that climate change affects territories and the consequent need to strengthen the resilience of communities. It also mentions water security and the reduction of socio-natural hazards as the most critical fields. It also proposes to strengthen adaptive management tools through Chile's Long-Term Climate Strategy by 2021, national and sectoral plans, and country vulnerability and risk studies, including the analysis of vulnerable groups, and taking into account the gender approach to address hazards.

It states that the inclusion of non-governmental agents in planning and implementing adaptation measures will be strengthened, and that the country's resilience to climate change impacts on water resources will be increased, through Strategic Basin Plans by 2030, among others. Regarding socio-natural disasters, the instruments committed consist in a guide related to human mobility related to climate change (2021); a national plan for heat wave hazards (2022); and regional disaster risk reduction plans (2025).

The instrument[42] "*guía con lineamientos acerca de efecto del cambio climático en el fenómeno de la movilidad humana en Chile*", should be clearer in order to understand its incidence and contribution. The wording does not draw a clear distinction as to whether it is a guide to generate diagnostics, i.e., to properly determine how climate change affects human mobility, or a document to guide specific State and community actions to face climate change migration.

39 *Op. Cit. Government of Chile. 2020. p. 34-35*

40 *Ibid., pp. 54-58.*

41 *Ibid., pp. 64-66.*

42 *Ibid, pp.44.*

As the first climate change migrants go back to 2014, and the intersectionality between climate change, mega-drought and water scarcity only aggravates the problem, it would be advisable for the NDC to commit not only a diagnostic tool, but rather a specific action planning tool, such as the Planned Relocation Guidelines of the Fijian Government, aimed at addressing this dramatic climate change impact[43].

At the same time, the text states that the guidelines shall be created *in line with related international instruments*[44]. In this regard, it is worth bearing in pointing out that in both the Paris Agreement and the documents prepared under the Warsaw Mechanism, climate change migration falls within the concept of loss and damage, not of adaptation. This, as it acknowledges that such serious damage to the habitat and livelihood of some individuals or communities is beyond any possible adaptation and should thus be compensated, or adequately recognized as such by the State, so as to ensure no further erosion of migrants' fundamental rights due to migration.

Finally, the NDC update considers the participation of civil society and the most vulnerable groups in the design of some of its instruments and implementation mechanisms[45]. However, it is to be expected that such participation will be put into action through adequate and specific legal information access tools and the participation in climate policies at all levels, which are so far insufficient. On the occasion of the legislative discussion of the bill of the Framework Law on Climate Change, the government pointed out that, in terms of citizen participation, our current legal system is the same as or more protective than the Escazú Agreement, an argument for refraining from signing and ratifying the Agreement. However, this is not the case, as citizen participation is very low in our current legal system: information and citizen consultation.

The Escazú Agreement regulates in greater detail both participation in early stages and the citizen consultation mechanism, strengthening aspects such as transparency, the use of non-technical language, the recording and treatment of observations, among others[46]. In terms of the treatment of the participant agents, it promotes participation through pre-established organizations, thus helping to unify the social and socio-environmental network, aspects that are key to strengthening citizen participation. Therefore, it is to be expected that citizen participation mechanisms provided for in the instruments of this NDC to adapt to the standards of said Agreement.

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43 *Ministry of Economy, Republic of Fiji. 2018. Planned Relocation Guidelines. A framework to undertake climate change related relocation. Available on: http://fijiclimatechangeportal.gov.fj/document/planned-relocation- guidelines-framework-undertake-climate-change-related-relocation. Retrieved: June 1st, 2020.*

44 *Op. Cit. Government of Chile. 2020, pp. 44.*

45 *Op. Cit. Government of Chile. 2020. Contribution in Implementation Measures, p. 74: "MI1)In 2020, Chile will develop 'Strategy for "Capacity Development and Climate Empowerment" and will begin its implementation in 2021, with the aim of strengthening the sectoral, national and subnational capacities of citizens and organizations (public and private, from academia and civil society), to achieve national mitigation and adaptation targets".*

46 *Madariaga M. 2020. Participación en el Proyecto de Ley Marco de Cambio Climático, Policy Brief para el Observatorio de la Ley Marco de Cambio Climático. CR2. In the press, July 2020.*

IV. Recommendations

i. Economic and social rights: Making progress in creating safeguards so that mitigation or adaptation measures taken, including market mechanisms, do not affect the human rights of the most vulnerable sectors of the population. Implementing a short-term closure plan of coal-fired thermal power plants, and a defined schedule to review or develop new regulations on air quality and climate pollutants, as per the WHO standards.

ii. Access to Information and Participation: Takings specific legal measures to guarantee and materialize the rights of access to information and participation in climate policies at all levels, by signing and ratifying the Escazú Agreement. Protecting environmental defenders and climate activists, through internal measures to protect civil society's contribution and work on these issues, allowing them to participate in a safe environment, is also pressing[47].

iii. Rights of indigenous peoples: Recognizing the knowledge and participation of indigenous peoples in the fight against climate change in Chile is crucial. This is considered a guiding criterion for climate action. However, the NDC does no mention, and should include, specific measures to recognize their rights and the importance of traditional knowledge in climate change adaptation, and their participation in the conservation of important ecosystems and carbon sinks. At the same time, it is essential for management instruments, policies, plans and guidelines to consider an indigenous consultation process, as required by Article 6 of ILO Convention No. 169.

iv. Just transition to clean energies: Creating a framework for a transition to a low-carbon economy that is just for all, aimed at promoting the creation of more decent jobs, setting measures to anticipate the impact of climate change on employment and promoting adequate social protection. Additionally, discussing the end of the so-called "sacrifice zones" in Chile, considering the ecological restoration of these territories, as well as the health of the communities affected by the operation of thermal power plants.

v. Climate migration and displacement: The guide on climate mobility should at least include the development of a registry of climate change impacts specific to each part of the country in the short term, focusing on the threats to the development of communities and their potential need to migrate. At the same time, it should allow to identify areas with development opportunities, and to facilitate, through subsidies, the access to land, economic instruments, infrastructure development, territorial planning and other mechanisms for planned population transfers[48]. Access to water resources should be at the center of the above-mentioned diagnosis. Finally, it should include specific compensation, relocation and assistance mechanisms for climate migrants, on the understanding that represent one of the most serious and unjust impacts of climate change.

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47 *Global Witness. 2019. Enemies of the State? How governments and businesses silence land and environmental defenders. July 30th, 2019. 52 pp. In Latin America, 89 environmental and land defenders were murdered in 2018.*

48 *Op. Cit. Ministry of Economy, Republic of Fiji. 2018.*

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2 Gender and NDC: a cross-cutting approach to climate change actions

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I. Introduction

Climate change does not impact people in the same way. On the contrary, its social and environmental effects are unevenly distributed, and the most vulnerable people (poor people, women, immigrants) are the most likely to suffer its effects in the short and long term[1]. In the case of women, several studied claim that precarious socio-economic situations and extreme poverty, in addition to traditional gender stereotypes, unequal opportunities and exclusion from decision-making processes aggravate the negative impacts of climate change[2, 3]. Certain information provided by the UNDP "Resource Guide on Gender and Climate Change" (2008) clearly illustrates this statement, by pointing out that "*Seventy percent of the 1.3 billion people living in conditions of poverty are women. In urban areas, 40% of the poorest households are headed by women. Women predominate in the world's food production (50-80%), but they own less than 10% of the land*"[4].

Regarding the gender approach in climate public policies, it has been found that extreme environmental phenomena not only have a different impact on men and women, but they have also different abilities when it comes to reducing and mitigating their effects at different scales[5]. On this latter point, the change of focus from vulnerabilities to action and innovation in climate change issues is noteworthy, allowing us to see the how "*...the same dynamics that produce unequal access to resources or disproportionate vulnerabilities to environmental changes are often key components*

1 *Olmedo P. 2018. Una comprensión del enfoque de género en el cambio climático en contextos actuales. In: Aproximaciones al estudio de la relación entre ciudades y cambio climático. Proyecto "Construyendo liderazgo en ciudades de América Latina y el Caribe frente al cambio climático". Novillo N, P Olmedo, Y Pérez & Y Rojas (Eds.). Quito: Flacso Ecuador. p. 85-110.*

2 *Idem.*

3 *Programa Naciones Unidas para el Desarrollo (PNUD). 2008. Guía Recursos de género para el cambio climático. Mexico. 123 pp.*

4 *Idem.*

5 *Op. cit. PNUD, 2008.*

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of social and political difference"[6]. This rereading of the intervention areas is key to drive policies, plans and programs with actions committed to address the deep challenges of human inequality in climate change impacts demonstrating that no step forward towards sustainable development goals is possible without environmental justice[7].

How does gender inequality affect the access to, and the use and management of, forests, water resources, food security, energy and solid waste? What are the educational, health, welfare and risk management vulnerabilities that make it difficult to effectively respond to climate change impacts, from a gender perspective? How do these vulnerabilities show us the relevant steps to be taken in this matter? These and other questions lead us to find out how the equality and gender equality approach are being included in global adaptation, mitigation and climate change action policies; and, in the case of Chile, how this has been reflected in the climate commitments assumed and materialized in the 2020 Nationally Determined Contribution (NDC) proposal for 2020.

II. Gender and climate change: global perspectives.

Internationally, one of the first contributions in gender issues was the creation of the Convention on the Elimination of All Forms of Discrimination against Women, adopted by the United Nations General Assembly in 1979. This Convention forces signatory States to recognize, protect and guarantee the rights of women, granting them equal opportunities in terms of economic, social, cultural, civil and political rights[8].

Later, in 1995, the Beijing Declaration and Platform for Action – currently considered as one of the most progressive plans in the history of women's rights - was implemented. It incorporates the gender perspective into all strategies, rule-making processes and actions on women's rights matters, especially within the framework of the United Nations system. The Platform made extensive commitments in 12 areas of special concern, including those related to Women and the Environment[9].

As for global Climate Change policies, the incorporation of gender issues has been slower. Year 2001 (COP 7) was the first call to improve women's participation in representing the parties in entities created under the UNFCCC or the Kyoto Protocol. In turn, in 2019, after a long struggle, women's and gender NGOs were officially and provisionally recognized as official constituencies for the process (COP 15). Nonetheless, it was not until 2011 (COP18) that these groups were finally granted permanent status, allowing women and gender groups to participate in official negotiations[10].

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6 *Buechler S & AS Hanson. 2015. A Political Ecology of Women, Water and Global Environmental Change. New York, USA. Routledge. 262 pp, p. 7-8.*

7 *Climate and Development Knowledge Network. 2019. Inclusión del enfoque de género en las políticas públicas climáticas de América Latina: aprendizajes entre Perú, Chile y Ecuador. Available on: https://cdkn.org/2019/10/intercambio/?loclang=es_es. Retrieved: January 16th, 2020.*

8 *Casas M. 2017. La transversalización del enfoque de género en las políticas públicas frente al cambio climático en América Latina. Comisión Económica para América Latina y el Caribe. Santiago, Chile. 102 pp.*

9 *Idem.*

10 *Stock A. 2012. El cambio climático desde una perspectiva de género. Available on: https://library.fes.de/pdf-files/bueros/quito/09023.pdf, Retrieved: June 1st, 2020.*

The greatest progress in this area was made a few years later, at the Lima COP 20, where a Work Program on Gender and Climate Change was established. This program commits the parties to the UNFCCC to take a step forward in the implementation of mandates and climate policies which take into account gender issues in all fields of negotiation. Despite the fact that no further progress was made in COP 21, it was the first time that the main text explicitly mentioned gender issues in the chapter on adaptation and in the chapter on capacity-building. Thus, the conclusion was that the criteria to face climate change should include, among other relevant criteria, the condition of people in vulnerable situations, the right of all citizens to development, and also gender equality, women' empowerment and intergenerational equity. Furthermore, the implementation of a Gender Action Plan (GAP) promoting the inclusion of the gender perspective in climate change policies and mitigation actions, to be developed by each of the Parties, was approved in the COP 23.

Whilst in the region, the process for the inclusion of the gender perspective in environmental and climate change institutions consists of three levels: national planning, based on the mechanisms of the UNFCCC; sectoral policies; and inter-sectoral policies. National planning includes Nationally Determined Contributions (NDCs), National Adaptation Programs of Action (NAPAs) and Nationally Appropriate Mitigation Actions (NAMAs). The Sectoral level includes Agriculture, Forests (REDD+ initiative), Energy and Disasters, whereas the Inter-sectoral level includes the GPAs[11].

We have now reached a time when the Parties must ratify their NDCs, incorporating them into their national planning. Therefore, the gender approach should be adopted as a concrete national public policy for climate change mitigation and adaptation actions.

III. Gender perspective in Chile's NDCs: a task ahead

Since the creation of the Ministry of Women and Gender Equality (2016), progress on gender equality in Chile has been triggered by the development of specific policies, plans and programs, such as the Plan for Equality between Women and Men (2010-2020), the National Policy for Gender Equality and Non-Discrimination by the Judiciary (2018) and the Law on Women's Right to a Life Free of Violence, which is still being discussed in the Senate chamber. Notwithstanding the progress made in this area, these are institutional frameworks and mechanisms for implementing public policies, which are currently not in line with the Nationally Determined Contribution (NDC), one of the country's main instruments to make its 5-year commitments and plans in order to meet the goals of the Paris Agreement (2015).

In the 2020 update of Chile's Nationally Determined Contribution (NDC), submitted by the Government in April of this year, the "gender equality and equality" perspective is presented as a list of examples, more like an intention rather than a specific strategy or action plan for a cross-sectional inclusion of the gender perspective. In this regard, the 2020 NDC acknowledges the existence of gender and climate change challenges, and it identifies for this purpose the need

11 *Op. Cit. Casas M. 2017.*

to include the gender approach in the key social pillars for a just transition and sustainable development in the country. This document is explicit in this matter, stating that "*...The design and implementation of this NDC must consider a fair allocation of charges, costs and benefits, with a focus on gender and special emphasis on sectors, communities and ecosystems vulnerable to climate change*"[12]. Among the climate actions outlined in adaptation matters, this intention implies the commitment that "*... By 2025, assessments of climate change risk to vulnerable groups nation-wide, with a special focus on indigenous peoples, poverty and gender shall be carried out*"[13]. It also states that "*...during the implementation phase of this NDC, existing studies and analysis on climate vulnerability and risk in Chile will be updated and expanded to address relevant threats, considering gender in the approach. Those studies wills serve as key inputs for the design of adaptation measures*"[14].

However, none of these cases expressly mention a specific coordination strategy between entities responsible for promoting equality and gender equality in the country, the instruments available for this purpose and the link with the climate change actions proposed in the document in the fields of energy, forestry and agriculture, forestry and land use, waste, biodiversity and tourism or fishing and aquaculture[15, 16], to name just a few key sectors of intervention aimed at reducing Greenhouse Gas (GHG) emissions.

According to UNDP, if an INDC becomes an NDC, the development of gender-sensitive actions and the incorporation of the gender perspective may be supported by measures at all levels, such as the in-depth knowledge of trends in addressing the gender perspective in the national context, especially regarding policies and mechanisms of action; incorporating the participation of women or women's organizations, in permanent consultation processes at the local, subnational and national levels; supporting capacity-building of different groups, communities, organizations and entities of the national and sub-national government; permanently monitoring and assessing the actions and their results, based on sex-disaggregated data and indicators; financing gender-sensitive actions through national and global climate fund mechanisms, as well as innovating in the creation of national tools to finance the participation of grassroots women's groups[17]. By failing to explicitly include these and other areas for action within the strategies for incorporating the gender equality and equality perspective into the climate change mitigation and adaptation measures, the 2020 NDC is nothing but another declaration of principles, as previous plans proposed by the Government, such as the 2014 National Adaptation Plan (NAP) or the 2015 INDC proposal.

12 *Government of Chile. 2020. Chile's Nationally Determined Contribution (NDC). 2020 Update*: 25.

13 *Idem*: 42.

14 *Idem*: 41.

15 *Op. cit.* CDKN. 2019.

16 *Op. Cit.* PNUD. 2018.

17 *Programa Naciones Unidas para el Desarrollo (PNUD). 2018. Cómo incorporar el enfoque de igualdad de género frente al cambio climático. Chile. Available on:* https://www.cl.undp.org/content/chile/es/home/presscenter/articles/2018/como-incorporar-el-enfoque-de-igualdad-de-genero-frente-al-cambi.html. *Retrieved: June 1st, 2020.*

Although this perspective is not part of an instrument as relevant as the NDC, we must also highlight the significant progress made through other efforts for a better deliberation and coordination between the government's institutions, such as the *Mesa de Trabajo de Gestión del Riesgo y Género*, launched by the *Oficina Nacional de Emergencia del Ministerio del Interior* (National Office of Emergency of the Interior Ministry or ONEMI by its Spanish acronym) or the *Mesa de Género y Cambio Climático* jointly coordinated by the Ministry of the Environment and the Ministry of Women and Gender Equity. The 2017 – 2025 National Strategy for Climate Change and Vegetation Resources (ENCCRV by its Spanish acronym) is also a remarkable experience. Based on the development of participative and inclusive process aimed at getting acquainted with the characteristics, conditions, interests, needs, vulnerabilities and capacities of men and women regarding forest management, the ENCCRV is currently one of the few instruments evidencing a systematic effort to integrate the gender perspective in its strategic planning, thus helping to guide the decisions related to the measures and actions proposed[18].

As for the Sustainable Development Goals (SDGs), Chile has committed to provide gender equality as a minimum floor to fulfill the agreements of the United Nations Framework Convention on Climate Change and the 2015 Paris Agreement, by incorporating this perspective in the Adaptation components and through the NDCs. However, as earlier discussed in this section, these efforts are still insufficient to meet such commitment as they have not materialized in measures of coordination between the national, sectoral and cross-sectoral levels, required needed to turn these principles into concrete actions in this field. Therefore, the need to ensure the cross-cutting inclusion of the gender equality and equality perspective in the 2020 NDC, in order to strengthen the capacities of all agents and sectors implementing climate actions, is a task ahead[19].

IV. The growing role of women in the fight against climate change

Local experiences in different parts of the planet evidence the importance of women's participation, who, from their socially assigned roles and responsibilities, provide solutions to respond to the heterogeneity of actions required to face a phenomenon such as climate change. This is ratified, for instance, in the recommendations of the IPCC Fifth Report, on the incorporation of the gender perspective in climate policies related to crops and the risks that warming and drought pose to their productivity, as well as the pests and diseases that will affect food systems. Based on the evidence, this report recommends the incorporation of the gender perspective in both the diagnosis and management of climate change risks[20].

From this perspective, experiences show that women have enormous potential as transformation agents in dealing with climate change, both in adaptation and mitigation actions. As UN

18 *Op. cit.* CDKN, 2019.

19 *Op. cit.* CDKN, 2019.

20 *Op. cit.* Olmedo, 2018.

Women has said, given that they manage and care for households and natural resources, they have enormous potential to create distribution and service networks in rural areas, reducing the cost and increasing access to sustainable energy. Women are the main household energy managers, so they are often important agents of change in the transition to sustainable energy. Additionally, when making decisions, they provide innovative solutions to address climate change impacts and to achieve a more sustainable development in general[21].

In Chile, women's organizations that are at the forefront of socio-environmental struggles, such as "Mujeres de Zonas de Sacrificio en Resistencia", the "Elqui Sin Mineras" movement, "Mujeres del Parlamento KozKoz", just to name a few, evidence the wide country's range and forms of activism against climate change. "Mujeres de Zonas de Sacrificio en Resistencia" is a group of women from the towns of *Huasco, Tocopilla, Mejillones, Coronel* and *Valparaíso*, who have managed to coordinate themselves and fight against the damages caused by the thermal electric industry in their territories and emphasize the urgent need to fully decarbonize the country's energy matrix. The "Elqui Sin Mineras" movement is a group of women of all ages, artisans and entrepreneurs from several fields, who agreed to take care of the Life We Choose, defending life in the valleys of *Elqui, Choapa* and *Limarí* in light of the growing drought in the region. Finally, the daily work of the grassroots organization Mujeres del Parlamento KozKoz in Panguipulli, around the *huerta mapuche* production network, which has ensured family sustenance, historically transmitted the Mapudungún language, and basically proposed a new alternative way of living and acting in the world[22]. All of these examples show a particular form of knowledge and experience to face climate change challenges in the different territories. The effective participation of these and other civil society groups seem to be the only way to finds a solution within in the wide variety of proposals and strategies implemented and to be implemented, which includes these and other vulnerable sectors of the population, strengthening climate change mitigation and adaptation proposals.

V. Conclusions

Incorporating a gender perspective into climate change policies and instruments, and effectively creating a set of measures and solutions to be implemented, goes far beyond understanding the gender-disaggregated impact of this phenomenon. It is rather an effort to understand these differences from a cross-cutting approach, considering the different areas and levels of climate change policies, plans and programs, from their design, implementation, monitoring and assessment. This is the only way to ensure that women and men benefit equally from adaptation and mitigation processes.

21 *ONU Mujeres. América Latina y El Caribe. 2015. Igualdad de género, empoderamiento de las mujeres y cambio climático. Available on: https://lac.unwomen.org/es/noticias-y-eventos/en-la-mira/climate-change. Retrieved: June 1st, 2020.*

22 *Fundación Heinrich Böll. 2018. Mujeres en defensa de territorios. Reflexiones feministas frente al extractivismo. Comp: Erpel A. Fundación Heinrich Böll, Regional Office Southern Cone: Santiago, Chile. 100 pp.*

Measures at the national level -i.e. government initiatives against climate change in Chile- still face great challenges in addressing the vulnerability of human systems, implementing measures aimed at reducing such vulnerability, and increasing the adaptive capacity of human systems in their different fields. From this perspective, the effective inclusion of a gender perspective in the NDC through multi-sectoral strategies to address climate change is essential in order to build future efforts to achieve a zero-carbon economy and implement actions to ensure the fulfillment of sustainable development goals under the essential principles of environmental justice[23].

In this sense, the effective mainstreaming of this approach in the NDCs is an essential step to move from principles to action when it comes to gender equality in the country. In practical terms, this objective can only be achieved if we understand that gender is a variable that cannot be isolated from other essential topics of the NDC. Gender perspective should materialize in strategic objectives, results, indicators and actions, especially at specific levels such as information management, capacity building, management policies and tools, adaptation measures and GHG emission management, for the different sectors. To this end, adopting essential measures such as methodologies integrating and promoting equitable participation of men and women in decision-making and training spaces, closing gaps in order to eliminate limitations to the access, use and control of existing resources to leverage the opportunities arising therefrom, developing management and planning documents that include, among others, the gender perspective and creating legal mechanisms that include this perspective in the intervention, information management, sex-disaggregated date, is crucial[24].

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23 *Op. Cit. Buechler & Hanson, 2015.*

24 *Op. Cit. Climate and Development Knowledge Network. 2019.*

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3 Climate change and socio-environmental emergencies

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I. Introduction

We have grown up hearing that Chile is a country of emergencies. The entire national territory is exposed to risks of one sort or another (earthquakes, volcanic eruptions, mud slides, snowfalls, forest fires, tidal waves, tornadoes, among other emerging ones). Added to this is the negative potential of climate change impacts and environmental degradation related mainly to extractive production patterns: mining, agriculture and forestry.

The earthquake and tsunami of February 27th, 2010 was a turning and reflection point for the Chilean society and public and citizen institutions, on how the country should prevent, mitigate, prepare for, respond to and recover from the impact of disasters, based on planning criteria that integrate coexistence with disaster risk as a cross-cutting issue. As humanitarian agents, we have faced the challenge of strengthening the challenges in terms of risk analysis and reduction, and enhancing community capacities to respond to adverse events. We have understood that risk management must be included in and is crucial for the socio-environmental agenda[1].

Several reports on the implementation of the Marco de Acción de Hyogo[2], recognize that the rate of exposure of people and property worldwide is greater than the rate at which their vulnerability has been reduced, creating new risks and increasing disaster losses, thus especially affecting the most vulnerable communities.

1 *Caritas Chile. 2014. Informe final: "Gestión local para la reducción de riesgos de desastres post- terremoto en Chile". Santiago, Chile.*

2 *Conferencia Mundial para la Reducción de Desastres. 2005. Estrategia Internacional para la Reducción de Desastres. Marco de Acción de Hyogo para 2005-2015: Aumento de la Resiliencia de las naciones y las comunidades ante los desastres. Available on: http://www.comunidadandina.org/predecan/doc/ext/hyogo.pdf. Retrieved: June 1st, 2020.*

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II. Meaning of Emergency Risk Management

Disaster risk is understood as the equation between basic and widely accepted concepts, such as risk, hazard, vulnerability, capacity, disaster.

Disaster is the partial or total, temporary or permanent, present or future destruction of an ecosystem and thus of human lives, the environment and livelihood conditions. It occurs when a potentially destructive force or energy, caused by nature or humans, is triggered (Hazard), in an environment characterized by a weak capacity to respond to this hazard, or by the inability to recover from its effects (Vulnerability). These hazards include latent conditions that may materialize in the future[3].

Therefore, Risk is defined as the relative vulnerability to a pre-existing hazard, increased by the misuse, excessive exploitation or improper management of the natural heritage in the ecosystem, which aggravates the problem or exposes the population.

The relationship is schematized as follows:

$$\text{Risk} = \frac{\text{Hazard} * \text{Vulnerability}}{\text{Capacity}}$$

Capacity of a system, community or society, potentially exposed to hazards, is their potential to adapt, resist or change, to reach or maintain an acceptable level in their operation and structure. Capacity is determined by the extent to which the system is able to organize itself and learn from past disasters to better protect itself from new hazards.

A disaster is an event that strikes and causes large-scale damage to communities. There are agents we can manage and others we cannot in reducing impact disasters. Risks often cannot be managed, so our possibility as communities is to reduce vulnerability by increasing capacities.

III. Risk Management and Climate Change

Due to its geographical location and climate conditions, Chile is one of the most affected countries by climate change:

"*The country meets seven of the nine vulnerability categories established by the United Nations Framework Convention on Climate Change (UNFCCC), namely:*

- *low-lying coastal areas;*
- *arid and semi-arid areas;*
- *forest areas;*

3 CEPAL. 2003. *Manual para la evaluación del impacto socioeconómico y ambiental de los desastres. Ciudad de México: Comisión Económica para América Latina y el Caribe.* 131 pp. *Available on:* https://repositorio.cepal.org/bitstream/handle/11362/2781/S2003652_es.pdf. *Retrieved: June* 1st, 2020.

- *territory prone to natural disasters;*
- *areas prone to drought and desertification;*
- *urban areas facing air pollution and*
- *mountain ecosystems*"[4].

The conditions are in place. The country experiences environmental vulnerability, which also affects the social and economic aspects, enhancing the effect of potential social, political and economic conflicts, as we have seen in recent times.

1. "New" hydro meteorological events.

Until a few years ago, Chile had a clearly defined climate: the so called "warm Mediterranean" climate, with four well-defined and clear seasons, hot and dry summers, cold and rainy winters. This is now changing.

For 10 years now, the country has been experiencing a process of drought due to the shortage of rain; short, not very rainy winters with wide temperature range. In areas of low rainfall, rain is as abundant as to cause floods and rivers to rise; heat waves and the lack of rain has increased the number of forest fires.

Some of the impacts currently present in our country are:

i. Between 2008 and 2018, about 265 million people were displaced by extreme disasters that destroyed their livelihoods, such as the earthquake in Haiti. Migration, whether internal or external, is a painful phenomenon for people and communities, who witness how their social relationships and culture are destroyed. In Chile, in the context of drought, there are no quantitative data on the population that has been forced to migrate due to the lack of water for their crops and animals.

ii. The impacts of extractive mega-projects and/or electricity production projects affect the communities where they are located, but with a cascade effect that affects distant communities and eventually to the whole country. Economist and short-term thinking is single-minded and it fails to comprehensively consider the territory and to measure the short and medium impact of its actions in territories and communities.

iii. Climate change recognizes no administrative boundaries; it affects ecosystems shared by different countries or regions. This is especially sensitive regarding the management of basins or aquifers spanning several countries.

iv. People's lives have undergone changes whose causes tend to go unnoticed. Likewise, as there is no awareness of the causes, we tend to overlook the fact that current lifestyles influence Climate Change. We witness communities that have lost their livelihoods due to Climate Change related phenomena, such as forest fires, who are forced to remain in the same territory and live in permanent vulnerability and fear.

4 *Ministerio del Medio Ambiente. Gobierno de Chile. 2017. Plan de Acción Nacional de Cambio Climático 2017-2022. 256 pp.*

IV. Some community experiences: Resilient Communities and Adaptation to Climate Change

With the aim of addressing the challenges of community work in risk management, Caritas Chile developed a community methodology for social development, based on the so- called *ME-COM model*[5]. This methodology focuses on the community and participatory nature of any action aimed at building risk prevention and mitigation capacity. Work has been done with rural communities in Talca and San Felipe, with communities in Valparaiso after the fires, and they are currently working with communities in Calama, Aysén and Santiago.

The principles of the work include the desired and the undesired:

Desired horizon	**Undesired horizon**
Empowerment	Assistance-based model
Coordination of local agents	Disassociation
Communality	Individualism
Extended active participation	Minority active participation

The least invasive intervention possible is sought, including local leaders. The basic inputs for the work, which provides information about the socio-natural character of the hazards affecting them as a community and allows to validate such knowledge, come from the community itself and are guided by the methodology. The History of the Community and the construction of a timeline are aimed at discovering the main historical information about the hazards and disasters occurred in recent decades.

Communities have a dynamic perception of risk, i.e., they are able to identify changes in their vulnerability conditions, such as water scarcity, which was not a problem in the past. Perceptions of the impacts caused by large-company interventions, which create new disaster risks, such as the collapse of mining tailings or forest fires, are also noteworthy. Likewise, they perceive that industries support their activities with water that used to be available to the communities.

> *"(...) what a nerve, the drought is not the problem, as I learned at ONEMI that disasters are caused by people, and people are the cause of the droughts in this valley, people with money power, or else how do you explain the drying-up of the valley in many areas? The river has no water but the hills (plantations) are all green. (...) The town of Panquehue has never been dry but this year... (...) This is where the name Panquehue comes from, from water"*[6].

5 *Kniffki J, A Calero & R Castillo. 2010. Metodología Comunitaria para el Desarrollo Social de Ed. Don Bosco: La Paz, Bolivia. 199 pp.*

6 *Caritas. 2017. Prácticas de Gestión Local del riesgo de desastre: Hacia la co-construcción de Comunidades Resilien-*

These elements help us address the analysis phase and the Risk Map, by geographically identifying safe and risky places, as well as places inhabited by the elderly and people with disabilities.

Mapping of Actors, Radius of influence and the Problem Tree are used to define a concrete action plan.

In practice, one of the biggest barriers is the distance between local governments and communities, a certain feeling of being on the periphery in the eyes of institutions. The mistrust caused by exploitation is deeply rooted in the communities and in how they relate to external agents, which the communities themselves believed to be the result of an individualistic culture.

> *"This, as many people believe that they better not get involved in a conflict, because you never know what may happen in the country again. Because older people, as myself, know that our parents disappeared for joining a certain party. Thus, people are still sort of scared to do something. Not here: everything is transparent here, we finish what we start"*[7].

1. Actors for Change: women, seniors and youth.

The work leads to several relevant considerations in terms of certain subjects who are essential to community work: women, seniors and youth.

Although women in fact lead change processes, this leading role is affected by gender relations that affect the work in progress:

> *"Mrs.: (...)as housewives, as mothers, uh, we do get some sort of support, in terms of notices, time, and children also give mothers time to attend meetings and participate. And I think that as they have their own jobs, the employer will not give them permission, like "hey, you know, we have an important meeting today and we have to work for this", I think that is the problem. And as moms are housewives who have nothing to do... I mean, the work we do as housewives is not taken into account or paid for, so they do have the time to attend. We give ourselves permission, and there, I feel I have support for everything we do. For instance, if I attend meetings 2 or 3 afternoons a week, I know they will give me the time for that, they will support me, they don't criticize me, they don't tell me "hey, why didn't you wash the dishes?", they don't tell me that and if they do, I don't know, I just don't listen to them, and I keep going and that's okay because they give me the time. And I ask: "hey, can we do this? are we going to do that? what do you think?", and well, everyone takes part in the meetings I organize, so (...)"*[8].

Older people see themselves as people who can spend time working in the community, and they also build the bridge between generations as witnesses of history.

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7 *Idem.*

8 *Idem.*

"Man: I'll tell you that older people are much more active than young people, more active when it comes to work, because if you summon 200 young people and 17 seniors, 15 seniors will be present, but 7 young people will attend".

However, young people are a primary concern. At the rural level, their lack of participation further challenges integration. Communities explain the situation in intergenerational terms, i.e. by their role in society and in the life cycle.

"*Man: Young people are not reliable, perhaps because we ignore them, that's what I think, but older people have this sense of responsibility that when something need to be done, they do it. We have to keep going, because later, when young people get older, they will take that responsibility too and realize the importance of this*"

V. Conclusions

"They also gave the example of seniors. In my case, I am the granny of the group but (...) our parents came up, the stories of our grandparents, the stories they told us about La Vega. So, it was something beautiful, which motivated me to continue supporting the youngest and to be with them"[9].

Our country is known as one of the most vulnerable to climate change impact, as it has seven of the nine vulnerability factors. These environmental vulnerabilities have a human, social, political and economic dimension which affects us all, because they relate to water, food, air, land and forests. Climate Change is here and the world, as we knew it, has changed. However, we still have time to decide which way to go.

In terms of risk management, risk can be prevented from becoming a disaster by increasing capacities, thus reducing vulnerability. The greater the awareness of hazards, the greater the territorial control of development and the existence of more (in)formed communities, which will allow to strengthen the local capacities to adapt to the new environmental conditions and, if possible, to mitigate their advance.

Increasing community capacities enhances their empowerment by recognizing their leadership and knowledge. In other works, it helps develop to participate in dialogue processes and influence the development plans affecting them. It is implies generating bridges and meeting points and trust-building spaces in historically complex relationships, whether with companies and/or the State.

Generating adequate conditions and dialoguing as equally as possible, unlocks the paths to tackle challenges with a collective and integrative perspective in the short term; and, despite the different positions and interests, seeking common ground between the different players, detecting the consensus and dissenting points in the long term sustainable development of territory, and reducing the impact of the risks arising from the climate change we are experiencing.

9 *Idem.*

Many empowered and resilient people in empowered and resilient communities can bring major changes in lifestyles and relationship patterns, which will ultimately allow for sustainability of Life as a whole.

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4 Social and solidarity economy (SSE) and climate change

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I. Introduction

Our time is mainly characterized by the idea of crisis and hazards to the humanity-nature system in terms of balance and sustainability. Recently, these issues have questioned our lifestyle, organization and public policies. As we have seen, this is a systemic or global crisis, or what many authors refer to as a crisis of civilization, which entails the need for new points of view, new ways to build a new relationship between society and nature, and the manner to solve our material conditions of existence.

The environmental dimension of this crisis is evidenced in large-scale problems, such as biodiversity loss, ocean and drinking water pollution, excessive waste, desertification or "sacrifice" zones and climate the increased climate change, and, according to the reports of the panel of experts, we are at risk water scarcity and reduced food security, the first victims of which are the poorest sectors.

In this context, climate change must be understood as the tip of the iceberg of a widespread and deep crisis that forces us to rethink the relationship between society and nature and relationships in society. Facing global change requires a comprehensive approach. Therefore, adaptation and mitigation policies cannot be planned if we do not look critically at, for instance, economic strategies based on the export of natural "resources", as they not only emit GHGs

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(perhaps a certain new technology to address this issue should be found), but they also affect other aspects of environmental reality[1].

Climate change must be understood as part of phenomena that are linked to the economic, social, political and cultural dimensions built by humans, which are decisive in our relationship with nature, and which, due to the aforementioned background, must also be understood as being in crisis.

Economic and development models are essential to both the diagnoses and the search for alternatives to the aforementioned situation. Production, distribution, consumption, savings and investment forms are crucial for societies, due to nature that they give to them.

Upon a diagnose of a serious and systemic crisis in human society, to which Chile is no exception, and considering that societies' nature is marked by the characteristics of their forms of organization and socioeconomic operation, the conclusion we draw is that we need transformed and alternative socioeconomic models to face de crisis.

This is possible, as economies are social constructions and not just the natural result of human evolution. As the SSE points out, it is possible to organize and institutionalize other ways to do business under different principles and rules. In this regard, these alternatives are often presented as options between the State and the Market: State property and public action versus private property (capitalist) and private action. The neoliberal time we live in, although despite its different intensity depending on each country, has focused the organization of the economy on the latter of the aforementioned poles; whereas the experience of real socialism was based on the former.

The stance and singularity of the SSE is not just to propose a certain combination between private capitalist action and public state action, but to strengthen a sector of the economy that is often invisible despite its historical tradition, and the characteristics of which are suitable in times of crisis and can help face the ecological and climate change risks under different economic and cultural patterns. The SSE appears as a potential new form of social organization, with practices that give life a new meaning, fulfilling not only material life conditions, but also the needs related to participation, creativity, affection, etc.

In fact, national constitutions recognize this sector under different names.

All of this should lead to the goal of building a pluralistic economic system, which, in addition to the classic agents mentioned above, is strengthened and gives rise to another system with these solid characteristics of cooperation, solidarity, participation, self-management and reciprocity in the production and management of goods and services. As we shall see, it appears to be suitable for providing an effective solution to reduce the socio-environmental impacts caused by our society and which have led to the current climate emergency.

1 *A clear example of this are the discussions about the Law on Biodiversity, also within the context of the export model, and the alteration of the cycles of phosphorus and nitrogen due to the use of fertilizers in extensive agriculture.*

II. Social and Solidarity Economy and climate change

The SSE comprises several initiatives that develop economic activity from a collective basis, clearly intended to contribute to experimenting and disseminating principles and values that transform the economy and society.

These practices have been implemented , for instance, by low-income sectors at different times, such as mutual aid or mutual societies, soup kitchens in cases of food scarcity, joint purchasing to reduce costs and face consumption in an associative way, urban vegetable gardens; and also practices to manage common goods, such as the rural drinking water committees essential to rural history; the creation of cooperatives offering goods and services on the market under democratic and egalitarian working relationships; cooperatives oriented to their member's benefit, such as peasant cooperatives and housing cooperatives. Some practices also emerge from middle sectors such as the commons, in experiences such as Linux or the fair-trade networks; including the production of community and neighborhood services which are not market oriented, and health, education (free preparation for university admission); foundations, several non-governmental organizations; social and popular finance institutions (or ethical banking).

In general, all of them basically are initiatives, experiences and institutions that i) meet the needs of their members, ii) sell goods and services under forms of democratic organization and all of them own their capital; iii) offer non-market services to the rest of society or to specific groups; and/or iv) have a high sense of community, and goods and services are shared.

An essential characteristic of the SSE is that economic activity is focused on people and concerned about meeting individual and collective needs. It thus differs from economic activities oriented to profit and continuous capital reproduction. In this regard, it is worth pointing out that the SSE's activities are focused on human life reproduction, not capital reproduction.

In placing life at the center and the quality of social relationships in economic activities, as proposed by the SSE, influenced by feminist economics and ecofeminism perspectives, we need to stop pursuing economic growth, prioritizing human needs and the protection of the planet. SSE is increasingly influenced by ecological ideas, focused on the reproduction living things. The goal of economic activity must be to increase life (nature) rather than capital. Hence, caring for the planet means taking care of ourselves.

Since the SSE, economy and economic practices are not essentially seen and organized from a competitiveness approach, but rather from the fulfillment of certain needs and the balance thereof, thus changing the focus to production relations that value social solidarity relations created in the exercise thereof. We need to create and give more space to current and future economic practices that create a new economy that leads us to assume new social relations for production. The SSE values and promotes a more community-oriented approach and practice of these relationships, rather than narrowing the economy to capitalist or state production modes.

Therefore, as value for the development of activities, solidarity and democracy imply the conservation of a "systemic balance", since it does not take advantage of "others", including both other people and nature itself as mere instruments to increase production.

This, in turn, is based on the fact that there are non-profit and also non-market motivations in the economy that mobilize several people, groups and economic activities. Thus, associativity, solidarity and democracy appear as the main mechanisms to link subjects, and the latter to nature. Hence the importance of transforming the way in which we relate in the production goods and services.

This makes it easy to understand the significant contribution of the practices and worldviews of indigenous communities to the SSE. They have taken the discussion to a more critical level, since their "lifestyles" and their visions not only believe human existence to be essential, but also the living system called "nature". In other words, they think about life from a holistic perspective, as a whole, which is consistent with the ecological perspective. Therefore, the SSE intersects with, and is imbued by, the speeches of the "Good Living", which have proven the existence and relevance for the current world of forms of property and economic organization of an associative or communitarian type.

For this reason, the SSE does not see this knowledge merely as part of the past, but rather as crucial for many economic practices, as it does not have a major impact on the material basis of production (nature), and it revitalizes more sustainable productive knowledge and practices.

The development of local economies and local initiatives is strongly emphasized in the SSE perspective. This is due to several reasons related to ecological and climate aspects. The "*territorialization*" of activities leads to more responsible relationships, based on the close relationship between society and nature. An economy linked to the development of local territories allows to envisage the general, humans and environmental effects of experiences and initiatives; something quite different from extractive activities, where alien agents only seek to extract resources.

Likewise, it promotes exchange and proximity economy between local products, and it may be the setting for the development of a wide range of noncommercial activities, which are essential to meet food, community health, recreation and art related needs, among others. It also promotes ecological circuits between agro-ecological farmers and responsible consumers in the city, at fair prices for producers.

If we take the agricultural and local potential of the SSE further, existing initiatives and groups might establish a "green" primary sector. Together with local and regional public institutions, the SSE could become one of this process's main agents to achieve a new development of the primary sector, by moving from agriculture and industrial livestock farming to agro-ecological farming, extensive livestock farming, reforestation with fruit trees and permaculture designs, and by training population in artisanal traditions and recovering local peasants' knowledge. This would also help solve the scarcity of food produced and marketed by large companies, which are based on concentrated markets and raise prices and which might also lead to adverse health effects due to the forms of production.

Finally, it is worth pointing out groups of experiences that may be strengthened and become part of the SSE organizations, the main concern of which is social, as they seek to recover ecosystems through voluntary activities that meet major needs from a community perspective. For example, clean-up organizations, pollution reduction, waste recycling, and afforestation and reforestation plans that transform spaces for use by local people and create new spaces through socio-environmental proposals.

III. Conclusions

We must understand that climate change is an expression of multiple causes that make up a whole. Thus, we should re-think and transform the social and economic relations and logics we are in. We need to understand that we are part of a system whose operation lies on the dynamic balance between all components allowing the reproduction of life in a broad sense. Thus, the improvement of human life conditions and the rest of nature must be approached simultaneously and systemically. This urges us to think how to achieve social welfare for all within a new relationship with nature.

We already mentioned that this means lo leave behind the main rule governing or guiding economic activities: competition, maximum profit, capital accumulation and the perpetual growth of the number of goods and services.

In logical contrast to the above, moving towards the constitution of a large sector of SSE, due to its principles and logics, will aid in the creation of an economy with ecological concerns and practices, with its relevant positive impact on stopping average global temperature rise. The principles, values, practices and ideas of the SSE may be a significantly aid in changing the logic types (re)guiding the current economic system and the type of social relations underlying it and that this very system creates and reproduces. Many common, environmentally activities (not necessarily state-run), could be created if strengthened. For example, local communal property and goods preventing the exclusive intervention of distant agents who are not committed to the local history and sustainability (as happens with extractive activities, strongly present in Chile and Latin America). In other words, the aim is not to damage what currently allows us to meet the people's needs.

An important aspect in this regard is that the experiences that lie within the historic and emerging line of the SSE are increasingly including environmental or "green" principles. It is worth bearing in mind that from its inception, the SSE (called Social Economy) emerged as mutual aid, mutual societies, cooperatives and other fellowship and mutual support associations, basically in the second half of the 19th century -amidst the growing industrial capitalism-, and it focused on human and social conditions. Likewise, those social situations led to the massive phenomena of Solidarity Economy in the 80's of the 20th century in Latin America, due to the application of neoliberal programs, giving rise to popular collective strategies.

Therefore, in recent decades, the SSE and environmentalism crossed paths, and the SSE became a key agent in a great ecological transition on which our social strategies are based. However, the

SSE's ecological dimension must be further strengthened. A plus point for this is that the SSE has been socially responsible since the beginning, thus facilitating a warm reception for ecological responsibility. Environmental concern does not depart from the logic of the SSE, it is part of its normal direction. The SSE is closer to civil society, more embedded in it, and it is thus more sensitive to the effects of ecological issues.

Finally, in order for the SSE and its different expressions (responsible consumption associations, fair trade associations, housing education, rural, service and labor cooperatives, fishermen's unions, artisan groups, several community organizations, cultural associations, savings and credit banks and cooperatives, indigenous associations, healthy food groups, etc.) to play a greater role in the path to a more ecologic economy and become an agent against climate change, they must coordinate with each other and with other social agents for a systemic that meets the level of the hazards. The existence of multiple agents becomes essential to develop activities against climate change, beyond mitigation and adaptation.

Second Part

5 Water and glaciers

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I. Introduction

Chile faces many challenges in terms of adaptation. The country is exposed to seven of the nine vulnerabilities described in the United Nations Framework Convention on Climate Change, and it is among the 10 countries with the highest risk concerning this phenomenon, as per the Global Climate Risk Index 2017, prepared by Germanwatch, Germany[1].

It is a discouraging scenario for the country and society, making it necessary to address adaptation and resilience issues thoroughly, in order to adapt ourselves to a reality in which global temperature will trend upwards. As a society, we must be prepared to face the impact of climate change.

International governance has been working hard to stop the rise of the global temperature as a way to address the climate and ecological emergency. The commitments of each country are enshrined in the Nationally Determined Contributions (NDC), containing the roadmap of each country to face the new reality that comes with climate change.

In preparing such roadmap, the Ministry of the Environment submitted to public consultation the updating of its NDC between October and December of 2019. Following such process, on April 9th, 2020, the government presented the official version of the NDC[2], which addresses adaptation in water issues, one of the most urgent areas for the country's climate action.

It is worth noting that, after the public consultation concerning water, the Sustainable Development Goals 2030 (ODS)[3] were included, and the guidelines of which were Goal 6 on Clear Water and Sanitation, Goal 8 on Decent Work and Economic Growth, Goal 12 on Responsible Consumption and Production and Goal 13 on Climate Action. Although this represents progress, it

1 *Germanwatch. 2016. Global Climate Risk Index 2017. Who suffers most from extreme weather events? Weather-related loss events in 2015 and 1996 to 2015. Kreft S, D Eckstein & I Melchior. 32 pp.*

2 *Government of Chile. 2020. Chile's Nationally Determined Contribution. 2020 Update. 97 pp.*

3 *United Nations. 2018. The 2030 Agenda and the Sustainable Development Goals: an opportunity for Latin America and the Caribbean (LC/G.2681-P/Rev.3). Santiago. 90 pp.*

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does not consider the urgency involved in water issues. The policies proposed by the NDCs in water issues are insufficient amid the mega-drought in the country, namely:

> *"Information and country mechanisms for managing the impact of climate change on water resources will be enhanced in order to improve resilience,*
>
> *Specifically, the following climate actions will be developed:*
>
> *a) By 2025, a national indicator and also at hydrological watersheds level will be established to track water scarcity and risk, helping to promote water security nationwide.*
>
> *b) By 2025, a system to certify levels of water consumption management at an organizational level will be created, through the HuellaChile Program.*
>
> *c) By 2030, Watershed Strategic Plans for the Management of Water Resources will be established, taking into account climate change adaptation in the country's 101 hydrological basins.*
>
> *d) By 2030, 95% of registered Rural Water Supply and Sanitation Systems will be inspected, ensuring the quality standards of rural drinking water.*
>
> *e) By 2030, 100% of companies in the water sector will have implemented disaster risk management plans, including consideration of risks resulting from climate change.*
>
> *f) By 2030, 100% of the 2030 Agenda Goals for the water sector will be implemented.*
>
> *g) By 2030, all water-related public infrastructure projects will consider in their assessment, the ability to protect the population and land (through river works) and/or support as a priority the demands of urban and/or rural human water consumption in their areas of influence.*
>
> *h) By 2030, non-revenue water will be reduced by at least 25%"*[4].

The proposals of the NDCs in water issues by 2025, which include the implementation of an indicator to monitor water risk and scarcity and a system of seals on water consumption management at the organizational level, reveal a disconnection with the serious water scenario in the country. Projections show that waterfall has been reduced and drought has gained favor, which has been further aggravated in the central area, where there already exist communities and ecosystems without water. Hence, the policies proposed do not address the immediate reality.

Although the proposals of the NDCs on water issues by 2030 do add up in terms of adaptation, and they are indeed a step forward compared to the NDC that was submitted to public consultation, they do not have the sense of urgency required by climate action. Unfortunately, climate change will keep racing forwards, and the country will not be prepared for profound adaptation policies addressing the water scarcity that is already being faced by the country, both for human consumption and for production activities at different levels.

4 *Op. Cit. Government of Chile. 2020, pp. 43.*

On the other hand, the policies proposed in the NDCs concerning water do not address the legal reality of this field. Both, the Political Constitution of 1980, which establishes the ownership of water use rights, and the Water Code of 1981, with a trend towards privatization and a market-focused approach, have further driven the extractivist model that has stressed and polluted many watersheds. The legal framework is not even mentioned as one of the obstacles to be sorted out by the country, and adjustments thereto are not mentioned either, which is a pressing matter if we really want to move forward in adaptation.

It is worth bearing in mind that the current legal framework was created 40 years ago, a time in which water was abundant. The current scenario is very different to such reality. Chile has been battling with drought for 10 years now, and, unfortunately, no substantial measures aimed at balancing the different water uses were adopted. For this reason, the updated NDC has no timely policies on one of the country's most serious issues: water scarcity.

NDCs are disquieting in terms of glaciers. None of its 97 pages mentions glaciers, not even once. In a country with around 24,000 glaciers on which it depends, this is serious and incomprehensible. The situation is especially critical in the country's central area, as there are no National Parks between the regions of Atacama and Maule protecting these key ecosystems.

Glaciers are essential in time of drought, and they also act as natural water reservoirs. Thus, protecting them should be a key task in the fight against climate change. Nonetheless, although the NDC believes that focusing on Nature-based Solutions is crucial to the country's resilience, this approach is empty of meaning when it comes to glaciers.

Finally, since 2008, after the outrageous case involving the destruction of glaciers by the Pascua Lama mining project, governments have not made a substantial commitment to protect glaciers. Although there has been some progress collecting information about them, they still are not preserved and protected by a draft bill. Unfortunately, for governments, mining extractivism predominates over the protection of such ecosystems, putting at risk the life of the communities and nature depending on them.

II. Elements to be taken into account

Considering water and glaciers as a cardinal feature of our relationship with nature is pressing. They are vital to our ecosystems, and there can be no life without them. For this, a water regime must be created, taking into account the ecosystems and the human right to it. We need to make progress in changing the Constitution, in order to create a new social contract, which prioritizes water uses and the protection of watersheds, enabling the country to make progress in the protection of glaciers, as they are vital ecosystems, especially in time of drought.

The State must face the new reality and the country's multiple diagnosis on water. Preparing concise solutions to poor water management and the zero protection of glaciers is crucial. Therefore, we propose that the following elements be introduced in order to move towards a new paradigm for such common asset to be sustainable and compatible with distributive justice: Resolution

64/292 de la UN General Assembly, dated July 28th, 2010, which recognizes that the *"right to drinking water and sanitation is essential to enjoy life fully and to the realization of all human rights"*[5].

The recognition of water as a human right is based on human subsistence and on the performance of activities necessary for life. Thus, the State has a leading role in fulfilling the right of all people to quality, readily accessible and available water. In our country, this right in enshrined in the Water Code Reform (boletín7543-12). Nonetheless, this compliance is yet to be included in a legal text. Hence, we are making an urgent call for this challenge to be faced, and for it to be included in both the new Constitution and in the current Water Code.

On the other hand, in 2015, the United Nations established the Sustainable Development Goals 2030 (SDG) as general framework, as a roadmap for generating public policies for the States, in order to remedy structural environmental, social, economic, justice and other issues. These goals include SDG 6, regarding Clean Water and Sanitation, with the following commitments:

> *"By 2030, achieve universal and equitable access to safe and affordable drinking water for all.*
>
> *By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.*
>
> *By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.*
>
> *By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.*
>
> *By 2030, implement integrated water resources management at all levels, including through transboundary co-operation as appropriate.*
>
> *By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes."*[6]

Regarding SDG 6, although it involves many challenges, achieving such goals in crucial, in order to fulfill the human right of all people to water, which shall be quality water, readily available and to care for the environment. Although this goal was included in the updated NDC, with the current legal framework and the policies proposed, unfortunately, it will not be achieved if we do not go deeper on the measures offered by the authorities.

Finally, another tool created in the international arena are the Nature-based Solutions (NBS), which promote conservation and restoration, circular economy and green growth, identifying those solutions as:

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5 *UN General Assembly. 2010. Resolution 64/292. Human Right to Water and Sanitation, 3 pp.*

6 *United Nations. 2018. The 2030 Agenda and the Sustainable Development Goals: an opportunity for Latin America and the Caribbean (LC/G.2681-P/Rev.3), Santiago, pp 35-36.*

"NBS mainly address water supply through managing precipitation, humidity, water storage, infiltration and transmission, so that improvements are made in the location, timing and quantity of water available for human needs." [7]

Nature-based solutions should be the heart of both the building of public policies and the construction of infrastructure in cities and urban centers. In order to face the climate and ecological emergency, a concrete example of NBS is the protection of glaciers and wetlands as a key element to ensure water supply and mitigate the impact of drought.

Finally, the discussion on the new constitution should include the relationship of humans with nature, with a comprehensive view. Putting an end to the anthropocentric perspective that has led humans away from nature is essential, and balancing the relationship between humans and nature should be a leading element in constitutional matters.

III. Climate action measures to which we aspire

Below, we propose a list of measures additional to those included in Chile's 2020 NDCs.

1. Institutions:

i. The creation of an Undersecretariat for Water Resources, which concentrates the country's dispersal of powers at different State levels in water issues.

ii. Generate a Glaciology and Snow Directorate with sufficient resources to protect glaciers.

2. Legislation:

i. Constitutional Change that puts an end to the ownership of water use rights and allows to create a new balanced relationship between the different water uses.

ii. Make progress in the Water Code Reform, which prioritizes water uses and ensures an ecosystem-based protection of the sources.

iii. Creation of a Glacier Protection and Preservation Law.

iv. Protection of wetlands and peatlands.

v. Expediting the processing of the Biodiversity and Protected Wildlands Bill.

3. Preservation and conservation:

i. Establishment of Ecological Water Flows for surface water, for old and new rights.

ii. Conservation of coastal and urban wetlands, which means stopping their intervention through a delay (*moratoria*) until laws are created in this regard.

iii. Restoration of ecosystems with native species.

iv. Protection of the headwaters of a watershed.

7 WWAP (United Nations World Water Assessment Programme). 2018. *The United Nations World Water Development Report 2018: Nature-based Solutions. Paris, UNESCO.*

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6 Land use, land-use change and forestry to face the climate crisis

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I. Introduction

Native forests and natural ecosystems provide many benefits to society, as they help regulating climate, soil fertility, erosion control, the supply of medicines, food, fibers, they preserve biodiversity, create landscapes, are resilient to the impact of climate change and they are major carbon reservoirs. However, at the present time, one of the main functions of native forests and natural ecosystems is the continuous supply of large amounts of quality water[1]. For decades now, decision-makers across the world have decided to preserve native forests in watersheds surrounding the big cities, in order to ensure the supply of water for human consumption and prevent floods[2]. This, as it is the most cost-effective and safe solution over time[3], providing city residents with a safe space for recreation and welfare[4] and improving air quality[5].

Forest plantations, on the contrary, with species chosen for rapid growth, dry up the water sources and cause the level of water tables to fall in dry periods[6, 7]. In Chile, we have had to prove what

1 *Nearly DG, GG Ice & C Rheet Jackson. 2009. Linkages between forest soils and water quality and quantity. Forest Ecology and Management 258(19): 2269-2281.*

2 *Kittredge J. 1948. Forest influences: The effects of woody vegetation on climate, water and soil, with applications to the conservation of water and the control of floods and erosion. McGraw-Hill Book Co., Inc. New York, USA.*

3 *Dudley N & S Stolton. 2003. Running Pure: The importance of forest protected areas to drinking water. World Bank/ WWF Alliance for Forest Conservation and Sustainable Use. World Bank. Available on: https://openknowledge.worldbank.org/handle/10986/15006 License: CC BY 3.0 IGO*

4 *Mao GX, XG Lan, YB Cao, ZM Chen, ZH He, YD Lv, YZ Wang, XL Hu, GF Wang & J Yan. 2012. Effects of short-term forest bathing on human health in a broad-leaved evergreen forest in Zhejiang Province, China. Biomedical and Environmental Sciences 25(3): 317-324.*

5 *Nowak JD, S Hirabayashi, A Bodine & E Greenfield. 2014. Tree and forest effects on air quality and human health in the United States. Environmental Pollution 193: 119-129.*

6 *Rodríguez-Suárez JA, B Soto, R Pérez & F Díaz-Fierros. 2011. Influence of Eucalyptus globulus plantation growth on water table levels and low flows in a small catchment. Journal of Hydrology 396 (3-4): 321-326.*

7 *Licata JA, JE Gyenge, ME Fernández, TM Schlichter & BJ Bond. 2008. Increased water use by ponderosa pine plantations in northwestern Patagonia, Argentina compared with native forest vegetation. Forest Ecology and Management 255 (3-4):753-764.*

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is already obvious: the more native forests in watersheds, the more surface water available, and on the contrary, the more forest plantations in the watersheds, the less surface water is available[8]. While Chile is still challenging the evidence[9], and the government, through CONAF, is still giving public funding to pine plantations through tender processes in areas destroyed by fire in 2017[10, 11], despite the fact that there are no legal instruments in force allowing it to do such a thing, presenting them as the perfect candidate to capture emissions, the revision of 86 researches shows that native forests store 28% more carbon than plantations[12].

In countries such as South Africa, commercial plantations have been subject to restrictions since 1972, for they are considered as an activity that reduces water flow. Exotic forest plantations must apply for a permit, which indicates the amount and place allowed to be planted, and they must pay for the water they consume since the 90s. Pines are considered to be invasive species, and fires are more destructive due to the increase in biomass and fuel availability, and the resulting impacts in soil erosion[13].

The idea of mitigating emissions with commercial forest plantations of exotic species deepens the effects of the climate crisis due to the species chosen, the required surface area and the manner in which plantations are handled. Pine and eucalyptus, some of the favorite species of the forestry sector for their rapid growth, exacerbate drought and water scarcity in the country. They are also pyrophytic species[14]: they love fire, with alcohol and flammable oils that contribute to the expansion of fire[15], especially during the increasingly frequent heat waves. Additionally, harvest every 10 or 20 years does not generate carbon storage landscapes, promotes soil erosion[16], and conifers, as pioneer species that are planted at large-scale, become invasive species[17].

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8 *Lara A., C Little, R Urrutia, J McPhee, C Álvarez-Garretón, C Oyarzún, D Soto, P Donoso, L Nahuelhual, M Pino & I Arismendi. 2009. Assessment of ecosystem services as an opportunity for the conservation and management of native forests in Chile. Forest Ecology and Management 258:415-424.*

9 *País Circular. 2019. CORMA propone forestar dos millones de hectáreas a 2040 para avanzar hacia la carbono neutralidad. July 8th, 2019. Available on: https://www.paiscircular.cl/agenda-2030/corma-propone-forestar-dos-millones-de-hectareas-al-2040-para-avanzar-hacia-la-carbono-neutralidad/; Retrieved: January 22nd, 2020.*

10 *Mercado Público. Licitación ID: 2573-2-LQ19. Servicios de reforestación 604 hec., pino P. Propietarios. Licitación ID 1090-3-LR19, CONAF, VII Región, Oficina Regional del Maule.*

11 *Licitación ID 2134-1-LQ19, CONAF, VIII Región, Provincial Arauco.*

12 *Liao C, Y Luo, C Fang & B Li. 2010. Ecosystem carbon stock influenced by plantation practice: Implications for planting forests as a measure of climate change mitigation. PLoS ONE. 5(5): e10867. doi:10.1371/journal.pone.0010867.*

13 *Van Wilgen BW & DM Richardson, 2012. Three centuries of managing introduced conifers in South Africa: Benefits, impacts, changing perceptions and conflict resolution. Journal of Environmental Management 106:56-68.*

14 *Bowman D. 2005. Understanding a flammable planet-climate, fire and global vegetation patterns. New Phytologist 165:341-345.*

15 *McWethy DB, A Pauchard, RA García, A Holz, ME González, TT Veblen, J Stahl & B Currey. 2018. Landscape drivers of recent fire activity (2001-2017) in south-central Chile. PLoS ONE 13(8):e0201 195. Available on: https://doi.org/10.1371/journal.pone.0201195.*

16 *Soto L, M Galleguillos, O Seguel, B Sotomayor & A Lara. 2019. Assessment of soil physical properties' statuses under different land covers within a landscape dominated by exotic industrial tree plantations in south-central Chile. Journal of Soil and Water Conservation 74(1): 12-23.*

17 *Simberloff D, MA Nuñez, NJ Ledgard, A Pauchard, DM Richardson, M Sarasola, BW Van Wilgen, SM Zalba, RD Zenni, R Bustamante, E Peña, SR Ziller. 2010. Spread and impact of introduced conifers in South America: Lessons from other southern hemisphere regions. Austral Ecology 35(5):489-504.*

Experiences in countries around the world show that the best strategy to mitigate the impact of the climate crisis is, on the one hand, reducing emissions, and on the other hand, protecting the existing native forests and natural ecosystems, creating effective measures to promote their natural regeneration and recovery, and use them sustainably[18, 19]. Areas requiring active ecological restoration activities to recover lost ecosystem services require participative prioritization in the territories.

II. Chile's climate mitigation and adaptations goals

The Ministry of the Environment, in its proposal for Chile's Nationally Determined Contribution[20] includes the handling and recovery of 200,000 hectares of native forest by 2030. Additionally, it implicates the afforestation of 130,000 hectares with exotic species and of 70,000 hectares with native species, and it plans on reducing the emissions from the degradation and deforestation of native forest. It has made a commitment to develop a National Landscape Restoration Plan by 2021, incorporating 1,000,000 hectares into restoration processes by 2030. Its goal by 2025 is to have a national inventory of wetlands and peatlands and to protect at least 20 coastal wetlands, and to develop standardized metrics by 2030, in order to evaluate the climate change adaptive capacity of wetlands and peatlands in five pilot sites and to protect 10 additional coastal wetlands.

1. Management of native forests

The sustainability of native forests under management plans approved by CONAF is debatable. Problems start with the legal definition of forest, which is limited to a minimum of 5,000 square meters of area, to at least 40 meters wide and to a tree coverage of at least 10% in arid and semiarid conditions, and of 25% in other conditions. CONAF processes the management plans with a total lack of transparency, acting against their public nature and failing to meet the legal requirement to make them available on the website to whoever requests them. Activities financed by the regulations include activities that do not promote the recovery and sustainability of forests, but quite the opposite: they enhance their degradation. For instance, according to Decree No. 24, restoration logging allows cutting trees that have died or have been damaged in forest fires in any stage of development[21]. This subsidized logging adversely affects the recovery of areas destroyed by fire, reducing the resilience of damaged ecosystems and it further deteriorates several ecological and ecosystem processes[22].

18 *IPCC, 2018. Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [V. Masson-Delmotte, P. Zhai, H. O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J. B. R. Matthews, Y. Chen, X. Zhou, M. I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, T. Waterfield (eds.)].*

19 *Intergovernmental Panel on Climate Change IPCC. 2019. Climate Change and Land. An IPCC Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems.*

20 *Government of Chile. 2020. Chile's Nationally Determined Contribution. 2020 Update. 97 pp.*

21 *Ministerio de Agricultura. Gobierno de Chile. Decreto N°24 del 01 de agosto del 2017.*

22 *Fernández I, N Morales, L Olivares, J Salvatierra, M Gómez & G Montenegro. 2010. Restauración ecológica para*

The establishment of natural regeneration involves, for instance, soil scarification. This technique removes 0 and A surface horizons, consisting of organic matter and microorganisms responsible for nutrient recycling, relevant for water infiltration and gas exchange processes. Scarification has been proven to enhance erosion[23], reduce the functional diversity of microbial communities[24], lowering the retention and provision of nutrients to plants[25] and promoting the presence of invasive exotic species[26], which increase the need for herbicides. The Regulation on Clearance by Burning (*Reglamento Sobre Roce a Fuego*), Decree 276 of 1980 of the Ministry of Agriculture, which involves the use of fire for agroforestry and forestry activities, remains in force in our legislation. In our opinion, the information available on the impact on the biota, structure and physical-chemical properties of the soil, and on the emissions arising from this practice, does not justify its continued use.

2. Plantations with exotic species.

The incorporation of plantations with exotic species into Chile's climate commitments is consistent with CONAF's previous arrangements. Since 2018, through tender processes[27], this entity finances and provides the technical criteria for pine plantations in lands of small and medium landowners, in areas destroyed by the major 2017 fires that struck between the regions of *O'Higgins* and *Biobío*. The regional program Recovery of Burned Forests, of the Ministry of Agriculture, with a projection up to 2022, intends to cover 23,439 hectares. With this same aim, the regional reforestation program Dune Agroforestry Systems, in the Province of Arauco, has promoted pine plantations in dunes stabilized through tender processes[28]. These initiatives are debatable considering the impact of *Pinus radiata* on water availability, the incidence of fires, soil erosion, its status as invasive species, and that, when the 2017 fires took place, most of the surface between the region of Maule and the northern half of the region of Los Lagos were under quarantine due to the presence of the *Sirex noctilio* (wood wasp).

Ending state incentives for forest plantations with exotic species is a matter of urgency. Such plantations should be submitted to the Environmental Assessment System, setting restrictions concerning management and harvesting, maximum area and location in watersheds according to the rainfall and climate forecasting, and setting measures to mitigate and compensate the environmental impact of economic activity, such as a water consumption tax payment mechanism.

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ecosistemas nativos afectados por incendios forestales. Gráfica LOM, Santiago, Chile. 162 pp.

23 *Piirainen S, L Finer, H Mannerkoski & M Starr. 2007. Carbon, nitrogen and phosphorus leaching after site preparation at a boreal forest clear-cut area. Forest Ecology and Management 243:10-18.*

24 *Staddon WJ, LC Duchesne & JT Trevors. 1997. Microbial diversity and community structure of postdisturbance forest soils as determined by sole-carbon-source utilization patterns. Microbial Ecology 34:125-130.*

25 *Jiménez E, M Stromberger & W Shepperd. 2008. Soil scarification and wildfire interactions and effects on microbial communities and carbon. Soil Biology and Biochemistry 72: 111-118.*

26 *Vilá M, F Valladares, A Traveset, L Santamaría & P Castro. 2008. Invasiones biológicas. Edición a cargo de Cyan, Proyectos y Producciones Editoriales, S. A. Consejo Superior de Investigaciones Científicas Madrid.*

27 *Mercado Público. 2019. Licitaciones CONAF. 1090-3-LR19, 2573-2-LQ19, 1035-2-LQ19, 1035-9-LQ19, 2574-2-LP19, 2573-3-LE19, 2573-4-LE19, 2573-5-LE19.*

28 *Mercado Público. 2019. Licitación CONAF 2134-1-LP19.*

Forest plantations must be reformulated as to their management and extension, allowing the development of diverse landscapes, where restoring natural vegetation in the far end of streams is essential, maintaining key ecosystem functions, such as water supply, as a habitat and as a biological corridor.

3. Reducing emissions from degradation and loss of native forest.

Degradation is an anthropogenic process which leads to the loss of biodiversity, production and structure of native forests[29]. Intact forests, i.e., those that have not been intervened by direct human actions, store higher amounts of carbon than other types of forests[30]. Hence, they should be preserved. According to calculations based on official figures, between 1995 and 2016, a total 242,459 hectares of native forest were lost due to their degradation into shrub (47% of the total), which were replaced by forest plantations (40%) or converted to agricultural land and others (12%)[31].

According to estimates, about 59,679 ha and 71,230 ha per year of native forests were lost during the last two decades[32], the main causes of which were degradation from livestock and selective logging and the replacement by plantations. Hence, the prevention of degradation and loss of native forest calls for incentives aimed at keeping livestock out of the forest, promoting sustainable management, thus avoiding the selective logging and properly punishing the replacement of native forest by agricultural or forest monocultures.

The calculation of emissions and capture by forests and the changes in the use of land entail serious problems. For instance, they do not account for emissions in the event of scheduled selective logging of native forest, and the change in the use of land from native forest to plantation is considered as degradation, whereas in fact native forest has been replaced by a monoculture of a toxic species. The reduction in degradation and loss of native forest and natural ecosystems must be based on area calculations, and not on calculations of emissions.

Another relevant factor for the degradation of native forests are forest fires. It is imperative to pursue plans to control invasive pyrophytic species such as broom (*Teline montpesulana*), gorse (*Ulex europaeus*), radiata pine (*Pinus radiata*), Australian blackwood (*Acacia melanoxylon*) and contorta pinea (*Pinus contorta*)[33], and to reinforce measures related to forest fire planning and prevention. Agricultural and prescribed burning must be prohibited, and fire laws must be enacted in order to hold the owners of the land in which the fire started liable for rural fires.

29 *Ghazoul J, Z Burivalova, J Garcia-Ulloa & LA King. 2015. Conceptualizing Forest Degradation. Trends in Ecology & Evolution 30(10): 622–632.*

30 *Watson JE, T Evans (...) D Lindenmayer. 2018. The exceptional value of intact forest ecosystems. Nature Ecology & Evolution 2:599-610.*

31 *Marquet, P., A. Lara, A. Altamirano, A. Alaniz, C. Álvarez, M. Castillo, M. Galleguillos, A. Grez, Á. Gutiérrez, J. Hoyos-Santillán, D. Manuschevich, R. M. Garay, A. Miranda, E. Ostria, F. Peña-Cortéz, J. Pérez-Quezada, A. Sepúlveda, J. Simonetti y C. Smith. 2019. Cambio de uso del suelo en Chile: Oportunidades de mitigación ante la emergencia climática. Informe de la mesa Biodiversidad. Santiago: Comité Científico COP25, Ministerio de Ciencia, Tecnología, Conocimiento e Innovación.*

32 *Idem.*

33 *Idem.*

Communities should be invited to participate in this process, in order for them to design their own permanent forecasting, management and firefighting work plans, as those successfully implemented in South Africa[34].

4. National Landscape Restoration Plan

Ecological restoration only makes sense if ecosystem degradation processes are stopped. Maintaining and creating mechanisms to stop ecological degradation is cheaper and much more efficient. The National Landscape Restoration Plan submitted to public consultation[35] could become a new forest development instrument, such as the abrogated DL 701, or a mechanism to finance the installation of monocultures of fruit trees, despite the fact that they are the main activities responsible for the loss of natural ecosystems and their ecological functions[36, 37]. The Plan submitted to consultation lacks the approach required to recover ecological and ecosystem processes and it clearly involves productive interests.

Stopping the loss of natural ecosystems, and driving a net increase in the area of natural ecosystems by restoring ecosystems that are essential for the recovery of lost ecosystem services, limiting the activities of forestry and agricultural export industries seem to be the minimum standards in terms of use of land and forestry, which entails several benefits, such as water supply, climate regulation, the protection of land from erosion, the protection of watercourses, the protection of biodiversity, landscape diversity and human welfare.

5. Wetlands and Peatlands

Wetlands, which include peatlands, among other ecosystems, are considered to be carbon sinks, capturing up to 830 million tons of carbon per year, with an average of 118 g Cm^2/year[38]. In Chile, estimates indicate that mature forests store between 470 and 1,070 t C/ha in aerial and above ground biomass, whereas peatlands can store up to 1,680 t C/ha[39]. Current estimates suggest that the Region of Magallanes and Antártica Chilena has more than 2 million hectares of peatlands[40], which might contain 3,500 million tons of subsurface carbon. In the Region of Los Lagos, anthropogenic peatlands in the Island of Chiloé are estimated to store an average of 11.99

34 *Republic of South Africa. National Veld and Forest Fire Act. 27 November 1998. Government Gazette. Capetown.*

35 *Ministerio del Medio Ambiente y Ministerio de Agricultura. Gobierno de Chile. 2019. Plan Nacional de Restauración de Paisajes. Consulta Participación Ciudadana. Available on: https://consultasciudadanas.mma.gob.cl/storage/consulta/antecedentes/b6d654bb-2ed2-42a6-aac6-dc6ab3a31b25.pdf*

36 *Ministerio del Medio Ambiente. Gobierno de Chile. 2019. Quinto Informe Nacional de Biodiversidad de Chile. 269 pp.*

37 *Ministerio del Medio Ambiente. Gobierno de Chile. 2019. Sexto Informe Nacional de Biodiversidad de Chile. 269 pp.*

38 *Mitsch WJ, B Bernal, AM Nahlik, Ü Mander, L Zhang, CJ Anderson, SE Jorgensen & H Brix. 2013. Wetlands, carbon, and climate change. Landscape Ecology 28: 583-597.*

39 *Op. Cit. Marquet et al., 2019.*

40 *Domínguez E, D Vega-Valdés. 2015. Análisis espacial de la distribución geográfica de las Turberas de Sphagnum de la Región de Magallanes y Antártica Chilena. In: Domínguez E, D Vega-Valdés (Eds.). Funciones y Servicios Ecosistémicos de Las Turberas en Magallanes. Colección de Libros INIA No. 33. Instituto de Investigaciones Agropecuarias, Centro Regional de Investigación Kampenaike. Punta Arenas, Chile. p. 43-77.*

kg C/m^2 [41]. Hence, the province of Chiloe alone, which has 47,000 ha of peatlands[42], could store 5,600 tons of Carbon.

Nonetheless, the change in the use of land of forests and peatlands and their degradation has led to a significant loss of stored carbon. The change from an anthropogenic peatland for conservation in Chiloé to an anthropogenic peatland for agricultural use implies an 11% reduction in carbon storage, whereas a North-Patagonian forest converted into meadows and grazing shrubs stores 59% less carbon[43]. Hence, peatlands and wetlands must be considered key ecosystems for carbon storage, and due to their ecological and hydrological functions, they should be preserved in order to achieve Chile's climate goals. Identifying and assessing them is totally insufficient to prevent their degradations and extinction.

III. Conclusions

Native forests and natural ecosystems, such as wetlands, provide multiple ecosystem services, which mitigate the impact of climate change and are major carbon reservoirs. These natural ecosystems must be protected as part of Chile's climate commitments. Natural ecosystems must be used in a sustainable manner, ensuring their conservation in time and preventing their degradation. Developing a governance system that meets the local needs and respects human rights and the rights of indigenous people is essential.

An ambitious climate commitment in terms of forests and natural ecosystems would involve the preservation of existing natural ecosystems, landscape restoration in places where land use has led to the loss of ecosystem functions and the development of forest fire prevention mechanisms. The process must include the participation of local communities, indigenous people and scientific evidence, supporting the creation of special, domestic and regional markets, research and training funding, and with multiple decision-making spaces, thus avoiding the concentration of power, unlocking the value of native forests, natural ecosystems and the many goods and services that they provide, respecting landscape diversity and cultures.

We demand that the need for protecting and preserving native forests and natural ecosystems in the country, and to set goals related to an increase in the total area of native forests and key natural ecosystems, be addressed with the utmost urgency, and that the main carbon reservoirs, such as intact and mature forests, wetlands and peatlands, be subject to special protection. Human life is based on natural ecosystems, and a participative and strategic planning of landscapes to preserve and restore ecosystem functions reduces the costs associated with climate change and build resilience to its impacts.

41 *Cabezas J, M Galleguillos, A Valdés, JP Fuentes, C Pérez, J Pérez-Quezada. 2015. Evaluation of impacts of management in an anthropogenic peatland using field and remote sensing data. Ecosphere. 6(12): 1-24.*

42 *Geosoluciones. 2007. Estudio Acerca de las Turberas Productoras de Musgo en la Región de los Lagos. Santiago. 27 pp.*

43 *Idem.*

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7 Agroecology to face the climate crisis

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I. Introduction

Water and land are crucial for the development of agriculture. However, in Chile, to date, the scenario in terms of water and land is alarming. By November 2019, rainfall deficit was near 80% between the regions of Coquimbo and El Maule, and near 30% between Biobío and Los Lagos[1]. Water consumption by vegetation has increased and the main ground water reservoirs have decreased in the country's central-southern area. Nationally, the agricultural sector uses 88% of the surface and ground water, and 37% of the rainwater[2].

On the other hand, by 2010, 49.1% of the national territory evidenced a certain degree of erosion as a result of farming malpractice, which has not been corrected and threatens the integrity and existence of the fundamental backstop to life on earth. The regions with the highest soil erosion levels are Coquimbo, Valparaíso and O'Higgins, with 84%, 57% and 52% respectively. Those regions also have the highest "serious" and "very serious" erosion risk levels[3].

Financially speaking, Chile has chosen to open up to foreign trade, unilaterally lowering its taxes and signing free trade agreements with 64 countries, with 28 treaties in force. By 2018, the exports of the agricultural and forestry sectors accounted 23.7% of the country's total exports, mainly corresponding to fresh fruit and industrial products of the forestry sector in the form of cellulose, the main purchasers of which were China and the United States. On the other hand, imports of the agricultural and forestry sectors account for 8,7% of the country's total imports, mainly meat, oilseeds and cereals produced in Argentina, Brazil and Paraguay[4].

In order to meet the requirements of the country's agricultural export sector, CONAF allowed,

1 *Garreaud R, T Caballero, M Zambrano-Bigiarini & A Muñoz. 2019. Análisis: Sequía, escasez hídrica y vegetación. November 6th, 2019. Available on: http://www.cr2.cl/sequia-escasez-hidrica-y-vegetacion/; Retrieved: February 12th, 2020.*

2 *Fundación Chile. 2018. Radiografía del agua. Brecha y riesgo hídrico en Chile. Escenarios Hídricos 2030. Chile. 140 pp.*

3 *CIREN. 2010. Determinación de la erosión actual y potencial de los suelos de Chile. Final Report. Publication No.139. Santiago, Chile. 292 pp.*

4 *Oficina de Estudios y Políticas Agrarias (ODEPA), Ministerio de Agricultura. Gobierno de Chile. 2019. Panorama de la agricultura chilena. 152 pp.*

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since the Native Forest Law became effective, the replacement of native forests and vegetation by agricultural monocultures. In the Investigation Commission of the Chamber of Deputiesque entró en vigencia la Ley de Bosque Nativo, la sustitución de bosques y vegetación nativa por monocultivos agrícolas. En la Comisión Investigadora de la Cámara de Diputados[5], CONAF declared to have approved 1,189 native forest logging management plans to *"recover lands with agricultural purposes"* between the regions of Coquimbo and La Araucanía, for a total 19,998 hectares between years 2008 and 2018. According to the judgement of the Comptroller General of the Republic, these types of management plans are not compatible with the aim to protect, recover and enhance native forest[6].

Our country's increasing and predominant agro-export model[7], which expands without control throughout the territory, driven by foreign trade agreements valid in Chile and commercial demands of foreign markets, is not sustainable in the current situation of drought and erosion, and it cannot further expand at the expense of native forests' deforestation and degradation, natural and aquifer ecosystems, leading to the loss of ecosystem functions that are crucial to regulate the cycles of nature.

In light of the foregoing, it is urgent to implement improvements in the regulation and management of interventions in the territories, with a landscape-scale design and planning, implementing systemic and multipurpose, effective, coordinated and cost-efficient solutions[8]. Likewise, promoting access to natural, fresh, healthy, safe, nutritious, fair and locally produced food, seems to be a needed remedy to address the country's obesity epidemic[9] Likewise, promoting access to natural, fresh, healthy, safe, nutritious, fair and locally produced food, seems to be a needed remedy to address the country's obesity epidemic.

Local and indigenous people's knowledge is key to increase the resilience of the food system to the effects of the climate crisis[10]. A deep change in our diet, our landscapes and the system of production, consumption, distribution and supply of food can improve our health, reduce greenhouse gas emissions and reduce vulnerability to the impact of climate change[11]. Unfortunately,

5 *Informe de la Comisión Especial Investigadora de los actos de CONAF, el Servicio de Impuestos Internos y otros órganos de la administración del Estado, en relación con los procedimientos de autorización de planes de manejo forestal en las regiones de Coquimbo, de Valparaíso, Metropolitana de Santiago, del Libertador Bernardo O'Higgins, del Maule, del Biobío y de la Araucanía en los últimos 10 años. CEI-23.*

6 *Contraloría General de la República de Chile. 2020. Dictamen N°6.271 de 2020. CONAF, plan de manejo de corta de bosque nativo, reforestación, imposibilidad recuperación de terrenos para cultivos agrícolas.*

7 *Op. Cit. ODEPA. 2019.*

8 *Op. Cit. Fundación Chile. 2018.*

9 *Organización para la Cooperación y el Desarrollo Económico (OCDE). 2019. Estudios de la OCDE sobre Salud Pública. Chile. Hacia un Futuro más sano. Evaluación y recomendaciones. Ministerio de Salud, Gobierno de Chile. 30 pp.*

10 *Altieri MA & CI Nicholls. 2013. Agroecología y resiliencia al cambio climático: Principios y consideraciones metodológicas. Agroecología 8(1):7-20.*

11 *Intergovernmental Panel on Climate Change. 2019. Climate Change and land: An IPCC Special Reporton climate change, desertification, land degradation, sustainable land management, food security and greenhouse gas fluxes in terrestrial ecosystems. Intergovernmental Panel on Climate Change (IPCC): Geneva.*

Chile's commitment on climate matters[12] states that there will be a National Landscape Restoration Plan by 2021, and that the Adaptation Plan for the Agricultural Sector will be updated in 2021 and in 2026.

II. Agroecology as an alternative to sustainable food

Agroecology is an approach inspired in natural ecosystems, which combines scientific, local and ancestral knowledge, which is then applied to the ecological, social and economic dimensions of the agricultural systems. Interactions between plants, animals, human beings and the environment in these ecosystems receive special attention[13]. The presence of more soil organic matter, increased erosion control, crop diversification, use of local seeds, healthy and sustainable diets, ecological restoration, ecosystem conservation and lower food waste and increased capacities of the communities simultaneously contributes to improve food safety, reduce poverty, promote sustainable development and restore the soil, reverse desertification and mitigate the impact of climate change[14].

In this context, food sovereignty plays a key role in the response to the climate, ecological, economic and social crisis. Food sovereignty is the right of peoples to sufficient, nutritious food that is culturally appropriate, affordable, produced sustainably and ecologically, and their right to choose their own food and production system, defending the interests, and including future generations. Food producers, distributors and consumers are at the heart of food systems and policies, beyond the demands of markets and corporations. Food sovereignty prioritizes local economies and local and national markets, it empowers small-scale farmers, family farming, non-industrial fishing and traditional grazing[15]. Farmers and indigenous peoples, ancient experts in food and agriculture are food producers, and they are capable of and willing to feed people around the world[16].

Agro-ecological systems have the potential to capture greenhouse gases by turning the food system into a local system, preserving material and energy flows in agroecosystems and increasing food safety. Landscapes that preserve and restore local natural biodiversity, soil biomass and that produce energy and nutrients in the form of food[17] should prevail in our rural environment engaged in food production.

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12 *Chile's Nationally Determined Contribution. 2020 Update. Government of Chile. 96 pp.*

13 *Francis C, G. Lieblein, S. Gliessman, T. A. Breland, N. Creamer, R. Harwood, L. Salomonsson, J. Helenius, D. Rickerl, R. Salvador, M. Wiedenhoeft, S. Simmons, P. Allen, M. Altieri, C. Flora & R. Poincelot. 2008. Agroecology: The Ecology of Food Systems, Journal of Sustainable Agriculture. 22:3, 99-118, DOI: 10.1300/J064v22n03_10*

14 *Op. Cit. Intergovernmental Panel on Climate Change. 2019.*

15 *Declaración de Nyéléni. February 27th, 2007. Nyéleni, Sélenguié, Malí. Available on: https://nyeleni.org/IMG/pdf/DeclNyeleni-es.pdf*

16 *Idem.*

17 *Vandermeer J, G Smith, I Perfecto & E Quintero. 2009. Effects of industrial agriculture on global warming and the potential of small-scale agroecological techniques to reverse those effects. A report to Via Campesina by The New World Agriculture and Ecology Group.*

Soil is key in the production of agro-ecological food. Organic matter is recycled in unploughed soil. Organic waste is decomposed by soil organisms and transformed into available plant nutrients, boosting their fertility and allowing them to grow strong, and enhancing their ability to retain and infiltrate waters. Eliminating industrial products to fertilize and control weeds and plagues allow agro-ecological systems to protect biodiversity in and on the soil and to be self-sufficient. These types of agroecosystems promote and enhance the complex material and energy cycles at the local level, and the presence of biodiversity increases resilience and biological control. Crop diversification increase biodiversity at the home-stead and landscape scales. Different species interact in multiple ways, generating trophic and mutual relations, promoting resilience to and further mitigating the impact of climate change[18].

Small-scale local production of healthy and different food provides multiple fresh nutrients to the diet, and costs related to transport, cooling, processing, wrapping and packaging drop. A diverse local production of food makes us more autonomous and less dependent on external contributions, it lowers costs associated with packaging, transport and maintenance, reduces the need to use fossil and agrochemical fuels, prevents indebtedness and promotes local management of resources.

Agroecology systems are self-sufficient. In such ecosystems, people are just one more species, which interacts with the rest of the species. People produce food, medicine, fibers, leather, rubber, wood and energy, and they manufacture a wide variety of products required to meet their needs, returning to the soil the waste which provides nutrients to preserve soil life and fertility, and generating tradable surpluses and supporting a sustainable economy.

The knowledge, participation and the decentralized and democratic organization of farmers and indigenous people in the design, implementation, revision and permanent contribution to ecosystems, is essential for agroecology. The existence of multiple decision-making spaces is crucial within the governance scheme proposed, thus avoiding the concentration of power. Agro-ecological systems are aimed at reconnecting people with the biosphere, through a food culture based on solidarity and trust, both between farmers and consumers. When faced with challenges, people seek for collective solutions, maintaining traditional culture and livelihoods. For such an enormous challenge, we must bear in mind that 26% of the country's population lives in rural areas, which account for 82.7% of the national territory. By 2007, the census recorded a total of 301,376 agriculture and forestry properties, 73.4% of which had less than 20 hectares, and 41.6% of them had less than 5 hectares[19].

One of the main causes of the degradation of native forests and one of the limiting factors for the regeneration of scrub vegetation is an excess of livestock[20, 21]. There are several holistic

18 *Op.Cit. Altieri MA & CI Nicholls. 2013.*

19 *Op. Cit. ODEPA. 2019.*

20 *Schulz JJ, L Cayuela, C Echeverría, J Salas & JM Rey Benayas. 2010. Monitoring land cover change of the dryland forest landscape of Central Chile (1975-2008). Applied Geography 30:436-447.*

21 *Zamorano-Elgueta C, L Cayuela, JM Rey-Benayas, PJ Donoso, D Geneletti & RJ Hobbs. 2014. Ecosphere 5(7):1-17.*

approaches to livestock production worldwide, which increase the accumulation of carbon in the soil, improve water infiltration and retention in soil, increase plant diversity, reduce bare soil areas and allow plant roots to reach deeper into the soil. These types of initiatives should be adapted to the territorial realities in Chile, to enable the development and regeneration of the country's natural vegetation.

III. Conclusions

Both our diets and agriculture must be analyzed systemically, caring for natural ecosystems that sustain our existence, our health, our society and our economy. The promotion of agroecology, which proposes a political and technical transformation of food production and consumption is a pressing matter. We need policies aimed at promoting and facilitating agro-ecological farmers' access to local and regional markets, rural infrastructure to store food and technology for toxic-free agriculture, with no deforestation and regenerating the soil, biodiversity, the cycles of nature, people and society as a whole. Co-creating special markets, research funding and training in the territories is needed to promote this transformation[22].

Solidarity-based partnerships between consumers and producers are essential[23]. As consumers, we should prefer local, diverse, natural, seasonal food, avoiding waste. We should reduce our consumption of meat and dairy products, and support local agro-ecological farmers by purchasing in their markets. Let us date to prepare our food, and produce healthy, safe and nutritious food where we live, and share these experiences with those around us, this caring for our own health and our immediate ecological and social environment.

Sustainable peasant agriculture and food sovereignty can cool-down the planet[24]. In Chile, prohibiting agricultural burning, deforestation, stopping the destruction and degradation of natural ecosystems and eliminating state contributions to the use of agrochemicals is crucial. In turn, we should encourage practices which promote the storage of carbon in soils, without ploughing or using pesticides or transgenic products.

We must take urgent action to address the climate and ecological crisis, desertification, land degradation and food safety by restoring the ecological systems, promoting social development and creating an economic system on solidarity, with the participation of the farmers and indigenous people that live in the territories, concerning both their design and implementation. These types of actions can help eradicate poverty and create more resilience in the most vulnerable human settlements. Peasant and traditional agriculture, regenerative agriculture, agro-ecolo-

22 *De Schutter O. 2010. Report submitted by the Special Rapporteur on the right to food. UN General Assembly. Human Rights Council Sixteenth Session, Agenda item 3 A/HRC/16/49.*

23 *Fernandes LA & G Gotuzzo. 2012. Agroecology and solidarity economics: a sustainable simbiosis. Presented at ISEE conference: ecological economics and Rio + 20: challenges and contributions for a green economy.*

24 *Lin, BB, MJ Chappell, J Vandermeer, G Smith, E Quintero, R Bezner-Kerr, DM Griffith, S Ketcham, SC Latta, P McMichael, K L McGuire, R Nigh, D Rocheleau, J Soluri & I Perfecto. 2011. Effects of industrial agriculture on climate change and the mitigation potential of small agro-ecological farms. CAB Reviews: Perspectives in Agriculture, Veterinary Science, Nutrition and Natural Resources 6(020):1-18.*

gical practices, sustainable forest and natural ecosystem management, agroforestry systems and holistic breeding are low cost, self-sufficient alternatives, which could bring substantial social, economic and ecological benefits in the short term, as they contemplate the capture of carbon in the soil, soil life recovery, erosive and desertification processes are stopped and reversed, promoting water retention and infiltration, food safety and sovereignty are enhanced with healthy, nutritious, toxic-free food, while at the same time generating opportunities for the development, cooperation and strengthening of local economies.

Human life and the well-being of humankind are based on natural ecosystems. Participative and strategic landscape planning to preserve and restore the functions of ecosystems and ensure human welfare allows to reduce costs and build resilience to climate change. Agroecology is a proposal to engage humanity and nature in a harmonic relationship. It generates local knowledge, builds and maintains social relationships based on trust and solidarity, promotes identity and culture and reinforces the economy of rural and urban areas in a context of social justice[25].

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25 *Declaración de las Organizaciones de Pequeños Productores e Alimentos y de organizaciones de la sociedad civil en el 2° Simposio Internacional de Agroecología convocado por FAO. 2018. Quoted in: La Via Campesina en Acción por la Justicia Climática. La Via Campesina 2019. Heinrich Böll Stiftung (Ed.). Publication Series on Ecology 44(6). 29 pp.*

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8 Energy

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I. Introduction

Chile is highly vulnerable to climate change, and its impact is glaringly obvious in natural ecosystems and human systems. Climate inaction affects the availability of and access to basic resources that are essential for human subsistence, it exacerbates inequality, multidimensional poverty and prevents sustainable local development in regions.

In the context of the climate crisis, the IPCC[1] points out the need to limit global temperature rise to 1.5°C. To achieve this goal, CO_2 emissions should be reduced by 45% by 2030, and we should be carbon neutral by 2050. This requires fast, far-reaching transitions in terrestrial, urban and infrastructure power systems, including transport, buildings and industries, so that they continue meeting the service demand with clean energies, and encouraging less energy consumption, especially by increasing energy efficiency.

Additionally, as mentioned in the SDG 7 of the 2030 Agenda for Sustainable Development, the transition to an affordable reliable and sustainable energy system must be boosted by investing in renewable energy sources, prioritizing energy-efficient practices and adopting non-polluting technologies and infrastructures[2].

1 *IPCC. 2018: Global Warming 1.5°C, IPCC Special Report on the impacts of global warming 1.5°C above pre-industrial levels and corresponding trajectories that global greenhouse gas emissions should follow, in the context of strengthening the global response to the threat of climate change, sustainable development and efforts to eradicate poverty[Masson-Delmotte V., P. Zhai,H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor and T. Waterfield (eds.)].*

2 *Organización de las Naciones Unidas (ONU). 2016. Energía Asequible y no contaminante: Por qué es importante. Available on: https://www.un.org/sustainabledevelopment/es/wp-content/uploads/sites/3/2016/10/7_Spanish_Why_it_Matters.pdf. Retrieved: June 1st, Retrieved:2020.*

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On April 9th, 2020, the Government of Chile filed the update of the Nationally Determined Contribution (NDC) 2020-2030 with the Convention on Climate Change Secretariat[3], as part of the commitments made in the COP25. Such updating of the NDC corresponds to the third goal submitted by Chile, as in 2010 (COP15), the Nationally Appropriate Mitigation Actions (NAMAs) were submitted, and in 2015, the first Nationally Determined Contribution (COP21) was submitted.

Regarding the Chilean proposal, the scientific group Climate Action Tracker[4] acknowledges that there has been and improvement compared with the NDC submitted in 2015. Nonetheless, it criticizes that the goal associated with the reduction of the net emission by 45% by 2030 compared to 2016, is conditioned to market, financial, political and technological factors, which undermines the country's potential climate commitment to fulfill the Paris Agreement and keeping warming well below 2°C and very close to 1.5°C.

Specifically, on the mitigation proposal (excluding the LULUCF), Chile commits a Greenhouse Gas (GHG) emission budget of 1,110 $MMtCO_{2eq}$ between 2020 and 2030, the peak of GHG emissions taking place in 2025m and to achieve a GHG emission level of 95 $MMtCO_{2eq}$ by 2030. It also committed a reduction of at least 25% in the total black carbon emissions by 2030, compared to 2016.

In the opinion of *Sociedad Civil por la Acción Climática*, the NDC proposal of the Chilean Government is woefully inadequate considering the scientific recommendations and social demands in energy matters. Below, we outline our proposals and stand on the transformations required in all sectors of the economy, with special emphasis on energy systems and particularly on the country's electricity systems.

II. Our guidelines and future strategic vision

For many decades, fossil fuels such as coal, oil or gas have been the main electricity generation sources. The burning of these fossil fuels accounts for 60% of the world's greenhouse gas emissions[5]. This trend is echoed in Chile: 78% of Chile's total GHG emissions recorded in 2016[6] correspond to the energy sector, most of them come from the energy industry (41.5%), followed by the transport sector (31.3%), manufacturing and construction industries (18.7%) and other sectors (8.5%).

The issue of energy in Chile is characterized by a lot of social and environmental conflicts due to the local impact of power stations and electricity transmission lines on the territories and settlements in which they are installed[7].

3 *Government of Chile. Chile's Nationally Determined Contribution. 2020 Update. 97 pp.*

4 *Climate Action Tracker (CAT). 2020. Chile's updated NDC. Available on: https://climateactiontracker.org/climate-target-update-tracker/chile-submitted-ndc-2020-04-09/ Retrieved: June 1st, 2020.*

5 *Op. Cit. Organización de las Naciones Unidas (ONU). 2016.*

6 *Ministerio del Medio Ambiente. Gobierno de Chile. 2018.Tercer Informe Bienal de Actualización de Chile Sobre Cambio Climático. Santiago, Chile. 397 pp.*

7 *Bertinat P. 2016. Transición Energética Justa. Pensando la democratización energética. Análisis 1. Friedrich Ebert Stiftung.*

Another problem of our energy matrix is that almost 50% of it corresponds to fossil fuels, i.e., coal, gas and oil, which are imported into the country, which leads to a strong dependence on external markets and to price volatility[8]. This is in addition to the lack of both a state and citizen participation strategy to build national and local energy policies, and there is an excessive concentration of property and energy sources managed by a few actors[9].

In order to create proposals to mitigate greenhouse gases in the energy sector and make progress in the process of a low-carbon energy transition that is capable of fulfilling the international commitments to climate change, we must also give more prominence to the social, political, economic and cultural dimensions that could be involved in any intended energy transition in the country. We define energy this, as *Sociedad Civil por la Acción Climática*, as a tool to improve the living conditions of the people and, hence, any energy transition should be focused on issues such as environmental, social and climate justice, by a democratic and participative construction of a new energy model.

More specifically, we must change our current energy paradigm, reducing our dependence on fossil fuels, increasing investment in the development of Non-Conventional Renewable Energies (NCRE) in a decentralized fashion. We also need to make a drastic change in our energy consumption and production habits, towards a radical transformation of the way in which we use energy and commodities, through mechanisms aimed at disengaging economic development from the use of energy and material resources.

To achieve this, we need to apply the principles of climate justice, acknowledging that some sectors and countries are more responsible for climate change than others, and they should bear the costs of adaptation and, obviously, of mitigation in the different sectors of society, as stated by the principle of "common but differentiated responsibilities" of the Paris Agreement.

The need and possibility of a fair energy transition in climate, environmental and social terms, leads us to propose a first approach with 6 measures to build a new perspective of the energy system.

III. Climate actions measures to which we aspire

1. Decarbonization of the electrical grid

Chile currently is highly dependent on coal. 40% of the national power generation is produced by 28 thermal power stations with an installed capacity of about 5,500 MW. Following the Announcement made by President Piñera on the Decarbonization Plan, updated on December 9th,

8 *Comisión Nacional de Energía. 2019. Anuario energético. Available on:https://www.cne.cl/wp-content/uploads/2019/04/Anuario-CNE-2018.pdf. Retrieved: June 1st, 2020.*

9 *Sohr R. 2012. Chile a Ciegas: La triste realidad de nuestro modelo energético. 289 p. Ed. Random House.*

2019, and the recent announcement made by Enel[10], a commitment was made to close 11 power stations before 2025, and other 17 power stations before 2040[11].

The commitments of the Government of Chile and enterprises have strayed quite far from those made by different OECD countries to achieve a carbon-neutral society by 2030, or from the initiative of the coalition Powering Past Coal Alliance (PPCA), which brings together 33 countries 27 states, governorates or cities, and 37 companies, which are committed to curtail coal-fired power generation by 2030 at the latest[12].

Consequently, we urge the authorities and national companies to show more ambition in order to put an end to Sacrifice Zones and close the coal-fired thermal electrical power plants before 2030, in accordance with the international guidelines of the OECD and the Powering Past Coal Alliance.

Additionally, the authorities must urge enterprises to accompany the end of coal-fired thermal electrical power plants in the National Electricity System (SEN, by its Spanish acronym) with a closure plan that includes, at the very least, measures to address the environmental liabilities arising from their shutdown.

Another issue to be addressed in the accompaniment of a decarbonizing plan is the need to undergo Environmental Impact Assessments which ensure that power stations do not put at risk the people that live in areas declared saturated or latent, in terms of pollution. This measure should be especially applied to power stations that were not submitted to the Environmental Impact Assessment System (SEIA) and which are currently operating.

2. Decentralization of the electric grid

We strongly believe that this energy transition must lead to a more equitable economic system for the whole population, in which renewable energies play a key role and all of us can access its benefits and participate in the electricity market without frontiers entry barriers to new actors and competitors.

The highly-centralized structure of the Chilean Electrical System requires major infrastructure for power transmission throughout the country, which makes the energy transition to multiple non-conventional renewable energy projects more difficult.

There is a need for significant regulatory changes which benefit Small Means for Distributed Generation (PMGD by its Spanish acronym). Likewise, there is a need to strengthen the capacities and

10 *Enel. 2020. Enel Generación solicita autorización para adelantar retiro de Bocamina, su última central a carbón. Comunicado de Prensa Enel. 2020. Available on: https://www.enel.cl/content/dam/enel-cl/prensa/comunicados_de_prensa/2020/20200527-cp-bocamina.pdf. Retrieved: June 1st, 2020.*

11 *Ministerio de Energía. Gobierno de Chile. 2019. En el marco de la COP25: Ministro Juan Carlos Jobet anunció el cierre adelantado de centrales de generación a carbón. Available on: https://www.energia.gob.cl/noticias/nacional/en-el-marco-de-la-cop25-ministro-juan-carlos-jobet-anuncio-el-cierre-adelantado-de-centrales-de-generacion-carbon. Retrieved: June 1st, 2020.*

12 *Powering Past Coal Alliance (PPCA). 2020. Available on: https://poweringpastcoal.org/. Retrieved: June 1st, 2020.*

promotion of self-generating projects, association mechanisms in investment projects and the drive towards community, inclusive and affordable power generation. All such measures would contribute to reduce the dependence on the current power system and promote smaller scale generation with a lower environmental impact.

3. A fair energy transition

If we minimize the energy transition process only to a technological change of the energy system towards renewable energies, we are in danger of implementing "false solutions" which will continue to perpetuate the logic of extractivism.

As for the energy transition in Chile, imagining a post-fossil fuel era for communities that have been dependent on such a production activity for over 50 years, in a context of weak social protection and high economic vulnerability, generates suspicion. Hence, an energy transition process must be socially fair and place the recognition of the impact on workers and communities, and their right to participate in the decision-making process, to the forefront of the deliberations.

This is particularly relevant, as we believe that transitions to well-managed, environmentally and socially sustainable economies, can be a major drive to create jobs, improve job quality, social justice and eradicate poverty. Thus, we recommend that the principles for a fair transition proposed by the International Labor Organization (ILO) in 2016 be followed[13].

We also consider that we need to collectively build a long-term vision of the type of development expected for the area, through participation, and not only think about creating jobs in the short-term. On the contrary, pursuing a labor and economic reconversion allowing to increase the welfare of all people living in the areas where these industries are to be closed.

Additionally, for Chile to be able to face the challenge of creating models for a participation of the communities, companies, the State and direct and indirect workers, the actors that will be involved and the power dynamics between them, must be identified beforehand.

A key element for a fair transition, is for pension funds called to ensure social security not to invest in industries that will be forced to close in the short and medium term, as this would put at risk the pensions for retirees. On the contrary, such investments must be transferred to clean energies and environmentally responsible businesses.

Finally, it is also necessary to recognize issues of restorative justice for communities and the environment that have been affected by polluting industries. With this, energy transition towards cleaner fuels must be especially focused on distributed generation, or in the case of the existence of renewable energy mega-projects, it must be ensured that the generation infrastructure and transmission lines have the social license of the communities and territories.

13 *Organización Internacional del Trabajo (OIT). 2015. Directrices de política para una transición justa hacia economías y sociedades ambientalmente sostenibles para todos. Ginebra. 23 pp.*

4. Atmospheric decontamination

Chile's dependence on fossil fuels to supply energy has significantly interfered with the enjoyment of the right to health and other economic, social and cultural rights of Chilean people. This impact has been extremely severe for people living in "Sacrifice Zones". These are areas where coal-fired thermal power stations are located: Mejillones, Huasco, Quintero - Puchuncaví and Coronel.

It is crucial that Chile improves the lax standards on air quality and emissions from fixed sources regarding NO_x, SO_2 and Particulate Matter, setting more stringent standards consistent with the World Health Organization (WHO) and the rest of the world's countries (Chile Sustentable, 2018)[14], so as to properly protect the right to health of people living in "Sacrifice Zones". Likewise, creating new standards for Volatile Organic Compounds (VOCs), which are not present in Chilean laws for concentrations and which unfortunately could be the cause of the poisonings that took place in Quintero-Puchuncaví, according to the effects on the people's health.

In addition to this, and although a 25% reduction of black carbon by 2030 has already been committed in the NDC, the target should be increased and be particularly focused on pollutant-saturated or latent cities. Designing measures for pollution from the use of wood in southern Chilean cities, consistent with the rural contexts and the local economies that depend on it, must also be a priority.

Solutions to health problems due to the emission of fine particulate matter (MP2.5), which creates black carbon and precursor of CO_2, should be included in Prevention and Decontamination Plans (PPDA by its Spanish acronym), which should be stricter than the 15 Decrees that are currently in force. The environmental authorities should devote more efforts to update them and include in the upcoming plans measures to regulate the use of wood as fuel, adding the costs arising there from and effectively punishing its use in critical events, in order to change the behavior of the economic players and promote the transition to cleaner and more efficient fuels.

Regional and local Governments, with support from the central level of the Ministry of Energy, should speed up investments that facilitate energy supply with community district heating projects based on cleaner, more regulated and low cost fuels, so as to enable a balanced transition between consumers and sellers whose source of income might be affected. This, considering that each plan must provide a mechanism to monitor, report and verify the effectiveness of the planned measures and a fast updating system, in order to reduce the high concentrations of particulate matter currently present in most Chilean cities and determine the contributions to reduce CO_2.

14 *Chile Sustentable. 2018. Impactos de las termoeléctricas a carbón en la salud de la población local. September 20th, 2018. Available on: http://www.chilesustentable.net/publicacion/impactos-de-las-termoelectricas-a-carbon-en-la-salud-de-la-poblacion-local/. Retrieved: June 1st, 2020.*

5. Energy poverty and energy efficiency

In order to meet the GHG emission reduction commitments, we should consider energy efficiency measures as a key aspect to disengage economic growth from our consumption of energy and fossil fuels. We must also address the inequalities in the access to energy, caused by the commodification of energy goods and services.

Our daily life depends on reliable and affordable energy services to function smoothly and evenly. A well-established energy system provides support to all sectors and places life in the center of development. Thus, adaptation and mitigation commitments in energy matters should address energy poverty, improving the quality, equity and the access to energy for people's personal and social development, taking the structural inequalities into account.

Next to this, we must also make sure that the houses of people vulnerable to extreme climatic events, such as heat waves, cold snaps, etc., are thermally insulated, have proper technologies, quality energy and sufficient access to energy, so that their thermal comfort and consequent mental and physical well-being is not affected[15].

Finally, in terms of energy efficiency, including the efficient use of our resources in our personal habits is extremely important. For this reason, Energy Efficiency Law for environmental sustainability is crucial in Chile, applicable to the construction of new households, 100 large consumers and the vehicle market, and which will allow Chile to reduce 6.9 million tons of CO_2 by 2030, and the final consumption of energy by 5.5%, with savings of 2,400 million dollars by 2030[16].

6. Green Tax and other economic incentives

A motto of Pigouvian taxes is "the polluter pays". Their ultimate aim is to discourage polluting activities and encourage companies to innovate in pursuit of cleaner technologies, or directly at searching for more cost-efficient economic sectors.

In Chile, green taxes on fixed sources are 5 US dollars per ton of CO_2 emission (Law 20780, 2014)[17], which, compared to international standards, is insufficient. Additionally, the green tax application method generates serious distortions in the collection thereof, as part of this tax is even transferred to clean energy generation companies which do not discharge pollutants (Chile Sustentable, 2018)[18].

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15 *Universidad de Chile. 2019. Acceso desigual a la energía: U. de Chile publishes document with proposals for tackling energy poverty. Available on: https://www.uchile.cl/noticias/159653/u-de-chile-presento-documento-que-aborda-pobreza-energetica-chilena. Last Access: June 1st, 2020.*

16 *Chile Sustentable. 2019. Presentación Proyecto de Ley de Eficiencia Energética. Sara Larraín. Comisión de Minería y Energía de Cámara de Diputadas y Diputados de Chile. 27 de Noviembre de 2019.*

17 *Ministerio de Hacienda. Gobierno de Chile. 2014. Ley 20.780. Reforma tributaria que modifica el sistema de tributación de la renta e introduce diversos ajustes en el sistema tributario.*

18 *Op.Cit. Chile Sustentable. 2018.*

For this reason, as Civil Society, we see how important it is for the State to modify the distortions of green taxes and to increase the value of the tax per ton of emissions towards values consistent with the goals set in the Paris Agreement, which includes costs per ton of CO_2 ranging from US 40 to 80 dollars for 2020, and from US 50 to 100 dollars for 2030[19]. We also recommend tax revenues associated with any type of Pygouvian levies or taxes be used for social programs, environmental restoration or technological transition in the polluted areas.

Finally, as Civil Society, we expect for the national CO_2 budget to be mainly aimed at implementing sectoral public policies with benefits for the people and ecosystems, and not at creating carbon markets solely for the benefit of the private sector.

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19 *High-Level Commission on Carbon Prices. 2017. Report of the High-Level Commission on Carbon Prices. Washington, DC; World Bank. License: Creative Commons Attribution CC BY 3.0 IGO.*

Ministerio de Energía. Gobierno de Chile. 2019. En el marco de la COP25: Ministro Juan Carlos Jobet anunció el cierre adelantado de centrales de generación a carbón. Available on: https://www.energia.gob.cl/noticias/nacional/en-el-marco-de-la-cop25-ministro-juan-carlos-jobet-anuncio-el-cierre-adelantado-de-centrales-de-generacion-carbon. Retrieved: June 1st, 2020.

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9 Transport and Sustainable Cities

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I. Introduction

The Energy sector was responsible of 78,0% of Chile's total GHG emissions in 2016[1]. Most of these emissions come from energy production activities, from the use of energy for cargo and passenger transport, and from the use of energy by the different players in the economy (industry, mining, trade and residential sector). The Transport sector faces huge challenges, as they account for just over a third of the problem (35%). Innovative and urgent solutions are thus required to meet the climate change goals adopted by Chile. We believe that this problem is not only the result of the burning of fossil fuels in this area, but rather of the lack of structural land-use policies that stimulate our human development and the quality of life of our cities.

On the other hand, 74.5% of the national population lives in the cities, which needs clean water, energy and supplies, and generate emissions, waste and water with residues. Sustainable cities should be healthy and safe environments for the people, where people can walk or ride their bikes to school, to a health center and to a vegetable shop in order to meet their daily needs[2]. Vibrant neighborhoods complement uses for households, workplaces, schools, health facilities, trade and services, parks and squares, and they balance the new and the old. In this context, sustainable cities should preserve and restore the ecological infrastructure required to enable systemic cycles and ecological systems, mitigating heat generation and bringing multiple benefits to society. Likewise, sustainable cities should be able to feed themselves to a great extent, maintaining harmonic relationships of interaction with their environment, and they should be able to foster social interaction, promote the use of public transport, have many traffic-free areas and large pedestrian zones and cycleways, produce the energy that they need from renewable sources, be equitable, diverse, connected, democratic and give a good quality of life to their inhabitants.

1 *Ministerio del Medio Ambiente. Gobierno de Chile. 2018. Tercer Informe Bienal de Actualización de Chile Sobre Cambio Climático. Santiago, Chile. 397 pp.*

2 *Institute for Transportation & Development Policy. 2018. The right mix matters! Building Blocks for inclusive cities. Available on: https://itdpdotorg.wpengine.com/wp-content/uploads/2019/02/Screenshot-2018-03-14-15.25.12.png; Retrieved: January 20th, 2020*

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Nonetheless, the scenario in most Chilean countries is not very encouraging. Cities grow by building civil works, forgetting to include the preservation of key elements of the ecological landscape in the planning. Moreover, in recent years, mainly due to power supply suspensions caused by the contact of electric cables with trees or by the fall of nearby trees, generated by snow or wind, Chile has chosen to prioritize the continuity of electricity supply at the expense of logging or indiscriminate and mutilating pruning of urban trees, under the responsibility of the operators of electrical installations as part of their maintenance programs.

From an economic perspective, transport and land use are closely linked to people's economic decisions, as their income rise will not only lead them to demand more goods and services, but also more space and territory. The spacial location of households, production and consumption is determined by the territory, creating more transport demand to meet their requirements of connectivity and mobility. However, Transport is not a purely economic and energy efficiency matter, but rather an integral and transcendent part of people's lives, as in that drive to meet our needs of connection and mobility, we seek access to better living conditions and opportunities to flourish and live life to the full.

In the Nationally Determined Contribution (NDC)[3], Chile commits to reduce al 25% of the total black carbon emissions by 2030, compared to 2016, through national policies related to air quality, and to update the City's Adaptation Plan in 2023 and in 2028. Given benefits for health, quality of life and climate change mitigation involved in the reduction of black carbon, we believe that such goal is unambitious and that it is not consistent with the urgent needs of communities.

II. Our future vision on city transport

In light of these assumptions, we believe there is an urgent need for the goals and actions in our Nationally Determined Contribution (NDC) to be consistent with the Sustainable Development Goals (SDGs) 2030, especially those referred to Sustainable Cities and Communities (Goal 11). Chile must abandon the "development" model on which the construction of our cities has been based, expanding the urban territory, encouraging the growth of the vehicle market and increasing spending on highways, with environmentally, socially and economically unsustainable results. On the other hand, the city's expansion has destroyed the pre-existing nature, as civil works have been chosen over nature-based solutions, deepening the dependence on external supplies and waste processing in the suburbs or beyond the city limits.

Chile should implement its commitment[4] to a Sustainable Transport, on the understanding that it is "*lthe provision of services and infrastructure for the mobility of persons and products needed for economic and social development and improved quality of life and competitiveness. These services and*

3 *Government of Chile. Chile's Nationally Determined Contribution. 2020 Update. 97 pp.*

4 *The representatives of national transport and environmental organizations from Argentina, Brazil, Bolivia, Chile, Colombia, Ecuador, Mexico, Paraguay and Uruguay met in Bogotá, Colombia, between June 23rd and June 24th, 2011, on the occasion of the first Regional Forum on Sustainable Transport (FTS) agreed to adopt The Bogotá Declaration on Sustainable Transport Goals.*

transport infrastructure provide secure, reliable, economical, efficient, equitable and affordable access to all, while mitigating the local and global negative impacts on health and the environments, in the short, medium and long term, without compromising the development of future generations" [5].

In order to implement it and to undertake more stringent commitments in light of the climate emergency, competent entities in our country should adopt mitigation measures based on the transport paradigm "*Avoiding-Changing-Improving*" [6]. In other words, *Avoiding* and reducing motorized travel distance, *Changing* the trend of individual motorized transport to safer, more and efficient, low-emission modes and, *Improving* the transport service infrastructure and management through clean, efficient and safe technologies and practices. Measures to reduce the vulnerability to climate change adaptation of existing transport services and new projects, should also be included.

In parallel, Chile must commit cross-cutting efforts that support measures based on this paradigm, mainly through actions to strengthen the Governance and Institutional Development between Land Use and Transport, eliminate economic distortions of fuel taxes and make progress in accountability and compliance indicators in this dimension (travel times and access to services, for instance).

All of this, while ensuring that actions are focused on the equitable development of all people, especially of women, the elder, people with reduced mobility, children and the poorest population.

If our aim is for the transport sector to significantly reduce its emissions, implementing relevant changes to reduce the use of motor vehicles and excessive car use is crucial. Technology by itself, such as a massive shift to electric vehicles, will not solve the problem.

III. Climate action measures to which we aspire concerning urban transport

Below, we propose a list of action measures additional to those included in Chile's NDC 2019.

1. Measures to Avoid unnecessary motorized travel and reduce travel distance

i. Road Pricing, by applying an additional rate to car journeys to highly congested areas.

ii. Transit-Oriented Development (TOD), through mandatory Territorial Planning Instruments (IPT, by its Spanish acronym) that include high densities and mixed uses in main transport axes, infrastructure for non-motorized and public transport.

iii. Incentives towards densification and creation of centralities of the IPTs by implementing tax incentives. Similarly, allowing to use urban ground in consolidated areas for social housing and avoiding price speculation.

5 *Foro de Transporte Sostenible para América Latina. Declaración de Bogotá. Objetivos de Transporte Sostenible. Definición de Transporte Sostenible. Government of Chile. Chile's Nationally Determined Contribution. 2020 Update. 97 pp.*

6 *Institute for Transportation & Development Policy. Available on: https://www.itdp.org/; Retrieved: December 20th, 2019*

iv. Random and flexible road-space rationing, to avoid car use in peak days and hours in capital cities.

v. Promote flexible and remote work schemes (telecommuting), providing companies with tax incentives.

2. Measures to Change the path of individual motorization to more efficient, low-emission modes.

i. Public Transport Corridors and underground and suburban Trains that will lead to improve travel times, quality of service and add value to public spaces.

ii. Unified self-service bicycle systems throughout the city.

iii. Rail freight transport.

iv. Bicycle and pedestrian infrastructure to revitalize areas and commerce.

v. Limit the number of parking lots, through IPTs or by establishing areas where parking is temporarily not allowed facilitating the operation of public transport.

vi. Intermodality and transfer centers for passengers and goods.

vii. Even out the specific tax on Diesel and Gasoline.

viii. Correct tax benefits for the use of Diesel in trucks.

3. Measures to Improve the technology and management of transport services

i. Energy efficiency goals for an average of the fleet of vehicles entering the market.

ii. Certify and label energy efficiency in trucks.

iii. Low-Emission Zones, in heavily congested and polluted cities, in order to promote technology replacement.

IV. Our vision of cities as sustainable ecosystems

Sustainable cities in Chile consider having a participatory design, planning and revision of the cities, allowing to prioritize and restore key elements of the landscape to improve human welfare, reducing the risks connected to disasters and the impact of climate change, through an ecological urban design[7], using the so-called nature-based solutions, green infrastructure, ecological infrastructure and landscape restoration. Sustainable urban development includes everyone's right to access opportunities, culture, services and community throughout the city, through comprehensive designs that bring together people, activities, constructions and public spaces, with pedestrian connections and quality bicycle lanes and transport to other parts of the city[8].

7 *Nassauer, JI. 2012. Landscape as medium and method for synthesis in urban ecological design. Landscape and Urban Planning 106(3):221-229.*

8 *Institute for Transportation & Development Policy. 2020. This is what urban equity looks like. Available en: https://www.itdp.org/our-work/sustainable-urban-development/; Retrieved: January 20th, 2020.*

Green infrastructure and nature-based solutions in cities provide several benefits to society[9]. These are actions aimed at protecting, sustainably managing and restoring or modifying systems, which meet the needs of society in an effective and adaptive manner, while providing human wellbeing and benefits to biodiversity. They leverage the sophistication of living creatures, their interactions and natural ecosystems to turn the social, environmental and economic challenges into innovation opportunities sustainably, with multiple benefits for society[10]. Nature based solutions are efficient, economically convenient, resilient and provide multiple co-benefits for health, the economy society and the environment.

Green infrastructure and nature-based solutions can be parks and recreational routes with the proper design, restoration of water courses, management of rainwater and preservation of nature. It is a step forward in territorial planning, aimed at integrating natural ecosystems and the welfare of the communities[11]. They improve physical and mental well-being, air quality, noise reduction, the maintenance of spaces for social integration, climate regulation, sports facilities and recreational areas, natural habitat restoration, opportunities for education, biodiversity and habitats of native species, property value increase, flood control, aesthetic landscape improvements, efficient resource management and a better image for the city[12]. They also help reducing multiple risks and develop more resilience, potentially bringing further benefits than conventional methods.

On the other hand, the production of and access to fresh, healthy, safe, nutritious and agro-chemical free food in cities is an increasingly pressing matter to create community, stimulate self-management, food safety and sovereignty, social integration, the creation of educational spaces, the opportunity to implement sustainable lifestyles and resilience to extreme events, and with the benefits related to the minimization of the distances between the food production and consumption site, with the potential to create jobs and local income. Food productions in the cities themselves might eliminate the use of fossil fuels in the production and transport of fresh food for good[13].

Initiatives of cities where food is produced are multiple and historical throughout the world[14]. We have, for instance, the case of Andernach in Germany, which has been transforming urban

9 *Benedict MA & MT McMahon. 2006. Green infrastructure: Linking Landscape and Communities. Island Press, Washington.*

10 *European Commission. 2015. Towards an EU Research and Innovation policy agenda for Nature-Based Solutions & Re-Naturing Cities. Final Report of the Horizon 2020 Expert Group on 'Nature-Based Solutions and Re-Naturing Cities' (full version). Directorate-General for Research and Innovation Climate Action, Environment, Resource Efficiency and Raw Materials. 71 pp.*

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13 *Puri V & T Caplow. How to grow food in the 100% renewable city: Building-Integrated agriculture. 229-241. In: Droege P (ed.). 2009. 100% Renewable: Energy Autonomy in Action. Routledge. 368 pp.*

14 *Alonso M & A Hernández. 2011. Historia de los huertos urbanos. De los huertos para pobres a los programas de agricultura urbana ecológica. Actas del I Congreso Estatal de Agricultura Ecológica Urbana y Periurbana. Valencia: SEAE. 12 pp.*

living based on an edible city concept since 2010. The project was launched by the Urban Planning Office, and it currently has 8,000 square feet of vegetable gardens and 13 hectares managed by the local government to grow vegetables that citizens can harvest for their own consumption, participating in both the design and it is execution and care[15]. Cattle farming is also practiced, and products can be purchased at a lower cost as they are state-subsidized. The local government encourages its citizens to plant and harvest different fruit trees and vegetables without using agro-chemicals[16].

These types of initiatives play multiple roles: they contribute to sustainable development in cities, to healthier food habits and more affordable food, recycling organic waste in the same city, capturing carbon in the soil, improving its infiltration and fertility properties, mitigating climate change and contributing to the creation of new spaces for social participation, creating opportunities for well-being and a direct relationship with nature.

Since the industrial revolution, cities have received immigrants from rural areas to work in factories. Nonetheless, vegetable gardens tend to appear as livelihood tools in moments of crisis. The current situation of the climate, economic and social emergency and our dependence on fossil fuels and the crisis of the agricultural business must be transformed from the grassroots. We can choose a sustainable model, encouraging the development of multifunctional green spaces in cities, which provide healthy food, an habitat to biodiversity, care for people and nature, allow the recovery of different local traditional crops, promote social cohesion, enhance the landscape and the habitability and physical and mental well-being of citizens, and create spaces to develop educational activities and promote to the creation of jobs[17].

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15 *El Horticultor. La Ciudad Comestible de Alemania. Available on: https://elhorticultor.org/la-ciudad-comestible-de-alemania/. Retrieved: February 12th, 2020.*

16 *Construir TV. Una ciudad comestible en la que la fruta y verduras son gratuitas. 2018. Available on: https://www.construirtv.com/una-ciudad-comestible-en-la-que-frutas-y-verduras-son-gratuitas/. Retrieved: February 12th, 2020.*

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10 Household waste

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I. Introduction

In nature, there is no such thing as "useless" thing. In terms of household waste, this logic of nature can only be achieved with a Circular Economy, where the start of manufacturing processes is connected with the end of the useful life of the products and services we consume.

For this, we must understand that nature needs a certain time for the renewal of natural elements, which must be respected, understanding that nature is, and should be considered in the Constitution of Chile, as a subject of rights and not of exploitation.

Efforts should be focused, firstly, on the implementation of preventive strategies to prevent waste generation. This type of strategy is directly related to robust institutions and State public policies, such eliminating single-use materials, eco design, banning planned obsolescence and reducing waste generation in the food production chain, among others.

Secondly, strategies should be aimed at extending the useful life. For example, reducing or eliminating taxes on repairs of various items and encouraging entrepreneurship based on revaluated materials that promote the emergence of a creative, collaborative and human-scale productive industry.

Thirdly, but not less important, waste management systems should be incorporated at the household, local, communal and regional levels, allowing organic and inorganic waste to become part of the recycling chains, preserving their value in the economy and adding new value by generating by-products. Organic waste can be managed to obtain energy by-products, such as biogas, heat and electricity, and to provide nutrients and organic matter for the soil, such as compost, humus and bio digester effluents. On the other hand, inorganic waste requires a

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management system ensuring its sustainability over time; which shall include, at least, the following aspects:

1. Use of non-virgin feedstock: Companies must be required to manufacture products containing certain percentage of recycled feedstock, thus adding value to products with these characteristics.

2. Eco design: Manufactured products should always undergo an eco-design process in which the product and the package –if any- are eco designed to be easily incorporated to the recycling chain once their useful life ends.

3. Associated tax for non-recyclables: Associated tax for companies generating products that cannot be managed in the recycling system.

4. Rewarding zero packaging: Encouraging bulk sales through incentives. Although this measure is aimed at preventing waste generation rather than at recycling, it is deemed relevant for the efficient operation of the recycling system. We must beat in mind that the greatest efficiency is achieved when no waste is generated.

We believe that these four measures could substantially improve the current Chilean recycling system. Focusing efforts on these strategies would defuse the current situation of the country's collapsed landfills and dumpsites.

A Zero-waste Chile can be achieved without straining the relationship between the economy and the environment. On the contrary, private investment in science and technology adds value to the economy and fosters the creation of a new entrepreneurial ecosystem, favoring capacity building and the formalization of labor at the local and national level. In this regard, we appreciate policies such as the Framework Law for Waste Management, the Extended Producer Responsibility and Promotion of Recycling (EPR Law), holding producers of consumption goods –i.e. producers and importers of products- responsible for waste management[1]. This law could be a starting point for strong regulations aimed at preventing waste production.

Preventing the production of waste would help reduce the waste generated by the consumption of economic goods and non-hazardous industrial waste, which in 2016 accounted for 61.67% of the total non-hazardous waste[2], which can be recovered. However, we must avoid recovering waste through methods such as Waste to Energy, whose feasibility for a plant in the Metropolitan Region has already been assessed. This approach intends to install a false concept of circular economy, by trying to label oil derivatives under the concept of renewables, as plastics and waste with "gross calorific value" for this industry, which would be a step backwards in the goals set out in the Mitigation item of the NDCs.

1 *Subsecretaría de Desarrollo Regional (SUBDERE). Gobierno de Chile. 2018. Diagnóstico de la situación por comuna y por región en materia de RSD y asimilables. Programa Nacional de Residuos Sólidos. 56 pp.*

2 *Ministerio del Medio Ambiente. Gobierno de Chile. 2019. Cuarto reporte del estado del medio ambiente 2018.*

It is worth pointing out that one of the goals of the Proposed National Waste Policy 2018-2030[3], submitted to public consultation in 2017, is a non-hazardous waste recovery rate of 30%. However, by 2016, 23.6% was recovered through recycling and other methods. In this regard, this objective must be more ambitious and seek the global reduction of the waste disposed of in landfills every year, considering that Chile is the South American country with the highest waste per capita per year, with 456 kilos[4]. For example, the collection and recovery targets for the EPR Law published in 2019 for containers and packaging[5], and tires[6], are an average of 70% for collection (which varies according to the type of container or packaging material) and 90% for recovery, respectively. In this sense, the 30% target proposed can be deemed obsolete.

The adverse effect of diffuse emissions from pollution on the environmental layers, soil and water, can only be reversed by reducing waste to the maximum, through an actual Circular Economy, based on natural cycles.

Therefore, the following goals are set out for a Circular Economy:

i. Developing, in 2020, a Circular Economy Roadmap 2020 to 2040, agreed upon at the national level, aimed at the transition to a circular economy, withinthe approach set forth herein, with short, medium and long-term measures for 2040.

ii. Developing an institutional framework based on the current framework for recycling (EPR Law and the Recycling Fund and Chile Recicla, dependent on the Ministry of the Environment), contributing to strengthen the degree of circularity of priority products defined in Law 20,920 of 2016.

iii. Reducing the disposal of waste to sanitary landfills by 10% in 2030.

II. Circular Economy Roadmap 2020-2040

How can we reach national consensus for the Circular Economy Roadmap 2020-2040? The proposal for a Nationally Determined Contribution shows the Circular Economy Roadmap 2020-2040 as the path to follow when moving from linear economy -(contemporary societies' predominant economic-productive system, and considered to be the main driver of major problems in terms of responsible production and consumption) to a new model promoting an efficient management of available resources and the eradication of negative externalities, such

3 *Ministerio del Medio Ambiente. Gobierno de Chile. 2017. Política Nacional de Residuos 2018-2030. Consulta ciudadana. Available on: https://consultasciudadanas.mma.gob.cl/portal/consultas_cerradas. Retrieved: June 1st, 2020*

4 *Villalobos F. y Equipo Multimedia Emol. 2018. ¿Cuánto contaminan los chilenos? Las cifras del país que genera más basura per cápita en Sudamérica. Emol Nacional. May 16th, 2018. Available on: https://www.emol.com/noticias/Nacional/2018/05/15/906114/Cuanto-contaminan-los-chilenos-Las-cifras-del-pais-que-mas-basura-per-capita-genera-en-Sudamerica.html: l. Retrieved: January 16th, 2018.*

5 *Ministerio del Medio Ambiente. Gobierno de Chile. 2019. Resolución Exenta N°544. Aprueba anteproyecto de Decreto Supremo que establece metas de recolección y valorización y otras obligaciones asociadas de envases y embalajes.*

6 *Ministerio del Medio Ambiente. 2018. Resolución Exenta N°897. Aprueba anteproyecto de Decreto Supremo que establece metas de recolección y valorización y otras obligaciones asociadas de neumáticos.*

as the excessive generation of waste that is not reinserted in new operating cycles. The Circular Economy model meets these objectives. To this end, we first need to define what the government's agenda will be, the manner in which it will be drawn up and in which we will move along this path.

Given the importance of this gradual change in the country's economic system, the Roadmap must be agreed upon by agents from different social, economic and political backgrounds at the national level, dialoguing in a direct democratic platform giving great legitimacy to the projects arising from this joint effort. Ensuring citizen participation in political decision-making processes is the minimum basis for citizens to fully exercise their sovereign powers. Therefore, civil society organizations must contribute to this Road Map. Their stance and needs must be reflected in the new guidelines that will lead the country to a better future. The transition from a linear to a circular economy can have multiple impacts on individuals, civil society, ecosystems and the market. Based on this latter point, those potentially suffering the direct impact of this economic transition should be involved in the Roadmap, to prevent them from challenging it when the project is being implemented, and other difficulties that may jeopardize the full meaning of public policy.

Therefore, roundtables throughout the country are an optimal channel to reach consensus at the national level on the issues at hand. This dynamic implies public-private participation in a political-social forum, chaired by a governmental agent (in this case, the Environment *Seremis*). This space would make it possible to obtain a cross-overview of the perception of citizens in each region, meeting the needs and demands of its participants, including workers' unions, civil society organizations, neighborhood council leaders and representatives of the private sector who are part of the community and of the territories likely to be affected by the changes arising from this public policy. Additionally, as the NDC's new proposal incorporates the gender variable for the first time, it must ensure institutional mechanisms for women to represent themselves in the decision-making and negotiation spaces. Hence, we propose the application of gender quotas ensuring that the asymmetry does not exceed 40/60 in the roundtable, as a minimum floor in the process of eradicating gender inequality and promoting female leadership. Likewise, roundtables should include different mixed gender and ethnicities, on the understanding that the recognition and participation of our indigenous peoples and their leaders is essential to develop legitimate national covenants. In addition to this, the roundtable would include the participation of other strategically selected Seremicontributing to cooperate and transmit technical knowledge, through inter-ministerial committees including the ministries of the Economy, Energy and Science.

The participation of civil society representatives in the working tables would be organized through a public tender prepared by the Ministry of the Environment. The selection system would give priority, firstly, to organizations with a larger number of people or territorial space, appealing to a broad representation of the region, as long as the activity that they carry out meets certain requirements, for instance, that the territorial work they perform is related to the productive processes of the economic activities at stake, whether they are engaged in the in-depth study of those processes or organized to mitigate their negative effects on the community, etc.

Asymmetries in technical and academic knowledge should also be taken into account in highly sophisticated and bureaucratic discussions. Many citizen consultation models have been criticized for this reason, as there are asymmetries of power in the debate, leading to differences in the access to cultural capital. Thus, there must be a period to standardize minimum knowledge for all participants at the roundtables, putting those who may have intellectual gaps in a better position to debate. Finally, there must be a local authority, namely the Regional Governor[7] (currently the highest regional authority), who shall be well aware of his territory, be able to create networks and links between the parties, and at the same time understand the limitations or potential of the region. The public-private ratio should also be the same, without according priority to one of the two sectors at the roundtables.

As for the periodic operation of the roundtables, they should meet periodically, starting in 2020. To draw up an initial schedule of meetings once a month. The goal is to agree upon the Roadmap's action plans within a year. The progress of the tasks performed should be presented at each meeting, and the compliance with the proposed goals should be reviewed and monitored. There would be a chairperson who would be a member of the Ministry and someone elected by the table to draw the meeting minutes and record the members' attendance and commitments[8, 9].

III. Organic household waste management. Towards a national low-carbon strategy

Mitigation measures of national contributions should include a large number of actions for management to be as efficient and as close to the use of resources as possible. Thus, the following is required:

1. Working in food production, transport, preparation and consumption chain, seeking to minimize food waste along the food chain. In 2011, it was found that 40-60% of the products turned into waste before reaching their end-use or final consumption[10]. Due to the growing demand for food, related to inefficient chain, agricultural soils are expanding, limiting their function as carbon sinks, and increasing an already excessive use of agrochemicals that generate polluting emissions (around 20% of the global greenhouse gases).

2. Addressing different strategies for the treatment goals by 2020 and 2040, starting with the most obvious and easy to deal with tasks, in addition to the urgent ones:

7 *After the 2020 election of Governors, they shall be the ones called to continue the Circular Economy policy due to their representativeness, as they will be democratically elected, whereas the regional governor is directly appointed by the President of the Republic*

8 *Consejo Nacional del Libro y la Lectura. Secretaría Ejecutiva. 2015. Metodología Mesas Técnicas Públicas; Política Nacional de la Lectura y el Libro 2015-2020. 11 pp. Available on: https://www.cultura.gob.cl/wp-content/uploads/2014/08/Metodolog%C3%ADa-Mesas-T%C3%A9cnicas-Publicas-04.12.2015. Retrieved: June 1st, 2020.*

9 *The methodology of the working tables will be based on the Roundtables of the National Book Council for developing the National Policy of the Reading and Book.*

10 *CEPAL 2012. Agricultura y cambio climático: del diagnóstico a la práctica. Seminars and conferences series. Santiago, Chile. 78 pp. Available on: https://repositorio.cepal.org/bitstream/handle/11362/7043/1/S1200799_es.pdf; Retrieved: January 16th, 2020.*

i. Creating urban areas where the accumulation of raw and processed organic waste is more easy andfeasible to deal with, such as markets, wholesale markets, school canteens, hospitals, offices, shopping center food courts, restaurants, squares and parks, etc. In peri-urban or rural areas, it is even easier to provide the substrates from all types of organic waste from the agroindustry, the brewing and wine industry, etc.

ii. Implementing alternatives to landfills next to cities of regions where doing so is pressing, as there already exists a deadline for their use. Example: The Greater Island of Chiloé, which is currently on health alert as the landfill in Ancud was closed[11, 12], or in Temuco, where the municipal landfill was closed after operating for 24 years[13].

3. Seeking solutions as decentralized as possible, thus avoiding the use of land transport in waste management.

i. Anticipating several waste treatment sites, avoiding sacrifice zones.

ii. Anticipating several degrees of organic waste treatment: household, neighborhood and community, communal.

4. Mitigating GHG emissions through clean energy generation and the replacement of fossil fuels, and by-products thereof, from anaerobic digestion.

i. For example, for the treatment of household organic waste in a borough of 500,000 inhabitants, 2 MWe can be generated[14]. Energy can be used and exploited in the form electricity, heat, bio methane (equivalent to natural gas, which is even used for transport)[15]. In the United Kingdom, 10% of household natural gas could come from the treatment with anaerobic digestion; this, in addition to the use that can be given to fertilizers, thus helping replace synthetic fertilizers.

ii. Seeking partnerships with related organizations. For example, the energy generated in bio digesters can be used by neighboring communities for productive purposes, generating new forms of business, such as fruit and vegetable dehydration, heat for greenhouses or human centers (universities, shopping centers, sports centers, etc.). Fertilizers from composting and

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11 *La opinión de Chiloé. 2019. Decretan alerta sanitaria en Provincia de Chiloé tras falta de vertedero en Ancud. April 12th, 2019. Available on: http://laopiniondechiloe.cl/decretan-alerta-sanitaria-en-provincia-de-chiloe-tras-falta-de-vertedero-en-ancud/. Retrieved: June 1st, 2020*

12 *González, K. 2019. ¿Qué hacer con la basura en Chiloé? El colapso sanitario en la Isla Grande. La Tercera. Qué Pasa. 16 abril 2019. . April 16th, 2019. Available on: https://www.latercera.com/que-pasa/noticia/que-hacer-con-la-basura-en-chiloe-el-colapso-sanitario-en-la-isla-grande/617974/. Retrieved: June 1st, 2020.*

13 *Parra A. 2016. Proyecto de incineradora, cierre del vertedero y abandono de reciclado@s: La gestion de residuos de la Municipalidad de Temuco. Red de Acción por los Derechos Ambientales. November 18th, 2016. Available on: http://www.radaraucania.cl/noticias/gestion-de-residuos/cierre-del-vertedero-abandono-de-recicladors-y-proyecto-de-incineradora-la-gestion-de-residuos-de-la-municipalidad-de-temuco/. Retrieved: June 1st, 2020.*

14 *Manchester Bredbury Parkway (UK). Available on: http://www.bta-international.de/en/referenzen/ausgewaehlte-referen0/manchester-bredbury-parkway.html. Retrieved: June 1st, 2020.*

15 *Anaerobic Digestion and Bioresources Association (ADBA). You're throwing away 52£ a month. Available on http://adbioresources.org/docs/Public_BG.pdf. Retrieved: June 1st, 2020.*

digestion can also be used among association of organic farmers, peasant family agriculture, and medium scale associations at the perimeter of cities.

5. Working on these topics institutionally, with those able to address the solutions, in order to plan the implementation of these steps on the territory. For example, the recycling of materials and their transformation.

i. Encouraging the reduction of taxes on companies, municipalities and generators that use anaerobic digestion as part of the process to treat waste, as it never reaches landfills.

ii. Continue encouraging research, regulatory modifications and promoting development to implement Zero Waste practices throughout the country, and from human settlements to cities.

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11 NDC, Industrial processes and product use

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I. Introduction

The Industrial Processes and Product Use (IPPU) sector considers as industrial processes those releasing Greenhouse Gases (GHGs) during the physical and/or chemical transformation of certain materials into new products, as well as the use of products containing GHGs that will be released during their useful life. Worldwide, IPPUs directly target productive sectors becoming increasingly relevant as the country's industries grow. According to Chile's National Greenhouse Gas Inventory (INGEI by its Spanish acronym) 1990 - 2016[1], the IPPU sector accounts for 6.2% of the total GHG emissions in Chile, which, according to the same report, are caused by the following categories:

2.A. Mineral Industry[2]: In the national context, this category includes cement, lime and glass industries, where the cement industry is the one with the highest emissions, and the glass industry the one with the lowest emissions. This category is characterized by the use of carbonate for its productive processes and the release of CO_2 during them.

1 *Ministerio del Medio Ambiente. Gobierno de Chile. 2019. Inventario Nacional de Gases de Efecto Invernadero de Chile 1990-2016. Tercer Informe Bienal de Actualización de Chile sobre Cambio Climático 2018. 762 pp.*

2 *There are no other uses in Chile for carbonates.*

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2.B. Chemical Industry[3]: In the national context, this category includes the production of nitric acid, methanol and ethylene (the latter two grouped as petrochemical production and carbon black). GHG emissions are released by chemical reactions in production processes.

2.C. Metal Industry[4]: In the national context, this category includes the production of steel and iron, and production of ferroalloys, where the iron and steel industry are the most relevant in this category. This category is responsible for certain secondary effects such as generation of acid gases and particulate material.

2.D. Non-energy products from fuels and solvent use[5]: In the national context, this category includes the use of lubricants and paraffin wax. It includes GHG emissions generated by the first uses of fossil fuels as products for primary purposes, except for energy purposes and use as a feedstock for processes or as a reducing agent. These are liquid products that sometimes volatilize CO_2. In this case, the use of lubricants is the most relevant in terms of emissions.

Considering that the IPPU 2.D. industrial processes and those of the energy sector are similar, we must make note for the correct allocation of GHGs:

> *"Combustion emissions from fuels obtained from the feedstock for an IPPU process will normally be allocated to the part of the source category in which the process occurs. However, if the derived fuels are transferred for combustion in another source category, the emissions should be reported in the appropriate part of Energy Sector"*[6].

2.E. Dielectric conductors: In the national context, this category is not applicable.

2.F. Use of products as substitutes for ozone-depleting substances[7]: In the national context, this category includes the subcategories of refrigeration and air conditioning, foaming agents, fire protection, aerosols and solvents. This category includes emissions of fluorinated HFC gases and to a small extent PFCs. Refrigeration and air conditioning are the most polluting subcategory at the country level.

2.G. Manufacture and use of other products[8]: In the national context, this category only records activity related to electrical equipment. It is due to the use of SF6 as electrical insulator and to interrupt the current in equipment used for transmitting and distributing electricity.

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3 *Production of Ammonia, Adipic Acid, Caprolactam, Glyoxyl and Glyoxylic Acid, Carbide, Titanium Dioxide and Soda Ash, does not take place in the country.*

4 *Production of Aluminum, Magnesium, Lead, Zinc and others does not occur in the country.*

5 *Use of solvents and Others do not occur in the country*

6 *IPCC. 2018: Calentamiento global de 1,5 °C, Informe especial del IPCC sobre los impactos del calentamiento global de 1,5ºC con respecto a los niveles preindustriales y las trayectorias correspondientes que deberían seguir las emisiones mundiales de gases de efecto invernadero, en el contexto del reforzamiento de la respuesta mundial a la amenaza del cambio climático, el desarrollo sostenible y los esfuerzos por erradicar la pobreza. [Masson-Delmotte V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor y T. Waterfield (eds.)]*

7 *Subcategory Others do not occur in the country*

8 *SF6 and PFC for other uses and N_2O for use in products do no occur in the country.*

Emissions occur at all stages of the life cycle of the equipment.

The most relevant categories in Chile, in decreasing order, are the following:

- 2.F. Use of products as substitutes for ozone-depleting substances (41.4%).
- 2.A. Mineral industry (23.1%).
- 2.C. Metal industry (19.1%)
- 2.B. Chemical industry (10.6%).
- 2.G. Manufacture and use of other products (3.9%).
- 2.D. Non-energy products from fuels and solvent use (1.9%).

The way of measuring IPPU emissions in Chile is unclear and is highly uncertain, as estimates are based on the amount of inputs used in productive processes.

II. Proposals

1. General guidelines

Below, the cross-cutting aspects to be taken into account in the proposals for any productive industry and product use are presented.

Firstly, it is worth pointing out that the way of measuring IPPU emissions in Chile is unclear and highly uncertain, as estimates are based on the amount of inputs used in the productive processes.

The proposal is to move towards a paradigm shift in the production system, from a linear to a circular model, following the guidelines of the Circular Economy and using methodologies and tools that help reduce GHG emissions and other environmental impacts. The new NDC[9] includes the development of a Circular Economy Roadmap for the year 2020 to 2040, and the generation and implementation of indicators on circularity by 2022. Regarding this proposal, lead times are long, and other intermediate milestones and other types of incentives are to be expected, such as: Implementing an adequate regulatory framework, promoting R&D&I initiatives, working groups with civil society, economic incentives, funds to implement measures oriented to the Circular Economy, among others.

Although this is a step forward, companies should take the initiative and include these principles beforehand, as they contribute to the efficient use of feedstock and more sustainable supply chains.

Among these tools and methodologies, we propose the Life Cycle Assessment (LCA) -in both processes and products- in order to determine critical environmental impact issues and propose improvements therefrom, considering the entire life cycle. One way of interpreting the results

9 *Government of Chile. 2020. Nationally Determined Contribution (NDC) of Chile. 2020 Update. 97 pp.*

of an LCA is the Carbon Footprint. This footprint, measured in CO_2 equivalent, called *global warming potential*, is only one of 18 categories in LCA methodology. We suggest incorporating other environmental footprints included in the LCA into the national metrics, supporting proposals for environmental improvements in the productive sector (water footprint, water eutrophication potential, among others). This incorporation should be carried out in the medium and long term.

LCA has several categories of environmental footprints, and characterization factors are used for its calculations. However, we currently do not have enough characterization factors for Chile, so factors from other countries must be used. We should make efforts to build local characterization factors to measure environmental footprints. Producing a ton of cement in Chile and China may have different environmental impacts, due to the differences in the production processes, in the type of technology, energy matrix and inputs used.

On the other hand, at the national level, we have the *Programa Huella Chile* program, for companies and institutions to quantify their carbon footprint and subsequently reduce and neutralize it, on a voluntary basis.

Other mechanisms contributing to the reduction of GHGs are the commitments undertaken by institutions through the Clean Production Agreements of the Agency of Sustainability and Climate Change. Under these mechanisms, we must promote Best Available Techniques (BAT). These are techniques applied to processes in different production sectors in the protection of the environment and people's health, on a scale applicable to their context and with technical and economic feasibility. As a country, we must aim for all production processes to be aimed at BAT.

As general guidelines for IPPU, we also suggest integrating eco-design as a minimum requirement for product design and production, and incorporating green chemistry principles into production processes. To this end, research, development and innovation areas in private and public institutions must be promoted, focused on nature-based solutions.

Both the quantification of GHGs and the commitments and measures taken for their reduction must be monitored under the principles of transparency and traceability. This information must be reported and verified. We strongly suggest that mitigation and adaptation actions be systematized so that all institutions follow the same guidelines for measurement, reporting and verification (MRV systems). One proposal is to aim for all companies to measure their carbon footprint through the *Programa Huella Chile* program, under the same methodologies, and considering comparable scopes, following an LCA approach. MRV systems will facilitate processes of inspection, taxes and fines, and also the delivery of information to consumers and users.

Currently, another system seeking to reduce GHGs is the "green tax" eco tax. However, these taxes are only applied to establishments whose sources are boilers or turbines with thermal power equal to or greater than 50MWt (thermal megawatts). At the moment, this tax corresponds to US$5/tCO$_2$, while the social price of carbon in Chile - calculated by the Ministry of

Social Development - amounts to US$30/$tCO_2$[10]. In other countries, this value exceeds USD 100/tCO_2[11]. Therefore, we recommend to study alternatives to increase the coverage of sources burdened by such tax, and, at the same time, to set a price increase allowing the true impact of GHG emissions to be internalized, which could include taxes in tranches.

Finally, as a general guideline, we propose that the INGEI allows for a cross-sectional analysis of the information by type of industry. For example, if we look at the cement industry, we can observe total emissions, including transport, energy, and others, in addition to direct emissions. In this way, GHGs reduction decisions and measures can be taken when each sector is most affected.

III. Specific proposals

In this section, we will delve into some of the general measures previously mentioned around some subcategories of GHG emissions that we have selected. The chosen subcategories are presented in a disaggregated manner; however, we believe that solutions should be addressed comprehensively. For this reason, within each subcategory, we cannot limit ourselves to the exclusive framework thereof.

Cement production: In cement production, GHG emissions are generated in the clinker production process. This leads us to think about the options to reduce emissions in production process, considering that these emissions in the national inventory are only allocated to the national cement industry if the clinker was produced in Chile. If these industries decide to import all the clinker from abroad, the emissions, as a subcategory, would be reduced to zero. However, emissions are still taking place in another country, thus maintaining their effect on global impact.

The first recommendation is to carry out a life cycle analysis of the entire production process, at least allowing to compare it with processes that incorporate alternative materials in terms of impacts. The second recommendation is to promote R+D+I initiatives that allow to study the behavior of different types of materials, which may replace both inputs in cement production and the final product (cement). Previous studies, in specific contexts, have demonstrated that the CO_2 emissions of this process can be reduced by over 94% by recycling cement[12].

Construction is the main cause of the trend and the inter-annual variations in the emissions of this subcategory. Therefore, cement production and associated emissions depend on the construction industry. For this reason, this analysis must be addressed from the perspective of this industry, and the idea that a change of paradigm is necessary must be set out. This was mentioned in the general guidelines, thinking in a long term logic according to the principles of the

10 *División de Evaluación Social de Inversiones. Departamento de Metodología. Ministerio de Desarrollo Social y Familia. Gobierno de Chile. 2020. Precios Sociales 2020. Santiago, Marzo 2020. 23 pp. Available on: http://sni.ministeriodesarrollosocial.gob.cl/download/precios-sociales-vigentes-2017/?wpdmdl=2392. Retrieved: June 1st, 2020.*

11 *World Bank; Ecofys. 2018. State and Trends of Carbon Pricing 2018. Washington, DC: World Bank © World Bank.*

12 *He Z, X Zhu, J Wang, M Mu & Y Wang. 2019. Comparison of CO2 emissions from OPC and recycled cement production. Construction and Building Materials 211(30): 965-973.*

Circular Economy: reuse of materials, modular construction that allows to easily replace parts of a building, prioritizing materials not only of a renewable origin but also those that can be managed more responsibly - from an environmental perspective - at the end of their useful life, and which, since it is cement, new initiatives in line with the reduction of impacts in the final disposal of waste shall be developed and implemented.

Iron and steel production: Again, we recommend a comprehensive approach when addressing the guidelines for iron and steel. As with cement, the intended use of steel industry is the construction local market, with 32.4% of the total, followed by formers, with 25.4%, and mining, with 19.4%, among others. In this way, the GHG emissions for this subcategory are indirectly related to the demand of these industries, making it necessary to regulate the demand from these markets.

In the case of lime production, the use of lubricants, the use of paraffin wax and glass production, similar phenomena occur, it is advisable to observe the indirect responsibility that demand has on GHG emissions in order to incorporate a more comprehensive vision in the solutions that will make production processes more efficient.

Refrigeration and air conditioning: When we refer to implementing long-term measures, it is not trivial. We understand that, on the one hand, we are making and must make great efforts in mitigation, but even so, we must adapt to climate change, which has reached critical levels. Thus, if we observe the use of air conditioning - in an integral manner - and considering the logic in the long term, one of the first proposals is to improve the quality of thermal insulation of the buildings, since this would decrease the demand of air conditioning and would directly impact on a decrease in the demand for HFC-type gases. In addition, it is essential to address public and private buildings with a view to energy efficiency, favoring direct sunlight and shade times as methodologies for regulating the temperature of buildings, which has a significant impact on air conditioning requirements.

In terms of refrigeration, our main recommendation is to prioritize shorter cold chains for food preservation (short food chains). In this regard, to encourage the consumption of local products over those requiring long transportation times, and in the same way, avoid the long timeout period before the products are consumed.

Finally, we strongly recommend the improvement of the methodologies for collection and validation of information with which the national inventory is created, which allows to establish goals in each of the defined sectors. To this end, it is important to strengthen MRV systems across industries, in order to obtain more detailed information on emissions, and also as a way of systematizing commitments. In this way, there would be a tool for the State to be the main guide and regulator of the goals proposed before the international community.

IV. Conclusions

The first question raised and to be answered by Chile is: Why are we generating these emissions?

As a source of GHG emissions, industrial processes should aim at cleaner and more efficient production, reducing the use of fossil fuels as an energy source, minimizing their direct emissions and waste, and making better use of their inputs and feedstock. For this reason, we propose a circular perspective for productive processes, from the Circular Economy, using tools such as the Life Cycle Analysis or others that help to understand the whole life cycle of the processes; and working to achieve the reduction of GHG in a focused way, but framed within a broad perspective. Likewise, adaptation and mitigation plans must contribute to atmospheric decontamination as much as to other natural systems: soils, rivers, wetlands, glaciers, among others; as part of this broader view, also using diverse environmental footprints, not only GHGs, allowing a more realistic analysis of the socio-environmental impact of industrial processes.

Something we must consider is the impact of industrial processes and product use, beyond the GHG emissions and pollution they generate at the atmospheric level. There are many socio-environmental injustices associated with them: the pollution and occupation of soils and territories, water pollution, harmful effects on people's health, damage or alterations to ecosystem balances, among others. These impacts often violate human rights, especially of women, girls, children and the elderly from poor rural sectors and/or sacrifice areas. It is necessary to propose comprehensive sustainability measures involving social, environmental and economic aspects, beyond GHG emissions.

One aspect that could enrich the diagnosis to implement adaptation measures in the industrial field is to carry out analyses by industry that complements the NDCs. For example, the mining industry contributes with emissions in several categories; therefore, it would be interesting to make a particular analysis of this industry and other large industries in Chile, to validate the NDCs. One way would be, as we said before, to use LCA to precisely identify the critical points of each industry and use eco design methodologies on them, integrating Circular Economy perspectives. If this country wants to make a significant reduction and, more importantly, an efficient and effective adaptation plan, we must be adapted to our reality and raise valuable and quality information. This information will probably be more valuable if the NDC classifications and information management are complemented with this perspective.

Finally, we make an urgent call to decarbonize Chile's economy and to demand more from the country's industrial sector. We do not consider it crucial for polluting companies to comply with more ambitious standards; we should urge them to measure their emissions and make this information public. We suggest leaving the model of estimation based on demand and use of feedstock in both the IPPU and in all other polluting industries in the country.

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Ministerio del Medio Ambiente. 2019. Inventario Nacional de Gases de Efecto Invernadero de Chile 1990-2016. Tercer Informe Bienal de Actualización de Chile sobre Cambio Climático 2018. 762 pp.

World Bank; Ecofys. 2018. State and Trends of Carbon Pricing 2018. Washington, DC· World Bank © World Bank.

12 Oceans, Climate Change and Chile's NDC

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I. Fisheries

The national fishing activity is believed to be highly vulnerable to the effects of climate change, as it is exposed to a significant environmental variability and its consequences on economic activities or local communities[1]. According to FAO studies, the 92,000 registered artisanal fishermen will be the most affected by climate changes.

In the case of marine ecosystems, exposure to changes in temperature, tides, currents, oxygen, and availability of chlorophyll, among others, raises the need to first define the environmental variables to be monitored, with extensive time series, in order to establish trajectory analyses, thus being able to predict certain effects on the environment.

In turn, local communities have experienced processes of adaptation to environmental and anthropic changes over time. In this sense, adaptation capacity must be strengthened and tools must be improved, whether in fields of knowledge or practices. We must also involve communities in telling their life experiences and sharing their traditional knowledge. Participation is a must in any action to be developed.

As indicated in the General Law for Fisheries and Aquaculture, applying the precautionary principle in decision making is essential, especially when mitigating changes in environmental variables. To this end, models should include higher ranges of uncertainty, for the recovery of fisheries, which are mostly overexploited or collapsed.

1 *Subsecretaría de Pesca y Acuicultura y Departamento de Cambio Climático. 2015. Plan de Adaptación al Cambio Climático en Pesca y Acuicultura. 77 pp.*

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A clear example of fisheries at risk due to climate change impact and overexploitation in Chile is the forest of brown seaweed or kelp. In northern and central Chile, kelp populations are systems of ecological, social and economic importance. Ecologically speaking, Brown algae forests are feeding, breeding and shelter systems for fish and commercially important invertebrate species[2]; whereas in socio-economic terms, they have become an important source of income for local pickers[3]. In this sense, Chile is an important producer and exporter of these species, used in the global market due to a growing demand for their biomolecules, mainly alginates, which are used in industries such as cosmetics and biotechnology.

At the global level, macro-algae forests have become less abundant and their range of distribution has narrowed down, mainly due to the effects of climate change[4]. In addition to this, the intensive extraction of species such as *cuchayuyo, huiro, huiro palo* and *huiro negro* in Chile is comes from natural populations, since mass cultivation has not yet been established. The absence of regulations and management plans for the sustainable extraction and use of the resource has led populations of these species to collapse, reducing their distribution and abundance in central and northern Chile[5], putting fish and invertebrate communities dependent on them and the associated socio-economic activities at serious risk.

Therefore, for macro-algae to continue providing ecosystem services and goods to local and global communities, we suggest the development of management plans regulating the tools and techniques used for their extraction, as the definition of a minimum size required in order to make proper use of them without affecting their ecological, social or economic capacity[6]. Moreover, decisions made regarding these resources must be based on scientific information allowing to determine the correct measures as to their minimum extraction sizes and collection techniques.

We recommend that the following be adopted:

1. Adaptive Management

A review and subsequent adaptation of the regulatory and management frameworks is required to incorporate flexibility and adaptation. It is essential to create a framework for action with

2 *Wernberg T, K Krumhansl, K Filbee-Dexter, & M Pedersen. 2019. Status and trends for the World's Kelp Forests. In: World Seas: an Environmental Evaluation (Second Edition) Volume III: Ecological Issues and Environmental Impacts, Ed. 2 (pp. 57-78). Elsevier Ltd.*

3 *Vásquez JA, S Zuñiga, F Tala, N Piaget, DC Rodríguez & JMA Vega. 2013. Economic valuation of kelp forests in northern Chile: values of goods and services of the ecosystem. Journal of Applied Phycology 26(2): 1081–1088.*

4 *IPCC. 2019. Summary for Policymakers. In: IPCC Special Report on the Ocean and Cryosphere in a Changing Climate [H.-O. Pörtner, D.C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, M. Nicolai, A. Okem, J. Petzold, B. Rama, N. Weyer (eds.)]. In press.*

5 *Krumhansl KA, DK Okamoto, A Rassweiler, M Novak, JJ Bolton, KC Cavanaugh, (...) & JEK Byrnes. 2016. Global patterns of kelp forest change over the past half-century. Proceedings of the National Academy of Sciences 113(48): 13785-13790.*

6 *Vásquez JA. 2008. Production, use and fate of Chilean brown seaweeds: re-sources for a sustainable fishery. In: Borowitzka MA, AT Critchley, S Kraan, A Peters, K Sjøtun & M Notoya (eds). Nineteenth International Seaweed Symposium. Developments in Applied Phycology, vol. 2. Springer, Dordrecht.*

optional areas, so that sectoral authorities have decision-making tools during highly variable or uncertain times.

2. Ecosystem Vision

Generating models analyzing both the environmental factors and their effects on the economic and social reality of fishing communities. In this sense, territorial variables essential to adaptation should be included.

3. Participation

Implementing a system of active participation of communities in the discussion, design and planning aimed at reducing vulnerability to climate change impacts. Also, to implement permanent information systems.

4. Multidisciplinary science

The effects of climate change must be addressed from the perspective of oceanography, fisheries science and also from the point of view of engineering, infrastructure, economy and sociology. The aim is to face a global problem affecting the population in different ways. These studies should be aimed at a multidisciplinary vision, guiding the adaptation and resilience of ecosystems and human populations.

5. Fishing Gear Regulation

The current condition of national fisheries, as published by *Subpesca* in March 2019[7], shows that approximately 70% of commercially relevant species are overexploited or collapsed/exhausted.

Hence, we must make progress in the proposals of the FAO Code of Conduct for Responsible Fisheries, regarding the adoption of "*... selective and environmentally safe fishing gear and practices...*"[8], which pose a challenge to the regulation of bottom trawling developed in crustacean and common hake fisheries.

Hence, we must Freeze the Trawling Footprint[9] the main objective of which is to limit the operation of fleets to those areas where the operation has historically been carried out, limiting its annual surface expansion to other areas. This way, spatially limited monitoring and follow-up can be carried out, particularly focused on the effects of this gear on the recovery of fisheries and the regeneration of marine habitats and ecosystems.

7 *Subsecretaría de Pesca y Acuicultura. 2019. 2019. Estado de situación de las principales pesquerías chilenas, 2018. 102 pp. Available on: http://www.subpesca.cl/portal/618/articles-103742_recurso_1.pdf. Retrieved: June 1st, 2020.*

8 *FAO. 1995. Código de Conducta para la Pesca Responsable. Artículo 6, Principios Generales. Punto 6.6. Roma. 46 pp.*

9 *Informe Propuesta para la eliminación progresiva de la pesca de arrastre en Chile. Página 19. Oceana, 2016.*

II. Pollution

1. Tailings

The disposal of tailings at sea is a highly polluting practice that generates multiple impacts on the oceans, including rising temperatures and loss of oxygen. The disposal of tailings at sea causes environmental damage[10]. Tailings dumped at sea are deposited on the seabed, suffocating the aquatic environment along the way. They lead to the destruction of marine habitat, reducing the abundance and diversity of species, and to an increased risk of bioaccumulation of heavy metals in aquatic organisms and humans[11].

There is scientific evidence linking climate change and the disposal of tailings in the oceans. Organic and inorganic particles, including pollutants within the tailings plume disposed at sea, have potential to alter the biogeochemistry of the seabed and water column, aggravating climate-related temperature, oxygen and pH stress[12]. Therefore, we propose banning the disposal of tailings at sea.

2. Plastics

Pollution by plastics is a global problem aggravated over time. An estimated average of eight million tons of plastic enter the sea every year[13], and 75% of the waste found at sea is plastic[14]. In addition to this, the production and manufacturing of plastics directly contributes to climate change through high greenhouse gas (GHGs) emissions. 99% of plastic produced is made from fossil fuels, and it is estimated that by 2050, 22% of the extracted oil will be used to produce plastics[15].

In addition to the air emissions generated in producing plastics, their degradation also generates significant amounts of GHGs. However, the lack of knowledge about the total emissions associated with this process is worrisome. Today, we fully understand only the emissions produced by plastics degrading at the surface of the ocean, whereas the emissions from the 99% of plastics below the surface have yet to be determined. It has been explained that plastics continuously release methane and other GHGs to the surface of the ocean, and that these emissions increase

10 *Study commissioned by the London Convention and Protocol Office and Ocean Affairs, OMI, in collaboration with the United Nations Program (UNEP) Global Program of Action. May 2013. Evaluación internacional de la eliminación de relaves mineros en mares y ríos. 15pp.*

11 *Op. Cit. Krumhansl et al,. 2016.*

12 *Vare LL, MC Baker, JA Howe, LA Levin, C Neira, EZ Ramírez-Llodra, A Reichet-Brushett, AA Rowden, TM Schimmield, SL Simpson & EH Soto. 2018. Scientific considerations for the assessment and management of mine tailings disposal in the deep sea. Frontiers in Marine Science 5:17. doi: 10.3389/fmars.2018.00017.*

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15 *Ellen Macarthur Foundation. 2017. The New Plastics Economy: rethinking the future of plastics and catalyzing action. 66 pp.*

over time as plastic breaks down[16]. Finally, the smaller the plastic (i.e. micro-plastics), the greater its toxicological effect[17].

This is of utmost relevance considering that the ocean's micro-components, such as phytoplankton and zooplankton, have been severely affected by this type of pollution. Plankton plays an important role in the ocean's capacity to absorb CO_2 and act as a carbon sink, preventing carbon from returning to the atmosphere. The photosynthetic capacity of phytoplankton, which fixates carbon, and the metabolic and reproductive rates of zooplankton, have been reduced, and also their ability to transfer carbon to the seabed[18].

Disposable plastics or single-use plastics, such as bottles and their caps, food wrappers, bags, light bulbs and shakers, and foam take-away containers, is waste mostly found during beach cleaning, and they are also part of the waste found in the water column and on the seabed[19, 20]. This type of plastic is fragile and easy to fragment, further increasing pollution and climate change.

Small, lightweight plastics of little economic value cannot be part of the circular economy through recycling, as their picking, sorting and subsequent recycling involve high costs that discourage their treatment. Therefore, the solution to keep these plastics away from the oceans is first to prevent or avoid their use, and then to prefer using reusable products[21].

At the same time, for those cases in which disposable products are exceptionally necessary, they should be made of materials other than plastic, or certified plastics. Now, new plastics are offered in the market as a better alternative to traditional plastics, but this is generally not the case, and consumers are provided incomplete information or misinformed. A more environmentally friendly plastic must: (i) be made from a polymer of renewable second or third generation sources; (ii) degrade in natural and marine environments within a given short period time; and (iii) not leave toxic substances in the environment. Plastics meeting these three cumulative criteria must be granted a certificate as proof of this.

Therefore, regulating disposable plastics, preventing their generation, is pressing.

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16 *Royer SJ, S Ferrón, ST Wilson & DM Karl. 2018. Production of methane and ethylene from plastic in the environment. PLoS ONE 13(8): e0200574.*

17 *AAnbumani S & P Kakkar. 2018. Ecotoxicological Effects of Microplastics on Biota: A Review. Environmental Science & Pollution Research 25 (15): 14373-14396.*

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19 *Ocean Conservancy & International Coastal Cleanup. 2018. Building a clean swell. 24 pp.*

20 *DIRECTEMAR. 2018. Reporte Nacional Limpieza de Playas 2017. Available on: https://www.directemar.cl/directemar/site/artic/20180904/asocfile/20180904113146/folleto_reporte_lp_2017_web.pdf. Retrieved: June 1st, 2020*

21 *Op. Cit. Ellen Macarthur Foundation, 2017.*

III. Conservation

1. Implementation of Marine Protected Areas

Oceans provide us with multiple ecosystem services, including a major source of food and much of the oxygen we breathe. They also protect us from extreme weather events and act as carbon sinks, lowering the surface temperature of the atmosphere and helping regulate global climate[22]. In the climate change scenario, we face a dramatic increase in sea surface temperature, melting ice caps, rising sea levels and acidification, coupled with losses of biodiversity from pollution, habitat degradation and overexploitation of resources[23, 24]. Under these circumstances, oceans and the associated benefits of the ecosystem services they provide to humanity have been extremely neglected[25].

The creation of protected areas has been widely used as a tool to protect the ecosystems that provide us with benefits and, in some way, to mitigate climate change impacts[26]. Marine protected areas (MPAs) range from small areas - for the protection of endangered species, unique habitats, or a site of cultural or historical interest - to large reserves and parks for conservation, economic and social purposes, including different levels and types of protection.

This way, the implementation of protected areas entails economic benefits related to tourism, recreation, and increased productivity of fisheriess[27]. Additionally, there have been cultural, political and social impacts on local communities associated with MPAs[28]. This tool allows for the maintenance and protection of the structures, functions and integrity of natural marine ecosystems[29].

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22 *Covich AP, MC Austen F BÄRlocher, E Chauvet, BJ Cardinale, CL Biles, P Inchausti, O Dangles, M Solan, MO Gessner, B Statzner & B Moss. 2004. The role of biodiversity in the functioning of freshwater and marine benthic ecosystems. BioScience 54(8): 767-775.*

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28 *Bennett NJ & P Dearden. 2014. Why local people do not support conservation: Community perceptions of marine protected area livelihood impacts, governance and management in Thailand. Marine policy 44:107-116.*

29 *Angulo-Valdés JA & BG Hatcher. 2010. A new typology of benefits derived from marine protected areas. Marine Policy 34(3): 635-644.*

Thus, the proper establishment and management of MPAs significantly helpbuild and maintain the ocean's resilience[30]. This is achieved by integrating ecological, social and economic management to achieve a sustainable use of natural resources at the local level[31], thanks to the protection of biodiversity and the increased productivity in protected areas[32]. This ultimately contributes to the conservation and maintenance of marine biological systems at a global level. In this way creating and implementing protected areas is a major step forward in the protection and maintenance of biologically rich and complex habitats.

Upon adhering to international agreements to meet sustainable development goals as a member of the United Nations, Chile committed to increase the protection of marine and coastal ecosystems by at least 10% by 2020[33]. For this reason, the creation of new protected areas increased the area of protection of the exclusive economic zone (EEZ) from 4.1% to 40.2% in 2018, thus placing Chile among the leading countries in this area.

However, there are some financial, operational and management gaps that prevent MPAs from fulfilling their purpose. A financial gap of 98.3% of the total cost required for the proper functioning and management of existing MPAs is estimated[34]. This same gap prevents to set up and implement appropriate management plans ensuring compliance with regulations in order to achieve the objectives of a protected area. For example, allocating a budget to control MPAs, along with other administrative measures, would help properly controlling illegal fishing.

2. Under-representation of MPAs in the continent

There are marine ecoregions recognized in Chile, including the area of oceanic islands (Archipelago Juan Fernández, Islas Desventuradas and Easter Island), and the area of continental Chile, subdivided into the Humboldt ecoregions in the north, central Chile, Araucana, Chiloense and the fjords and channels ecoregion of south-eastern Chile[35].

Regarding the latter, there is an under-representation of marine protected areas in the continental territory[36]. This is a problem, as coastal areas of the continent comprise complex systems, in which physical, chemical and biological processes converge to maintain their balance and productivity. In particular, off the coast of Chile there are upwelling zones or high biological

30 *Walker B & D Salt. 2012. Resilience thinking. Sustaining ecosystems and people in a changing world. Island Press. 192 pp.*

31 *Op. Cit. Ellen Macarthur Foundation, 2017.*

32 *AAgardy T. 1994. Advances in marine conservation: the role of marine protected areas. Trends in Ecology & Evolution 9(7): 267–270.*

33 *UN. 2019. The Sustainable Development Goals Report. United Nations, New York. 61 pp.*

34 *WCS. 2018. Pasos para la sustentabilidad financiera de las Áreas Marinas Protegidas de Chile. Wildlife Conservation Society - Chile. Santiago. 76 pp.*

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36 *Pliscoff P & T Fuentes. 2008. Análisis de representatividad ecosistémica de las áreas protegidas públicas y privadas en Chile. Informe final, GEF, Conama y PNUD, Santiago, Chile. 103 pp.*

productivity areas due to the Humboldt current system, one of the most productive ecosystems in the world[37].

Despite this, most protected areas in Chile are located on island territory. 91% of all protected areas are in the ocean, whereas 9% correspond to the protection of continental coastal areas. These account for 39.7% and 4% of the EEZ, respectively. The region with the greatest representation of protection is the V region of Valparaiso. However, if we count only the continental MPAs, the area with greatest representativeness is the Region of Aysén, with the protection of approximately 6950 km^2, of which 6,700 km^2 are the coastal marine area of Caleta Tortel (*Área marina costera protegida de multiples usos, AMCP-MU*).

Although protected insular oceanic areas are rich in biodiversity and highly endemic, they lack the fishing importance found on the continental coast. Coastal areas are not only highly productive - and therefore rich in fish catching areas and benthic resources - but they also host important areas for reproduction, recruitment and growth. Additionally, the latitudinal gradient of environmental conditions off the coast of Chile means that each ecoregion has unique conditions and, therefore, species that are exclusive to each region.

Thus, we value the fact that the oceanic contributions of NDC Chile 2020 consider protecting at least 10% of the underrepresented Humboldt, Central Chile, Araucana and Chiloense ecoregions.

On the other hand, considering that most fisheries in Chile are overexploited and depleted or collapsed[38], the protection of some of these areas should be a priority for conservation, as mentioned above in the section on fisheries, for a greater control and adequate management and monitoring of extractive activities carried out in these areas.

IV. References

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