

PAPILA: A High-resolution inventory of atmospheric emissions in Latin America

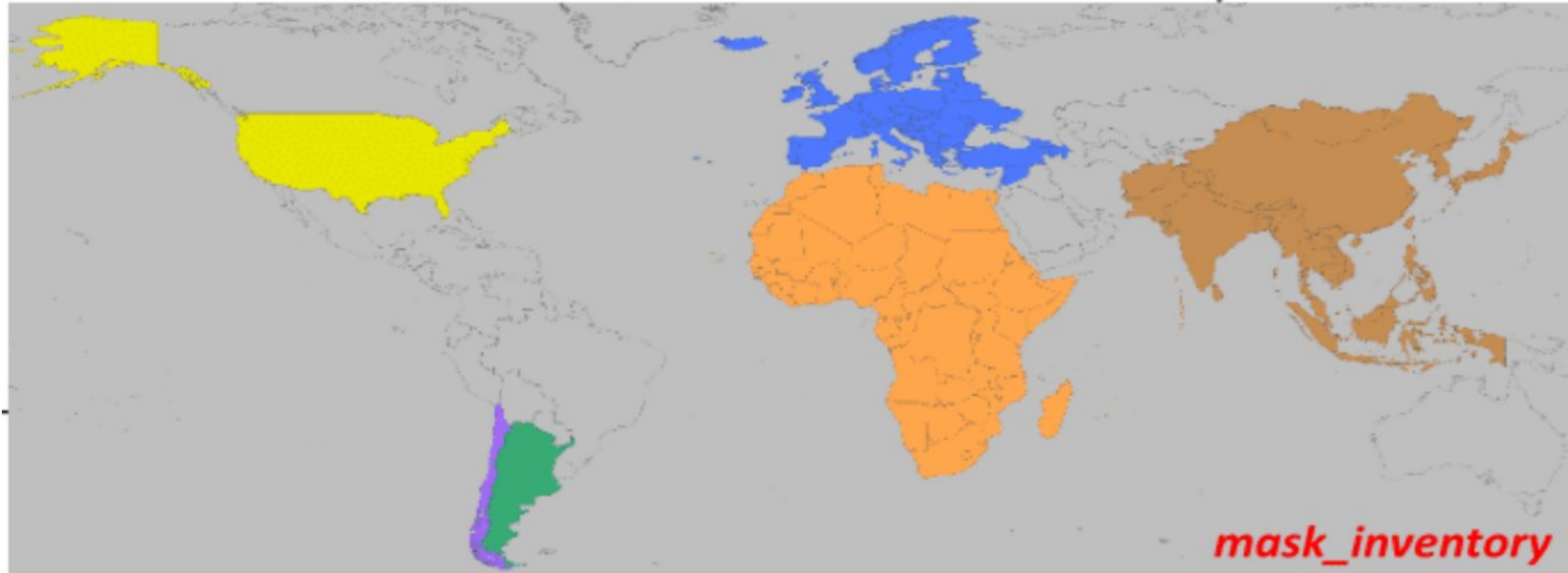
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■ Introduction



Why developing a new inventory



- Use of global emission inventories to understand the interactions between emissions, air quality and public health.
- Global AEI's miss information associated with local practices and technologies.
- Scarce regional inventories in Latin America.

PAPILA v1.0 Emission Inventory

PAPILA's inventory is the first EI from anthropogenic sources covering the continental SA region, which combines locally available information with a global database properly and rigorously.

Component	Description
Pollutants	Reactive gases: CO, NO _x , NMVOCs, NH ₃ , and SO ₂ .
Temporality	2014-2016
Spatial Resolution	Spatial resolution of 0.1° × 0.1° over a domain covering 32–120° W and 34N–58° S.
Sectors	Agriculture livestock; Agriculture soils; Fugitives; Industry; Inland Shipping; Non-road transportation; Road transportation Power generation; Residential and other sectors; Ships; Solid waste disposal
Inventories	CAMS-GLOB-ANT v4.1 enriched with locally developed inventories available in the literature until 2019 fot Chile, Argentina and Colombia

Table 1: Description of PAPILA emission inventory v1.0

PAPILA v2.0 Objectives

General Objective

Improve the PAPILA atmospheric emissions inventory by expanding its scope in terms of:

- Adding new local inventories.
- Temporality.
- Considered species.
- Sectors.

Specific Objectives:

- Create a repository with the information of local inventories.

■ Main Updates

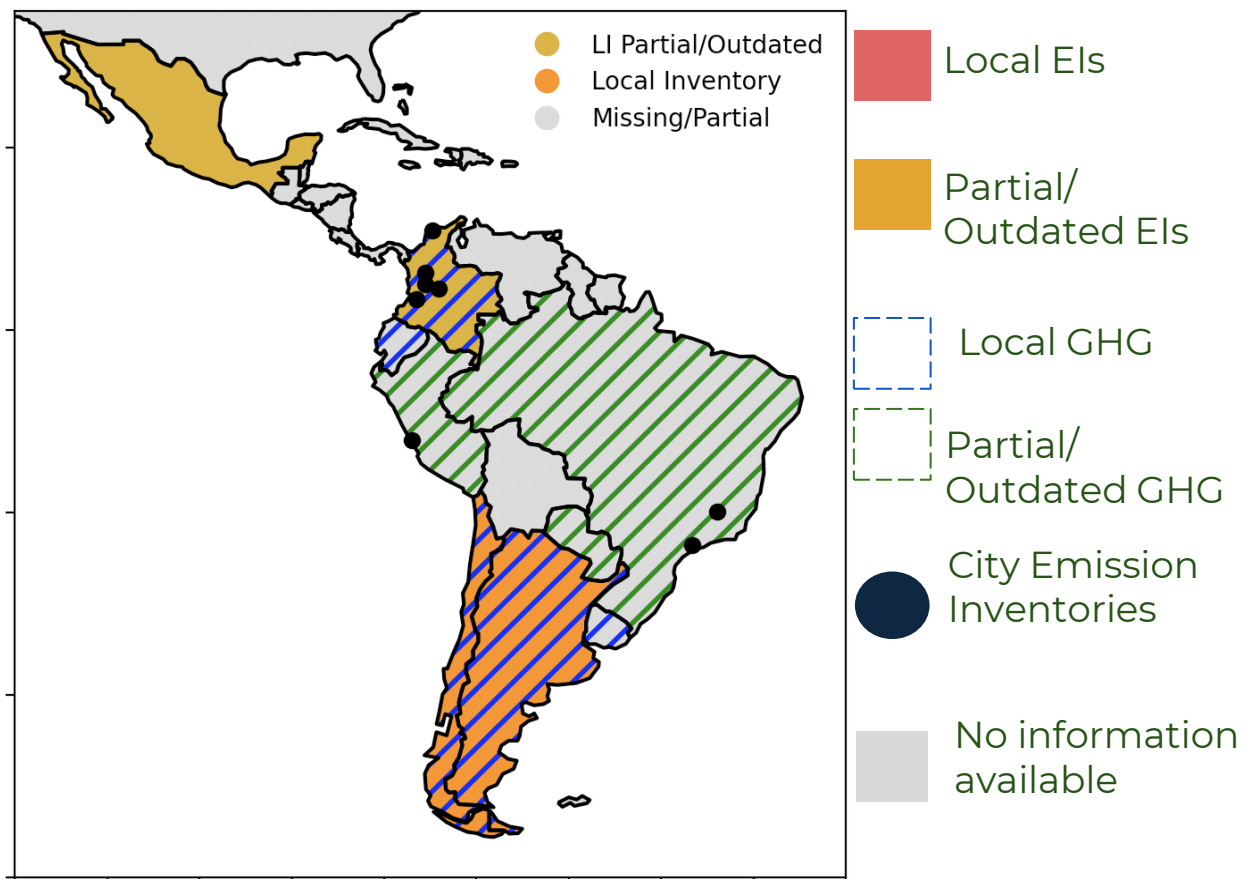


Santiago de Chile

PAPILA v2.0 Main Updates

1. **Adding new local inventories:** Local information of Mexico, Colombia and Ecuador is included in addition to those already considered from Chile and Argentina
2. **Temporality:** the inventory was extended from the period 2014-2016 to 2014-2020
3. **Sectors:** emissions from open biomass burning are included
4. **Considered species:** in addition to reactive gases, emission from greenhouse gases CH₄ and CO₂ and particles (PM₁₀, PM_{2.5}, BC and OC) are estimated.
5. **Base inventories considered:** CAMS-GLOB-ANT v6.1 inventory was complemented with EDGAR v6.1 for particulate matter emissions and GFAS for open biomass burning emissions.

1. Adding New local Inventories



- High-resolution emission inventories from Mexico, Colombia, Chile and Argentina are included.
- National greenhouse inventories that include emissions of reactive gases are considered for Chile, Colombia and Ecuador.

2. Temporality

Information available		all sectors interpolated		partial interpolation	
Country/Year	Chile	Argentina	México	Colombia	Ecuador
2014					
2015					
2016					
2017					
2018					
2019					
2020					

- For Ecuador and Colombia, GHG EI's had emission estimates available until 2018,
- Mexican inventory has information only for year 2016, while the Chilean inventory spans from 2015 to 2020.
- Missing estimates in Ecuador, Colombia Chilean and Mexican datasets were estimated through interpolation, employing CAMS trajectories.

3. Sectors

HR inventory		GHG Inventory		Base inventory	
Sectores	Chile	Argentina	México	Colombia	Ecuador
ENE					
RCO					
TRO					
TNR					
FEF					
IND					
OBB					
AGS					
AGL					
SHP					
SWD					
REF					
SLV					

- Open biomass burning emissions are included using GFAS as base inventory.
- Emissions from solvents and Refineries are disaggregated from IND sector.

4. Considered species

Information available	All sectors interpolated			Partial interpolation			
Species	Chile	Argentina	México	Colombia	Ecuador	CAMS	GFAS
CO ₂							
CH ₄							
CO							
NO _x							
NMVOCs							
NH ₃							
SO ₂							
PM ₁₀							
PM _{2.5}							
BC							
OC							

- For Chile and Ecuador GHG inventories, we estimated particle emissions by using the relationship between CO and these species in EDGAR.
- NH₃ emissions from CAMS were used in the absence of local data.
- OC and BC estimates were interpolated by applying the OC-to-PM_{2.5} ratio from each EDGAR sector, year and country.

Considered species: Adding Particles

Contribution of BC+OC to PM_{2.5} in South America

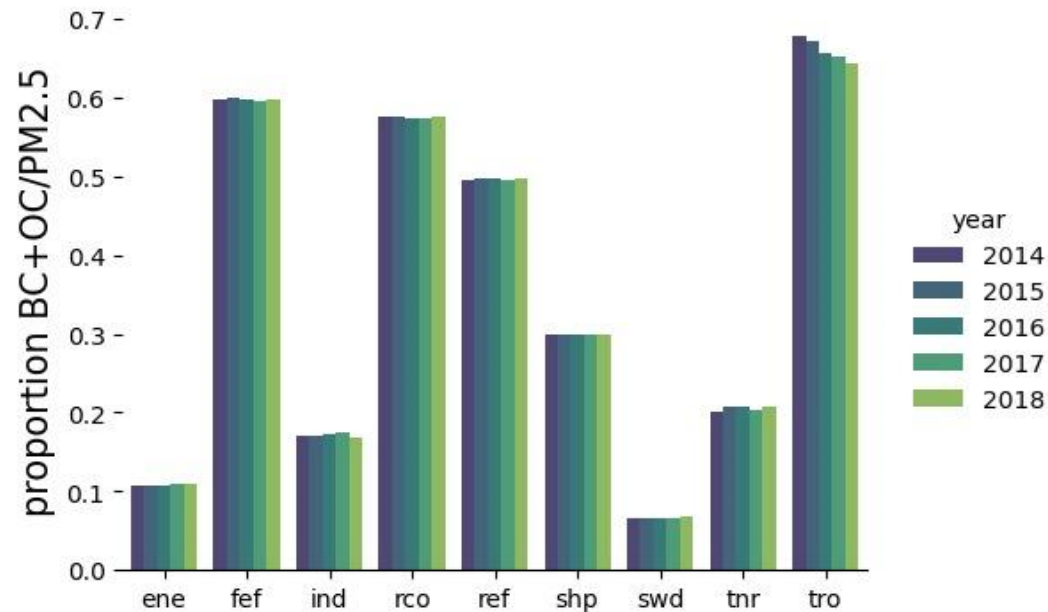


Figure based on EDGAR emissions.

To include the emissions of PM_{2.5} and PM₁₀ to the base inventory, we referred to the EDGAR v6.1 database.

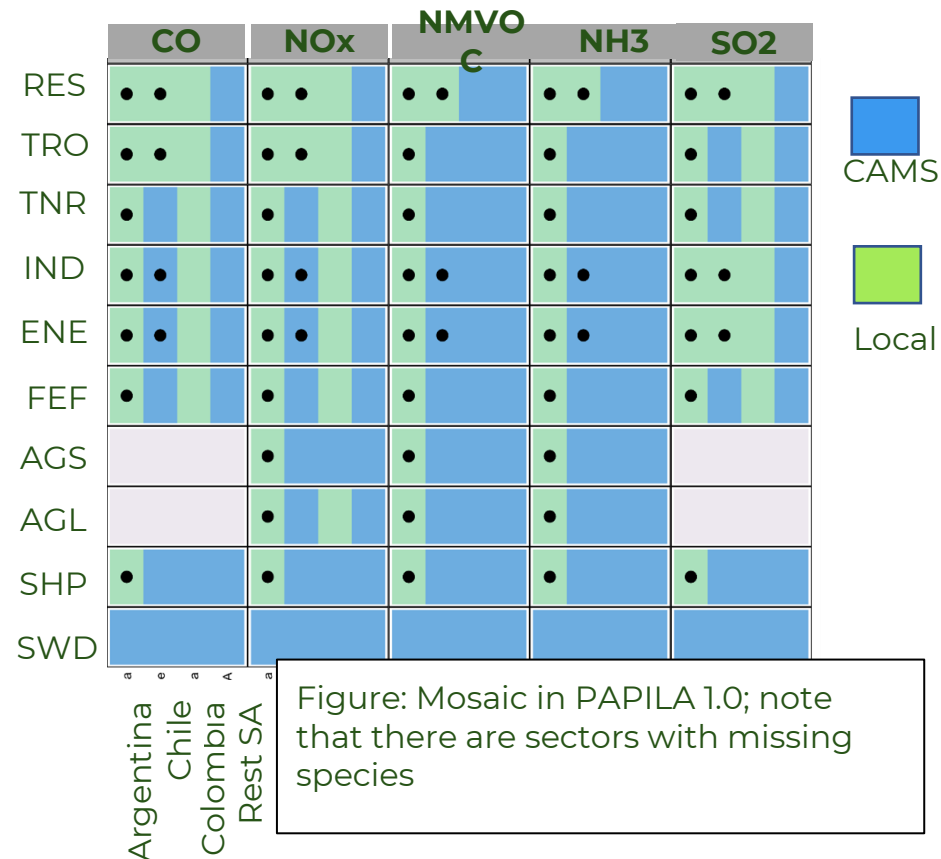
- EDGAR has PM, BC and OC emissions until 2018.
- PM emissions in PAPILA were projected until 2020 based on the BC+OC contribution to PM in EDGAR and using BC+OC emission in CAMS for years 2019 and 2020.

■ Methodology



Mosaic

Letra Montserrat 14



- Emission from local inventories were considered only for sectors that had estimates for all the species and throughout the entire study period.
- For those sectors with an absence of complete local data, the base inventory was used to fill the gaps

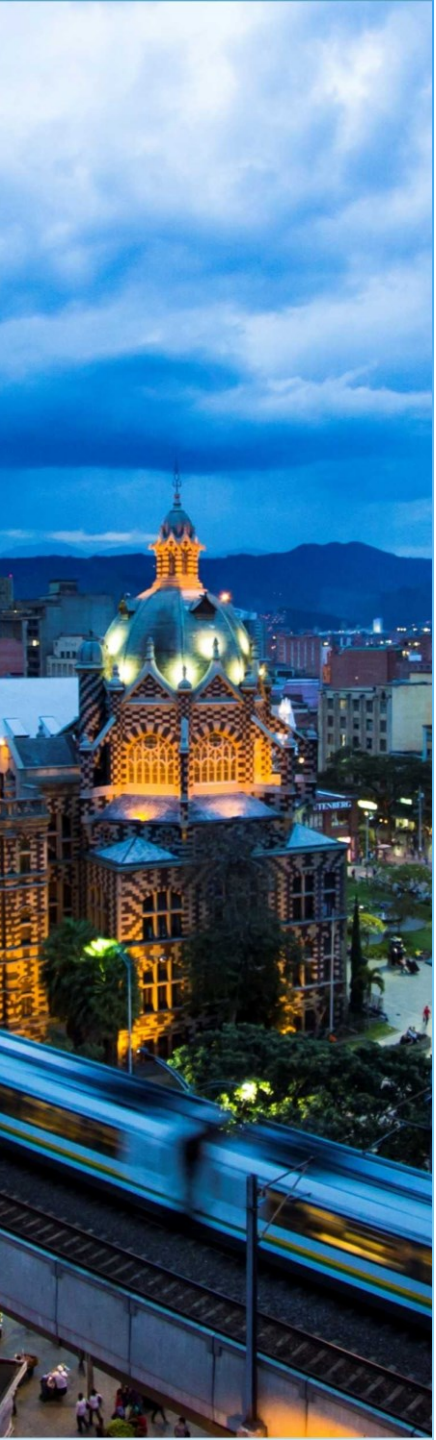
Aggregation by type of inventory

GHG emission inventories

- Emissions from the base inventory were scaled up to match the magnitudes of local GHG EI's.
- The spatial distribution of CAMS data was assigned to the total national emissions reported in the GHG inventories.

High-resolution Inventories

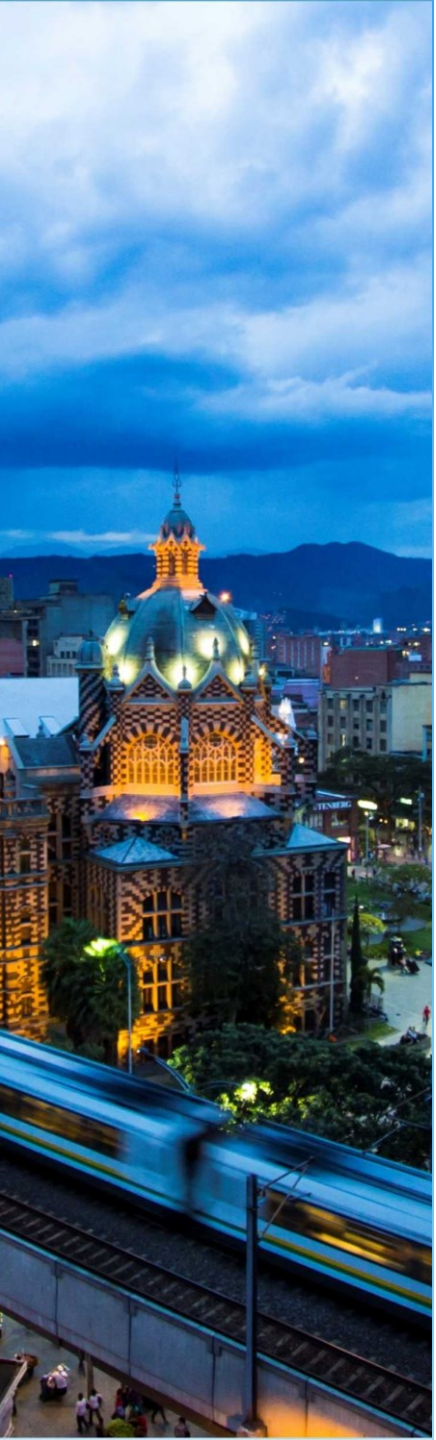
- Emissions were directly incorporated into the mosaic replacing the base data.
- Each original grid was homologated to the CAMS grid.
- Missing years were interpolated by using CAMS trajectories.

[illegible]



- Due to temporal inconsistencies in IND, REF, and ENE sectors, emissions were scaled to match the magnitudes estimated in the GHG inventory while preserving the spatial distribution from INEMA local EI.
- As a result, these sectors lack NH₃ emissions data.

[illegible]



100

- NH₃ Emissions for sectors RCO and FEF were missing. Values were set to 0.
- GEEA provides information for the OBB sector only, until 2019. We used the GFAS emissions data adjusted to GEEA's magnitude to extrapolate the emissions to 2020.

[illegible]



- A high-resolution database for the road transport sector was included. For the rest of the sectors, the national GHG EI was used, except SHP, SLV and OBB.
- GHG inventory is the most complete of the region regarding species; it also includes particles.

[illegible]



- There are missing data for the AGS and FEF sectors. these sectors were not considered.
- For sectors with missing emissions for some “non-relevant” species, the values were set to 0.

[illegible]



- FEF and AGL sectors weren't considered due to missing information on some species or to big inconsistencies in the magnitudes reported between species.

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■ Results





Total emissions

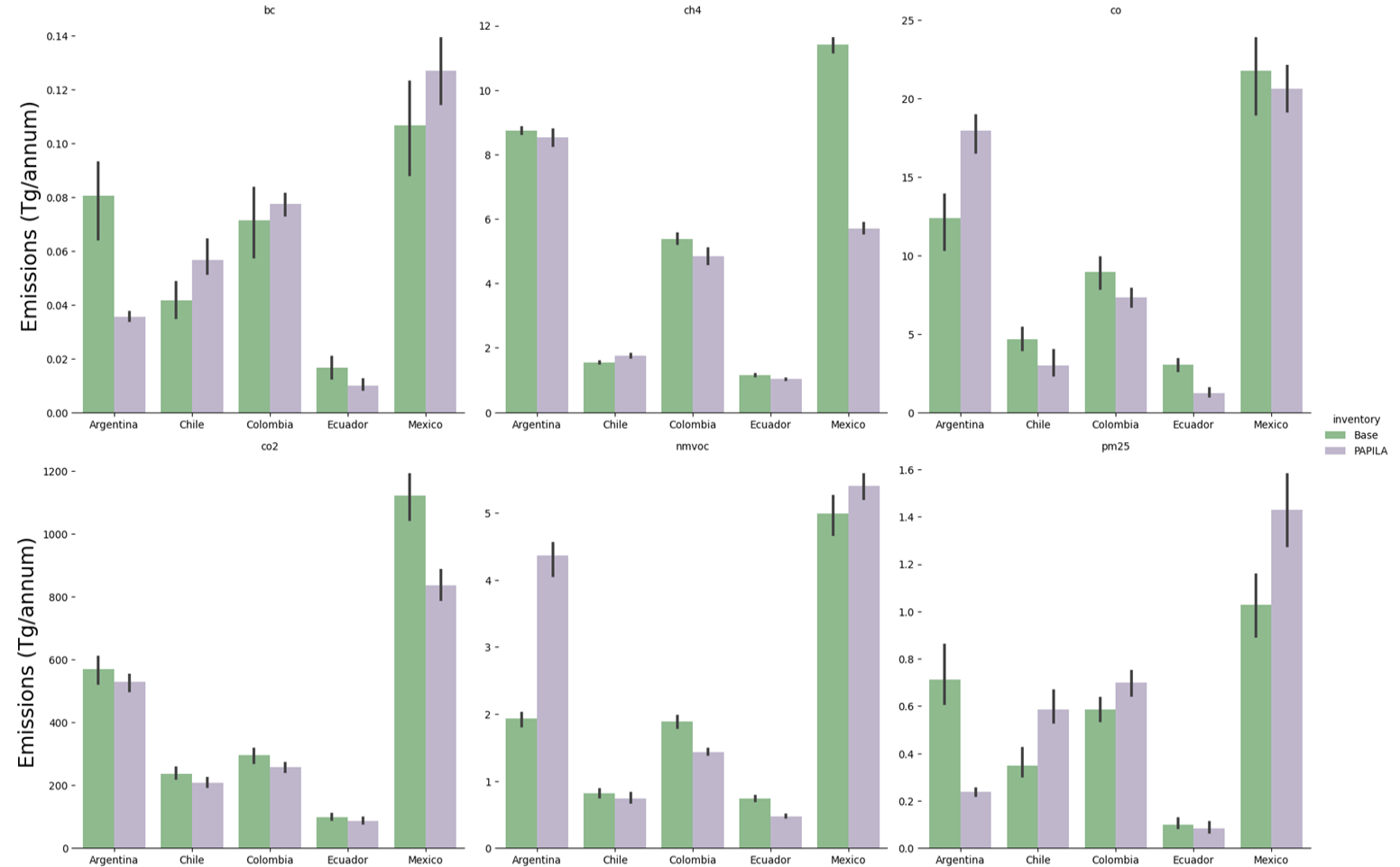
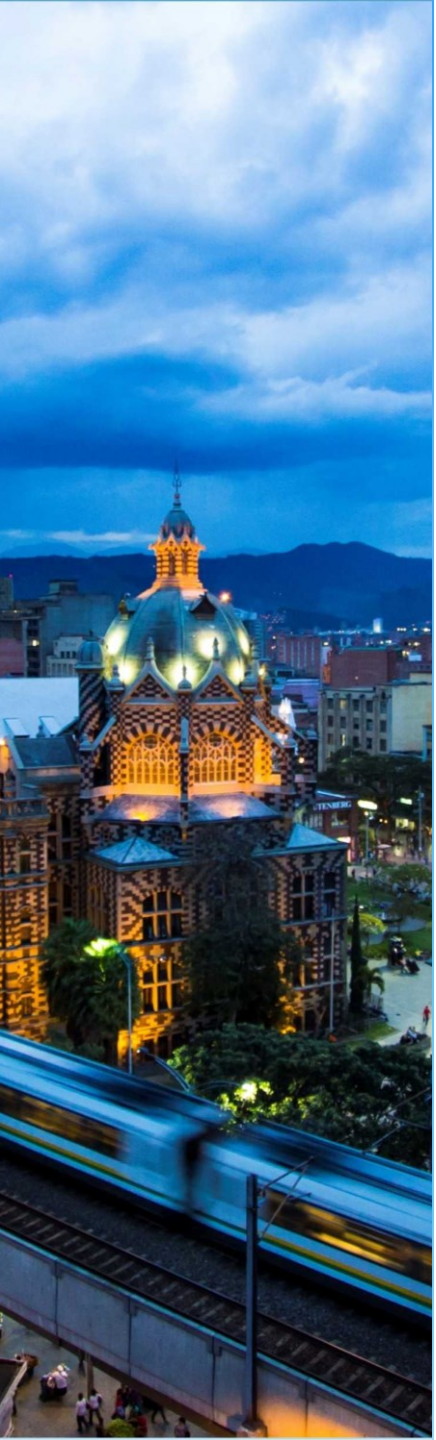
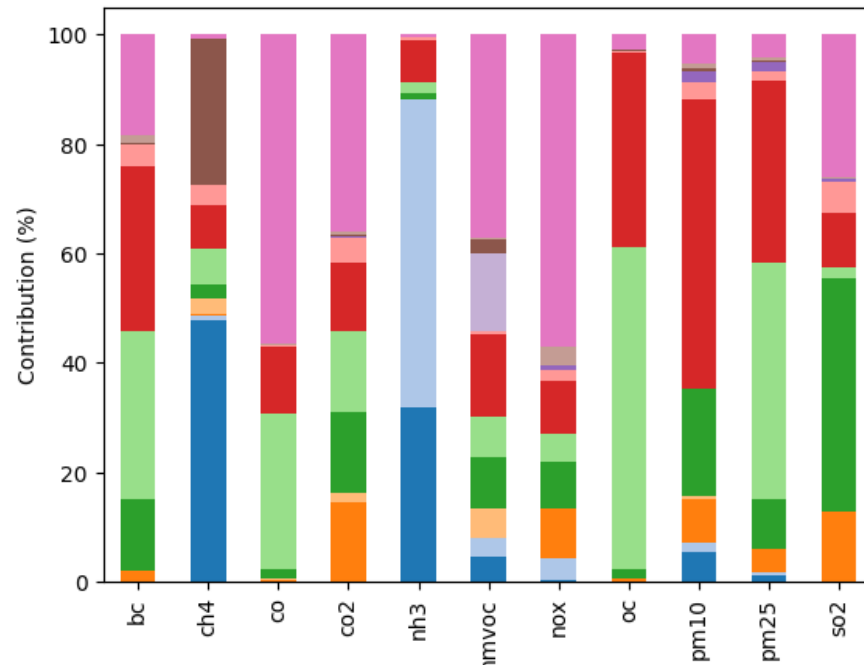


Figure: comparison of Total emissions between CAMS and PAPILA per specie and country

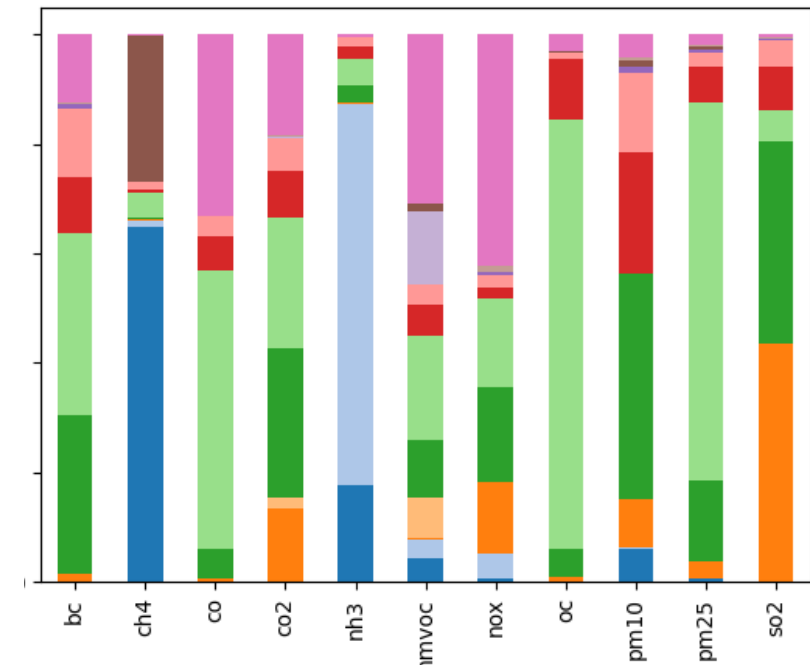


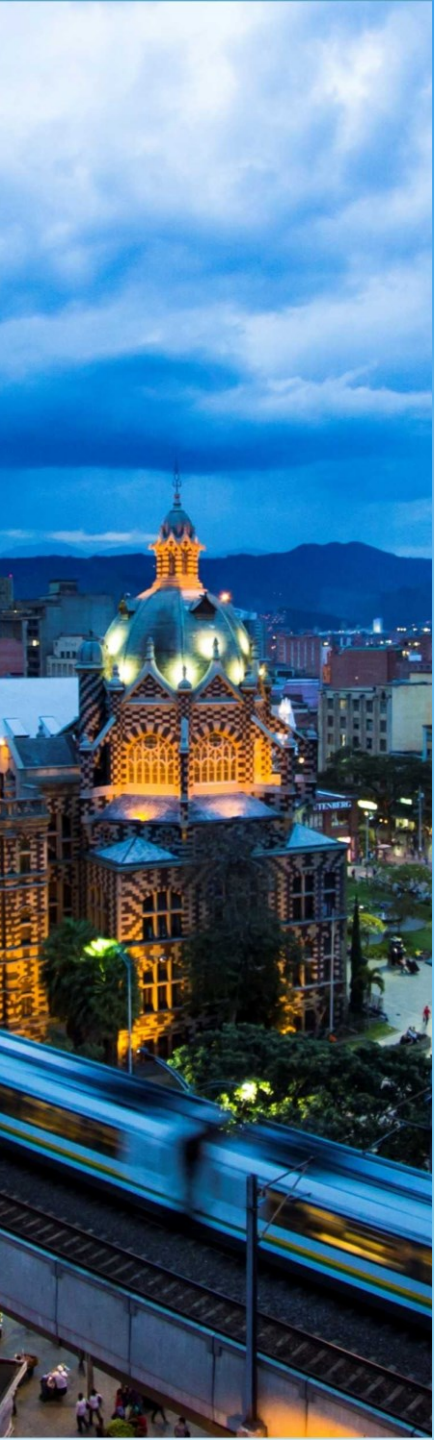
Sectoral Distribution

PAPILA



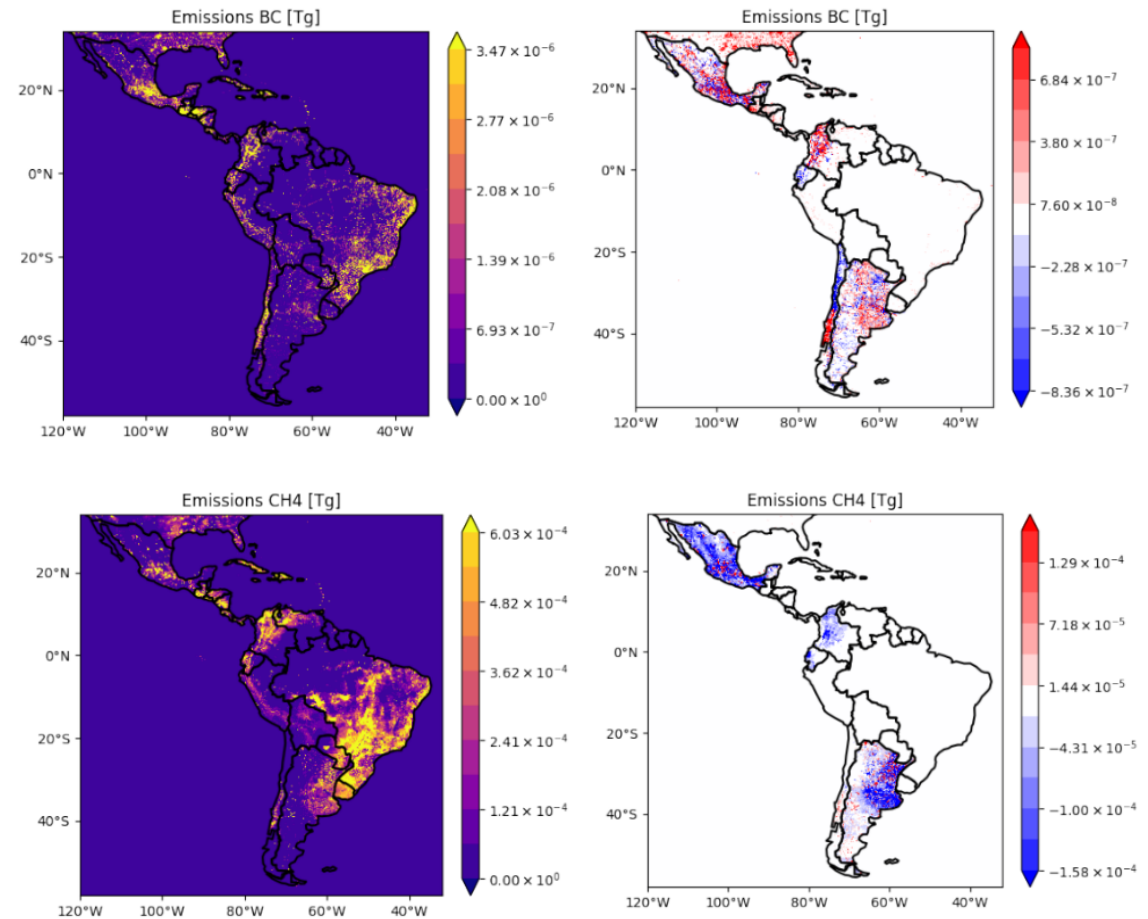
Base Inventory





Spatial Distribution

Results show differences between the PAPILA and CAMS datasets, in terms of both emission levels and their spatial distribution.



Final Remarks

Need to advance:

1. Definition and adoption of general guidelines for the development of high-resolution local inventories. So that they are compatible with global inventories and comparable with each other.
2. Recommendations to strengthen GHG EI's, favoring their use in a broader scope. Example from Colombia
3. Exploration of Pollutant Release and Transfer Registers (PRTRs), as input to generate high resolution inventories. Definition of minimum criteria for its adoption. (temporal consistency, validations, etc.)

Thanks!

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Logos entidades u otra información



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