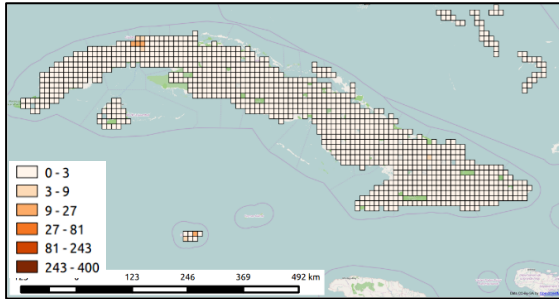


Emission inventories over Cuba and La Havana

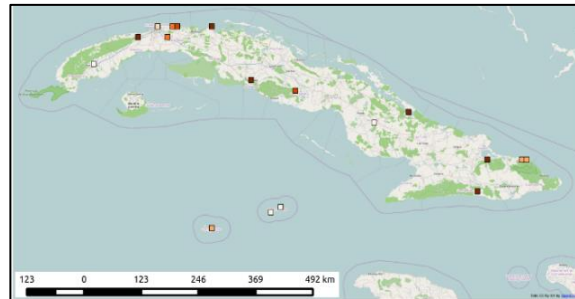
A. Clappier, J. Madrazo

EDGAR & CHIMERE grids

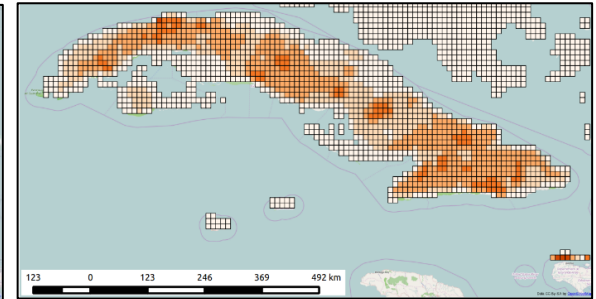
EDGAR grid: $0.1^\circ \times 0.1^\circ \approx 12 \times 12 \text{ km}$



Road traffic



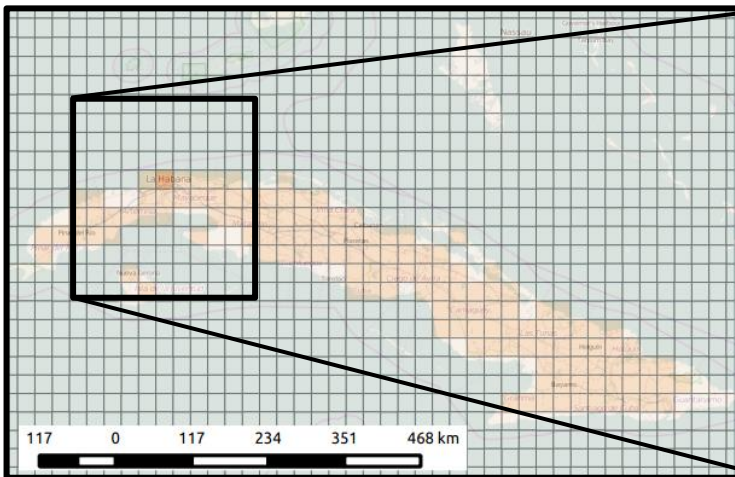
Heat Plants – Electricity generation



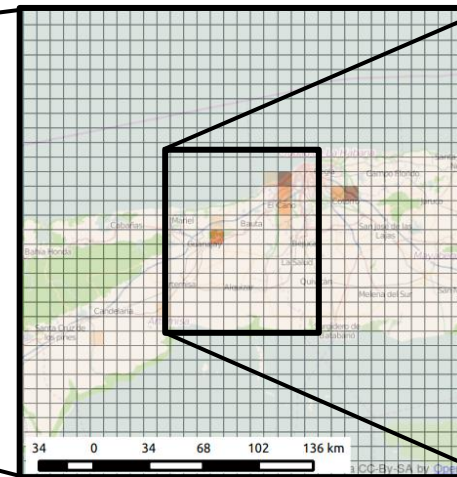
Residential - Agriculture

.....

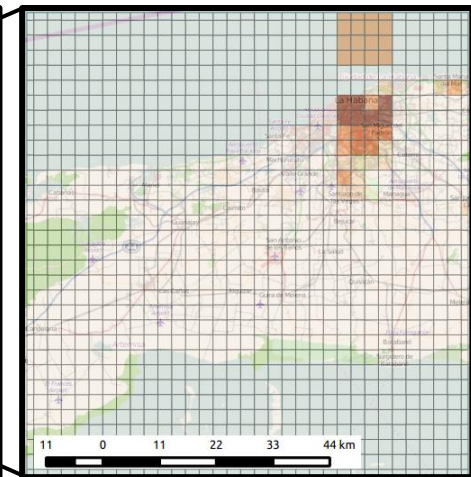
CHIMERE grids



27 x 27 km resolution



9 x 9 km resolution

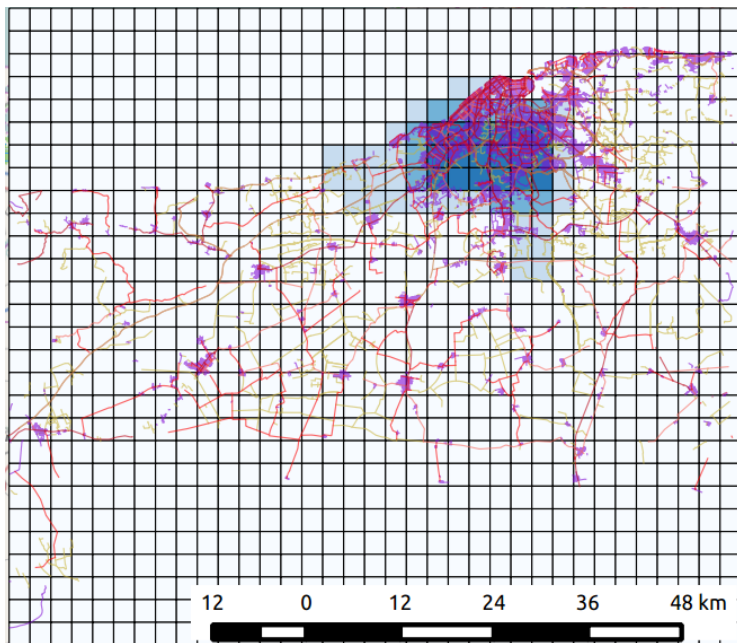


3 x 3 km resolution

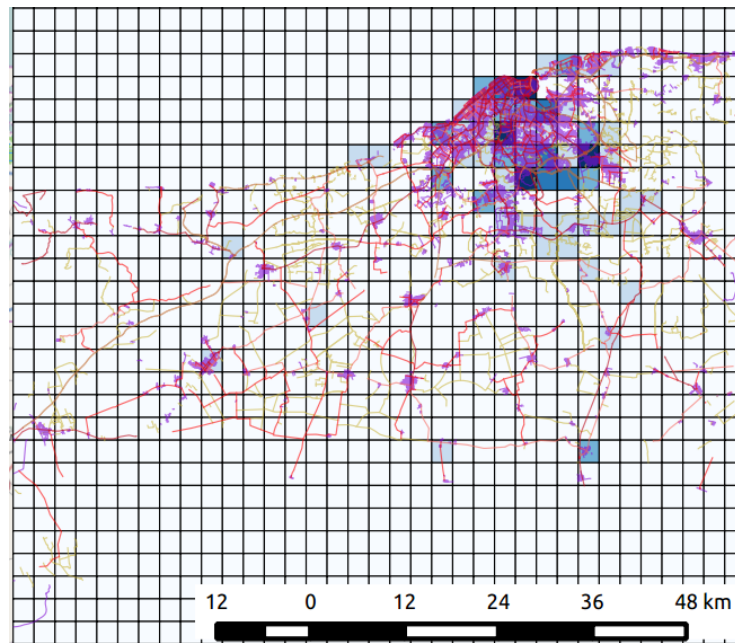
EDGAR & EMISENS inventories

CHIMERE grid, 3 x 3 km resolution, road traffic emissions.

EDGAR



EMISENS



Legend

- MainStreet
- UrbanStreet_1
- UrbanStreet_2
- UrbanStreet_3
- NeighborhoodStreets
- SemUrbanStreets
- Locals

annualAvgEmis_HAB5_0.026

- 0.0000 - 0.3180
- 0.3180 - 0.6360
- 0.6360 - 0.9539
- 0.9539 - 1.2719
- 1.2719 - 1.5899

Substitute EDGAR by EMISENS in the smaller domain.

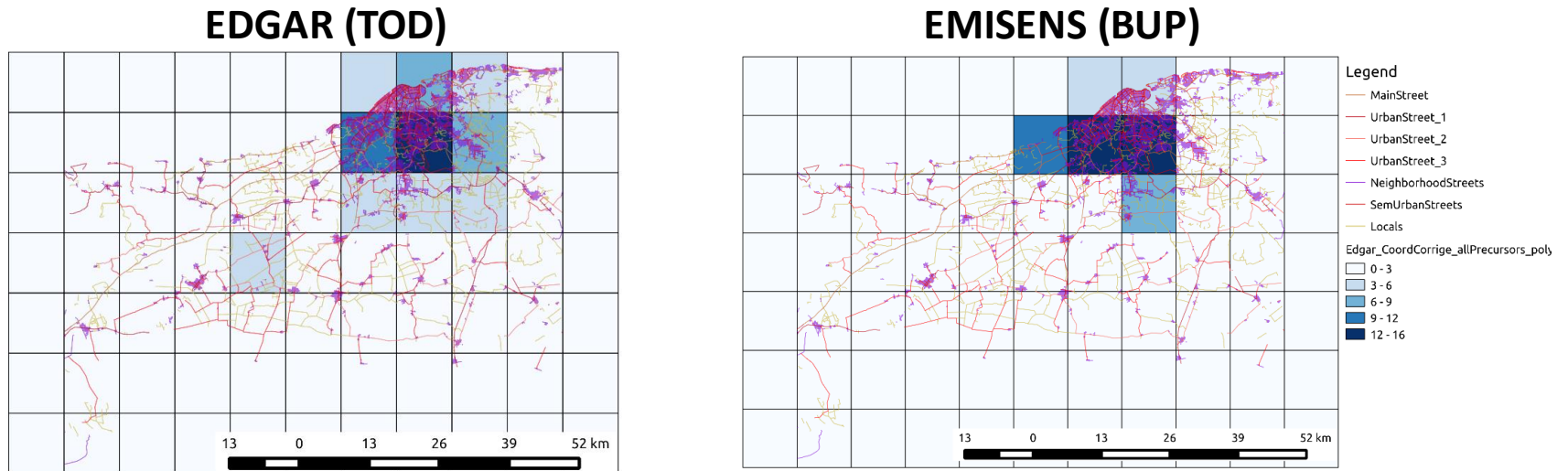
EDGAR & EMISENS inventories

The bottom-up emission inventory gives probably a more accurate results than the top-down emission inventory (at least, we know how it has been computed...).

How to use the EMISENS (bottom-up) emission inventory over the smaller domain to improve the EDGAR (top-down) emission inventory over the larger domains?

Correction of the Top-Down inventory

1. Compare the two inventories using the resolution of the inventory which should be corrected (here the EDGAR resolution).



2. Split between emission factors and activities.

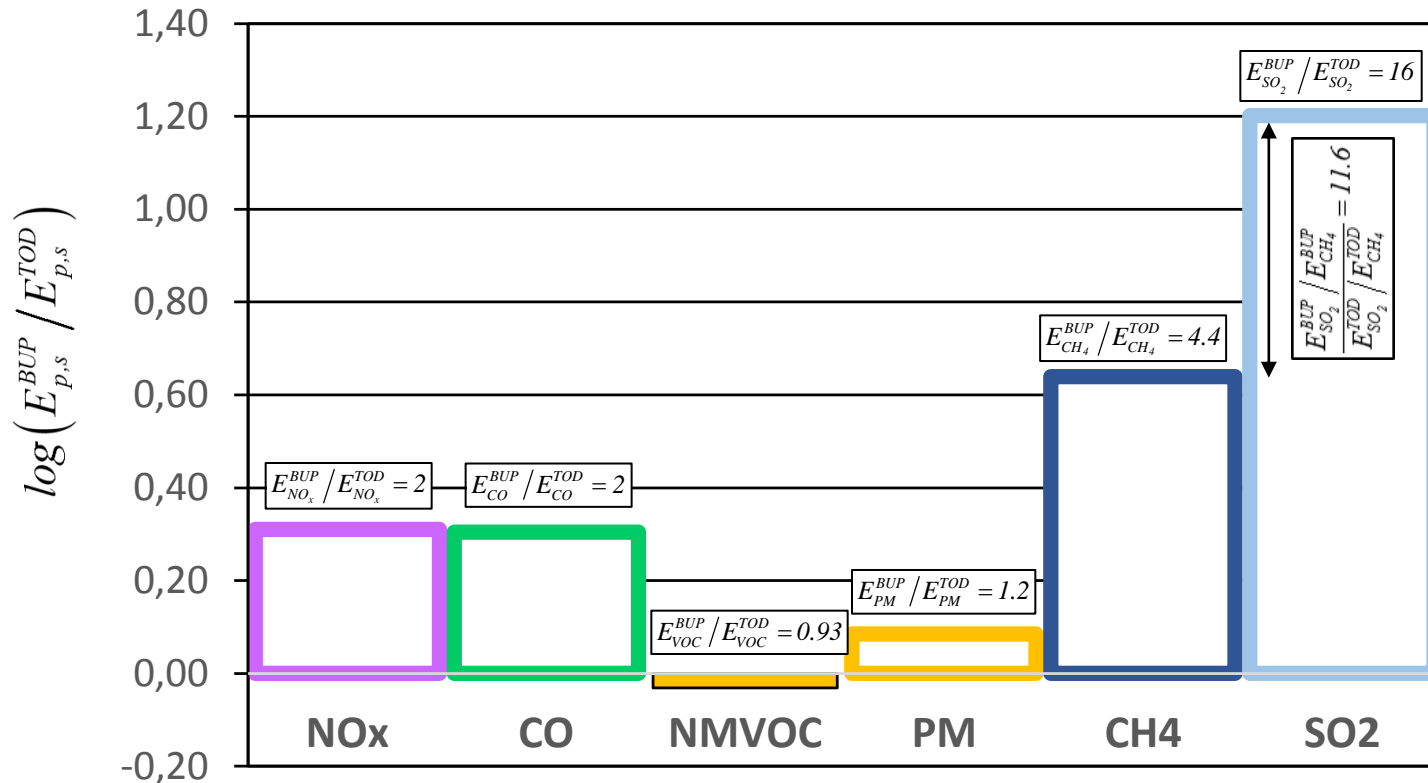
$$E_{p,S}(x, y) = e_{p,S} \times A_S(x, y)$$

p , pollutant
 S , macro-sector

We assume $e_{p,S}$ constant in space and time. **The correction of the emission factors on the smaller grid should then also be done on the larger grids.**

Correction of the Top-Down inventory

3. Consider the total emission on the smaller grid

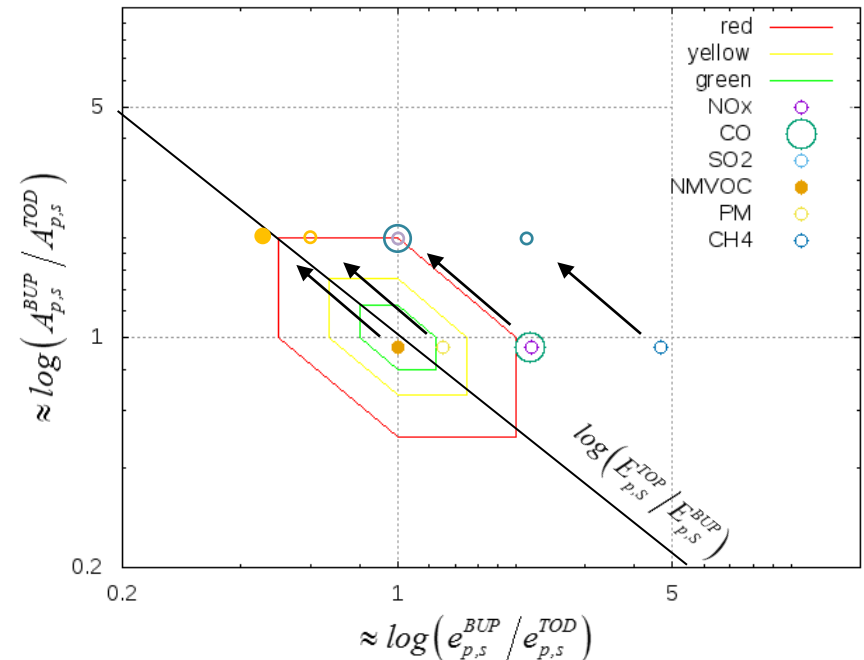
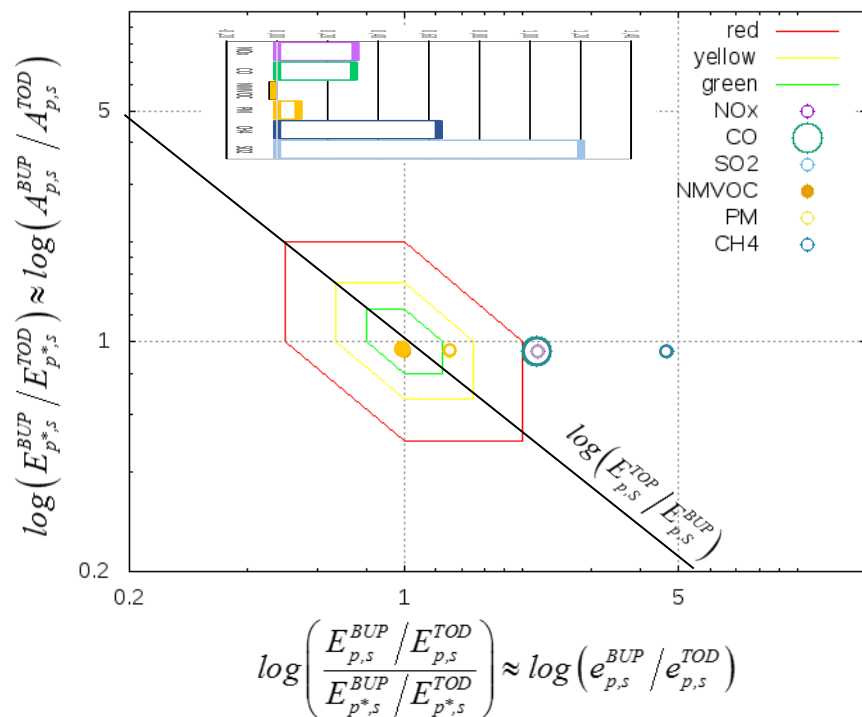


A correction of the activities will affect all pollutants in the same way while a correction of the emission factor will affect each pollutant independently.

Correction of the Top-Down inventory

The Diamond diagram gives a similar information as the Bar plot on its horizontal axis.

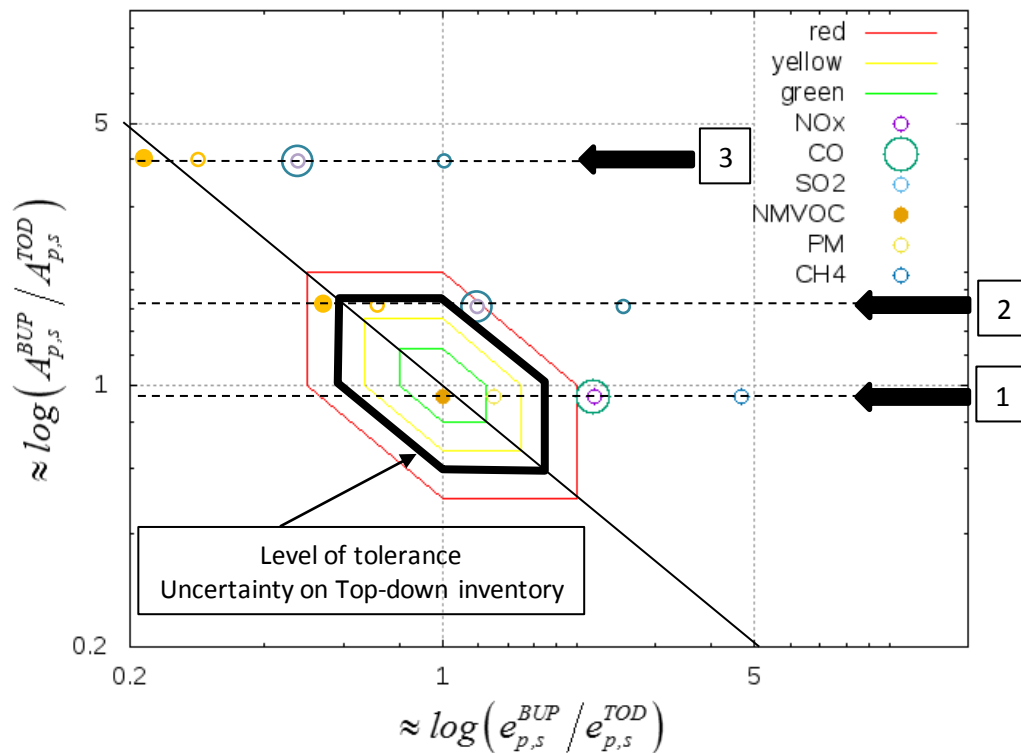
The Diamond plot “projects” the difference between the two inventories on two axes: the vertical axis showing a difference between activities and the horizontal axis between emission factors. This projection depends of a reference (p^*) which is arbitrarily chosen.



Correction of the Top-Down inventory

EMISENS calculate a level of uncertainties for the Bottom-up emission inventory.

Du to the uncertainties, a certain level of difference between the two emission inventories can be tolerated. Consequently, different combination of correction are possible.



For example:

In situations 1 and 2 no correction on activities are necessary while in situation 3, activity of the Top down inventory should be increased.

In situation 1, the top down emission factors for CO, NOx, CH4 and SO2 (not shown on the diagram) should be increased.

In situation 2, the top down emission factors for NMVOC should be decreased while for CO, NOx, CH4 and SO2 it should be increased.

A street scene in Havana, Cuba, featuring vintage cars and pedestrians. The image is overlaid with a semi-transparent grey box containing the text "Thank you for your attention!".

**Thank you
for your attention !**