

# ARE GROUND OBSERVATORIES IN DANGER OF EXTINCTION?

CAPSTONE PROJECT:  
DETERMINATION OF THE CARBON FOOTPRINT AT LAS CAMPANAS OBSERVATORY,  
LA SERENA - CHILE

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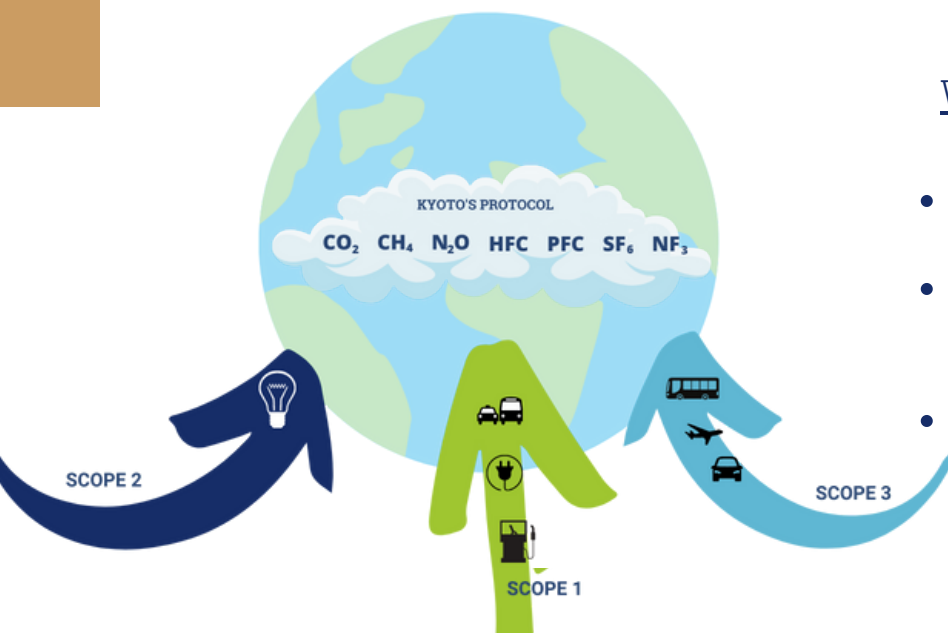
## WHAT IS THE CARBON FOOTPRINT?



Indicator of the impact that an activity or process has on climate change. It is measured in terms of CO<sub>2</sub>e, and used as a management tool allowing to understand organizational behavior and suggest resource efficiency.

$$\text{Carbon Footprint} = \sum_{i=1}^n AD_i * EF_i * GWP_i$$

Where:  
AD = Activity Data  
EF = Emission Factor  
GWP = Global Warming Power.  
i = Greenhouse Gas of Kyoto's Protocol



## WHAT IS THE PURPOSE OF THIS PROJECT?

- Quantify Las Campanas Observatory's (LCO) operations carbon footprint.
- Compare good sustainability practices from other organizations through DEA Benchmarking.
- Provide cost/efficiency arguments for strategic decision-making towards sustainable management.

## WHICH METHODOLOGY ARE WE USING?

LCA

Life Cycle Analysis

Goal & Scope



Life Cycle Inventory

Interpretation

Impact Assessment

Non-parametric quantitative analysis tool that uses linear programming to identify the efficiency frontier of a set of decision-making units (DMUs).

-Zhu, 2014.

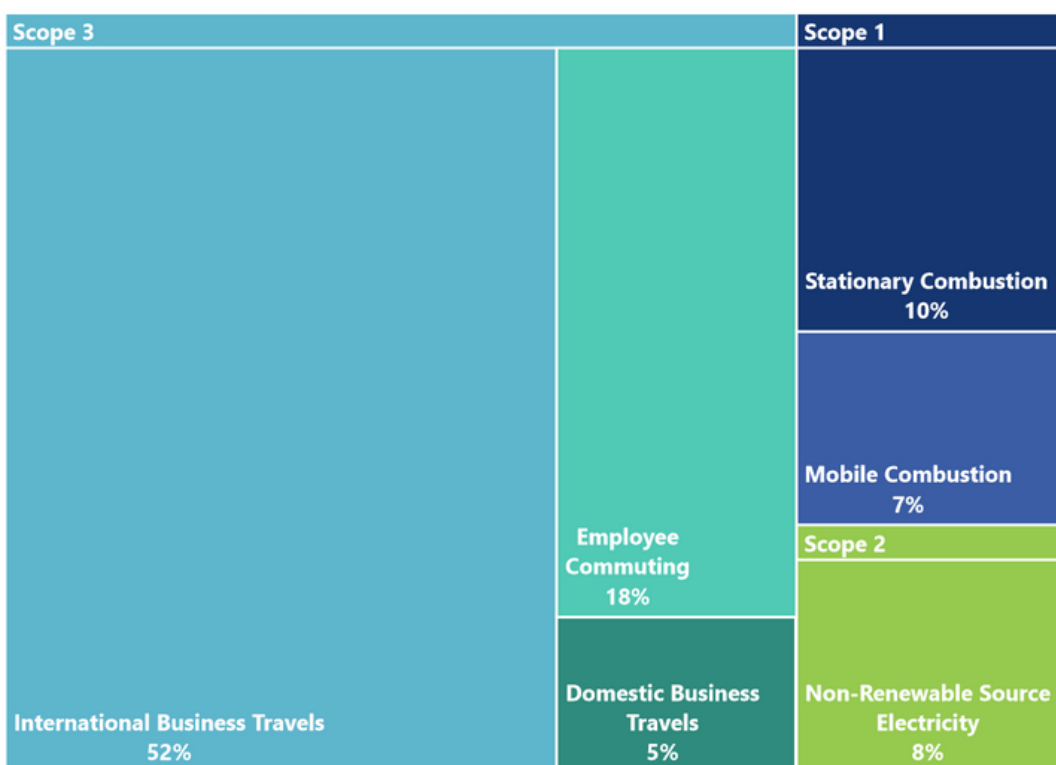
DEA

Data Evelopment Analysis

## HOW DOES LCO CONTRIBUTE TO CLIMATE CHANGE?

2022 Greenhouse Gas Emissions (GHG) by Source (tonne CO<sub>2</sub>e)

■ Scope 1 ■ Scope 2 ■ Scope 3



Evaluated emissions (2022) correspond to the Energy category (IPCC, 2006), which are:

- Mobile and Stationary Combustion.
- Electricity from renewable (zero emissions) and non-renewable sources.
- Commuting and business travels.

Scope 1 and 2 emissions contribute to 26% of the total GHG emissions produced by LCO, while 74% correspond to scope 3, where international business travels stand out.

**LCO's astronomical operations are feeded with renewable energy, therefore no carbon footprint is generated.**

## REFERENCES

- [1] IPCC (2006b). Volumen 2: Energía - directrices del ipcc de 2006 para los inventarios nacionales de gases de efecto invernadero.  
[2] Álvarez, S. (2017). La huella de carbono y el análisis de ciclo de vida. AEONOR- Asociación Española de Normalización y Certificación.  
[3] Zhu, J. (2014). Quantitative Models for Performance Evaluation and Benchmarking: Data Envelopment Analysis with Spreadsheets.