SUBNATIONAL CLIMATE FUND

Legal and Market Study for Waste Management Plants in Chile.

May 2022

Acknowledgements

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This report has been financed by the Subnational Climate Fund (SCF), which features a dedicated, grant funded facility for Technical Assistance (TA) that provides technical support to stakeholders in identifying and strengthening investment proposals for the fund.

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Executive Summary

This pre-feasibility study provides an overview of the waste management sector in Chile, specifically focusing on the National Strategy for Organic Wastes and the government bodies involved in planning, management, and operation.

The study notes that the National Strategy aims to increase the valorization of organic waste from 1% to 66% by 2040 and is part of a legal framework that includes the Climate Change Framework Law.

The study also discusses the various sources of organic waste, including household, industrial, agricultural, and service waste, and the current state of Anaerobic Digestion (AD) plants in the country. The government bodies involved in policy-making, authorizations and permits, and enforcement are outlined, with a particular focus on the Ministry of the Environment.

Overall, the study highlights the challenges and opportunities for waste management in Chile and the need for increased investment and incentives to achieve decarbonization goals.

Table of Abbreviations

AD	Anaerobic Digestion
CC	Climate Change
CC Law	Climate Change Framework Law
CEN	National Electric Coordinator
CER	Greenhouse Gases Emission Reduction Certificates
CH4	Methane
CMS	Council of Ministers for Sustainability
CNE	National Energy Commission
H2S	Hydrogen Sulfide
COEVA	Environmental Assessment Commission (regional)
CORECC	Regional Committee for Climate Change
Decree No. 86	Decree No. 86/2013, Ministry of Energy, Regulation for the determination of nodal prices
Decree No. 88	Decree No. 88, Ministry of Energy, Approves Regulations for Small Scale Power Plants
DIA	Environmental Impact Statement
DOM	Municipal Works Department
EIA	Environmental Impact Study
ETICC	Interministerial Workgroup for Climate Change
FAO	Food and Agriculture Organization
FNE	National Economic Prosecutor
GEF	Global Environment Facility
GLES	General Law of Electric Services
Grandfathering Period	Transitory period under which PMGD projects can opt to sell their energy in accordance with a third regime which is the stabilized price regime.
GTZ	German Technical Cooperation
ICC	Connection Criteria Report (Informe de Criterios de Conexión)
ICE	Consolidated Assessment Report
ICG N° 3/2013	General Instructions issued by the FNE to regulate transparency and open access in Municipal recollection and disposal contracts for Municipal Solid Waste
INN	National Institute for Normalization
LBGMA	Law 19,300 of the Ministry General Secretariat of the Presidency, which stablishes the General Basis of the Environment

LGUC	General Construction and Urbanism Law
LOSMA	Law 20,417 Organic Law of the Superintendency of Environment
MMA	Ministry of the Environment
MSW	Municipal Solid Waste
N2	Nitrogen
National Strategy	National Strategy for Organic Wastes
NCh	Technical Chilean Norm
NDC	National Determined Contribution
NTCO	Technical Norm for PMGDs Connection and Operation
NTSyCS	Technical Norm for Safety and Quality Service
OGUC	Ordinance of the General Construction and Urbanism Law
PAS	Environmental Sectorial Permits
PMGD	Small Distributed Generation Company
RCA	Environmental Assessment Approval
REP	Extended Producer's Responsibilities
REP Law	Waste Management, Extended Producer Responsibility and Recycling Incentives Act
RETC	Register in the Pollutant Release and Transfer Register
RILES	Liquid Industrial Waste
SEIA Regulation	Supreme Decree No.40/2012 of the MMA, which stablishes the Regulation of the SEIA
SAG	Agriculture and Livestock Service
SEA	Environmental Evaluation Service
SEC	Superintendency of Electricity
SEIA	Environmental Impact Assessment System
SMA	Superintendency of Environment
UNDP	United Nations Development Programme
WEEE	Electrical and electronic equipment waste

I. Introduction.

The National Determined Contribution ("NDC") presented by Chile at the Conference of the Parties of the Paris Agreement committed a National Strategy for Organic Wastes, along with other commitments, to achieve carbon neutrality by 2050.

In the 2nd semester of 2020 this National Strategy for Organic Wastes, entitled "The Country We Want For 2040", was published. Its goal is to evolve from 1 to 66 per cent the valorization of organic wastes by 2040. "Currently, 58% of municipal solid waste, by weight, corresponds to organic waste, that is, more than double what other fractions represent, such as containers and packaging (plastic, cardboard, glass, cans, etc.) waste. However, the recovery rate of organic waste is less than 1% of the total tons produced each year" (Ministerio del Medio Ambiente, 2020: P. 6).

It is important to note that recently, in March 2022, Congress approved the Climate Change Framework Law, which is about to be published and enacted. The National Strategy for Organic Wastes is part of a framework that has legal support and defined goals.

The challenge to achieve decarbonization goals is ambitious. During the last years, there has been a significant increase in the generation of organic waste[1].

In Chile, household waste management services are generally funded through the payment of real estate contributions[2] or cleaning rights[3], which are paid on a quarterly basis by landowners to the corresponding municipalities. However, as much as 77%[4] of all properties are excluded from these types of taxes. This causes a funding problem for the municipal authorities.

The Climate Change Framework Law ("CC Law") and the National Strategy for Organic Wastes (the "National Strategy") mandate the national government (the "Administration") to implement rules and standards to reduce organic waste and to treat them properly.

A summary of "strategic vision" for household waste contained in the National Strategy, and programs to implement, are illustrated as the following:

[1] In 2009, the estimated generation of municipal waste corresponded to 6.5 million tons, with a per capita generation of 1.05 kg. per person per day. While in 2017, 1.22 kilos of waste per inhabitant were generated daily (Ministerio del Medio Ambiente, 2020: P. 10).

[2] Real estate contributions are paid by landowners. The price is calculated on the basis of numerous factors, including location, and constructions on site. A percentage of the contribution is destined to waste management.

[3] Landowners exempted of real estate contributions have to pay cleaning rights to the municipality three times a year.

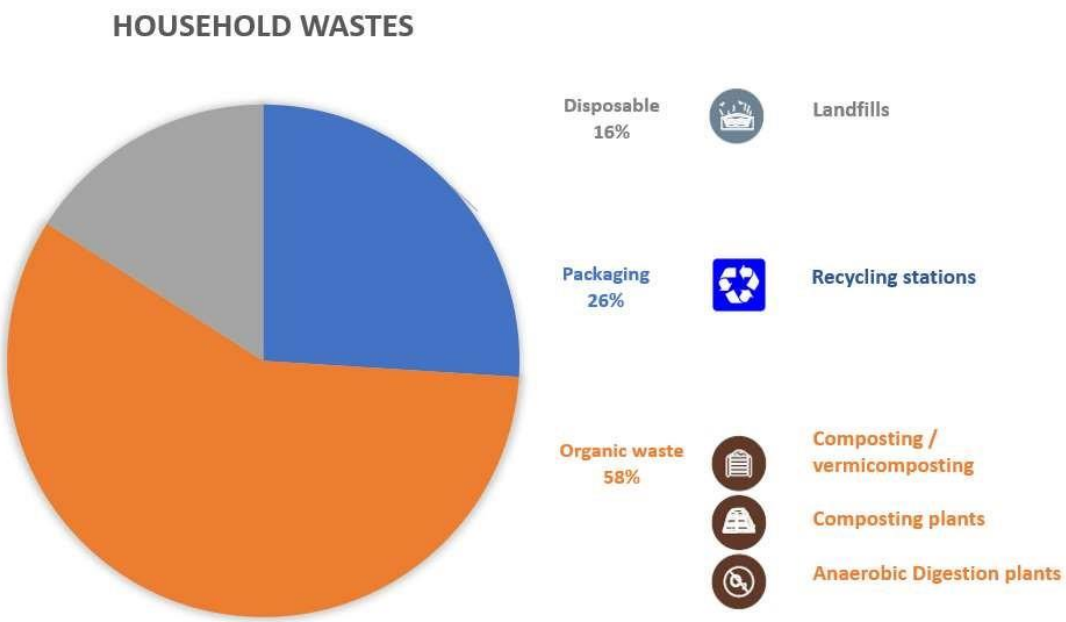


Figure 1 - Household wastes (Ministerio del Medio Ambiente, 2020: P. 21)[4]

Some of the specific programs implemented as part of the strategy, such as the REP Law, are described below. Nevertheless, there are no specific incentives to implement Anaerobic Digestion (AD) plants.

Organic waste comes from various sources, not only from households. Industrial activities, agriculture and services also generate organic waste, so methane emission from such sources also have the potential to be abated by AD and composting. In fact, there are more than a hundred of AD plants already in Chile, according to official figures[5].

[4] "Composting / vermicomposting" consider both home and community composting

[5] Ministry of Energy, cited by ImplementaSur: "Solid waste and biogas projects in Chile". July 13, 2021.

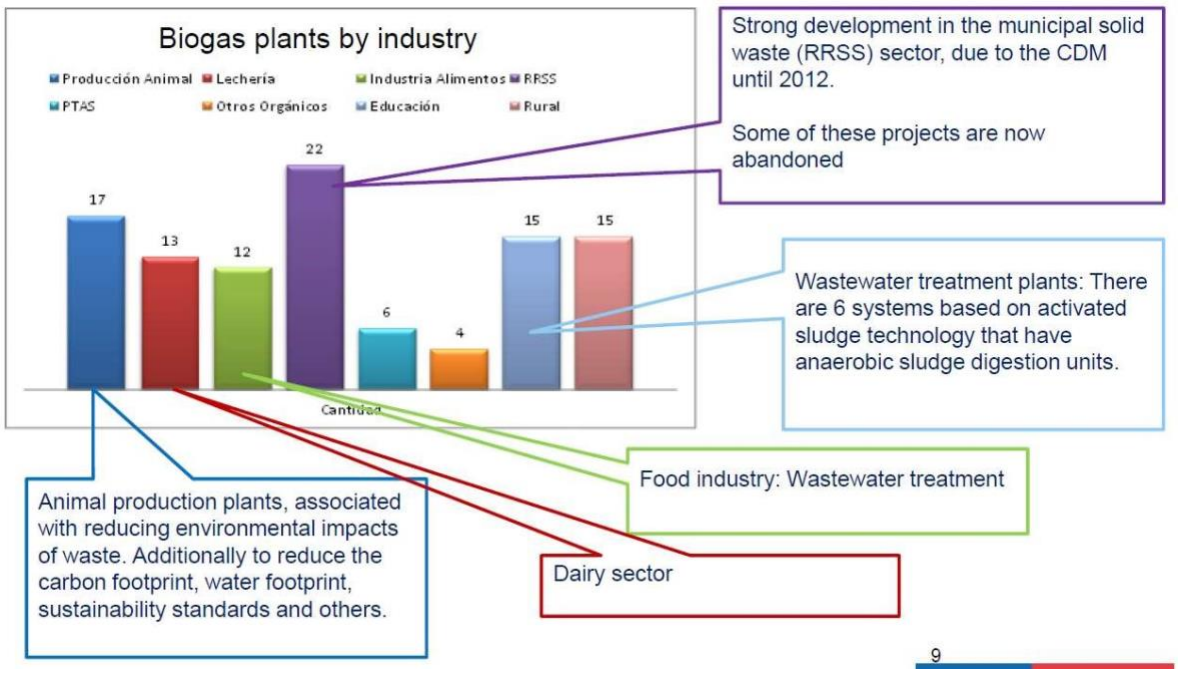
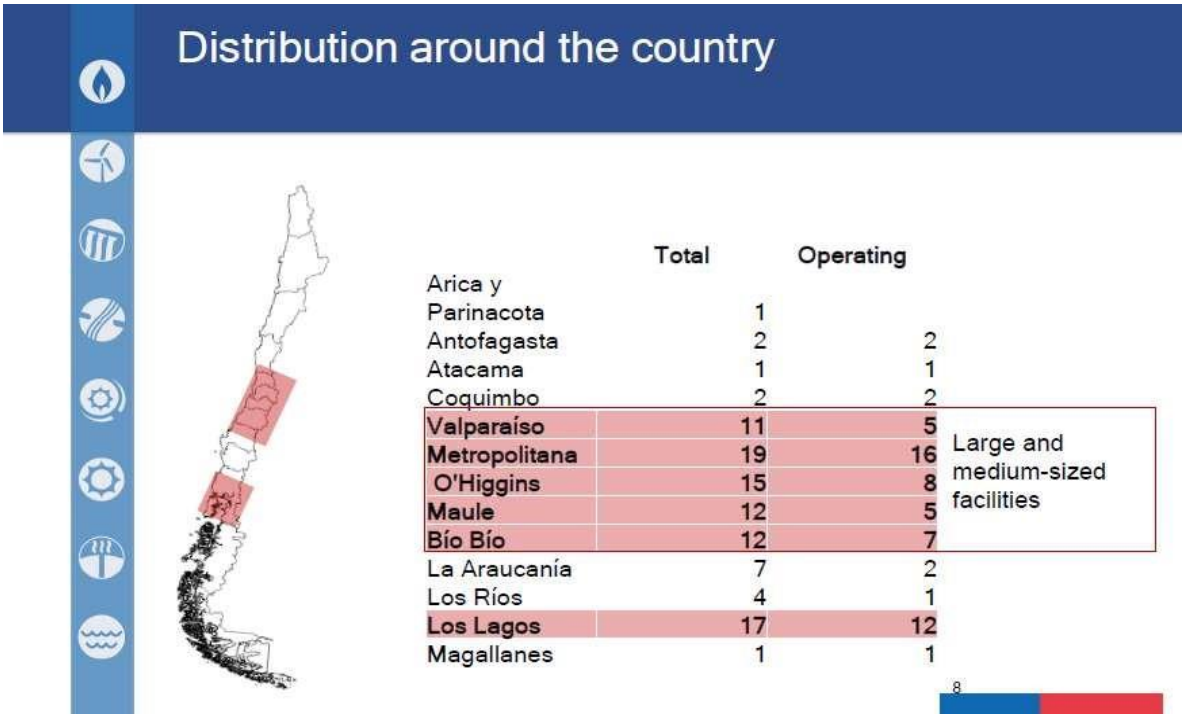


Figure 2 - Biogas plants by industry

The Ministry of Energy also informed how these AD plants are distributed around the country[6]:



Among those AD plants that are currently operating, 59% produce energy, while 41% just burn biogas. Most of those that produce energy is just for self supply, while only 8 are connected to the grid. 36 projects are just gas flaring (landfill gas).

[6] Ibid. Op. Cit. Page 11

Although there are no incentives for a waste management plant that results in an emission reduction, there are two driving forces that explain the execution of the AD plants in Chile, according to our experience:

a) The Environmental Impact Assessment System ("SEIA"), that is required for any relevant new activities, usually demand an AD plant for some activities, such as new pig farms. In this case, the purpose of the public administration is to capture methane emissions and reduce odours. Only some of these AD plants generate electricity.

b) The Clean Development Mechanism, of the Kyoto protocol. This mechanism gave domiciliary waste landfills the option to obtain some additional revenues through the issuance of Greenhouse Gases Emission Reduction Certificates ("CERs"), as shown in the following graph[7]:

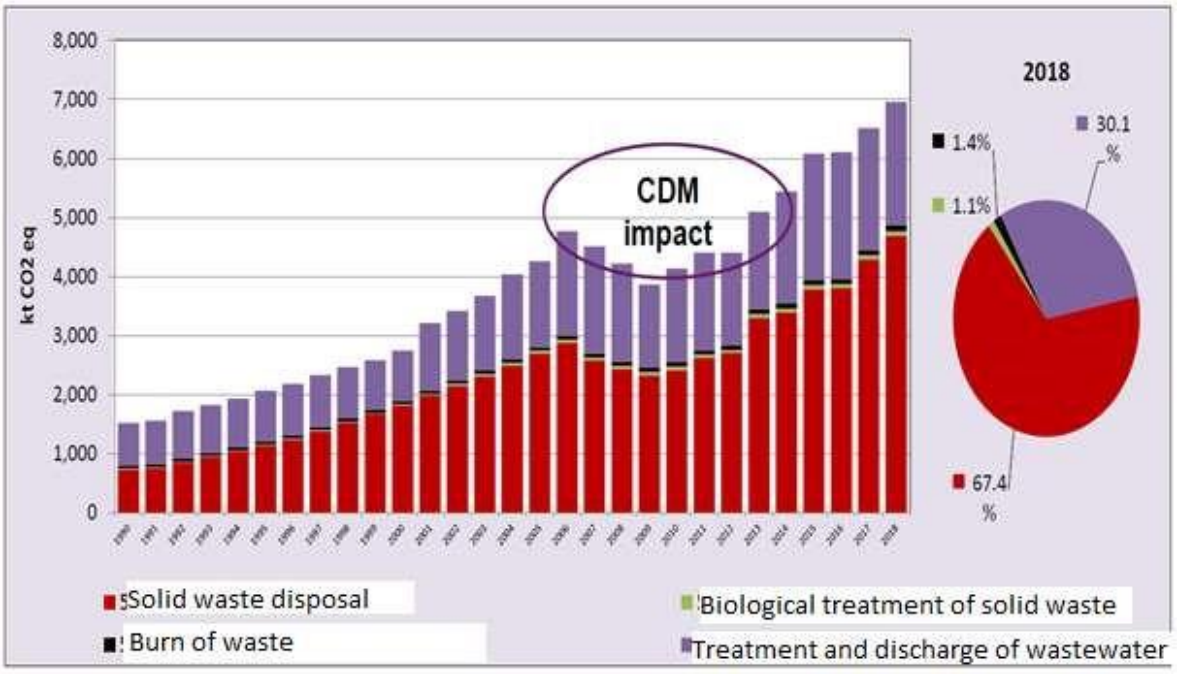


Figure 3 - CDM Impact (Reciclo Orgánicos, 2021: p.12)

II. Overview of government bodies involved in the planning, management and operation of the waste management.

[7] The Chilean projects registered at the UNFCCC for the CDM under the category of "Waste handling and disposal" are the following: (1) Coronel, (2) Regional landfill projects in Chile, (3) El Molle landfill, (4) Santa María de Liray compost, (5) El Panul landfill project, (6) Huasco valley Industry, (7) Lepanto landfill, (8) Russfin Biomass CHP Plant Project, (9) Corneche and Los Guindos methane capture, (10) Fundo Las Cruces landfill, (11) Quilpue Biogas, (7) Peralillo methane capture, (7) Maitenlahue and La manga swine manure, (8) Santa Marta landfill, (9) Loma Los Colorados landfill, (10) El Empalme landfill, (11) El Retamo landfill, (12) Bioenersis group of projects, (13) Pocillas and La Estrella swine manure treatment, (14) Cosmillo landfill, (15) Copielemu landfill, (16) Ramirana Emission Reduction Project of Agrícola Super Limitada, (17) De Martino WWTP upgrade

We should distinguish among several government bodies, according to the stage they are involved: policy level, authorizations and permits, and enforcement.

i. Policy level

In terms of policy, the Ministry of the Environment ("MMA") is the governmental body in charge of issuing new policies, standards, and regulations in general.

a. Environmental regulation framework.

According to the Law 19,300 of the Ministry General Secretariat of the Presidency, which stablishes the General Basis of the Environment ("LBGMA"), most relevant decisions in environmental policy making are presented by the Ministry of the Environment to the Council of Ministers for Sustainability ("CMS"). This is an interministerial body that proposes overall environmental policy to the President of the Republic and gives its opinion regarding environmental regulations prior to their approval.

The CMS is presided over by the MMA and also by the Ministers of Agriculture, Finance, Health, Economy, Development and Reconstruction, Energy, Public Works, Housing and Urban Planning, Transport and Telecommunications, Mining, and Planning.

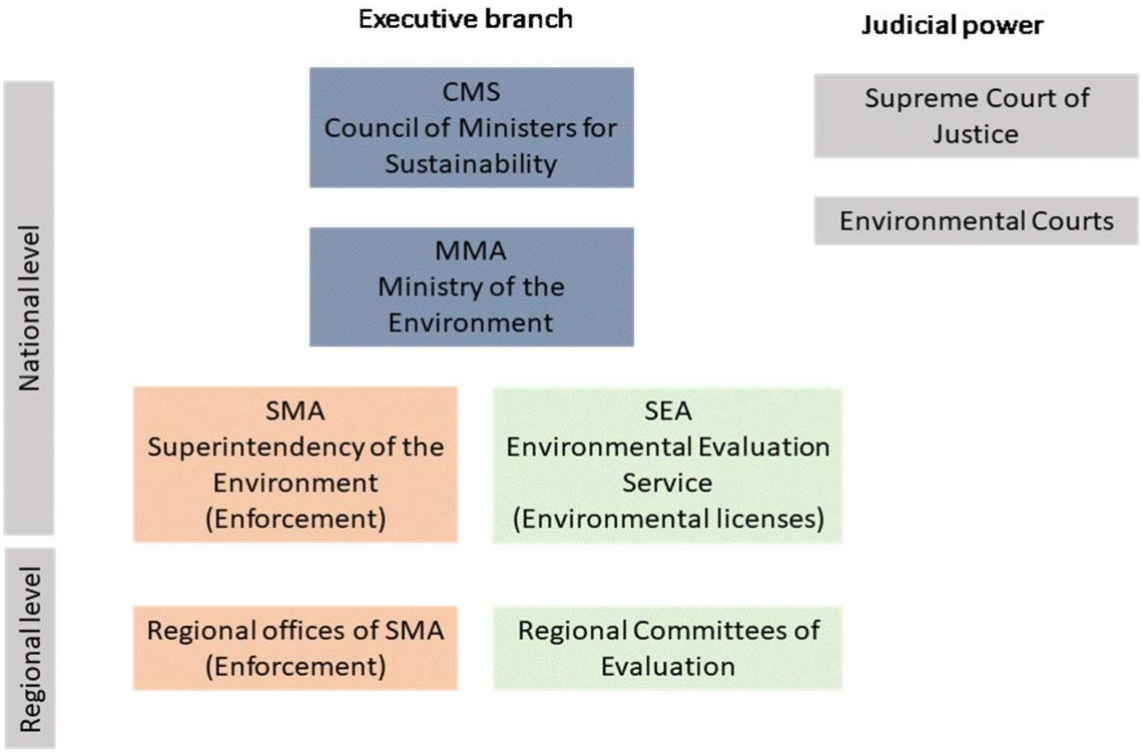


Figure 4 - Environmental authorities

b. Organic waste regulatory bodies

The National Organic Waste Strategy, on the other hand, proposes its own governance:

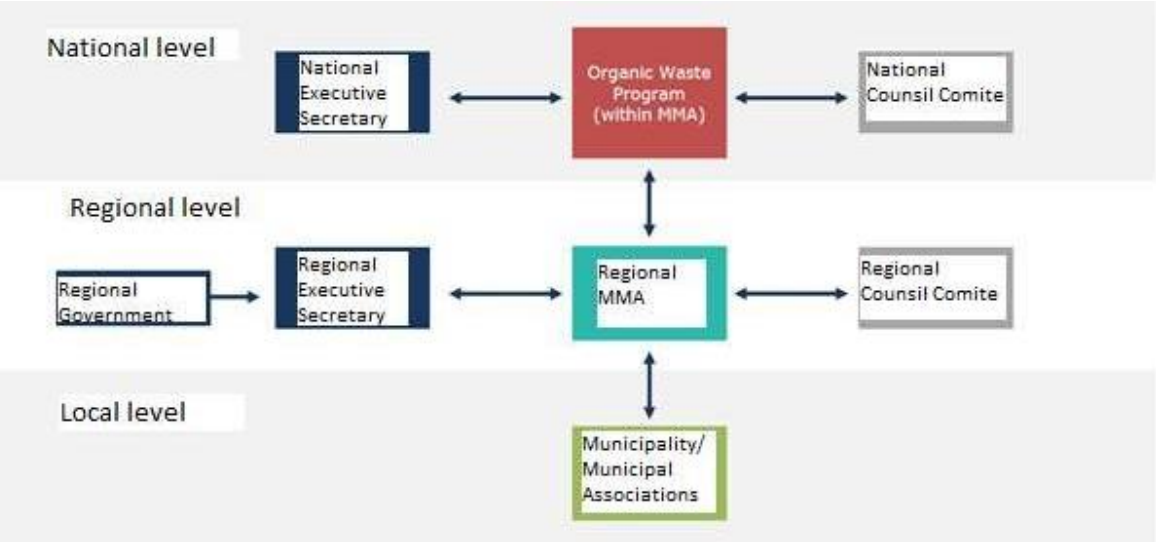


Figure 5 - Authorities involved in the National Organic Waste Strategy

Therefore, there are three levels of Governance. The national level, for the whole country, and at the subnational level we found the regional level (that gathers a group of municipalities), and the local level, the municipality.

In this case, though, it is only a policy strategy. Each agency or public service must perform their own activities according to their own legal statutes, or, preferably, according to those contained in the LBGMA.

c. Climate Change institutional framework.

Recently approved CC Framework Law appointed the MMA as the entity in charge of coordinating climate action and in charge of drafting diverse instruments, such as the long-term climate strategy, in collaboration with different sectorial entities.

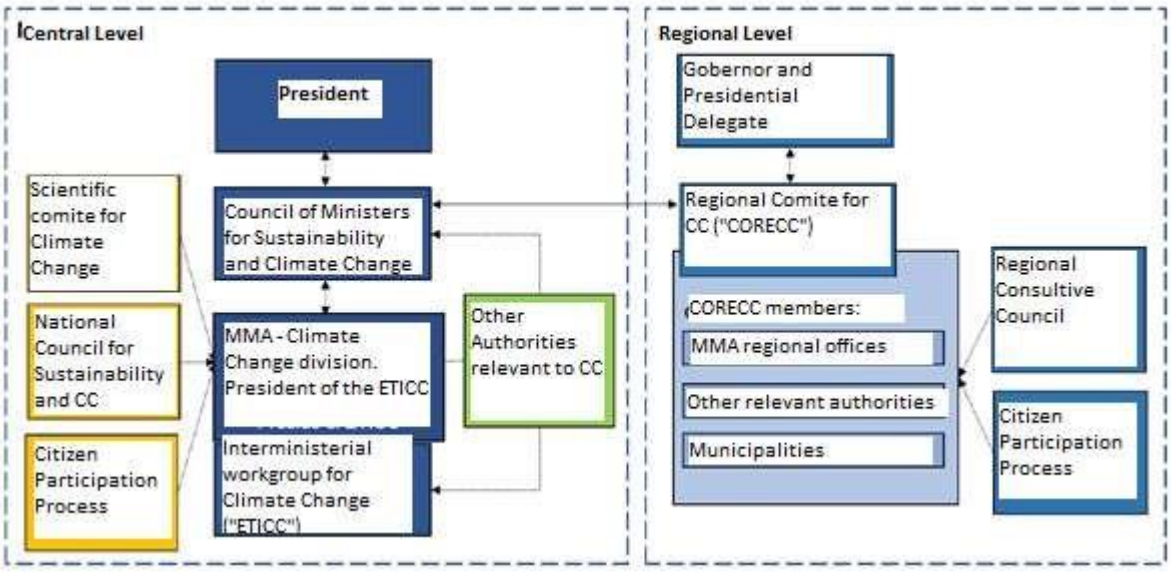


Figure 6 - Authorities involved in Climate Change policy

This governance is in charge of defining the following policy tools:

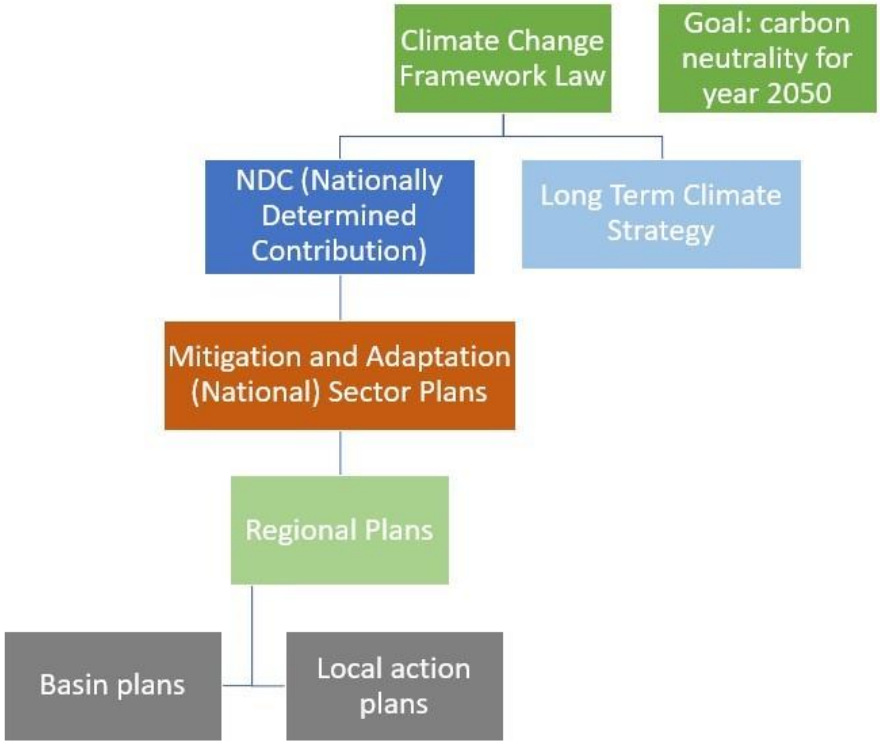


Figure 7 - Climate Change policy tools

At the end of the day, although they all look different, these governance schemes have a similar institutional design, and the same authorities in charge. They coexist and push for their own goals, within the governmental structures of the Chilean Government.

Indeed, for the three policy areas (environment, organic waste, and climate change), there are different board of ministries with legal responsibilities, that evaluate and approve or propose to the President of the Republic the approval of policies or regulations prepared by the Environmental Ministry to such governing board.

ii. Authorizations and permits

This is the most important chapter in terms of governance. The environmental approval of projects related to wastes of any kind is especially exigent in Chile because the studies required, and usually takes more time that what is expected.

The agency in charge of this process is the Environmental Evaluation Service ("SEA"), is part of the Ministry of Environment (see Figure 4). Decisions are adopted by the Regional Committees of Evaluation led by the Presidential Delegate and integrated by the regional representatives of the Ministries with environmental responsibilities.

In the case of Environmental Impact Assessment Statements ("DIA"), legal claims against the Environmental Assessment Approval (RCA) will be presented to the National Director of SEA.

In the case of Environmental Impact Assessment Studies ("EIA"), legal claims will be presented to the Board of Ministries[8].

iii. Enforcement

Environmental enforcement is defined in Law 20,417, Organic Law of the Superintendence of Environment ("LOSMA"). The Superintendence of Environment ("SMA") enforces all RCAs, as well as other environmental permits and regulations. SMA is a public body, functionally decentralized, endowed with its own legal personality and assets, subject to the oversight of the President of the Republic through the MMA.

[8] The Board of Ministries is integrated by the Ministries of all relevant Ministers for environmental assessment purposes. Its sole function is the decision of appeals against RCA that come from an EIA.

III. Overview of regulations and permitting for constructing and operating a waste sorting and anaerobic plant, including:

This report provides a brief description of the regulatory framework that affects an eventual AD plant, specifically the analysis of permits necessary to achieve its operation.

The foregoing, mainly considering the most relevant environmental permits and sectoral environmental permits, as well as the emission standards, safety requirements and specific requirements for biogas projects and their connection to the electricity grid. In this way, depending on the size and location of the project, it must manage different permits and/or commitments with the public services that are competent.

i. Environmental Evaluation Assessment System - SEIA.

One of the key instruments under Chilean law is the SEIA, which is managed by the SEA, to which all projects and activities must be submitted as specified by the Chilean law.

The SEIA is a preventive mechanism by which several types of projects (those mentioned in a list of projects in article 10 of the LBGMA) causing environmental impacts are assessed, prior to their environmental license.

The procedure for entering the SEIA is initiated at the request of the interested party. Any project or activity capable of causing an impact to the environment, including any modifications, can only be executed or changed following an assessment of its environmental impact.

According to the scale and duration of any potential environmental impact, projects can enter the system through a DIA or through an EIA. The main differences between both instruments relate to the level of detail in its contents, time frames for assessment and public participation.

According to the LBGMA and the Supreme Decree No.40/2012 of the MMA, which stablishes the Regulation of the SEIA ("SEIA Regulation"), an AD plant, that generates electricity should file an environmental impact assessment, based on the following types of projects or activities (article 10 of the LBGMA, article 3 of the SEIA Regulation)[9]:

> Article 3 letter b): High voltage power transmission lines (more than 23 Kv) and their substations.
>
> Article 3 letter c): Over 3 MW electric power generating plants.

[9] We have selected some of the categories that could apply to an AD plant. This revision must be carefully checked before making decisions for every specific project.

Article 3 letter h.2.): Industrial projects located in saturated or latent areas, with an emission of such pollutants equal or over 5% of the total daily emissions.

Article 3 letter k): Manufacturing installations, such as metallurgical, chemical, textile; building materials, equipment and metal product manufacturers, tanneries, all of industrial size.

It is considered industrial size those manufacturing facilities whose installed capacity is equal to or greater than two thousand kilovolt-amperes (2,000 KVA), determined by the sum of the capacities of transformers industrial establishment.

In the case of manufacturing facilities which use more than one type of energy and/or fuels, the limit of two thousand kilovolts ampere (2,000 KVA) will consider the sum equivalent of the different types of energy and/or used fuels.
Article 3 letter l): Agroindustry's, slaughterhouses, husbandry, dairy and animal breeding plants and stables of industrial size. Specifically:

- l.2. Slaughterhouses with the capacity to slaughter animals at a final total rate equal to or greater than five hundred tons per month (500 t/month), measured as slaughtered animal carcasses.
- Farms and stables for breeding, dairy and/or animal fattening, where they can be kept in confinement in food courts, for more than one continuous month, a number equal to or above:
- l.3.1 Three hundred (300) livestock animal units beef cattle;
- l.3.2 Two hundred (200) livestock animal units dairy cattle;
- l.3.3 Three thousand (3,000) minor pigs of twenty-five kilos (25 kg) or seven hundred fifty (750) major swine animals twenty-five kilos (25 kg); or
- l.3.4 Two thousand five hundred (2,500) animal units of sheep or goats.
- 1.4. Plants and stables for breeding, fattening, posture and/or reproduction of poultry animals with capacity to accommodate a daily amount equal to or greater than:
- l.4.1. Eighty-five thousand (85,000) chickens;
- l.4.2. Sixty thousand (60,000) hens;
- l.4.3. Sixteen thousand five hundred (16,500) turkeys; or
- l.4.4. An equivalent amount in live weight equal to or greater than one hundred and fifty tons (150 t) of other birds.
- 1.5. Farms and stables for breeding, dairy and/or fattening other animals, with the capacity to accommodate daily an equivalent amount in live weight equal to or greater than fifty tons (50 tons).

Article 3 letter n): Hydro-biological resources intensive development projects, culture, and processing plants.

Article 3 letter o): Environmental sanitation projects, such as sewage and drinking water systems, water or solid waste of domestic origin treatment plants, sanitary fills, underwater emissaries, liquid or solid industrial waste treatment or disposal systems.

Environmental sanitation projects shall be understood as set of works, services, techniques, devices or parts that correspond to:

- 1. wastewater sewage systems serve a population equal to or greater than ten thousand (10,000) inhabitants.
- 2. Sewage systems or water evacuation rains, when they are interconnected with networks of wastewater sewage system serving a population equal to or greater than ten thousand (10,000) inhabitants.
- 3. Drinking water systems that include works that capture and convey water from the place of uptake until delivery to the property of the user, considering the intermediate processes, and serving a population equal to or greater than ten thousand (10,000) inhabitants.
- 4. Source water treatment plants home care, serving an equal population or greater than two thousand five hundred (2,500) inhabitants.
- 5. Treatment and/or disposal plants household solid waste, landfills toilets, transfer stations and centers of collection and classification that meet a population equal to or greater than five thousand (5,000) inhabitants.
- 6. Submarine outfalls.
- 7. Treatment and/or disposal systems liquid industrial waste, which complies with the minus one of the following conditions:
  - 7.1 Contemplate within their facilities stabilization ponds;
  - 7.2 That its effluents are used for irrigation, infiltration, sprinkling and wetting of land or roads;
  - 7.3 That provide waste treatment service from third parties, or
  - 7.4 Treat effluents with a contaminant load daily average equal to or greater than equivalent to the sewage of a population of one hundred (100) people, in one or more than the parameters indicated in the respective regulation of waste discharges liquids.
- o.8. Treatment systems, disposal and/or, solid industrial waste disposal with a capacity equal to or greater than thirty tons per day (30 t/day) of treatment or equal to or greater than fifty tons (50 t) disposal.

Article 3 letter p): Execution of work, programs or activities in national parks, national reserves, natural monuments, wildlife reserves, nature sanctuaries, marine parks, marine reserves or in any other area under official protection, in the cases allowed by the respective legislation

The LBGMA establishes two ways in which the projects listed in Article 10 can be submitted to the SEIA: a DIA or an EIA, which is a stricter instrument of evaluation.

There are several differences between a DIA and an EIA, but the most important ones are:

- Level of information required: EIA require much more information than DIA.
- Assessment terms: The assessment of an EIA usually takes longer than a DIA:
  EIA usually takes between 1 to 2 years while DIA between 6 months to 1 year.
- Citizen Participation: All EIA have a Citizen Participation stage. In DIA, citizen must request the opening of this stage, which is not always granted.

- Identification of environmental impacts: DIA do not recognize the generation of significant impacts. EIA recognize the generation of an effect or impact of Article 11 of the LBGMA; therefore, the developer is obligated to submit a "Mitigation, Reparation or Compensation Plan" with all measures to mitigate, repair or compensate the impact.

Please note that, even though it is much preferable to file a DIA instead of an EIA, developers are not free to choose the assessment instrument. If the SEA identifies that the developer submitted the wrong instrument, the project can be early terminated or rejected.

The DIA is a sworn statement made by the project owner with regards to its plans and allows the relevant authority to assess whether its environmental impact is in accordance with current environmental regulations.

The EIA consists of a detailed description of the characteristics of the project or activity to be carried out or modified. This must be accompanied by supporting documents that allow for the prediction, identification and interpretation of the project's environmental impact and a description of the mitigation actions that will be adopted to prevent or minimize any significant adverse effects of the project.

In relation to the filing mechanism, a DIA is the general rule, unless the project or activity produces one of the following effects, characteristics or circumstances (article 11 LBGMA), in which case, an EIA will be required:

a) Hazard for human health, due to the amount and quality of the effluents, emissions or residues generated or produced.

b) Significant adverse effects on the quantity and quality of renewable natural resources, including land, water and air.

c) Resettlement of human communities or a significant alteration of human groups livelihood and customs.

d) Located adjacent to a protected population, resources and areas likely to be affected, as well as the environmental value of the territory in which they are intended to be undertaken

e) Significant alteration, in terms of extension and duration, of the scenic or tourist value of the area; and

f) An alteration of monuments, sites with an anthropological, archeological, historical value and, in general, belonging to the cultural heritage.

In both cases, the DIA or EIA is circulated among competent sectorial entities, which make comments and requests for the project holder to answer in a document named Addendum. In a descriptive process, these are the possible options:

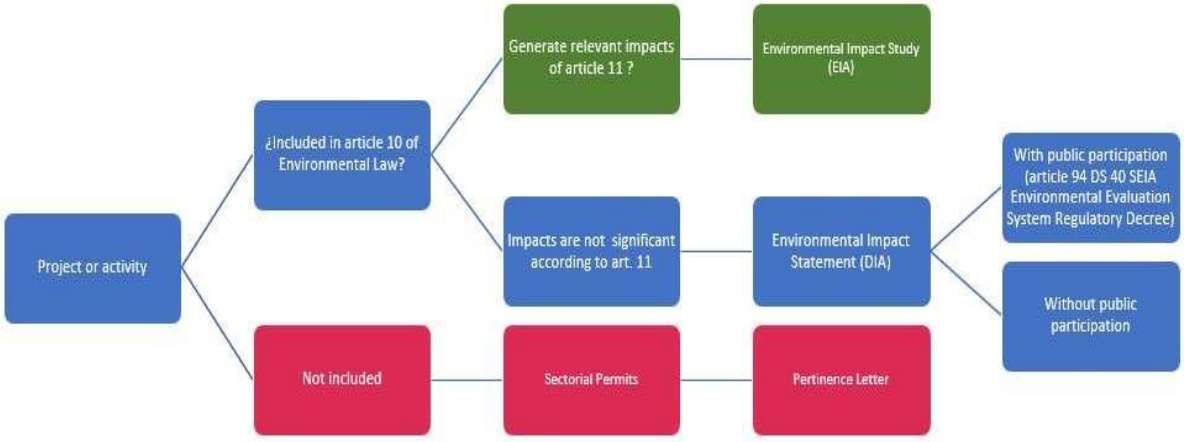


Figure 8 - Environmental impact assessment decision tree

If the SEA considers that the impacts of the project assessed by the DIA or EIA meet legal standards, and the DIA or EIA fulfils legal requirements, it will issue a Consolidated Assessment Report ("ICE"), where it will recommend approval of the project. Then, the Environmental Assessment Commission ("COEVA") of the respective region will vote on the approval or rejection of the project. Note that the COEVA is not bound by the recommendation of the SEA but only to those aspects regulated in statutes. If the COEVA approves, it will issue an favorable RCA, which authorizes execution of the project approved. The RCA must be strictly followed by the project holder, and to legally make changes considered as 'significant' to conditions or requirements of a RCA, it is necessary to assess such changes in the SEIA.

The RCA also approves environmental contents of several Environmental Sectorial Permits ("PAS"), detailed in the SEIA Regulation. When the contents of the PAS are solely environmental, they are granted in the RCA. When contents of the SEIA Regulation are environmental and sectorial, the RCA approves the environmental part of the relevant PAS. That is, the project proponent may show the RCA to the corresponding sectorial agency, which may not reject the permit on environmental grounds.

Whenever a project does not meet the criteria of article 10 and it is not obliged to submit an environmental impact assessment of any kind, then it is recommended to ask it formally to the SEIA through a Pertinence Letter, which is considered as if it had obtained an environmental permit, despite the need of sectorial permits that could be applicable as well.

ii. Environmental Sectoral Permits

It is important to point out that the favorable RCA will certify that the project or activity does not generate or present the effects, characteristics or circumstances established in article 11 of the LBGMA and that the project or activity complies with environmental regulations, including the requirements for each PAS, contained in the SEIA Regulation. The PAS are those permits, established in different laws and regulations, that have an environmental component. Those permits have been identified by the RCA as permits that are required, but

that have been approved in their environmental aspects when the project has been approved through the SEIA.

The PAS related to an AD Plant, that generates electricity at the Distribution grid, would be the following:

- Favorable Construction Report (Informe favorable para construcción) or PAS 160, as applicable, issued by the Agriculture and Livestock Service and Regional Housing and Urbanism Authority (PAS 160), if applicable.
- Industrial qualification permit (Calificación Industrial) issued by the Regional Office of the Health Ministry.
- Permit for archaeological, anthropological and for paleontological excavations issued by the National Council of Monuments (PAS 132), if applicable.
- Permit for the construction, repair modification and expansion intended for the evacuation treatment or final disposal for industrial or mining waste issued by the Regional Health Authority (PAS 138), if applicable.
- Permit for the construction, modification and expansion of waste treatment plants of any kind; or for the installation of any place that is destined to the accumulation, selection, industrialization, trade or final disposal of waste of any kind, issued by the Regional Health Authority (PAS 140), if applicable.
- Permit for the construction, modification and expansion of hazardous waste storage sites, issued by the Regional Health Authority (PAS 142), if applicable.
- Permit to hunt or capture examples of protected animal species for research purposes, for the establishment of breeding centers or hatcheries and for the sustainable use of resources, issued by the Agriculture and Livestock Service (PAS 146), if applicable
- Permit to carry out water channel modifications, issued by the Water General Direction (PAS 156), if applicable.
- Permit to cut native forests issued by the National Forestry Corporation (PAS 148), if applicable.
- Forestry Management Plan issued by the National Forestry Service (PAS 149), if applicable.
- Permit to carry out regularization and or defense works in natural water channels granted by the General Water Direction (PAS 157), if applicable.
- Compliance with voluntary environmental commitments and project execution conditions contained in the RCA, related to the construction stage, when applicable.

iii. Other sectorial permits not contained in the RCA:

- Provisional Patent and Definitive Patent (patente provisional y patente definitiva) issued by the Municipality, if applicable.
- Connection Criteria Report (Informe de Criterios de Conexión or “ICC”) and cost report, issued by the distribution company, in the case of a Small Distributed Generation Company (“PMGD”).
- Form No. 15, with the response to the ICC, by means of which the Company accepted the Connection Criteria Report.

- Technical feasibility of the Access Project approved by the Road Authority.
- Letter sent to the National Electric Coordinator ("CEN"), selecting the stabilized price as the regime for the valuation of the energy injections.
- Declaration of under construction of the Plant issued by the National Energy Commission ("CNE"), which allows the Plant benefit from the grandfathering period contained at interim article 2 of Decree No. 88.
- Municipal Preliminary Works Permit (Autorización de Obras Preliminares) issued by the local Municipal Works Department (Dirección de Obras Municipales or "DOM"), if applicable.
- Municipality Building Permit (Permiso de Construcción) issued by the DOM.
- Technical feasibility of the Crossing and/or parallelism project issued by the Roads Department of the Public Works Ministry.
- Crossing and/or parallelism permit issued by the Roads Department of the Public Works Ministry.
- Certificate of works reception (Certificado de recepción de obras) issued by the DOM.
- Favorable Report of Operation granted by the Regional Health Authority in the terms set forth in articles 80 and 83 of the Sanitary Code of the corresponding service provider.

iv. Specific regulations that apply to AD plants.

Technical standards on generation, production, storage, transportation and distribution of liquid fuels, gas and electricity, are responsibility of the Superintendency of Electricity ("SEC"). Compliance with the related regulations is mandatory, in particular, the regulations for the design, construction and operation of an AD plant.

Special regulations to be considered:

- Decree with Force of Law No. 1 of 1979, of the Ministry of Mining, Modified by Law 20,339: Establishes a Registry that will be kept by the SEC, for which it is the obligation of all biogas plants to register with the SEC, through the procedures that it has settled down.

- Supreme Decree No. 119/2017 of the Ministry of Energy that approves safety regulations in biogas plants and introduces modifications to the gas installers regulations.

This decree establishes the minimum safety requirements that biogas plants must meet in all their stages. The regulation establishes the minimum safety requirements that biogas plants must meet in the stages of design, construction, operation, maintenance, inspection and final completion of operations, in which the activities of reception, preparation and storage of substratum; production, storage, transfer, treatment, supply, use or consumption of biogas, and other related activities, as well as the obligations of the natural and legal persons involved in said activities in order to carry them out safely (Article 1).

This Regulation contains some specific definitions (Article 5):

- Biodigester: Container in which the anaerobic degradation of organic matter occurs, also known as digester, reactor or fermenter.

- Biogas production and supply facility: Facility located within a property where the activities of reception, preparation and storage of substrate, production, storage, treatment, transfer and supply of biogas are carried out indistinctly. These installations, in turn, can be small, medium or large in consideration of their nominal power.

  a) Small installations: Biogas production and supply installation whose nominal power is less than or equal to 180 kW.
  b) Medium installations: Biogas production and supply installation whose nominal power is greater than 180 kW and less than or equal to 900 kW.
  c) Large installations: Biogas production and supply installation whose nominal power is greater than 900 kW.

This regulation establishes some generic requirements that developers or operators, must consider for biogas plants. They must prepare, execute and/or supervise the design and construction of biogas plants in accordance with the provisions of this regulation and national or foreign standards, codes or specifications, as well as recommended practices. Once a biogas plant has been built and prior to its registration with the Superintendency, the gas installer must verify its correct operation, having to carry out visual inspections, tightness tests, equipment and instrumentation operation tests, Combustion of biogas appliances and/or adapted appliances, according to the standards or specifications under which they were designed (Article 28).

Regulation differs depending on the size of the AD plant. For instance, mediumsized facilities must have a gas detection system for hydrogen sulfide and methane in biogas consumption areas and compressor or blower areas (Article 36).

Big size facilities will have to comply with norms from Articles 40 to 43, among which, the most important are:

- The methane sensor of the gas detection system shall consider the application of two alarm thresholds, one at 20% of the lower explosive limit, by means of a remote alarm, and a second threshold at 40% of the lower explosive limit, which shall trigger an automatic shutdown system for biogas appliances and adapted appliances, biogas storage or other explosion risk areas that have been determined in the risk analysis (Article 41).

- They must have a certification of conformity with respect to the technical provisions and standards referred to in these regulations for the design and construction stages, carried out by a certification agency authorized by the Superintendency. The SEC shall determine the procedures for the certification and inspection of

installations, and those for the authorization of the respective organizations (Article 43).

In addition, the National Institute for Normalization ("INN"), who is in charge of establishing the official Technical Chilean Norms ("NCh")[10], has issued a special Guide NCh 3381:2016, that establishes considerations for the design and operation of AD plants, excluding associated safety matters. This standard does not establish requirements for sizing the parts and components of AD plants. It establishes a classification for AD plants according to the type of raw material processed in the plant. This standard does not apply either to handling and use of biogas, nor to degradation of organic matter in landfills and landfills.

[10] NCh are referential standards regarding various technical matters. They are not mandatory until a aw or another norm refers to it.

IV. Location of a waste treatment plant

Please note that the construction of any facility in Chile is regulated by the General Construction and Urbanism Law (known as "LGUC") and its Ordinance (known as "OGUC").

According to these norms, the location of any construction will depend on its compatibility with the applicable Zoning Plan.

Depending on the specific site chosen to develop the project, there could be a Municipal Zoning Plan, an Intercommunal/Metropolitan Zoning Plan, a Sectional Plan and/or an Urban Limit.

To accurately determine the Zoning Plans and the urban norms applicable to a certain property, any person can request a "Prior Information Certificate" to the Municipality. This certificate contains all the allowed uses and the prohibitions for that specific property.

The OGUC stablishes that a waste treatment plant or a transfer station must be located in a zone that allows "sanitary infrastructure". In case there are two or more applicable Zoning Plans, all of them must allow "sanitary infrastructure".

The Zoning Plans currently in force can be reviewed in the following link:
http://seguimientoipt.minvu.cl/main.php

The elaboration process of a Zoning Plan is very complex and includes a strategic environmental assessment[11]; therefore, once approved, all of the considerations regarding the nuisance or dangers of an activity such as a waste treatment plant (distance to human settlements, compatibility with other activities) are already incorporated in it.

That said, there are some cases where the Zoning Plan allows some uses (i.e. industrial, infrastructure, etc.) conditioned to a certain industrial rating. This rating is issued by the Regional Health Authority who assesses all the activities and components of an industry and rates them as "harmless", "annoying", "unhealthy", "polluting" or "dangerous"[12]. Keep in mind that the zones that allow unhealthy, polluting or dangerous activities are very few.

In case the project is located in a rural area with no applicable Zoning Plans, please note that, initially, this area only allows constructions related with agricultural activities, as well as the construction of a house for the owner and one worker.

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[11] Please note that this is different to the individual assessment of each project and corresponds to an environmental assessment of the entire Zoning Plan. In other words, while every project that meets the criteria of Article 10 of the LBGMA will have to be environmentally assessed (see Environmental Impact Assessment System chapter), some policy tools, such as Zoning Plans, also have to undergo an environmental assessment before approval. In the case of the former, it is a more global assessment.

[12] AD plants can be in any infrastructure zone that allows sanitary infrastructure. That said, the specific project has to be rated by the Regional Health Authority. With proper management and the implementation of measures to mitigate impacts, an AD Plant can be rated as harmless or annoying.

However, it is possible to request a special permit for constructions with a different purpose. This permit is known as the Favorable Construction Report or PAS 160 and consists of an authorization granted by the Regional Housing and Urbanism Authority and another one from the Agriculture and Livestock Service (see Sectorial Permits chapter above). In some cases, the authorization from the Regional Housing and Urbanism Authority is replaced by the Regional Government.

V. Environmental standards

Construction stage	
Emissions and Fluids	
Air pollution standards	
Prevention and Decontaminaction Plans	The applicable limits for emissions to the air will depend on the exact location of the plant. Emission limits are contained in Prevention or Decontamination Plans. However, Prevention or Decontamination Plans are specific for each of the 16 regions in Chile and not all regions have one. In case the area where the project is located has a Prevention and/or Decontamination Plan, exceeding the limit of emission for the regulated pollutant, will generate the obligation of compensating these emissions. Typically, these plans require the compensation of 120% of the exceeded emissions. During the construction stage, the emissions to the air are usually generated due to earth movement and transport by trucks. It is common that, during the environmental assessment of the Project, the different authorities ask for mitigation measures.
Fluids and wastewater	
Wastewater	During the operation stage, this kind of waste will come from the bathrooms of the workers. If the plant is located on an urban area, this kind of waste will be eliminated through the sewage system of the sanitation company who holds the sanitary concession in the area. In case the plant is in a rural area, it will have to obtain the authorization for a private sewage system that could include a plant for the treatment of this kind of waste. The authorization is granted by the Regional Health Authority. In case the treatment of this water is done by the project owner, the discharge will have to comply with the limits stablished below. Unlike the operation stage, for this stage, it is possible to obtain an authorization for a non-permanent sanitary solution.
Industrial Liquid Waste	The discharge of this kind of waste cannot be done freely. The limits for this waste are regulated by different norms depending on where they will be disposed. If they are to be disposed in the sea or continental courses of water, they have to comply with the limits of Supreme Decree 90/2000 of the Ministry of the General Secretary of the President. In case they are disposed to underground waters, they will have to comply with the limits stablished in Supreme Decree No.46/2003 of the Ministry of the General Secretary of the President. In case these waters are disposed to the public sewage, they will have to comply with the limits stablished by the Supreme Decree No.609/1998 of the Ministry of Public Works. It is very common that these companies offer the service of treating the water prior to the discharge to the sewage by means of a related company.

Other emissions	
Noise	The limit for the emission of noise for the entire country is established in Supreme Decree No. 38/2012 of the Ministry of Environment. Since the noise emissions during the construction stage are usually higher than for the operation stage, the authorities usually request mitigation measures during this stage. Please also note that certain municipalities have particular norms regarding noise limits for day hours and night hours.
Vibration	Please note that there is no emission norm for vibrations applicable to waste management plants. However, it is typical that authorities request information about these emissions during the environmental assessment process. To determine the limits applicable to these emissions, the project holder can use any of the reference norms contained in Article 11 of the SEIA Regulations (Supreme Decree No.40/2012 of the Ministry of Environment.
Odor	Usually, there are no significant odor emissions during this stage

Operation stage	
Emissions and Fluids	
Emissions	
Emissions to the air	As in the case of the construction stage, in this stage, the emissions to the air will be caused mostly by the movement of trucks from and to the plant. As in the case above, the limit will depend on each region (see Prevention and Decontaminaction Plans above).
Fluids and wastewater	
Wastewater	Please refer to wastewater during the construction stage. The only difference is that, in this case, the Health Authority cannot authorize temporary sanitary solutions (such as portable bathrooms).
Industrial Liquid Waste	Please refer to Industrial Liquid Waste in the construction stage.
Other emissions	
Noise	The limit for the emission of noise for the entire country is stablished in Supreme Decree No. 38/2012 of the Ministry of Environment. Please also note that certain municipalities have particular norms regarding noise limits for day hours and night hours.
Vibration	Usually, there are no significant vibration emissions during this stage
Odor	There is no regulation for odor emissions at a national level. There is only a project to regulate odors from the pork and fish industries, and there is a specific norm for cellulose plants. However, it is very common that one of the most important components during the environmental assessment of waste treatment plants is this. For this purpose, the authority will request the application of one of the reference norms of Article 11 of the SEIA Regulation and the elaboration of a odor management plan. Please note that there are also some odor regulations at municipal level that forbid "annoying odors".

VI. Regulatory framework for waste generation.

Chile has enjoyed rapid and sustained economic growth in recent decades. However, this economic growth has been accompanied by rapid increase in waste generation. Historically, the country has focused on the appropriate final disposal of waste through sanitary landfill. Until 1990 all the Municipal Solid Waste ("MSW") produced in Santiago was disposed of in landfills or dumping sites. Thanks to the policies introduced from the 1990s, the government improved quality landfill regulations and increased controlled post-closure programs, significantly reducing the number of dumpsites. The environmental problems generated by the hoarding of solid waste in landfills, such as GHG emissions, water pollution, land erosion, and the rapid filling of the landfills, led to the improvement of the current environmental and sanitary regulations.

In 2016 the Law 20,920 which established the Waste Management, Extended Producer Responsibility and Recycling Incentives Act ("REP Law"), was approved and officially published.

The law sets conditions for establishing an "Extended Producer's Responsibilities" ("REP") systems for six priority types of waste:

1. Tyres
2. Packaging
3. Lubricant oils
4. Electrical and electronic equipment waste ("WEEE")
5. Automotive batteries
6. Portable batteries

REP Law makes producers of priority products liable for organizing and financing systems to manage the products they market in Chile.

Under the REP Law, producers must:

i. Register in the Pollutant Release and Transfer Register ("RETC") system.
ii. Organize and finance the collection of waste generated from priority products anywhere on Chilean territory, as well as the storage, transportation and treatment of this waste by a system operator. iii. Comply with the objectives and other obligations set out in the decrees applicable to each category of priority product.
iv. Ensure that waste associated with priority products is managed by authorized and registered managers.

Despite these efforts to promote minimization of waste and recycling, organic wastes are collected by municipalities, usually by contracting private companies that transport and dispose organic waste.

In Chile, local governments are responsible by Law 18.695 (articles 3 and 20) of the collection, transportation, and disposal of municipal solid waste. This is a "privative responsibility", which means that it is an exclusive function, not shared with the national, nor the subnational governments.

Municipalities pay an average of $40 per ton of waste to be collected, transported, and disposed (Martínez Arce et al., 2010). However, as there is no specific policy about the way solid waste must be managed, each municipality has its own waste management system (Rojas et al., 2018).

According to the Ministry of the Environment, only 10% of waste is recycled. The rest of the waste is disposed of in landfills, which, in 2013, generated 34.8% of national Methane ("CH4") emissions, making the waste sector the second most relevant in terms of CH4 emissions (Ministry of Environment, 2016).

MSW is usually left in bags or containers on the street. The normal collection system takes all the mixed waste and then transports it to a transfer station or directly to landfill. Transfer stations aim to reduce transport costs, but there is no other value added in that process, meaning that usually transfer stations do not separate MSW, nor recycle.

Some municipalities have recycling programs and collect recyclable products on different days than organic waste. Other municipalities have "drop-off collection systems like the one introduced by the project Santiago Recycles. There are two types of locations, solitary bell-shaped container stations, and what in Chile is called "clean point" stations. A clean point station is a larger drop-off area that has various containers for different types of recyclable waste. Bell-shaped containers are usually associated with charity institutions, a main incentive the community has to separate and transport recyclable materials to this collection point. These drop-off stations can be managed by municipalities or by the recycling companies" (Rojas et al., 2018: P.5).

VII. Procurement and contracting for waste management.

i. Description of the MSW industry.

There is a saying in Chile, commonly used by journalists, that states: “in Chile, the least dirty thing of the MSW, is the waste”. Indeed, this industry has plenty of cases of corruption and anti-competitive practices against free competition.

A research journalist think tank, CIPER, has published several studies regarding the MSW industry and carried out a nationwide cadaster of the garbage category, reviewing contracts and budgets for this sector in the 14 regional capitals and 34 metropolitan urban communes. This link opens an interactive map of the MSW contracts of the main Chilean municipalities (CIPER, 2015). Main municipalities spend in MSW more than USD 90 MM, per year. The industry has 15 players, but 5 of them concentrate most of the contracts. Some of those contracts have been challenged by antitrust courts.

In terms of landfills, environmental and social constraints also reduce the options. Cities of the same region usually share one landfill. In Santiago, the capital, with more than 7 million inhabitants, has only 4 landfills.

Because the anti-competition problems that have characterized the collection and disposal of the MSW management industry, the National Economic Prosecutor (“FNE”), has published a set of General Instructions of general application (“ICG N° 3/2013”), that modify the previous General Instructions (ICG N° 1/2006), that demand municipalities to have special obligations of transparency and open access to their recollection and disposal contracts for MSW (FNE, 2013).

Likewise, in January 2013, the FNE published a Compendium of Criteria applicable to tendering for the collection, transportation, and disposal of household solid waste. These guidelines can be summarized as follows:

1. The tendering conditions for the collection, transportation and disposal of household solid waste shall ensure due transparency and guarantee free access, establishing general, uniform and objective conditions.
2. In the tendering processes, it should be explicitly defined the different services to be tendered.
3. Municipalities shall publish the call for tendering on the Public Market Portal at least 90 calendar days prior to the date foreseen for the receipt of tenders.
4. The tendering documents shall establish a minimum quality standard required of all proposals and shall establish as the main award criterion, the price offered, subject to this minimum quality standard. If parameters other than price are used for the final award of the tendering, they must be duly justified.
5. The tendering conditions must specify the composition of the evaluation committee and establish the guidelines to be used for the qualification bidders and their proposals.

6. Municipalities may not impose on those interested in participating in a tendering process requirement that grant artificial advantages that unjustifiably reduce the number of potential bidders in the respective bidding process.
7. The tendering conditions may not contain provisions that are a source of arbitrariness in the award. To the extent that this does not mean such arbitrariness, it is lawful for the municipalities to partially award some tendered services or declare a tendering void in those cases in which none of the proposals meets their needs. In case of declaring a tendering void, the municipalities will be obliged to start a new one, adjusting the bases of the same to the needs identified in the process declared void.
8. Clauses or provisions regarding the early waiver of actions before the Court for the Defense of Free Competition, or others that grant the respective municipality the right to terminate the contract awarded in advance without just cause, may not be included in the tendering conditions.
9. Practical application of the experience requirement must be carried out in such a way that said requirement does not constitute a barrier to market entry for new companies.
10. Incorporation in the tendering conditions of a detailed schedule that includes all the relevant milestones of the process. These milestones should include, by way of example, the following dates: publication of the call for bids; presentation of offers; award; subscription of the contract; and, start of services. In all these cases, the deadlines for each of these milestones must be specifically and clearly stated.

ii. Procurement schemes: tender, bilateral agreement and others if applicable:

Since Municipalities are public organizations, the determination of the allocation of household waste disposal services is generally carried out through municipal public tenders.

According to the Public Procurement Law, all agreements over US$68,000 overall, must be done by public tender. Exceptionally, public agreements can be achieved by private tender or a direct bilateral agreement in the following cases: there were no offers to the initial tender, emergencies, there is only one provider of the service or good, agreements with foreign entities to be executed outside the country, agreements that require confidentiality due to national security interest, and when the nature and circumstances of the agreement require a direct bilateral agreement.

With regard to the award criteria, the FNE states that "a harmonious interpretation of the purchasing and free competition regulations advises that the municipalities establish the price offered as the main award criterion. However, this does not exclude the use of other parameters as competition variables in the tender, to the extent that the criteria used to evaluate the bids are objective, previously and clearly established, and tend to ensure that the supply conditions of the services in question approximate those offered in a competitive market, both in terms of quantity, quality and price"[13].

[13] FNE, General Instructions N°3/2013

Therefore, Municipalities could propose different criteria, rather than just selecting by price, but this has to be justified before the FNE.

The award of the contract must be approved by the Mayor, together with the Municipal Council. Indeed, article 65 letter j), in coordination with article 79 letter b), of Law No. 18,575 Organic Constitutional Law of Municipalities prescribes in its letter j) that the Mayor requires the agreement of the Municipal Council to enter into agreements and contracts involving amounts equal to or greater than the equivalent of 500 UTM (USD 35,000 approximately). Regarding the quorums, as a general rule, the agreement of the absolute majority of the Council will be required, unless they commit the municipality for a term that exceeds the mayoral period, in which case the agreement of two thirds of said Council will be required.

In relation to this matter, article 6 of Law No. 19,886 of Bases on Administrative Contracts for the Supply and Provision of Services contemplates a subparagraph especially related to the bidding bases and adjudications of solid waste collection services. domiciliary, noting that these must be submitted to the review process by the Comptroller General of the Republic.

- Time frame and the process until the final granting of a contract

The Public Procurement Law and its Regulations do not regulate maximum terms for the duration of a tendering process.

As previously mentioned, the MSW tendering processes are established internally by each municipality, having as a limit the provisions of Law 19,886, regarding other aspects of the tendering process, e.g., requirements of the tendering conditions. Therefore, it is not possible to set the parameters of the process times in advance.

Notwithstanding the above, Contracting Resolution No. 26, which establishes recommendations for greater efficiency in the procurement of public goods and services, issued by the institution in charge of public procurement and tendering processes, Dirección de Compras y Contratación Pública, contemplates that tendering processes must establish terms that allow the necessary time for potential bidders to adequately prepare their bids, respecting the minimum terms of the Regulations of Law 19,886.

As a general rule, tendering processes include the following stages[14]:

1. Publication through the State's Public Procurement System website.
2. Period for receiving inquiries and clarifications on the tendering conditions. This usually takes place after the first week of publication, for a couple of days.
3. Contacts during the tendering process and clarifications by the Technical Unit, with a minimum recommendation of 30 calendar days for bidders to adjust their offers.
4. Date of bid opening and bid bond opening, which usually takes place within 1 day.

[14] This matter is established in general terms, considering they may vary depending on each Municipality.

5. Deadline extension period. If two or fewer bids are received, the closing date may be automatically extended by 2 additional working days.
6. Proposal evaluation period
7. Award or rejection of proposals
8. Contract execution period, which may vary from 7 to 15 working days from the date of publication of the tender.

According to the Public Procurement Resolution No. 18, which establishes Recommendations for the Tendering of Concessions for Collection, Transportation and Disposal of Domestic Solid Waste Services of the Direccion de Compras y Contratación Pública, it establishes that a minimum term of 60 calendar days from the call for the process must be established.

Regarding the duration of contracts for the provision of these services, the previous directive recommends that these contracts should not exceed 5 years, in order to allow for dynamism and competition in this market. No automatic renovations are recommended by FNE.

- Contracts do not have a minimum guarantee of waste supply

Contracts do not have a minimum guarantee of waste supply. The actual amount will depend on the generation of waste of each municipality. Tendering companies must consider the previous dimensions of the respective municipality. For example, the municipality of Puente Alto, with a size of 88 square kilometers and a population of approximately 620.000 inhabitants, has an average daily waste accumulation of 700 tons. In contrast, for example, the commune of San Miguel, with a size of 9.6 square kilometers and a population of approximately 91,000 inhabitants, has an average accumulation of 113.3 tons per day.

iii. Contractual relationship between landfills and municipalities.

Landfills, specially in bigger urban areas, are generally owned by private companies, that provide recollection of MSW and intermediate and /or final disposition. Based on the analysis of tendering conditions and award contracts, as a general rule, there are collection services from the municipalities to transfer stations or intermediate stations to be later taken by the same company to a sanitary landfill for final disposal. In rural municipalities, there is usually no intermediate station; instead, direct transfers are made to sanitary landfills.

There is no legal provision that determines the pre-established duration of the contracts. These may vary from 1 to 5 years.

As a general rule, subject to modification on a case-by-case basis, the contracts have a fee for intermediate disposal and another for final disposal.

- Is there a difference in the terms of contract between granting via tendering and granting via concession?

Tendering refers to the services of recollecting MSW and disposing it. But when the public bidding includes the operation of a municipal landfill, that could even be used by other municipalities and / or private companies, then a concession of the landfill is required.

Urban municipalities only contract for waste collection and intermediate and final disposal services. There are some municipalities, especially rural ones, that have concession contracts for final disposal sites.

- How is the gate fee determined? Is it based on a calculation? If so, what are the inputs for the calculation and which entity is responsible in determining it?

Based on the analysis of the tendering conditions and award contracts, competing companies propose their tariffs, in Chilean pesos plus and adjustment variable, by ton recollected and disposed at either an intermediate site or at a landfill. Therefore, the determination of fees depends on each bidding process, but they are usually by ton of MSW recollected and disposed, including both services within the same bidding process when the landfill is private, or only the recollection, when the landfill is municipally owned.

According to the Public Procurement Resolution No. 18, which establishes Recommendations for the Tendering of Concessions for Collection, Transportation and Disposal of Domestic Solid Waste Services of the Direccion de Compras y Contratación Pública, the tendering conditions must include bid bonds and contract performance bonds, or the subscription of bank guarantee bonds in favor of the respective municipalities. For example, in the case of the Municipality of Providencia, it is for an amount of 500 UF.

It is also common to require contractors to subscribe civil liability insurance in order to respond for eventual indemnities that the Municipality is judicially obliged to pay.

iv. Restrictions and regulations on foreign investment in local waste infrastructure, if any

We have not identified any restrictions on foreign investment in this matter.

VIII. Regulations on fertilizer, compost and biomethane

i. Introduction.

The construction of a biogas plant in a rural area translates into a new way of complete utilization of organic matter. The recovery of residual organic biomass agriculture transforms the single-use modality into a multiple system. with digestion anaerobic, two types of products are obtained: one is biogas, used mainly as fuel and the other, the stabilized organic residual sludge, used as a conditioner and/or soil biofertilizer.

Regarding this process, the Biogas Handbook states that: The bioprocesses used to stabilize organic waste are based on digestion aerobic type (composting, vermiculture) or anaerobic type (fermentation with production of biogas). The chemical composition of the products obtained in each case, compost and biofertilizer, is variable, depending on the raw material used and the stabilization time.

In general, obtaining a stabilized organic product is observed, with a drastic reduction of total coliforms, improving the sanitary quality, presenting a good biological activity and adequate development of nitrous and nitric ferments, of the microflora total, fungi and yeasts, which would allow a good complement when these are incorporated materials to unproductive sites (Ministerio de Energía, 2011: P.69).

In relation with stabilized organic residual sludge, it is important to note that there are two norms that regulate its use.

The technical characteristics for the disposal of sludges coming from a waste treatment plant for fruits and vegetables are contained in Supreme Decree No.3/2012 of the Ministry of Environment[15].

ii. Definition, quality standard, pricing and application of fertilizer from a waste AD plant

As we explained before, in Chile there is no legal body that regulates the use of agroindustrial waters in irrigation, and/or soils, which is why when considering the possibility that these Liquid Industrial Waste (known as "RILES") are used in the irrigation of plant species, compliance with the Official Chilean Norm NCh1,333 Off. 1978 "Water Quality Requirements

[15] Only in the case the AD plant receives sludges from agroindustry or other industries, note that, according to Supreme Decree No.4/2009 of the Ministry of Health, which regulates the management of sludge that comes from liquid waste treatment plants, only sludges rated as Class A o Class B can be applied to soil as a fertilizer. The application of both types must be approved by the Agriculture and Livestock Service, who has to review and approve an "Application Plan", prior to the use of the sludge.
In the case the received sludges come from wastewater treatments plants that process fruits and vegetables, the Supreme Decree No.3/2012 of the Ministry of Environment allows a simplified process for its application on soils.

for Different Uses – Water Requirements for Irrigation, declared official by Supreme Decree No. 867/78 of the Ministry of Public Works, is required, as a reference standard.

The advantage is that the main contamination parameter that this standard considers are coliforms, since this regulation lacks regulated values for a set of parameters that are normally present in Industrial Liquid Waste. In this sense, the regulations that regulate the discharge of RILES to different bodies of surface water, constitute an upper limit value compared to other possibilities of disposal of RILES. However, it is evident that the standard was not developed for irrigation with RILES, which is why the Agriculture and Livestock Service ("SAG") prepared a technical document that proposes the basic conditions for the application of RILES in irrigation: Guide for disposal of effluents to the soil, G-PR-GA-001".

The disposal of RILES on the soil is considered irrigation when it satisfies the water needs of a crop or some plant species, and it will be considered disposal when the RIL is applied to the soil in a controlled manner, regardless of the presence or absence of a crop. Notwithstanding the foregoing, the SAG, within the environmental evaluation, apart from the Biological oxygen demand -BOD5- balance, will also request a nitrogen balance that will probably determine the surface necessary for the layout. Additionally, it should be taken into account that requirements may be established for the storage of the digestate for dates and times when it is not possible to irrigate or dispose of it (times of high rainfall), which may require some type of pond or dam for temporary storage of liquid digestate.

Additionally, a digestate sanitation requirement may be established prior to its disposal to ensure sanitation in the fields that receive the digestate.

Regarding solid digestate, an AD plant must comply with the Chilean Standard NCh 3.375:2015 "Digestate - Quality Requirements". The foregoing mainly in terms of content of hygienic parameters, odor, heavy metals, degree of fermentation, organic matter and contamination with foreign matter. A monitoring plan and all the records required by the aforementioned standard must be carried out. Once compliance with this technical standard has been demonstrated, it is considered less complex to obtain environmental permits associated with the use of solid digestate as fertilizer.

Regarding the industry of fertilizers stores (Lizama, 2018), we have found that is the most commonly used product to be found in most specialized retail stores:

Suppliers and Products					
Suppliers	Stimulant	Fertilizer	Earth	Rooting Agent	Compost
Anasac	X	X	X	X	X
Armony		X	X		
Best garden		X			
Comercializadora VH			X		
Eco opción		X			
Ergo		X	X		
Jarditec		X			
Otto		X		X	
Pot garden		X	X		
Roots		X	X		X
Troots		X			

Figure 9 - Fertilizer products and suppliers (Lizama, 2018: P.50)

Regarding prices, we have found a recent study that conclude that fertilizers are around $2,000 per kilo (about USD2.5 /kl).

Retailer								
Product type	Suppliers	Code	Form	Measure	Qty	Description	Price	Origin
Fertilizers	Best garden	73294-X	Saco	Kilos	1	Humus enhancer	1.990	Organic
	Anasac	51224-9	Saco	Kilos	1	Humus enhancer	1.990	
	Anasac	51223-0	Saco	Kilos	3	Humus enhancer	3.690	
	Anasac		Saco	Kilos	1	Vermicompost	1.990	
	Anasac		Saco	Kilos	3	humus	$ 3.690	

Figure 10 - Referential prices of hummus fertilizers stores (Lizama, 2018: P.68)

iii. Definition, quality standard, pricing and application of compost from a waste AD plant

As in the previous chapter of fertilizers from an AD plant, there is no law, nor a standard defined for Compost, but there is a Technical regulation, that has to be considered as a reference standard: the Official Chilean Norm NCh2880.Of2002“Compost. Categories and requisites”.

According to NCh 2880 (2015), it is defined as the product that results from the composting process, it is mainly constituted by stabilized organic matter, where its origin is not recognized, since it degrades generating finer and darker particles. Composting is defined as a low-cost technology that allows transforming waste into organic by-products, biologically stable materials that can be used as soil amendments and/or fertilizers and as substrates for soilless cultivation, reducing their environmental impact and enabling the use of the resources they contain.

According to the quality of the compost, the Chilean standard classifies it as follows (INN, 2015):

- Class A Compost

Product of the high level and quality that meets the requirements established in this standard for Class A compost. It must comply with the maximum concentrations of metals established in the nch2880 standard. Its carbon/nitrogen ratio must be less than or equal to 25. And it must comply with the following maximum concentrations of heavy metals.

Heavy Metal	Maximun concentration in mg/kg of compost (dry base*)
Arsenic	15
Cadmium	0,7
Copper	70
Chromium	70
Mercury	0,4
Nickel	25
Lead	45
Zinc	200
* Concentrations shown as total content	

Figure 11 - Maximum concentrations of heavy metals in class A compost

- Class B Compost

Intermediate quality level product that meets the requirements established in the class B compost standard. It must meet the maximum concentrations of metals expressed in the following table. Its electrical conductivity must be less than eight decisiemens per meter (8dS/m) and its carbon/nitrogen ratio must be less than or equal to 30.

Heavy Metal	Maximun concentration in mg/kg of compost (dry base*)
Arsenic	33
Cadmium	9
Copper	400
Chromium	100
Mercury	2
Nickel	80
Lead	220
Zinc	800
* Concentrations shown as total content	

Figure 12 - Maximum concentrations of heavy metals in class B compost

- Compost market in Chile (Producers).

Within the Metropolitan Region, the following compost producers were identified:

Name	Address	Borough	Phone	Contact name	Activity
Agroindustrial Pullihue ltda	Av. Departamental N°8250 lote B,	Peñalolen	2841251 - 2841967	Enrique Vial Claro	Compost from vegetal waste, tree branches and horse manure
Planta de Compostación Aguila Norte	Parc. 28-B3. Comunidad Aguila Norte	Paine	09-1280122	José Tomás	Compost elaboration plant
Planta de Compostaje de Idea Corp.	Cam. Catemito Parc. N°6	San Bernardo	8563692 8595519	Carlos Deuster, Felipe Cifuentes	Compost from vegetal waste, tree branches and bio waste.
Reciclajes industriales S.A	Camino Lo Boza Km. 4,5	Pudahuel	2 583 81 37 / 2 583 81 83		Compost elaboration plant

Figure 13 - Compost producers identified in the Metropolitan Region

Regarding compost prices, this same study shows the following:

Retailer								
Product type	Supplier	SKU	Format	Unit	Qty	Description	Price	Origin
Compost	Anasac	46200-4	Sack	Kilo	50	Compost leaf soil	$5.490	Organic
Compost	Anasac			Liter	80	Compost organic soil	$5.490	
Compost	Roots			Liter	80	Compost soil	$6.490	

Figure 14 - Referencial prices of compost

iv. Definition, quality standard for sale, pricing and potential off-takers of biomethane from a waste AD plant

The Ministry of Energy, with the support of UNDP, FAO and GEF, has published a complete "Biogas handbook", to foster the production of renewable energy from this source.

A methane-enriched biogas is one that has a higher methane concentration to 95%. To reach this concentration, the carbon dioxide ("CO2"), must be removed. For most of the simpler biogas applications such as heaters, engines of internal combustion or generating systems, the removal of CO2 from the biogas is not necessary and the CO2 simply passes through the burner or engine. For more complex applications of biogas, such as vehicles, which require higher density fuels, the CO2 must be removed. The removal of CO2 increases the calorific power and generates a quality gas like that of natural gas.

As explained before, Supreme Decree No. 119/2017 of the Ministry of Energy contains the specific regulations for AD plants. It defines (Article 5, 10) Biogas as: "Gas obtained by anaerobic digestion processes of matter organic, whose main components are CH4, and CO2, with the presence of other components such as nitrogen ("N2"), oxygen (O2), hydrogen sulfide ("H2S"), water vapor and others to a lesser extent.

Regarding the size of this industry, a study by the German Technical Cooperation ("GTZ") and the CNE (CNE/GTZ, 2007) determined that the potential, at the national level, for

biomethane is 1,562 million m3 per year, although, these figures are considered conservative by some companies, such as Metrogas (Nelson, 2010), that consider the potential in the Metropolitan Region alone could amount to 250,000 m3 (around 91.2 million m3 per year) of natural gas equivalent per day and could reach 400,000 in 2017 (around 150 million m3). m3 per year).

IX. The PMGD Regime

The laws and regulations applicable to the PMGD regime are the following:

1) Decree with Force of Law No. 4/20018, Ministry of Energy, General Law of Electric Services ("GLES").
2) Decree No. 88, Ministry of Energy, Approves Regulations for Small Scale Power Plants ("Decree No. 88").
3) Decree No. 86/2013, Ministry of Energy, Regulation for the determination of nodal prices ("Decree No. 86") complemented by Exempt Resolution No. 641/2016 from the Ministry of Energy, that establishes the terms, requirements, and conditions for the determination of the short-term nodal price.
4) Technical Norm for PMGDs Connection and Operation ("NTCO").
5) Technical Norm for Safety and Quality Service ("NTSyCS").

i PMGD Definition.

Decree No. 88 defines PMGDs as "power plants which surplus of power is less or equal than 9,000 kilowatts, connected to facilities from a distribution company or to facilities from a company that owns distribution lines that use public lands".
It is relevant to point out that to connect a PMGD to the distribution grid there is the need that the distribution line and substation to which the energy is sent have enough capacity to receive the energy of the PMGD, otherwise, such injections will be limited to the remaining capacity available.

ii PMGDs Regime Main Features.

(a) Option to choose price regime. According to article 9 of Decree No. 88, owners and or operators of PMGDs have the right to choose between the following mechanism for the valuation of their energy injections: (i) instant marginal cost (general regime), (ii) stabilized prices mechanism, or, (iii) under some circumstances PMGDs can opt to dispatch their energy in accordance with the stabilized price regime.

(i) Instant Marginal Cost. It is the hourly marginal cost calculated by the National Electric Coordinator at the primary distribution substation that is closer to the connection point of the PMGD. Considering that the instant marginal costs is changing constantly, it is uncommon that PMGDs chooses to valorize their energy injections in accordance with this option, especially because it is difficult to obtain banking financing with this option.

(ii) Stabilized Prices Mechanism: The prices will be set by the Ministry of Energy biannually, in May and November, based on technical reports prepared by the CNE, and will rule from July and January each semester.
For the calculation of the stabilized prices the CNE will determine the Basic Price of Energy by Hourly Blocks for each bar of the national transmission system in which the Short-Term

Nodal Price is calculated, so it represents the system´s operation in 6 hourly blocks. These blocks are the following:

Block No.	Schedule
1	00:00 – 3.59
2	4:00 – 7:59
3	8:00 – 11:59
4	12:00 – 15:59
5	16:00 – 19:59
6	20:00 – 23:59

The formula to calculate the Basic Price of Energy by Hourly Blocks, which is based on the results of the short-term nodal price determination process made on February and August of the correspondent year, is contained in detail in article 19 of the Decree No. 88.
Once the Basic Price of Energy by Hourly Blocks is defined, the CNE must apply an adjustment of those prices considering a Market Price Band. The details of such adjustment band mechanism are contained from article 20 to 26 of the Decree No. 88.

(iii) Stabilized Price Regime. Please be aware that current regulations also consider a transitory period ("Grandfathering Period") under which PMGD projects can opt to sell their energy in accordance with a third regime which is the stabilized price regime. An PMGD will be able to opt to dispatch its energy in accordance with such regime for a period of 165 months counted from the publication of Decree No. 88 in the Official Gazette (such publication was made in October 8, 2020).

Such alternative is only available to:

(i) PMGDs under operation at the time Decree No. 88 was enacted; and

(ii) PMGDs not operating at the time the new regulation was enacted, as long as they opt to valorise their energy injections at the current stabilized price regime within the 48 months following the publication of Decree No. 88 in the Official Gazette, and only if the PMGD complies with any of the following conditions:

- The PMGD (i) obtains their connection permit to the distribution grid (named "ICC" for its initials in Spanish) within a period of 7 months counted from the publication of the new regulation in the Official Gazette, and (ii) obtain their declaration as under construction that is granted by the CNE within a period of 18

months counted from the publication of the new decree in the Official Gazette (this is no later than April 8, 2022[16]); or

- PMGD that fulfils the following conditions: (i) their environmental impact study (EIA), environmental impact declaration (DIA) or pertinence letter has been submitted before the Environmental Impact Assessment System or Environmental Evaluation Service, as applicable, within a period of 7 months counted from the publication of the new regulation in the Official Gazette (this requirement will not be understood as fulfilled if the EIA or DIA are early dismissed by the environmental authority pursuant to arts 15 bis and 18 bis of the LBGMA), and (ii) obtain their declaration as under construction within a period of 18 months counted from the publication of the new regulation in the Official Gazette.

The stabilized price is the energy short term nodal price for the national bar linked to the primary distribution substation related to the PMGD injection. The shortterm nodal price will be determined by the CNE every six months. Its determination will be reported to the Ministry of Energy who will issue the shortterm nodal price decree.
The elements that comprise the energy short-term nodal price and the guidelines for its calculation are subject matter of a legal level, specifically at the General Law of Electric Services, art. 162, as amended by the Law 20,936 enacted on 2016. That article is complemented by Decree No. 86 and by Exempt Resolution No. 641/2016, both from the Ministry of Energy.

(b) Payment: The difference of valuation between the PMGD injections valued at the stabilized prices mechanism and the correspondent hourly marginal cost, will be assigned by the CEN in proportion to the energy withdrawals at the respective system node, among all the companies that make withdrawals from such system (Article 14).The payment will correspond to the product of the MWh injected in the grid multiplied by the price applicable (in the case of the old regime by the price applicable to the 24 hours and in the new regime to the hourly block in which the energy was injected).

This is an important feature of the stabilized prices mechanism, because it is not a feed-in tariff mechanism since it will be calculated every six months based on the abovementioned rules and does not rely on a subsidy paid by the administration with public funds.
Additionally, note that PMGD projects can receive payments for their capacity. In accordance with article 72-17 of the General Electric Services Law, generation facilities under operation can make capacity transferences among them. Current regulation of such transferences is

[16] The Ministry of Energy has filed to the General Comptroller Office for its legality control, a new regulation that would allow to fulfil this requirement if the declaration as under construction request is filed to the National Energy Commission no later than April 8, 2022, even though the declaration as under construction itself is granted afterwards.

governed under Decree No. 62 of the Ministry of Economy, that Approves the Regulations for the Transferences of Capacity Among Generation Companies ("Decree 62").[17]
In accordance with article 162 of the General Electric Services Law, capacity transferences must be conducted based on the generation capacity and its compatibility with sufficiency ("Sufficiency Capacity") and the rush demand commitments, this is the average demand of the 52 highest hourly values of the annual load of each electrical system ("Rush Commitments").

In accordance with Decree 62, Sufficiency Capacity is the capacity that the generation unit provides to the sufficiency capacity of the electric system or subsystems. Remuneration to be paid are determined based on the Sufficiency Capacity.
To determine the capacity transferences, Decree 62 created capacity balances per electrical system or subsystem. These balances aim to determine which generation companies injected more power than the power they withdraw. If a company has capacity surplus, it can sell it at the node price.

(c) Auto dispatch: PMGDs operate with auto dispatch, which means that the PMGD operator will be responsible for the determination of the power and energy to be injected into the distribution grid in which it is connected. This is an important benefit of this type of generation projects, as they are not subject to the general rule in Chile which is that power plants can only dispatch by the merit order based on the lowest marginal cost of generation.

Notwithstanding the above, PMGDs, are considered coordinated companies and as all the participants of the electric system, they could be subject to temporary restrictions over the dispatch issued by the CEN due to safety or security reasons.

(d) Minimum permanence: The PMGD owner that chooses to sell its energy under the stabilized price regime shall communicate its decision to the CEN at least 1 months prior to the entrance into operation. The minimum permanence term in such regime is 4 years and the option to change the regime must be communicated to the CEN at least 6 months in advance (Article 12).

With regards to the abovementioned rules that govern the permanence in the stabilized price regime and related communications, it is important to note that: (i) There is no maximum period of time for a PMGD to remain subject to the stabilized price regime. Consistently, a PMGD which decides to maintain the regime for a new 4-year period is not required to send a communication to the CEN notifying such permanence, which is assumed by the authority. (ii) The communication rules contained in Decree No. 88 only refers to the minimum anticipation period that the PMGD owner and/or operator has to communicate its decision to choose or change the energy transfer valuation regime, but it does not establish a maximum period of anticipation to announce such decision.

[17] Please be aware that there is currently a new Decree, which is Decree No. 3 of year 2022, from the Ministry of Energy that aims to replace Decree 62. Decree No. 3 is currently at the General Comptroller Office for a legality control (toma de razón). In case passing the control, it will be enacted and will replace Decree 62. i

(e) **Fractioning Prohibition:** Decree No. 88 incorporates a fractioning prohibition. The National Energy Commission shall analyze whether the PMGD complies with the threshold of the 9 MW power surplus so a generation project can qualify as a PMGD, therefore, it can benefit from the special conditions of these type of projects, such as stabilized prices mechanism and auto dispatch, among other features.

As a consequence of such analysis, the CNE is prevented from declaring a PMGD as under construction if the PMGD has been fractioned (this is, that a larger project has been divided in two or more projects below 9 MW in order to qualify as several PMGD projects) or has been developed in two or more stages. In this regard, the CNE must consider the information of the particular project provided within the request of sectorial permits, its geographical location, its ownership, and electrical connection point, among others.

(f) **Capacity:** It is relevant to point out that to connect a PMGD to the distribution grid there is the need that the distribution line and substation to which the energy is sent has enough capacity to receive the energy of the PMGD, otherwise, such injections will be limited to the remaining capacity available.
Therefore, when evaluating the project, it is relevant to consider the feasibility of injecting electricity of the distribution grid.

X. Bibliography

CIPER (2015) El Mapa de Chile del millonario negocio de la basura. Available at: https://www.ciperchile.cl/2015/05/26/el-mapa-de-chile-del-millonarionegocio-de-la-basura/ [Accessed 20th April 2022].

CNE and GTZ (2007) Potencial de Biogás: Identificación de los distintos tipos de biomasa disponibles en Chile para generación de biogás. Available at: https://energypedia.info/images/d/dc/Potencial_Biogas_Chile.pdf [Accessed 20th April 2022].

FNE (2013) Instrucciones de carácter general No.3/2013. Available at: https://www.fne.gob.cl/wp-content/uploads/2017/10/inst_03_20131.pdf [Accessed 20th April 2022].

Lizama González, Milton (2018) Mercado de materia orgánica en Chile. Tesis para optar al grado de Ingeniero Comercial. Universidad Técnica Federico Santa María. Santiago. Available at: https://repositorio.usm.cl/bitstream/handle/11673/47136/3560903501040UTFSM.pdf?sequence=1&isAllowed=y [Accessed 20th April 2022].

Martínez Arce, Evelyn; Daza, Diego; Tello Espinoza, Pilar; Soulier Faure, Martin; Terraza, Horacio (2010) Regional Evaluation on Urban Solid Waste Management in Latin America and The Caribbean: 2010 Report. Available at: https://publications.iadb.org/en/regional-evaluation-urban-solid-wastemanagement-latin-america-and-caribbean-2010-report [Accessed 20th April 2022].

Ministerio de Energía (2011) Manual de Biogás. Available at: https://www.energia.gob.cl/sites/default/files/documentos/manual_de_biogas._pdf [Accessed 20th April 2022].

Ministerio del Medio Ambiente (2016) Chile's Second Biennal Update Report, to the United Framework Convention on Climate Change. Available at: https://mma.gob.cl/wp-content/uploads/2017/04/2016_2BUR_en_CL.pdf [Accessed 20th April 2022].

Ministerio del Medio Ambiente (2020) Estrategia Nacional de Residuos Orgánicos Chile 2040. Available at: https://economiacircular.mma.gob.cl/wpcontent/uploads/2021/03/Estrategia-Nacional-de-Residuos-Organicos-Chile2040.pdf. [Accessed 20th April 2022].

Nelson, Ian. CEO of Metrogas (2010) Explorando las oportunidades del biogás. Interview by Electricidad. La Revista energética de Chile. Available at: https://www.revistaei.cl/reportajes/explorando-las-oportunidades-del-biogas/# [Accessed 20th April 2022].

Reciclo Orgánicos. Chile and Canada joint program to tackle climate change (2021) Solid waste and biogas projects in Chile. Available at:

https://iea.blob.core.windows.net/assets/9268f77a-a01e-4c1f-8089495959240724/2.4_Gerardo__13Jul2021.pdf [Accessed 20th April 2022].
Rojas, Aylin; Yabar, Helmut; Mizunoya, Takeshi;Higano, Yoshiro (2018). The Potential Benefits of Introducing Informal Recyclers and Organic Waste Recovery to a Current Waste Management System: The Case Study of Santiago de Chile. Available at: https://www.mdpi.com/2079-9276/7/1/18/htm [Accessed 20th April 2022].

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