CLIMATE ACTION RESERVE

# Chile Landfill Protocol V1.0

Workgroup Meeting #3

September 30, 2025

# Introduction

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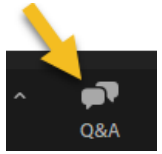
# Housekeeping

- **Participation of Workgroup members (WG)**
  - WG can actively participate throughout the meeting
  - Please, keep yourselves muted unless/until would like to speak
  - We will ask and take questions throughout the session. Please use “the raise your hand function.”
- **Participation of attendees/observers**
  - Will remain in listen-only mode
  - May submit questions in the question box 

- **Follow-up and materials**
  - We will follow up via email to answer any questions not addressed during the meeting
  - The slides and a recording of the presentation will be posted online

# AGENDA

- Introductions
- Process Overview
- Protocol Considerations
  - Previous meeting pending questions
  - Summary of Sections Reviewed in previous meetings
    - Remaining topics
  - Sections to Review:
    - Reporting Parameters
    - Verification Guidance
    - Appendix A
    - Appendix B
    - Appendix C
- Open Discussion
- Next Steps

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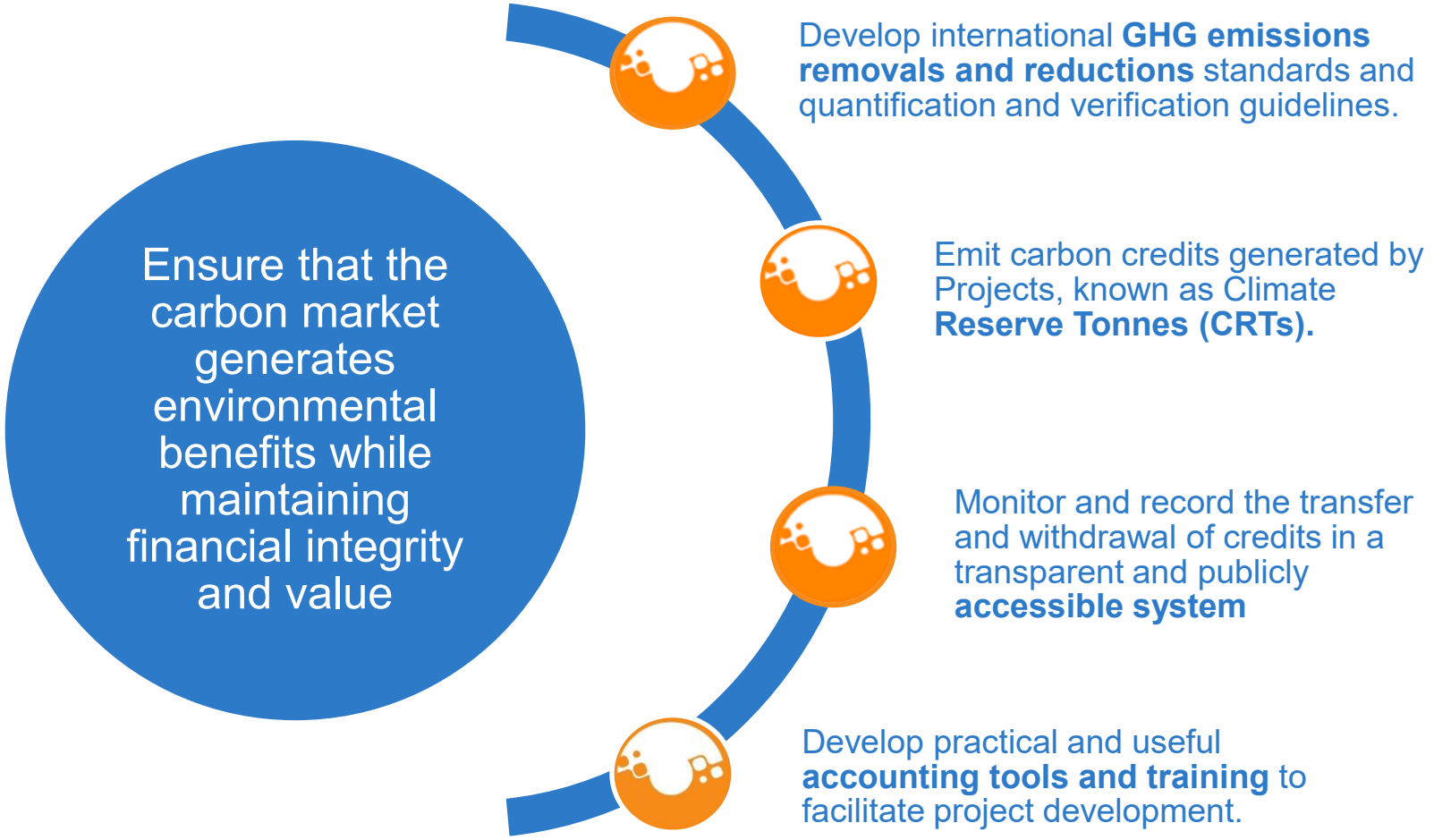
# INTRODUCTION

# Climate Action Reserve

**Mission**: *to develop, promote and support innovative, credible market-based climate change solutions that benefit economies, ecosystems and society*

- ✓ **Develop high-quality, stakeholder-driven, standardized** carbon offset project protocols internationally
- ✓ **Registry of carbon credit projects and offset projects** for voluntary and compliance carbon markets. California and Washington (EEUU); Queretaro (Mexico); CORSIA.
- ✓ **High reputation for integrity and experience** in providing best-in-class registry services for offset markets

# The Climate Action Reserve



# Principles of the Reserve Program

## All registered projects and credits issued by the Reserve must be:

**ADITIONAL**

Beyond common practices

Beyond regulatory requirements

**VERIFIED**

Standardized eligibility criteria and quantification methodologies

Independent third-party review.

**REAL**

Conservative emissions accounting

Prescriptive models and equations

Uncertainty reduction

**PERMANENT**

Monitoring and reporting processes

Any leakage or loss is quantified and compensated

**ENFORCEABLE**

Processes to ensure program compliance

Accountability mechanisms

- The Reserve seeks to be practical and ensures that projects do not have negative impacts
- The standards include social and environmental safeguards to ensure the participation and benefit of the participants

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# WORKING GROUP

# Workgroup Members

| Organization (Alphabetical) | Name |
|---|---|
| Energylab | Cristian Mosella |
| CO2CERO | Wilmer Martinez |
| ImplementaSur | Gerardo Canales |
| Grupo de Residuos Solidos<br>Pontifica Universidad Catolica de Valpareiso Chile | Marcel Szanto Narea |
| KDM Empresas | Jose Santiago Zuñiga |
| Mexico2 | David Colín |
| Núcleo Biotecnología Curauma<br>Pontificia Universidad Católica de Valparaíso | Andres Morales |
| Superintendencia del Medio Ambiente<br>Gobierno de Chile | Karin Salazar |
| Superintendencia del Medio Ambiente<br>Gobierno de Chile | Christian Calderón Duarte |
| Sustentalia Consultores | Javiera Labbé |
| UniCarbon | Nuno Barbosa |
| Veolia | Laura Landeta |
| VOLTA SpA | Pedro Alarcón Retamal |
| Windfall Bio | McKenzie Wilson |

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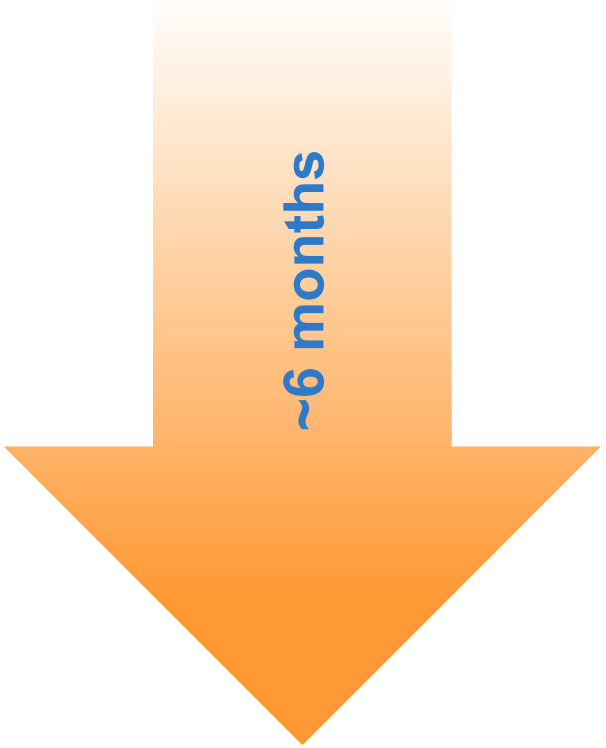
# PROCESS OVERVIEW

# Protocol Development Timeline

1. Kick-off meeting (*July 1 2025*)
2. Workgroup process
   - Formation (*July 2025*)
   - Meeting 1 (*August 6, 2025*)
   - Meeting 2 (*September 3th, 2025 – tentative*)
   - Meeting 3 *(September 30th 2025 )*
3. 30-day public comment period (Oct-Nov *2025*)
4. Propose to Board adoption *(Nov 2025)*



# Workgroup Process and Expectations

**CAR/Process:**

- Manage the protocol development process
- Hold 2 or 3 workgroup meetings
- Reserve staff identify and solicit feedback on specific protocol criteria
  - **Specific questions for WG will be highlighted in red**
- Reserve staff will share the draft protocol with WG
- Revise protocol based on feedback

**WG/Expectations:**

- Attend all (~2-3) workgroup sessions
- Be active participants: provide input and ask questions on protocol concepts and language
- After meetings, share additional input and expertise as needed
- Review draft protocol and provide written feedback to Reserve staff
- Be constructive, collaborative, and productive

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# PROTOCOL CONSIDERATIONS

# Previous meetings pending questions

- Please review and provide information or comments on the pending questions and inquiries to the WG that were addressed in the previous meeting, as well as on the shared sections of the protocol draft.
- Please review the Free Prior Informed Consent and Notification and Participation (SS1 and SS2), and provide an overview of the stakeholders involved
- Regarding the SS and SA, please provide any other SA or SS proposals
- Please provide information on specific Occupational Safety and Health laws for landfill operators and the applicable regulatory body/agency.
- Please provide the Emission Factors for Stationary and Mobile Combustion Fuels in Chile, Net Calorific Values of Fossil Fuels in Chile, and Predetermined Destruction Efficiencies for Combustion Devices. Alternatively, confirm that the use of existing values is appropriate.
- Please provide inventories or databases that track the operation of each landfill and data on landfill gas collection and control systems at any scale.
- Please provide studies and/or data to confirm that the installation of landfill gas collection and control systems is not common practice at landfills in Chile

- Please provide information on the participation of landfills projects in Chile in CDM or other international standards.
- Please provide further information on the passive destruction systems usually installed and the monitoring equipment used, if any.
- Please confirm feasibility of the suggested arrangement for the landfill gas flow meters and methane concentration metering equipment
- Please provide further information about the potential third-party technician for the field check for calibration accuracy. Location of the instrumental labs, ownership (private/public), services and/or expertise, accreditation and/or approval from the manufacturer, and others.
- Please send any questions or additional comments on the topics presented during WG meetings 1 and 2 of this protocol.
- Currently, the Reserve's landfill protocol does not account for CO2 reductions associated with the displacement of electricity generated by fossil fuels and supplied by the grid or the replacement of natural gas. In this regard, please submit any comments or justification as to why the protocol should account for this, if it is common practice in Chile, and a proposal on how you would assess its additionality.

# Summary of Sections reviewed in previous meetings

**First Meeting**

- Project Definition – Eligible landfill
- Project Ownership

**Second Meeting**

- Social and Environmental Safeguards
- Parameters/Default Values
- Social Safeguards MRV
- The GHG Assessment Boundary
- Quantification of Emission Reductions
- Project Monitoring & Monitoring Requirements
- QA/QC requirements

# Energy generation

## Energy generation through the use of landfill gas

1) Landfill gas is used in the project activity to generate electricity and/or heat in a boiler, an air heater, a glass melting furnace, or a cooking furnace, among others:
   • For electricity generation: this electricity would be generated for the grid or in captive power plants fueled by fossil fuels, and/or
   • For heat generation: this heat would be generated using fossil fuels in equipment located within the project boundaries.

2) Landfill gas supplied to the end user or end users through the natural gas distribution network, trucks, or the dedicated gas pipeline. The reference scenario is the displacement of natural gas.

Are there landfills that have energy generation systems using biogas?
Are energy generation proposals feasible in Chile? Are there other technologies or methods in use?
Does it make sense to include this project activity from the perspective of the sector in the country?

# Energy generation

## The Project Activity

- ✓ As a result of the carbon project, greenhouse gas emissions associated with fossil fuel-based energy are avoided.
- ✓ The renewable energy generated from biogas—whether in the form of electricity, heat, or upgraded biomethane—replaces the energy that would have been produced using fossil fuels such as coal, diesel, natural gas, fuel oil, etc.

**The key question is whether the generation and use of renewable energy from biogas would have occurred without the project activity and the associated carbon financing.**

Is any of the above common practice in landfills in Chile? If not, what are the barriers or challenges that arise?

Are there incentives (economic, fiscal, etc.) for renewable energy generation that apply to the proposed project activity (circular economy, waste valorization, renewable energy generation, etc.)?

# Energy generation

## Quantification

The following general formula is used to quantify the emissions avoided by replacing fossil fuels.

| Avoided Emissions (tCO2e) | = | Energy Generated (MWh or GJ) | X | Emision Factor (tCO2e/MWh or tCO2e/GJ) |
|---|---|---|---|---|

Where:

**Energy generated:** is the total amount of energy generated by the project.

- Electricity (in MWh or kWh) generated and exported to the grid or consumed on-site.
- Thermal energy (in GJ or MJ) produced and used.
- Volume of biomethane injected into a pipeline or used as vehicle fuel.

**Emission factor:** represents the amount of $CO_2$ (and possibly $CH_4$ and $N_2O$, if significant) emitted per unit of energy produced from fossil fuel. The project must define which type(s) of fossil fuel(s) the renewable energy would have replaced. Some examples:

- The grid emission factor (if electricity is supplied to the grid).
- The site-specific reference fuel factor if the energy replaces on-site fossil fuel use (generators, gas boilers, etc.).
- Conventional gasoline or diesel factors in the case that biomethane replaces transportation fuels.

Are specific emission factors available for Chile for the replaced fossil fuels or for the electrical grid (Official data from CEN, Ministry of Energy, ACERA)?

# Remaining Topics

**Section 5.1 Quantifying Baseline Emissions - The oxidation factor (OX)**

The OX reflects the amount of methane from landfills that is oxidized in the soil or other material covering the waste. Well-managed landfills may have a higher OX rate than uncontrolled dump sites, where sites with thick, well aerated material differ from those with no cover. The OX shall be determined based on the following scenarios:

- Equal to 0.0 for landfills that have a geomembrane (synthetic) cover with less than 12 inches of cover soil for above, the landfill area.
- Equal to 0.10 for landfills that don't meet the condition above, and the methane flux is unknown or if the landfill does not have a soil cover of at least 24 inches for the majority of the landfill area.
- Equal to 0.10 for landfills that have a soil cover of at least 24 inches for a majority of the landfill area and the methane flux rate is greater than 70 g/m2/d.
- Equal to 0.25 for landfills that have a soil cover of at least 24 inches for the majority of the landfill area and the methane flux rate is 10 – 70 g/m2/d.
- Equal to 0.35 for landfills that have a soil cover of at least 24 inches for a majority of the landfill area and the methane flux rate is less than 10 g/m2/d.

✓ Is methane flux testing feasible in Chile?

✓ Is there guidance for determining oxidation factors in chile?

✓ Other comments?

# Remaining Topics

**Section 3.4.2 Limits on Credit Stacking**

- Under this protocol, credit stacking is defined as receiving both offset credits and other types of mitigation credits for the same activity on spatially overlapping areas (i.e., in the same landfill).

- The Reserve has identified market opportunities for the upgrade of landfill gas into high-Btu fuels, or other fuel or renewable energy certificates programs that provides an incentive sufficient to raise additionality concerns. Analysis reveals that the strength of these incentives is driving investment in landfill gas projects at present, and that such projects can be considered "business as usual", without the additional presence of carbon offset revenues.

- Projects that receive mitigation credits for upgrading landfill gas into high-Btu fuels, or other mitigation credits directly related to the project activity will not be eligible to receive offset credits for the same period of time under this protocol.

✓ Are there any type of mitigation credits functioning in the landfill sector in Chile?

✓ Other comments

# Remaining Topics

**Section 6.1 Monitoring Requirements – non continuous measurements 10% discount**

When the fraction of methane in the landfill gas in not measured continuously and recorded every 15 min and averaged at list daily then a 10% discount is applied in the quantification of the baseline emissions.

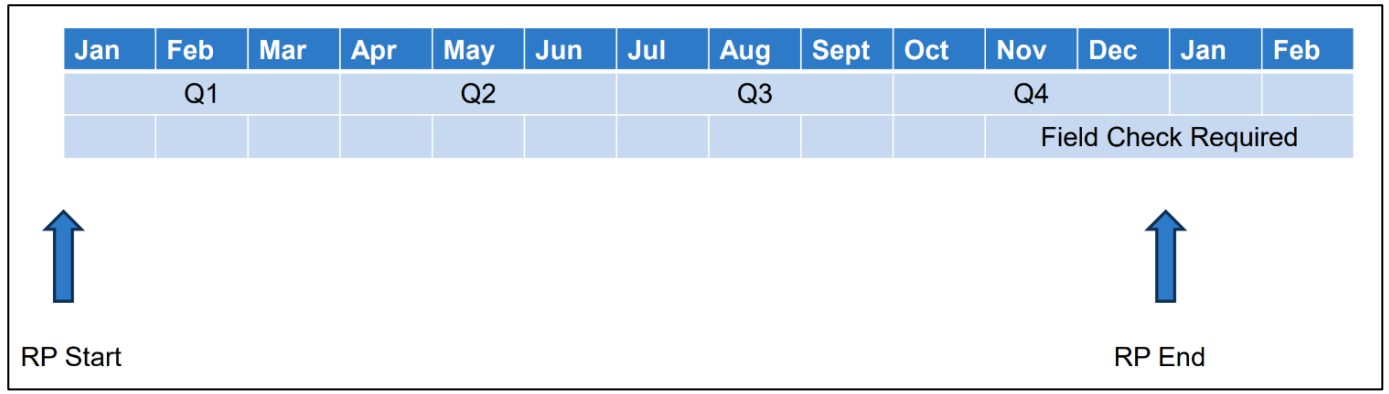
- measurements taken at a frequency that is between daily and weekly may be used with the application of a 10% discount in Equation 5.3

- Comment was received that the 10% discount may be too punitive.
  - 10% discount is to account for the methane fluctuations based on precipitation, temperature, waste accepted, etc.
- Other Comments?

# Remaining Topics

**Section 6.2 Instrument QA/QC – Third Party Technician**

- A field check is an on-site validation of a meter to determine drift and assure accuracy.
- All flow meters and continuous methane analyzers must be field checked for calibration accuracy by a third-party technician with the percent drift documented, using either a portable instrument (such as a pitot tube) or manufacturer specified guidance.
- All flow meter, continuous methane analyzer, and portable methane analyzer field checks and calibrations must have “as found” and “as left” conditions documented, and percent drift calculated and recorded. The percent drift must be assessed relative to the expected reading rather than the full-scale reading of the device.




- ✓ More info on third party technicians: availability, accreditation, etc.
- ✓ Comments?

# Sections to Review

- Reporting Parameters
- Verification Guidance
- Appendix A
- Appendix B
- Appendix C

# Reporting Parameters

- This section provides guidance on reporting rules and procedures. A priority of the Reserve is to facilitate consistent and transparent information disclosure among project developers.
  - ✓ Project developers must submit verified emission reduction reports to the Reserve annually at a minimum.
- All project submittal and registration documentation is listed in this section
- Record keeping is also covered in this section
  - ✓ For purposes of independent verification and historical documentation, project developers are required to keep all information outlined in this protocol for a period of 10 years after the information is generated or 7 years after the last verification.
- This section also brings clarity on Reporting Periods, Verification Periods and the Verification Site Visit Schedule

✓ Comments?

# Verification Guidance

- This section provides verification bodies with guidance on verifying GHG emission reductions from landfill gas projects developed to the standards of this protocol.
- The **monitoring plan** serves as the basis for verification bodies to confirm that the monitoring and reporting requirements in Section 6 and Section 7 have been met, and that consistent, rigorous monitoring and record-keeping is ongoing at the project site.
  - ✓ Verification bodies shall confirm that the monitoring plan covers all aspects of monitoring and reporting contained in this protocol and specifies how data for all relevant parameters in Table 6.1 are collected and recorded.

  - ✓ Comments?

# Verification Guidance

| Eligibility Rule | Eligibility Criteria | Frequency of Rule Application |
|---|---|---|
| **Location** | Chile | Once during first verification |
| **Start Date** | Project start date must be no more than 90 days after landfill gas is first destroyed by project destruction device. Projects must be submitted for listing within 12 months of the project start date | Once during first verification |
| **Project Crediting Period** | Ensure the project is within its first, second, or third crediting period | Once during each crediting period |
| **Performance Standard** | Installation of a qualifying destruction device where not required by law (see Section 3.4.1 for other requirements) | Once during first verification |
| **Legal Requirement Test** | Signed Attestation of Voluntary Implementation form and monitoring procedures that lay out procedures for ascertaining and demonstrating that the project passes the Legal Requirement Test | Every verification |
| **Regulatory Compliance Test** | Signed Attestation of Regulatory Compliance form and disclosure of all non-compliance events to verifier; project must be in material compliance with all applicable laws | Every verification |
| **Exclusions** | ▪ Bioreactors<br>▪ Landfills which re-circulate a liquid other than leachate in a controlled manner<br>▪ Indirect emissions from the displacement of grid electricity or natural gas | Every verification |

| Eligibility Rule | Eligibility Criteria | Frequency of Rule Application |
|---|---|---|
| **Social Safeguard 1 - FPIC** | Signed documentation demonstrating compliance with SS 1 FPIC. | Once during first verification |
| **Social Safeguard 2 - Ongoing notification, participation and documentation** | Signed documentation demonstrating compliance with SS 2 | Every verification |
| **Social Safeguard 3 – Work & Safety** | Signed compliance declaration form certifying material compliance with all applicable laws, including labor and safety laws. | Every verification |
| **Social safeguard 4 – Absence of Disputes** | Signed certificate of absence of conflicts attesting that there are no land tenure disputes affecting the project boundaries, including all landfill facilities directly associated with the carbon project. | Every verification |
| **Environmental Safeguard 1 – Air & Water Quality** | Signed Regulatory Compliance Declaration form certifying compliance with all applicable laws, including those relating to air and water quality. | Every verification |
| **Environmental Safeguard 2 – Pollutants mitigation** | Historical records and ongoing monitoring and reporting through recording data from physical measurements, online sources, and government data to demonstrate that the project has been designed and implemented to mitigate potential emissions of pollutants that may cause degradation of soil, air, surface and groundwater quality, and that project developers have obtained appropriate local permits prior to installation to avoid violation of all applicable laws. | Every verification |

# Appendix A – Regulatory Framework Review

- **Law No. 21,455 –Climate Change Framework Law**
  Define instruments and management responsibilities at the national, regional, and local levels.
- **DFL 725 Health Code**
  This law sets forth the regulations to promote, protect, and restore public health in Chile. It regulates, among other things, waste and garbage management.
- **Law No. 19.300 (General Environmental Framework Law, 1994)** Regulate instruments such as the Environmental Impact Assessment (EIA). and obtain approval through an **Environmental Qualification Resolution (RCA**) before a landfill can be built or operated.
- **Supreme Decree No. 40/2012 Regulations of the Environmental Impact Assessment System (SEIA)**
- **Supreme Decree No. 189/2005 (Regulation on Basic Sanitary and Safety Conditions in Landfills)** The Issued by the Ministry of Health, this is the specific technical regulation governing the design, construction, operation, closure, and post-closure of landfills
- **Decree No 119 Approves the Safety Regulation for Biogas Plants and Introduces Amendments to the Gas Installers Regulation**
  This regulation establishes **minimum safety requirements** for the design, construction, operation, maintenance, inspection, and decommissioning of biogas plants.
- **Decree No1 Approves the Regulation of the Emissions and Pollutant Transfer Registry**
  The **Emissions and Pollutant Transfer Registry (RETC)**
  - ✓ Any other relevant regulations to the sector?
  - ✓ ES2 and national regulation on pollutants Other comments?

# Appendix A – A.2. Reginal Laws and Municipal Regulations

Although regulations are primarily national, the Regional Health Secretariats (SEREMI) may issue complementary provisions adapted to local realities and oversee compliance with national regulations.
Examples:

- Metropolitan Region: Additional waste control regulations and recovery plans.
- Valparaíso Region: Specific rules for closing illegal dumpsites.
- Los Lagos Region: Additional operational requirements in high-rainfall areas.

Other Complementary Regulations

- ✓ Any other relevant provincial and/or municipal law or regulations to consider and add to the Protocol?
- ✓ Other comments?

# Appendix B Development of the Performance Standard Threshold

**Development of the Performance Standard Threshold**

- Waste management Practices in Chile
- Participation in the Carbon Market
- Recommendation for Performance Standard

  - ✓ Information about the landfills functioning in the country and any capture and destruction systems functioning, installed, or in development.
    - Confirmation that the capture and destruction of landfill gas is not common practice
  - ✓ Other comments?

# Appendix C Emission Factors

**Emission Factor Table**

- Stationary Combustion
- Mobile combustion

- It seems in the national inventory that mobile combustion EFs are IPCC values.

✓ Is there Chile specific information/ documentation on EFs?

**Fossil Fuels Net Calorific Values Table**

- Solid fuels
- Liquid fuels
- Gaseous fuels

✓ Is there newer national data on FF calorific values?

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# NEXT STEPS

# Next steps

- ***For Interested Stakeholders:***
  - Email us feedback anytime
- ***For Reserve:***
  - Compile a notes summary on the discussion
  - Post recording, notes, and presentation to the webpage
  - Incorporate feedback from workgroup discussion
  - Identify areas of focus for next workgroup meeting (if needed)
- ***For Workgroup:***
  - Email feedback on today's discussion (by October 7th )
  - Look out for information for the next meeting's discussion topics
  - Next steps: comments or feedback of the protocol draft by October 7th

# Key contacts

## *Climate Action Reserve:*


Protocol development lead:

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# THANK YOU!