

# Road transport exhaust emissions in Colombia. 1990–2020 trends and spatial disaggregation



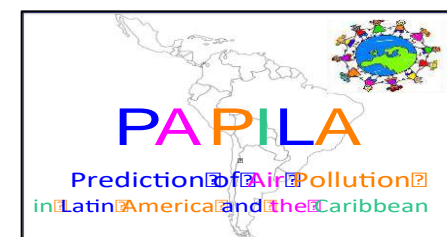
Néstor Y. Rojas, Sonia C. Mangones, Mauricio Osses, Claire Granier,  
Ignacio Laengle, Julieth V. Alfonso, Johann A. Méndez



UNIVERSIDAD  
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DE COLOMBIA



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FEDERICO SANTA MARÍA





## Highlights

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We estimated road transport exhaust emissions in Colombia 1990 – 2020.

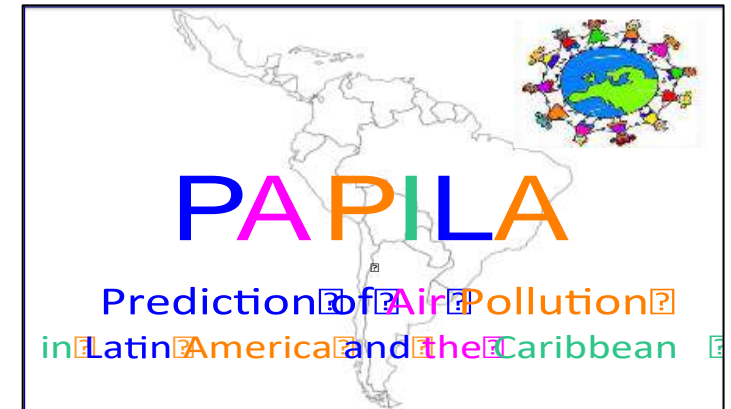
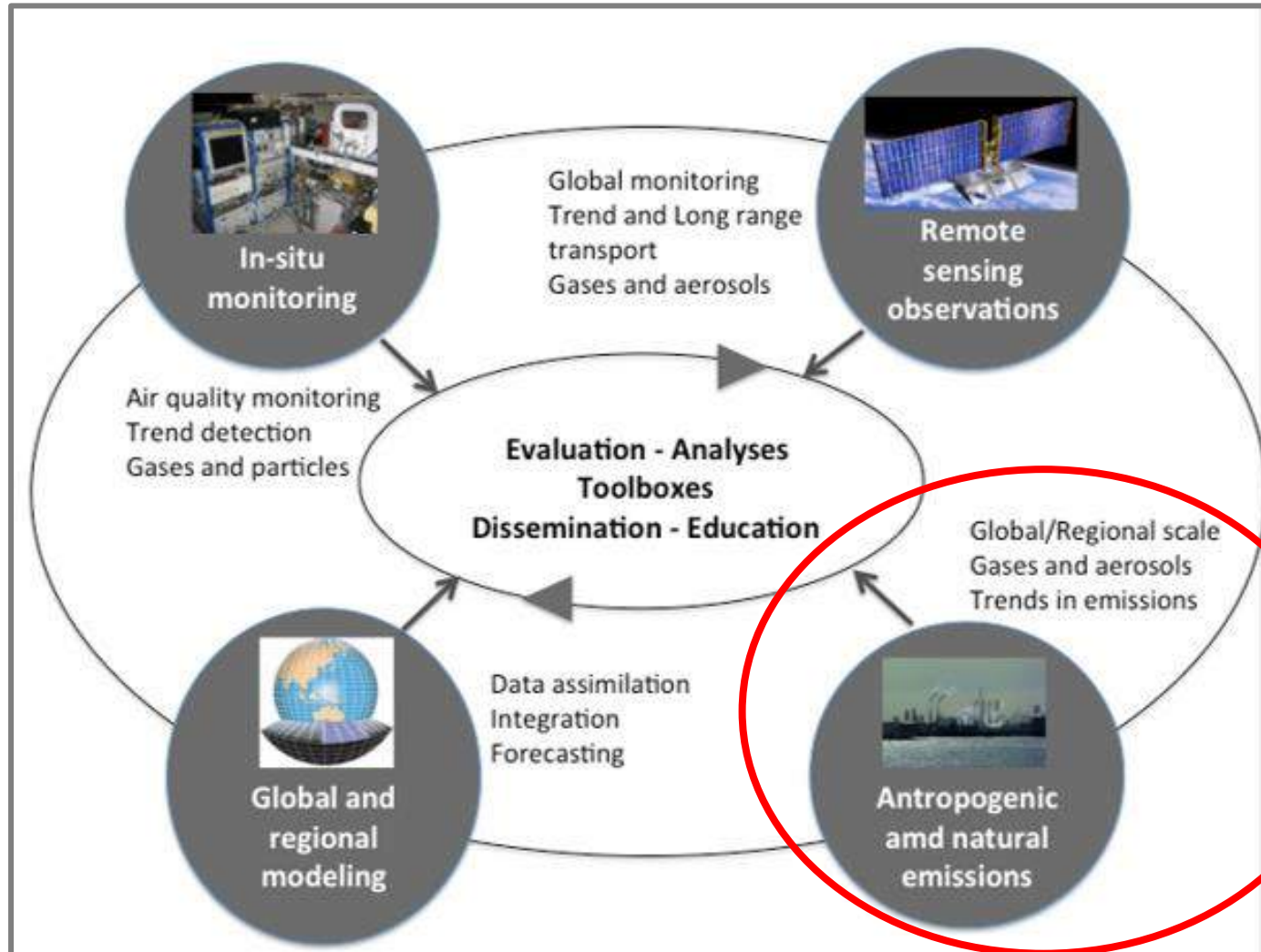
We compare total emissions and temporal trends to international estimates.

We present the spatial distribution of traffic emissions at high spatial resolution.

Our methodology was previously applied in Chile and our aim is to extend its use to other Latin American countries to build a continental database.



## Context and background

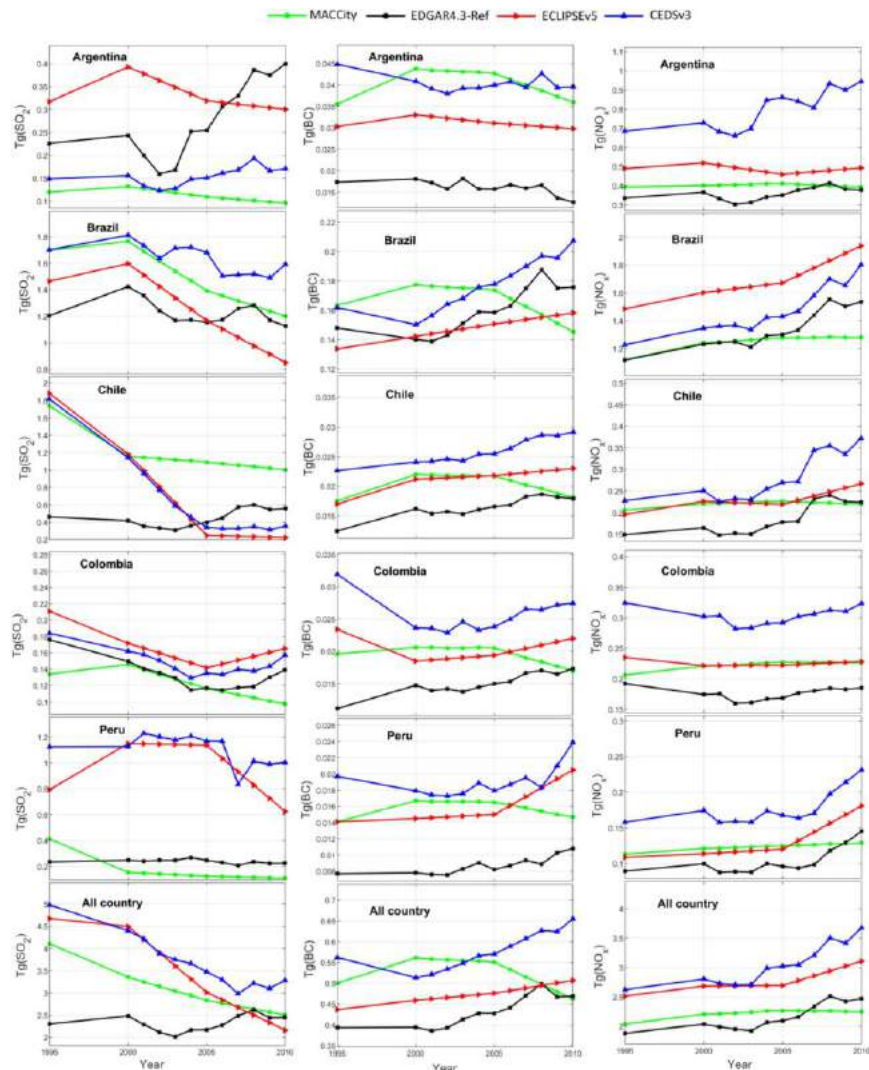


Emission inventories consistent with local estimates

- Time series
- Spatial disaggregation

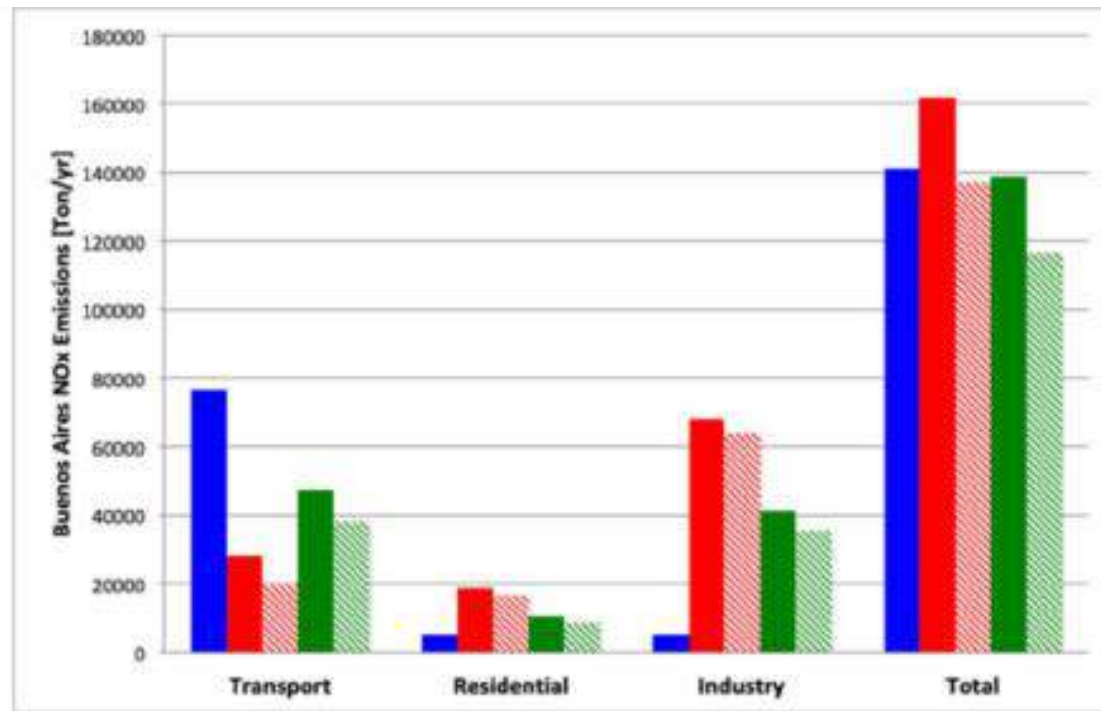


# Evaluation of emission inventories



## Evaluation of anthropogenic air pollutant emission inventories for South America at national and city scale

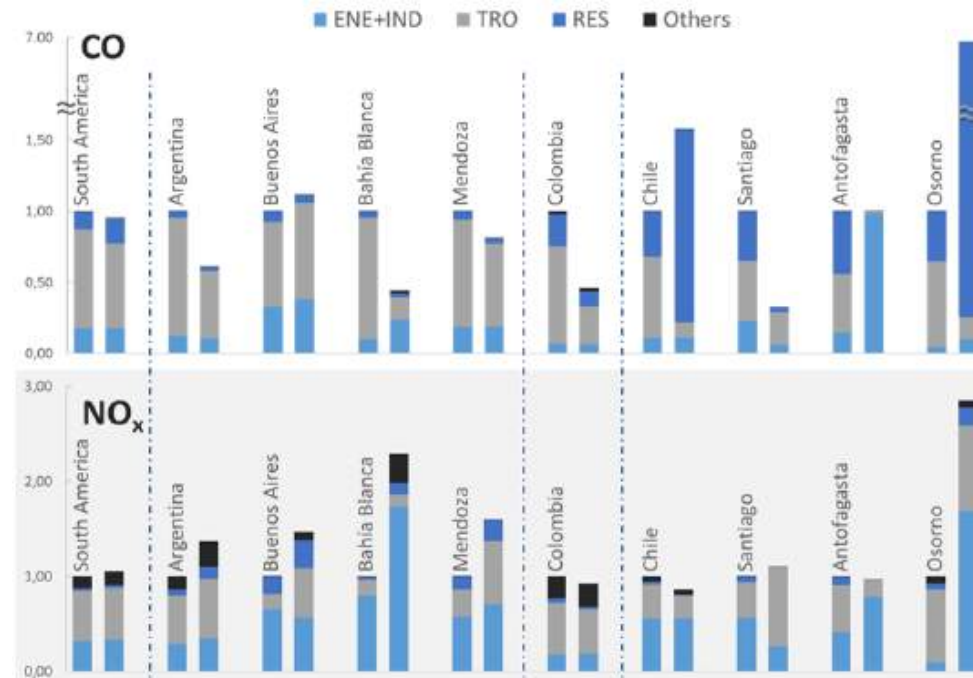
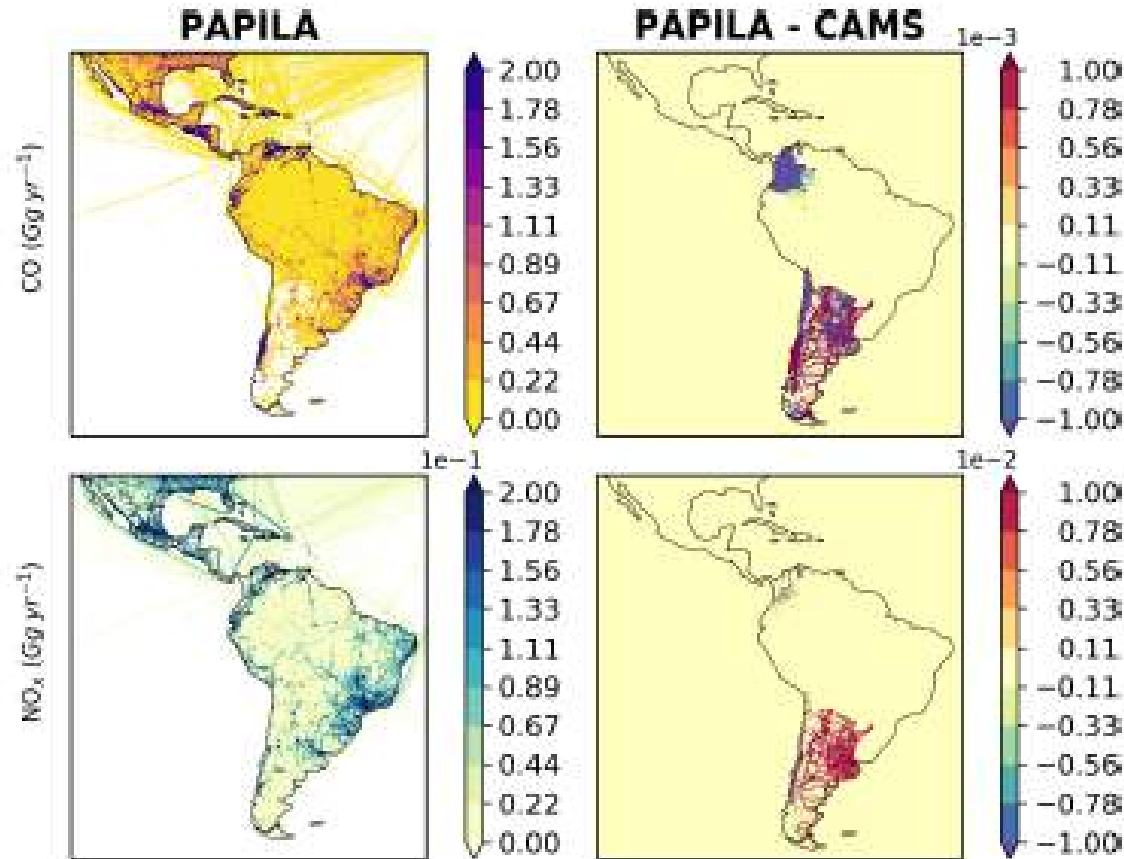
Nicolas Huneus<sup>a,b,\*</sup>, Hugo Denier van der Gon<sup>c</sup>, Paula Castesana<sup>d,e</sup>, Camilo Mennares<sup>a,b</sup>, Claire Granier<sup>f,g</sup>, Louise Granier<sup>f</sup>, Marcelo Alonso<sup>h</sup>, Maria de Fatima Andrade<sup>i</sup>, Laura Dawidowski<sup>e</sup>, Laura Gallardo<sup>a,h</sup>, Dario Gomez<sup>e</sup>, Zbigniew Klimont<sup>j</sup>, Greet Janssens-Maenhout<sup>k</sup>, Mauricio Osses<sup>b,l</sup>, S. Enrique Puliafito<sup>m</sup>, Nestor Rojas<sup>n</sup>, Odón Sánchez-Ccoyllo<sup>o</sup>, Sebastián Tolvett<sup>o</sup>, Rita Yurí Ynoue<sup>l</sup>





**PAPILA dataset: a regional emission inventory of reactive gases for South America based on the combination of local and global information**

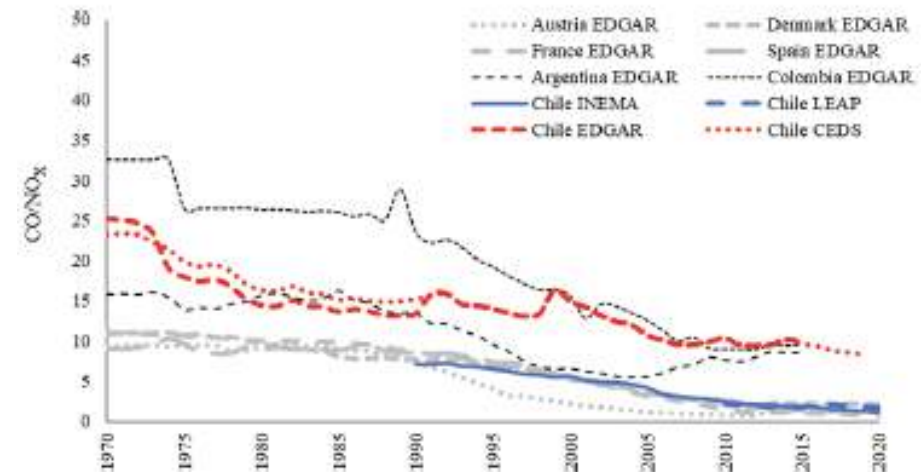
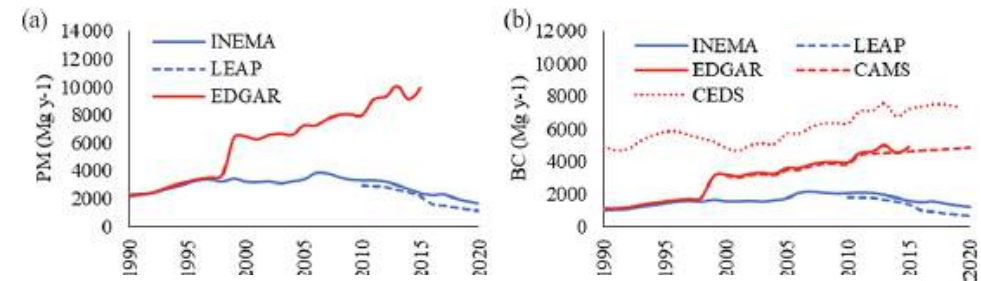
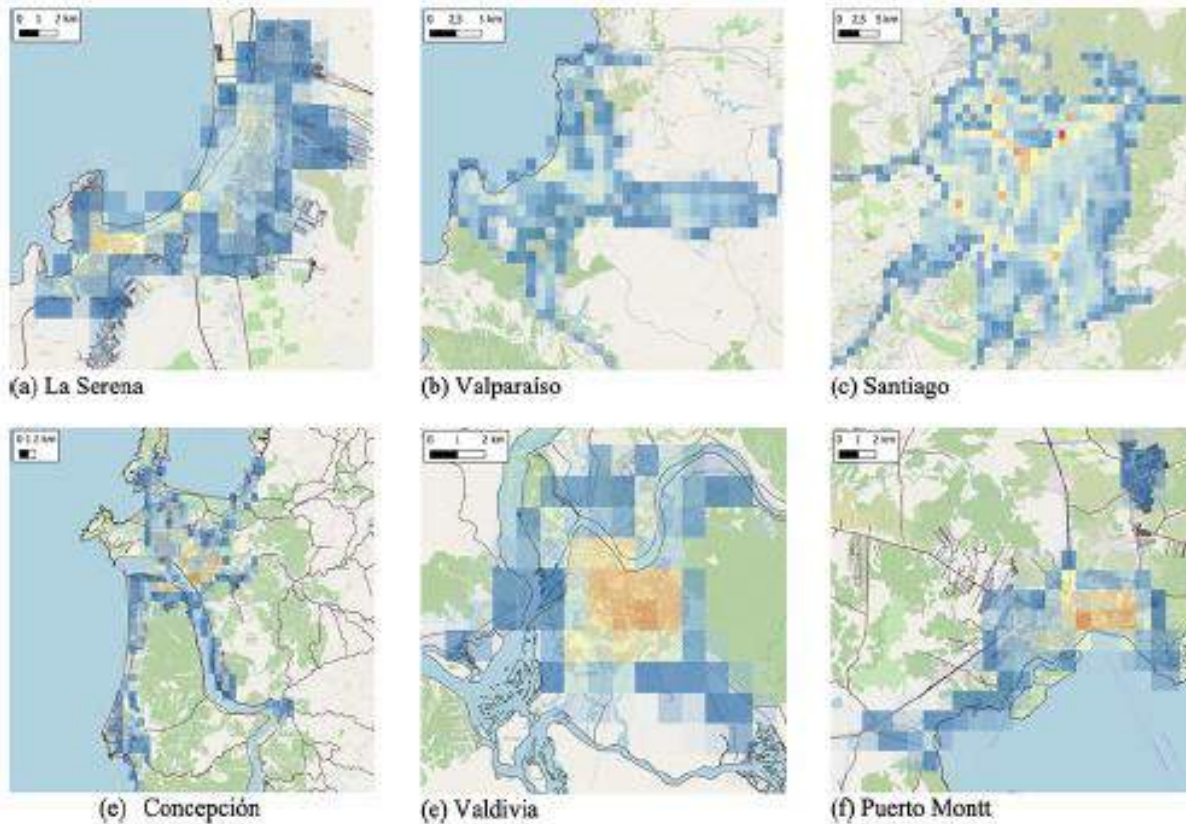
Paula Castesana<sup>1,2,3</sup>★, Melisa Diaz Resquin<sup>2,4,5</sup>★, Nicolás Huneeus<sup>5,6</sup>, Enrique Puliafito<sup>1,7</sup>, Sabine Darras<sup>8</sup>, Darío Gómez<sup>2,4</sup>, Claire Granier<sup>8,9</sup>, Mauricio Osses Alvarado<sup>10</sup>, Néstor Rojas<sup>11</sup>, and Laura Dawidowski<sup>2,3</sup>



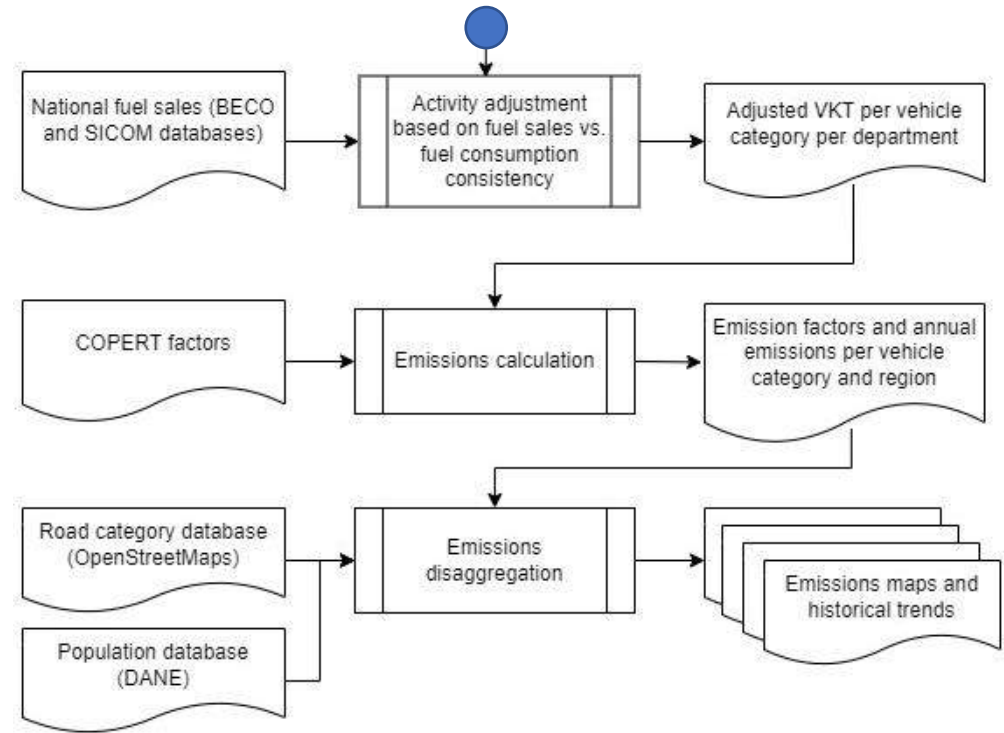
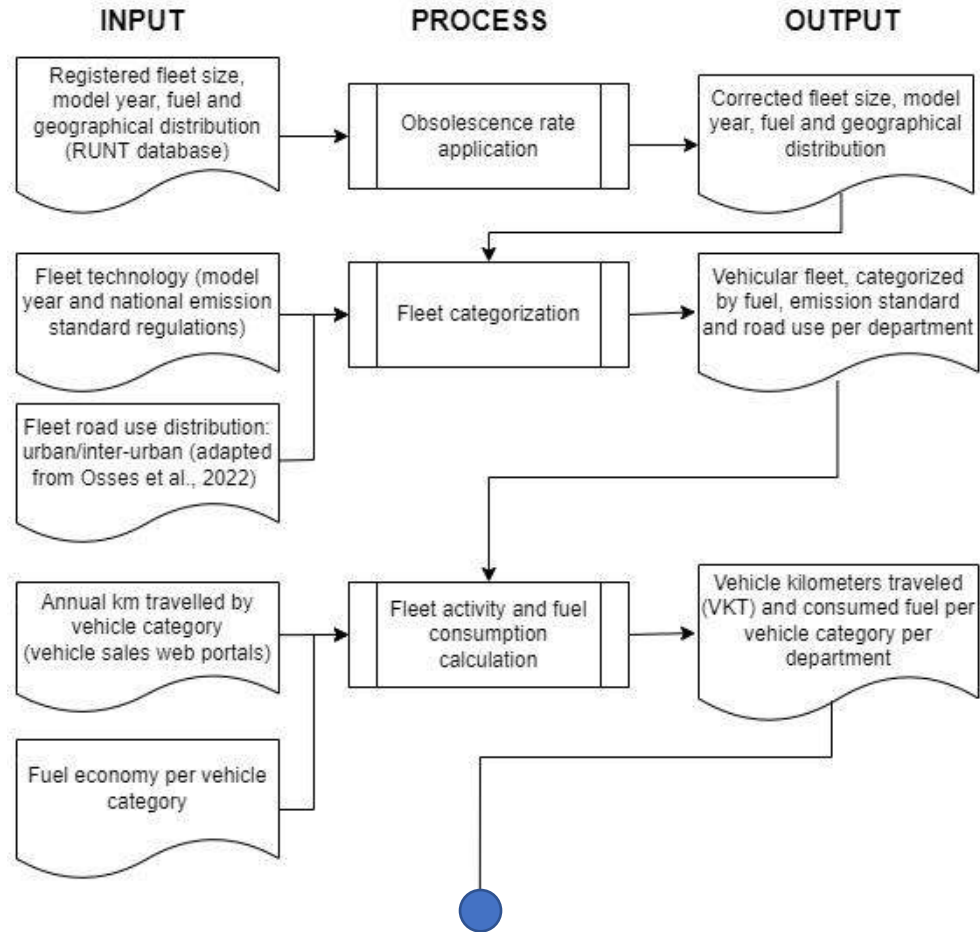


## High-resolution spatial-distribution maps of road transport exhaust emissions in Chile, 1990–2020

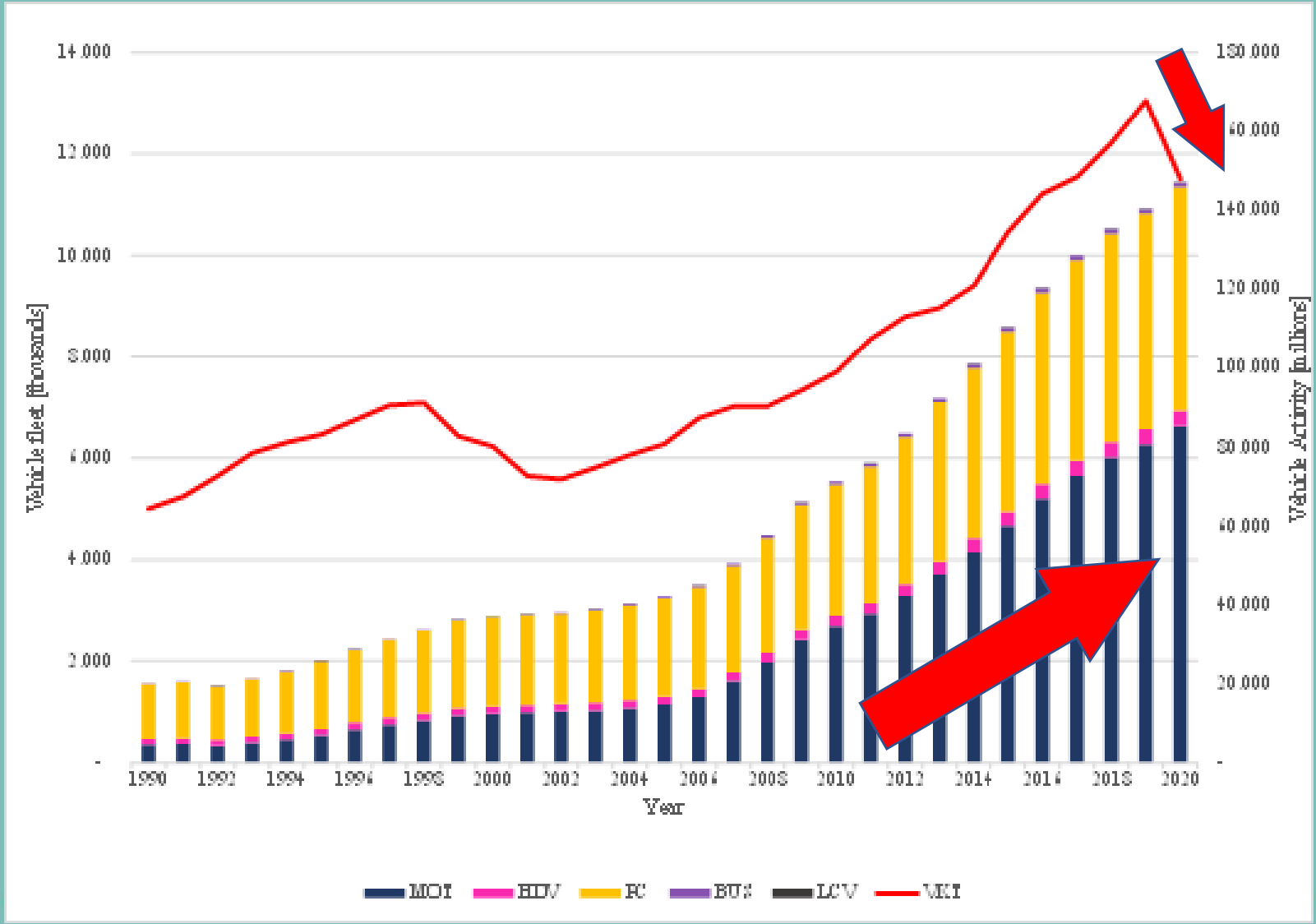
Mauricio Osses<sup>1,3</sup>, Néstor Rojas<sup>2</sup>, Cecilia Ibarra<sup>3,4</sup>, Víctor Valdebenito<sup>1</sup>, Ignacio Laengle<sup>1</sup>, Nicolás Pantoja<sup>1,3</sup>, Darío Osses<sup>4</sup>, Kevin Basoa<sup>3</sup>, Sebastián Tolvet<sup>5</sup>, Nicolás Huneus<sup>3,4</sup>, Laura Gallardo<sup>3,4</sup>, and Benjamín Gómez<sup>1,3</sup>



## Methods



# Results: Vehicle fleet and Vehicle Kilometers Traveled (VKT) trends



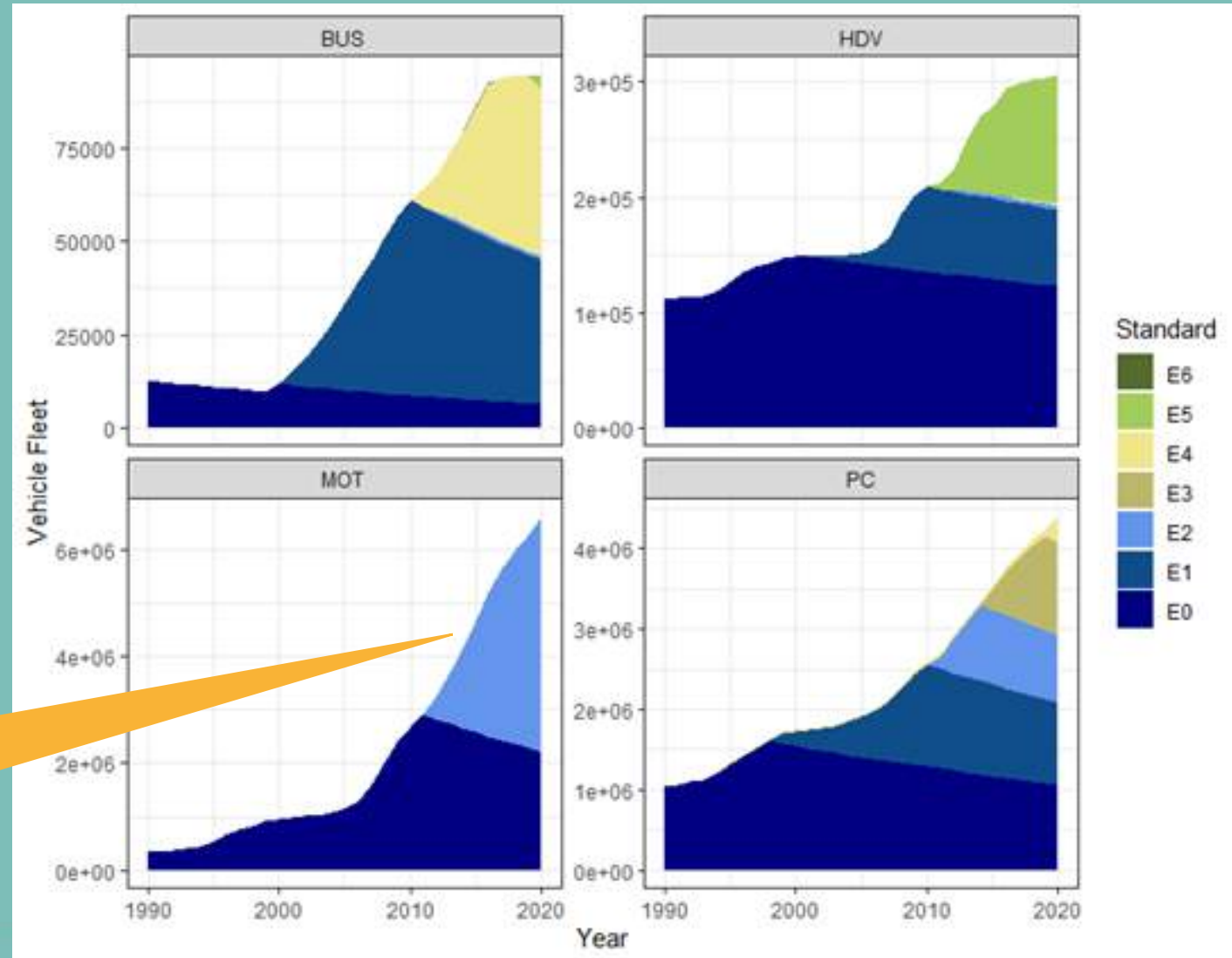
Drop in activity in 2020 (COVID-19 lockdowns)

Huge increase in motorcycles after 2007





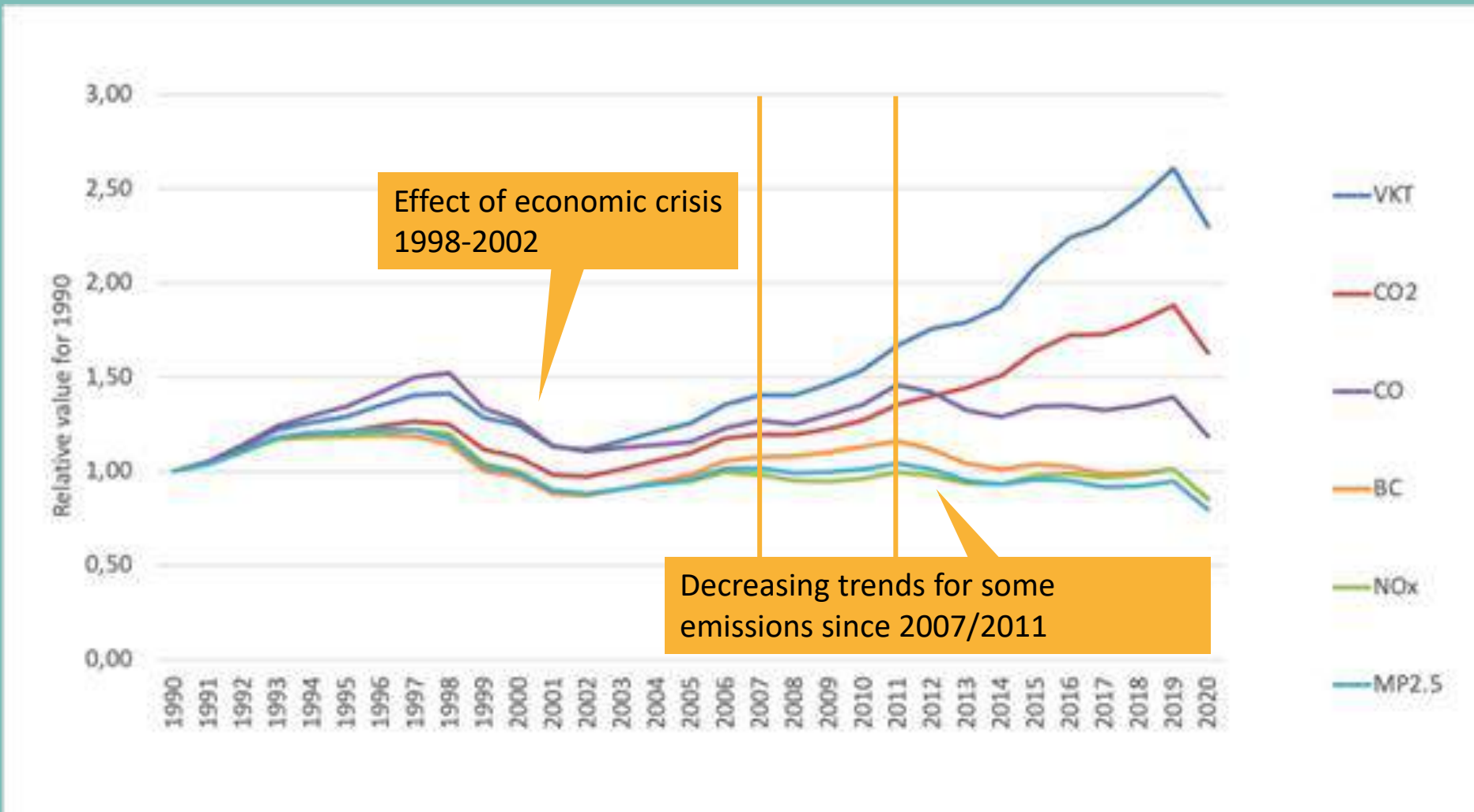
## Results: Trend Vehicle Fleet and standard 1990 to 2020



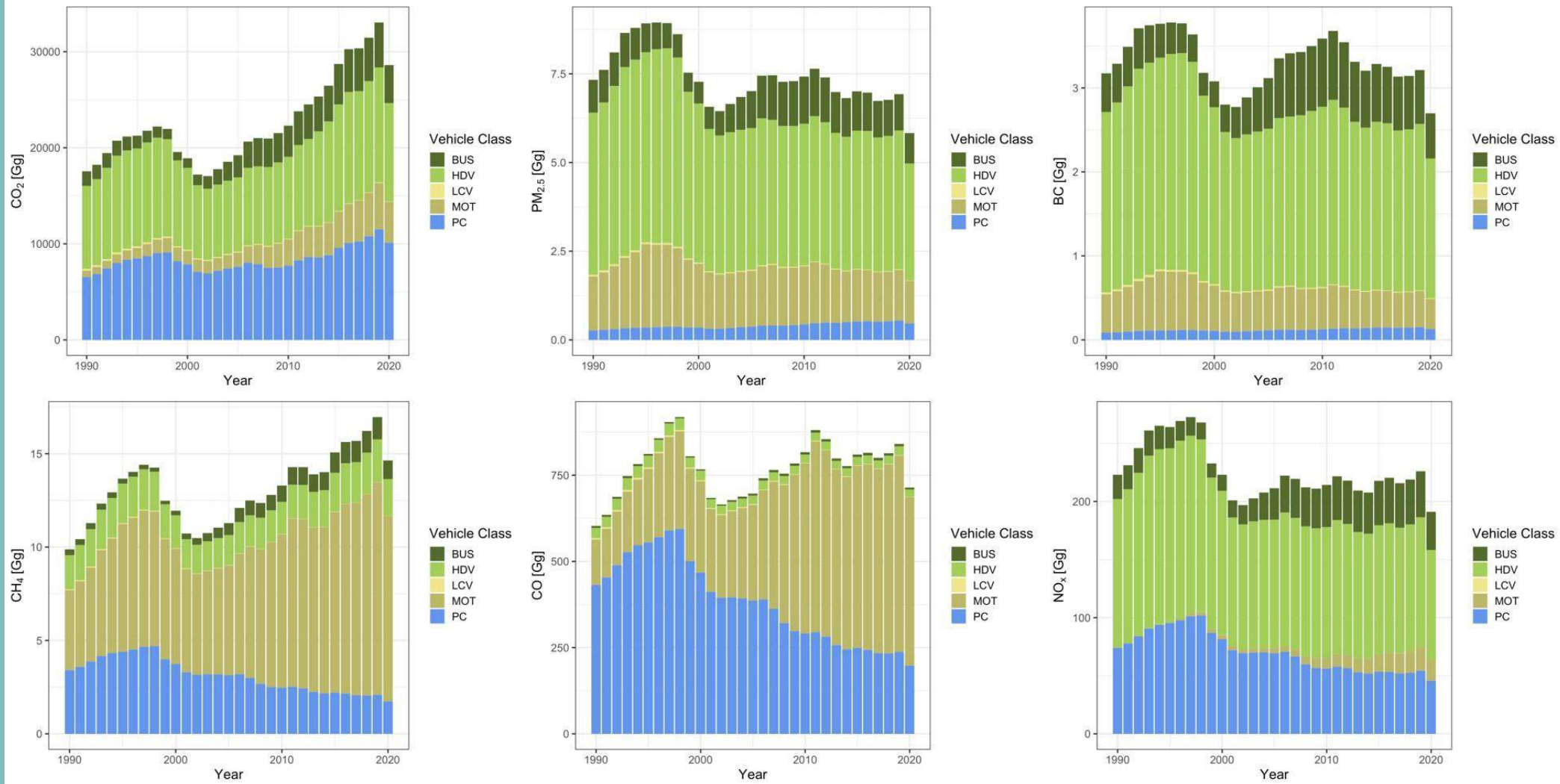
Old motorcycle  
emission standards



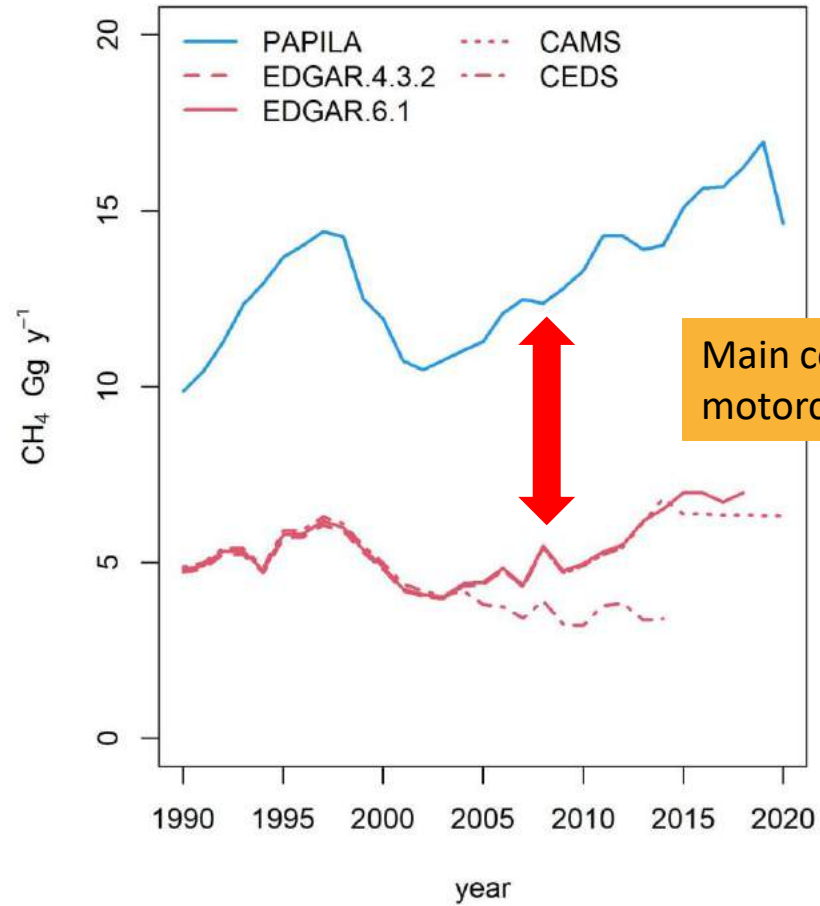
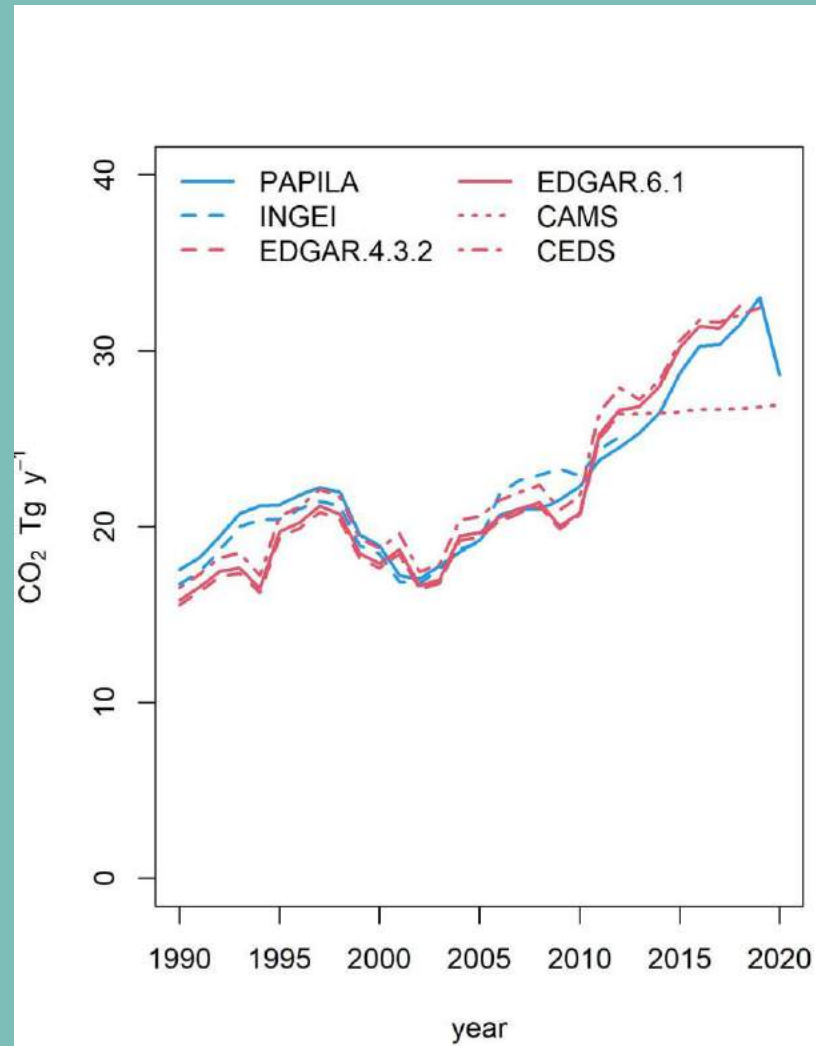
## Results: Normalized emission trends from 1990 to 2020



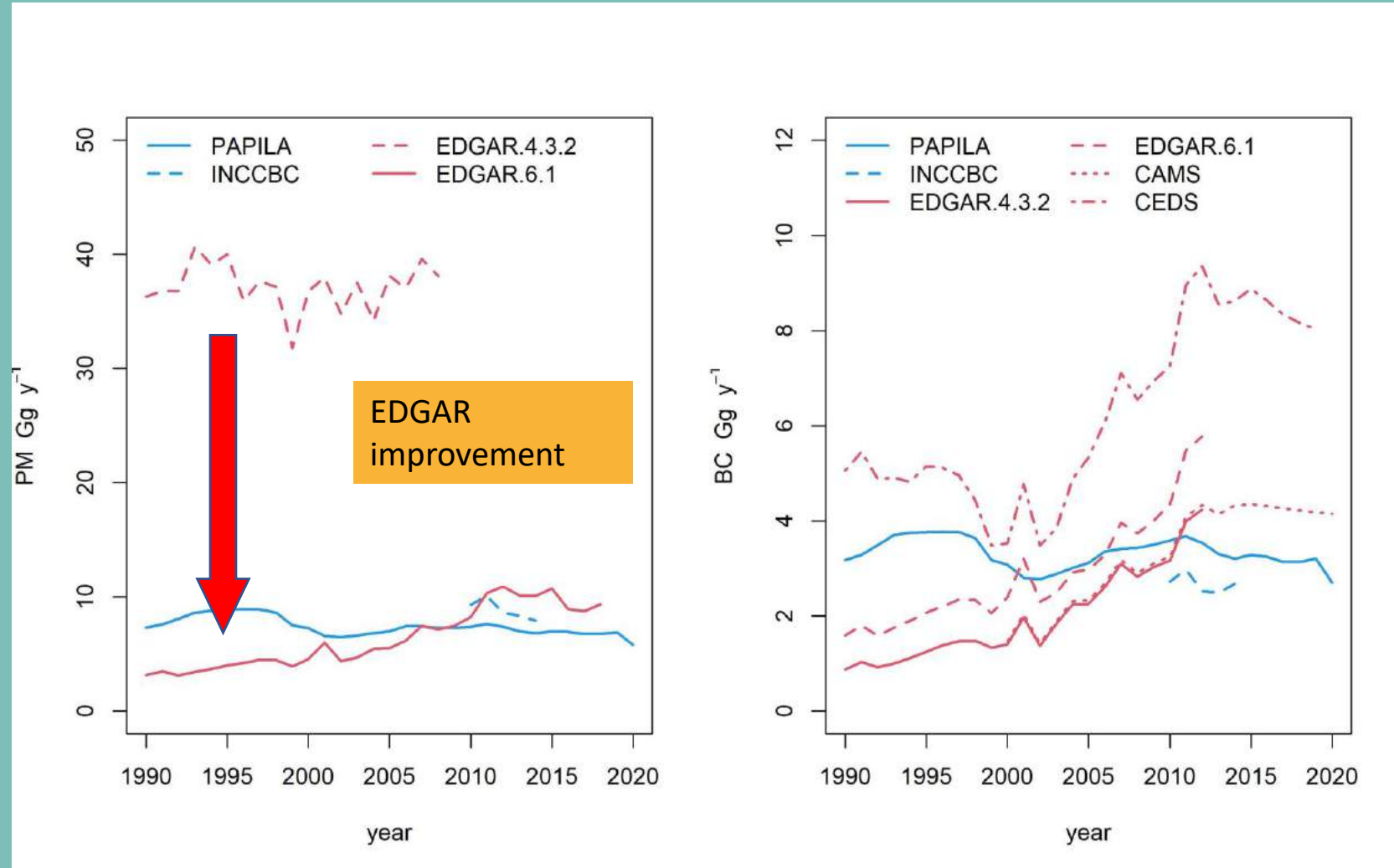
# Results: On-road transport emission trends from 1990 to 2020 per vehicle class



# Results: Comparison between this work (PAPILA) and other emissions inventories for CO<sub>2</sub> and CH<sub>4</sub>



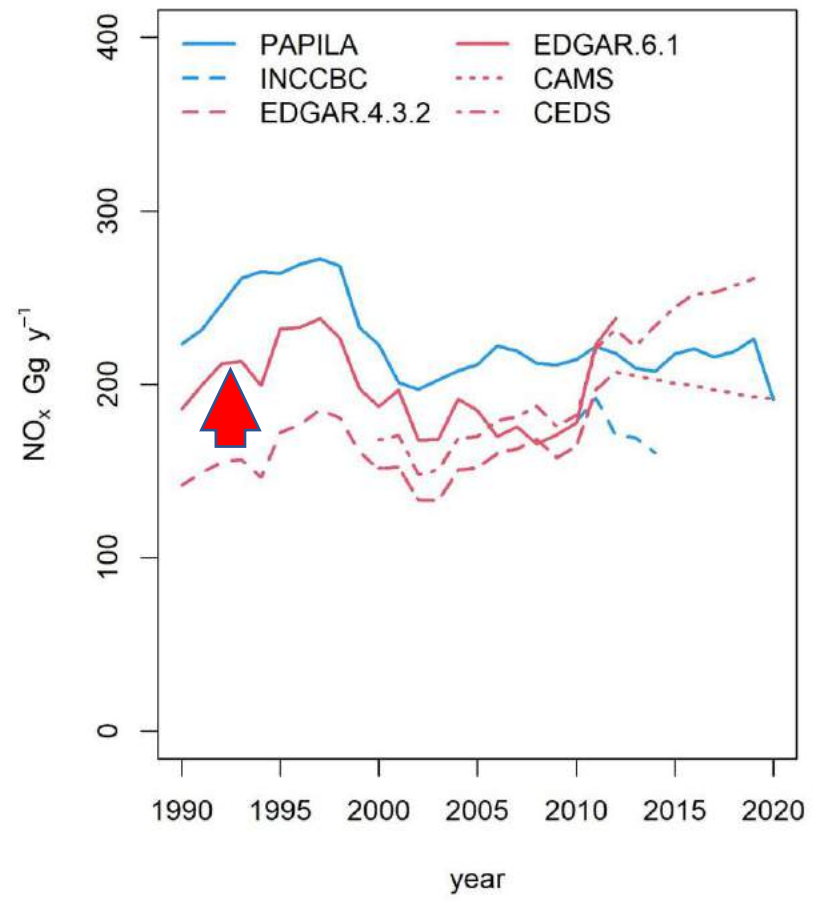
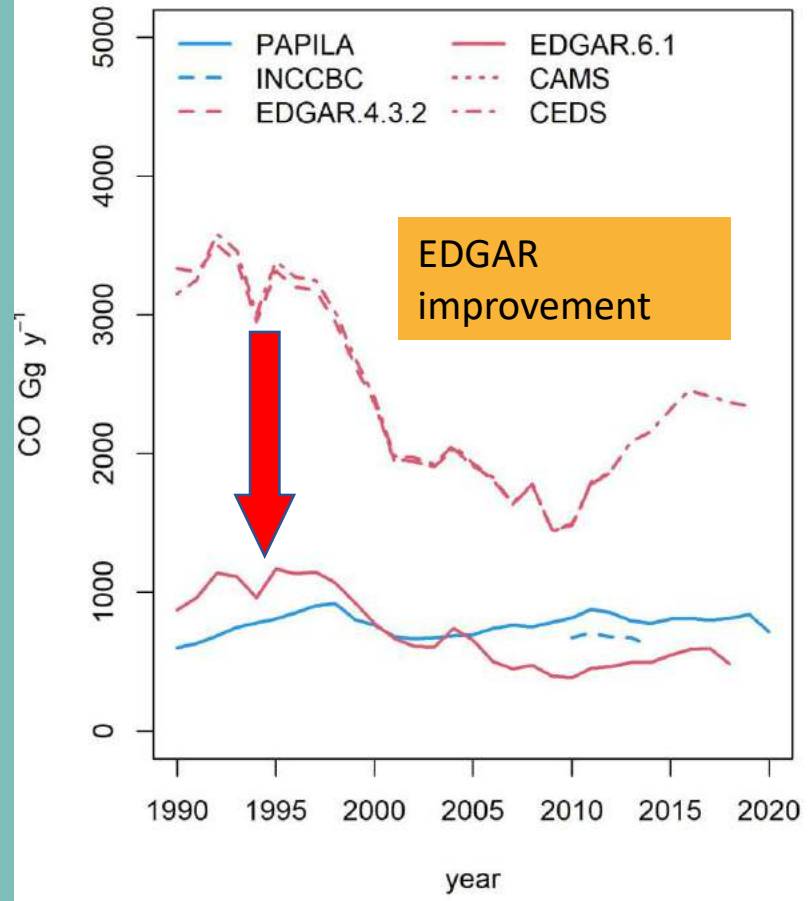
# Results: Comparison between this work (PAPILA) and other emissions inventories for PM and BC



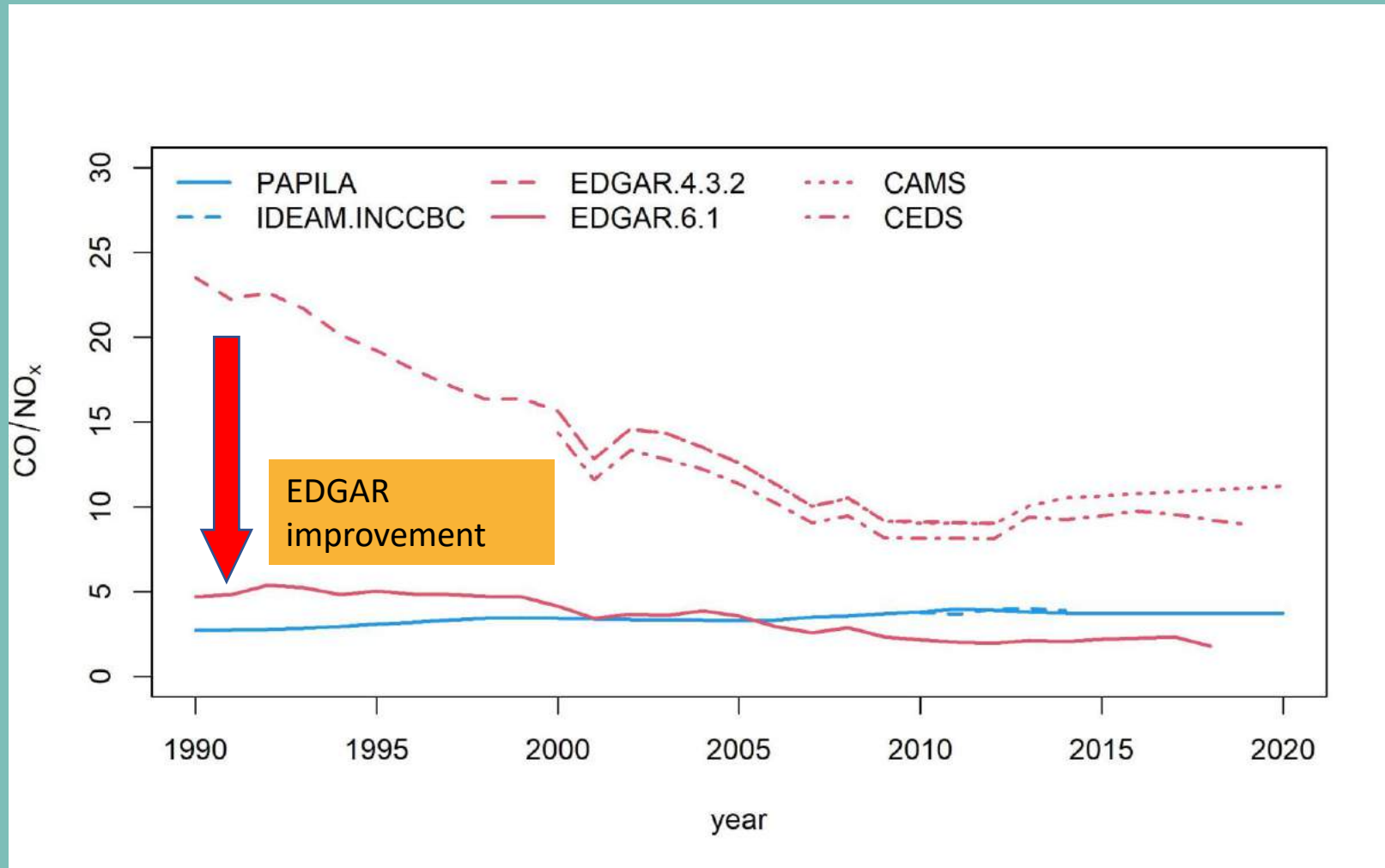
Opposite trends between PAPILA and other inventories suggest differences in emission standard evolution



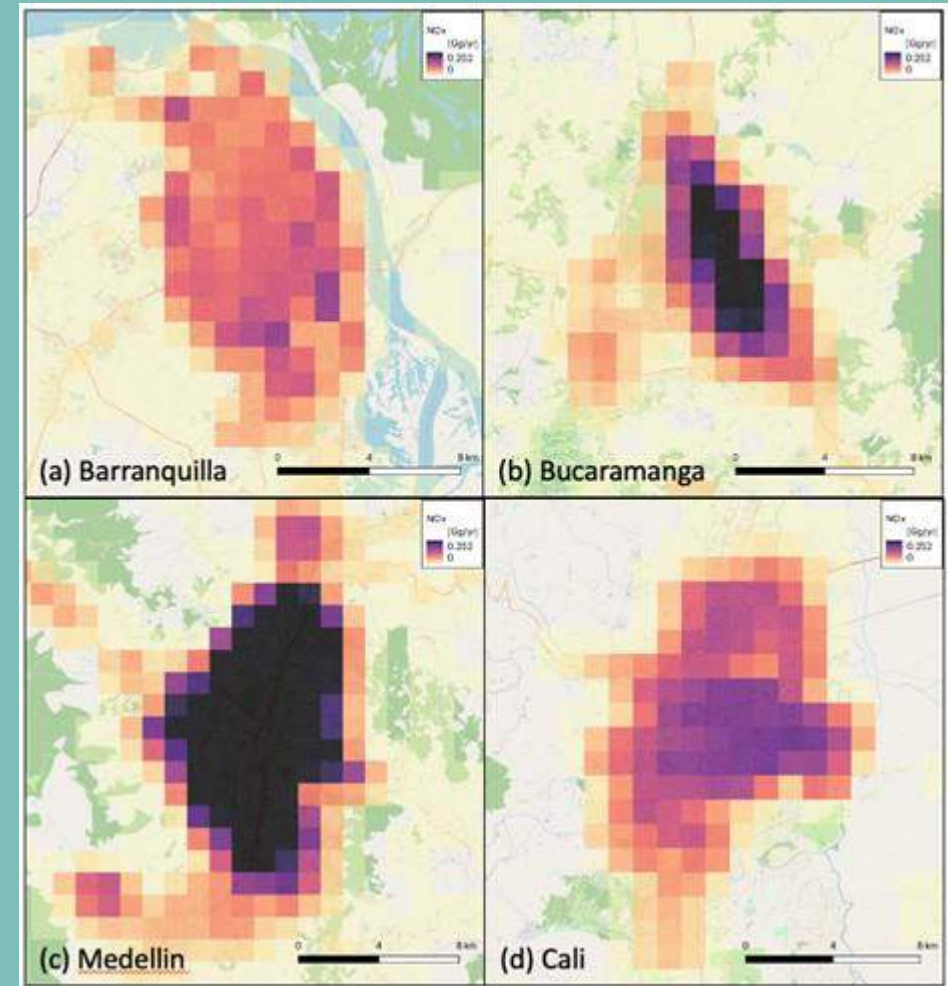
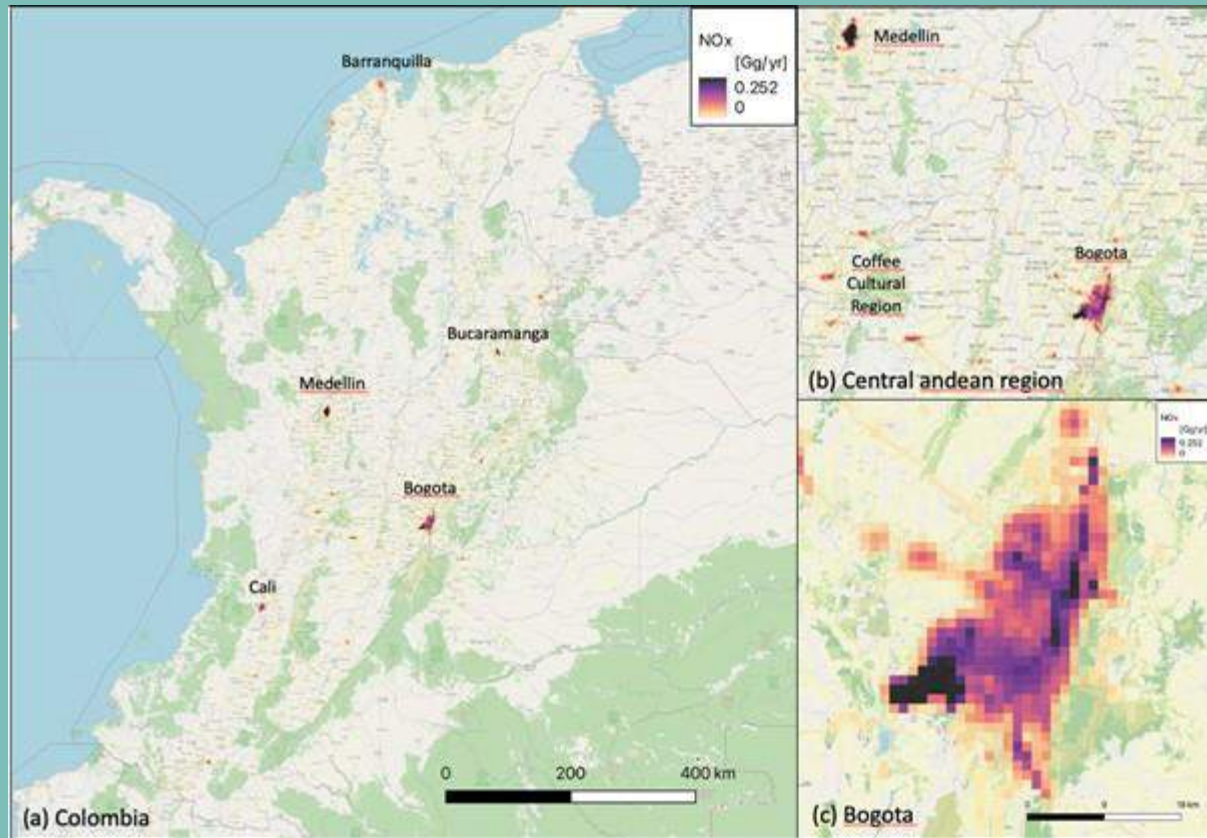
# Results: Comparison between this work (PAPILA) and other emissions inventories for CO and NO<sub>x</sub>



Results: Comparison between this work (PAPILA) and other emissions inventories for CO/NO<sub>x</sub> ratio



# Results: Spatial disaggregation





## Conclusions

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Impact of improved vehicle technology and better fuel quality is seen in declining air pollutant emissions, esp. after 2011

Nevertheless, there is a significant lag in the adoption of BAT with respect to other countries in the region.

The contribution of motorcycles to the vehicle fleet, activity, and emissions is striking.

COVID-19 pandemic lockdowns reduced emissions by 13% in 2020 with respect to 2021.

The agreement between our estimates and EDGAR 6.1 was remarkably better than with EDGAR 4.3.2.



Thanks!

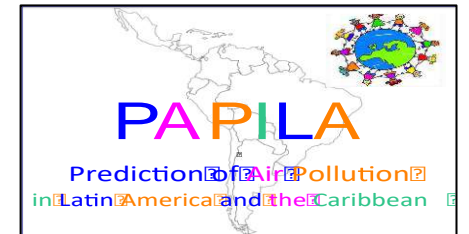
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