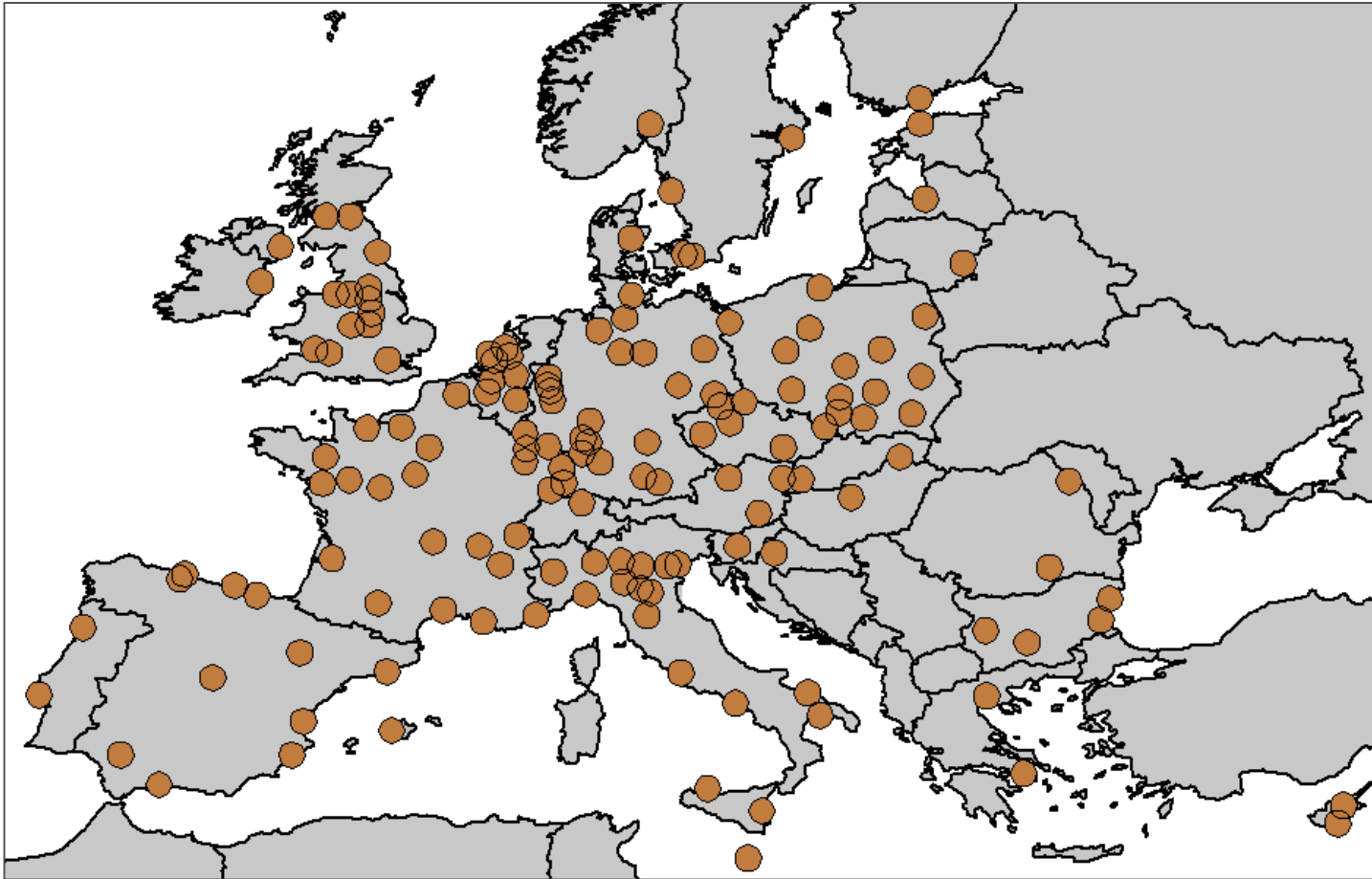




Proposal for a QA/QC approach for emissions

FAIRMODE meeting, October 2021

Required input data



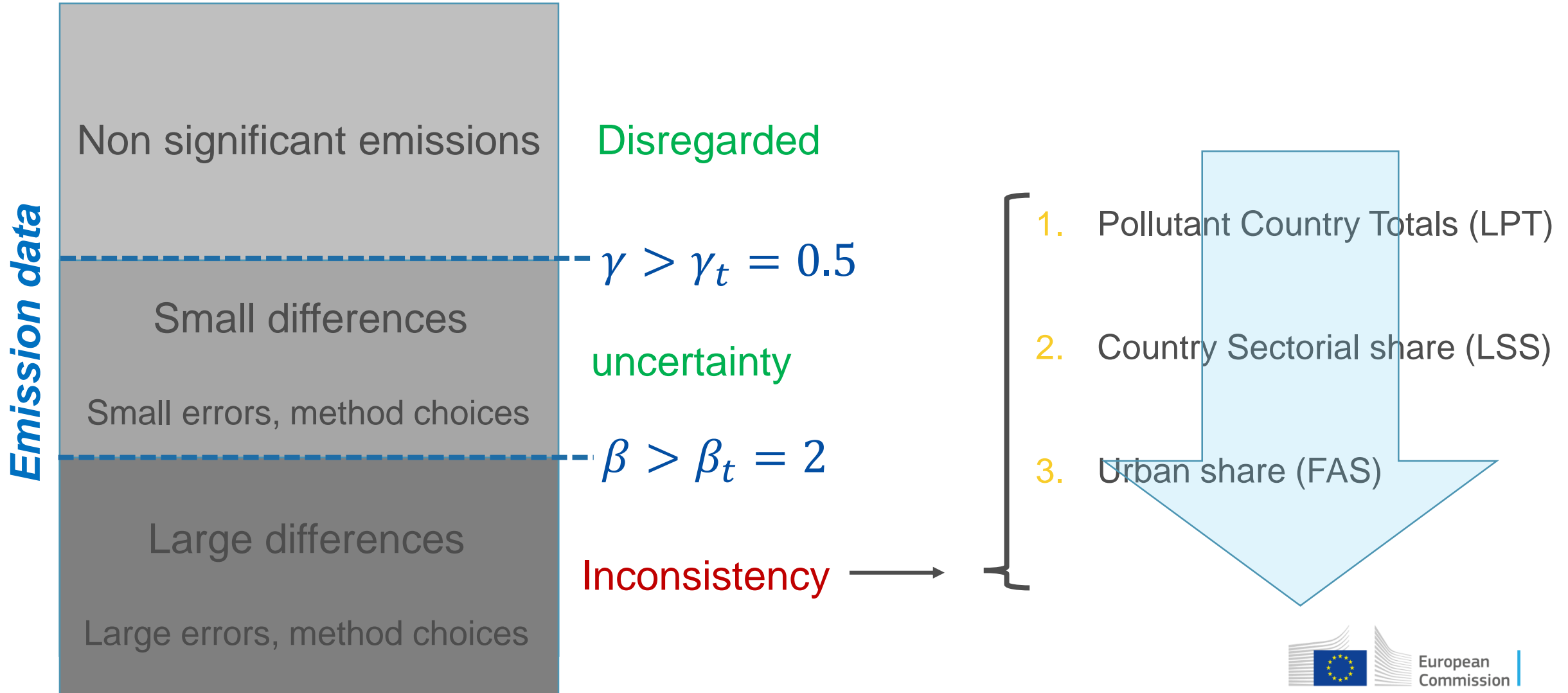
For each city: $e_{p,s}$

For each country: $E_{p,s}$

pollutant

sector

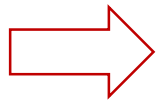
Relevant emissions AND detection of inconsistencies



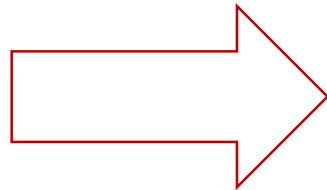
Decomposition (I)

$e_{p,s}$

$E_{p,s}$



\bar{E}_p



$$e_{p,s} = \frac{e_{p,s}}{E_{p,s}} * \frac{E_{p,s}}{\bar{E}_p} * \bar{E}_p$$

Urban
Activity
Share

UAS

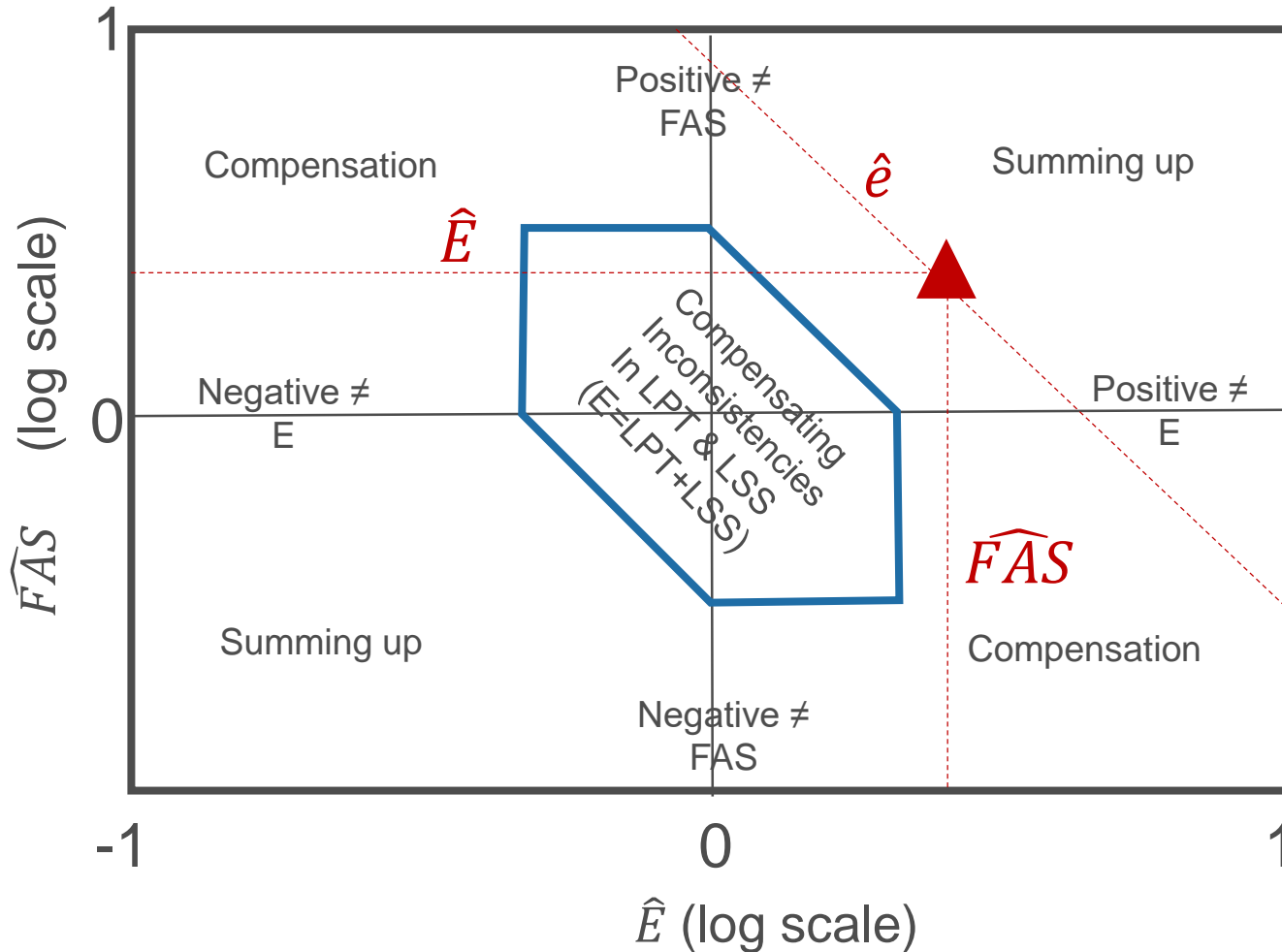
Country
Sector
Share

LSS

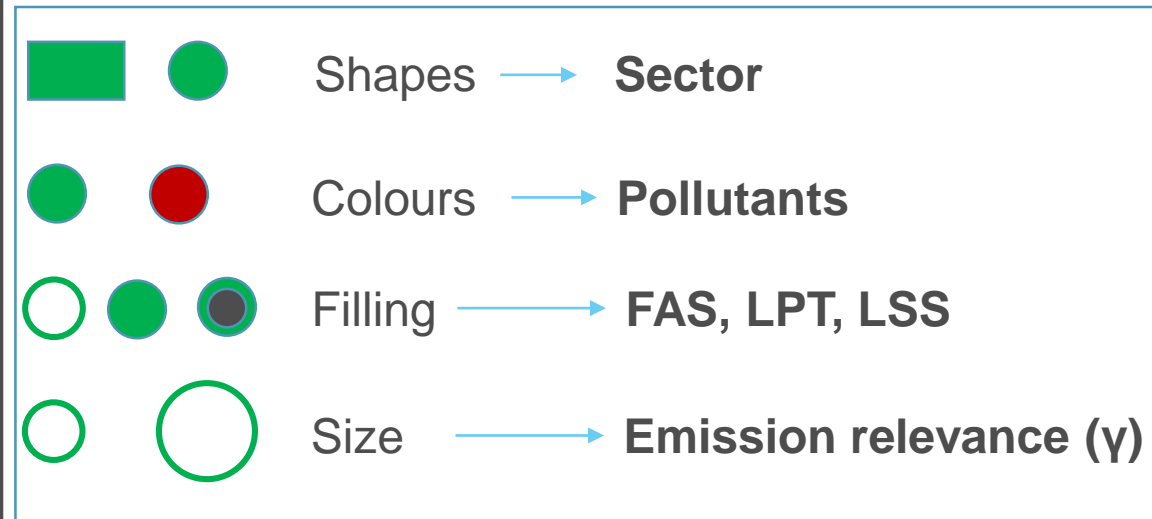
Country
Pollutant
Total

LPT

Diamond representation



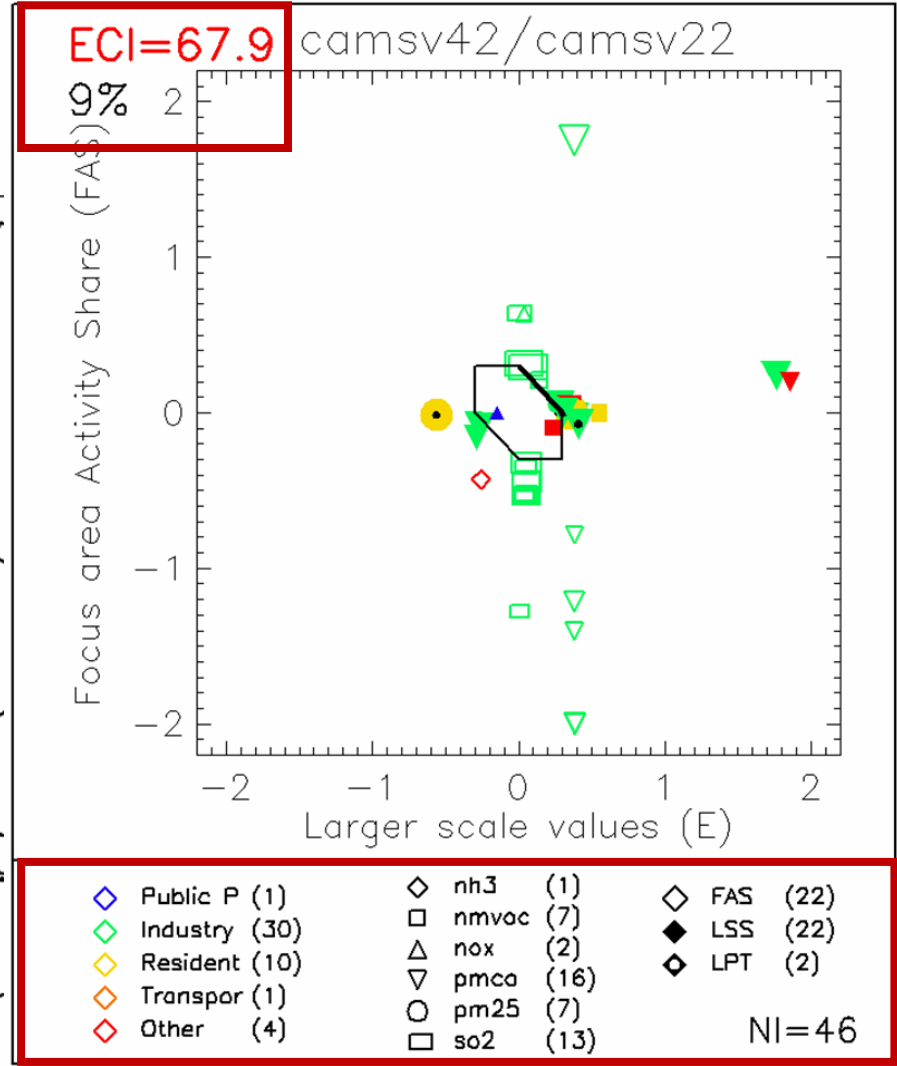
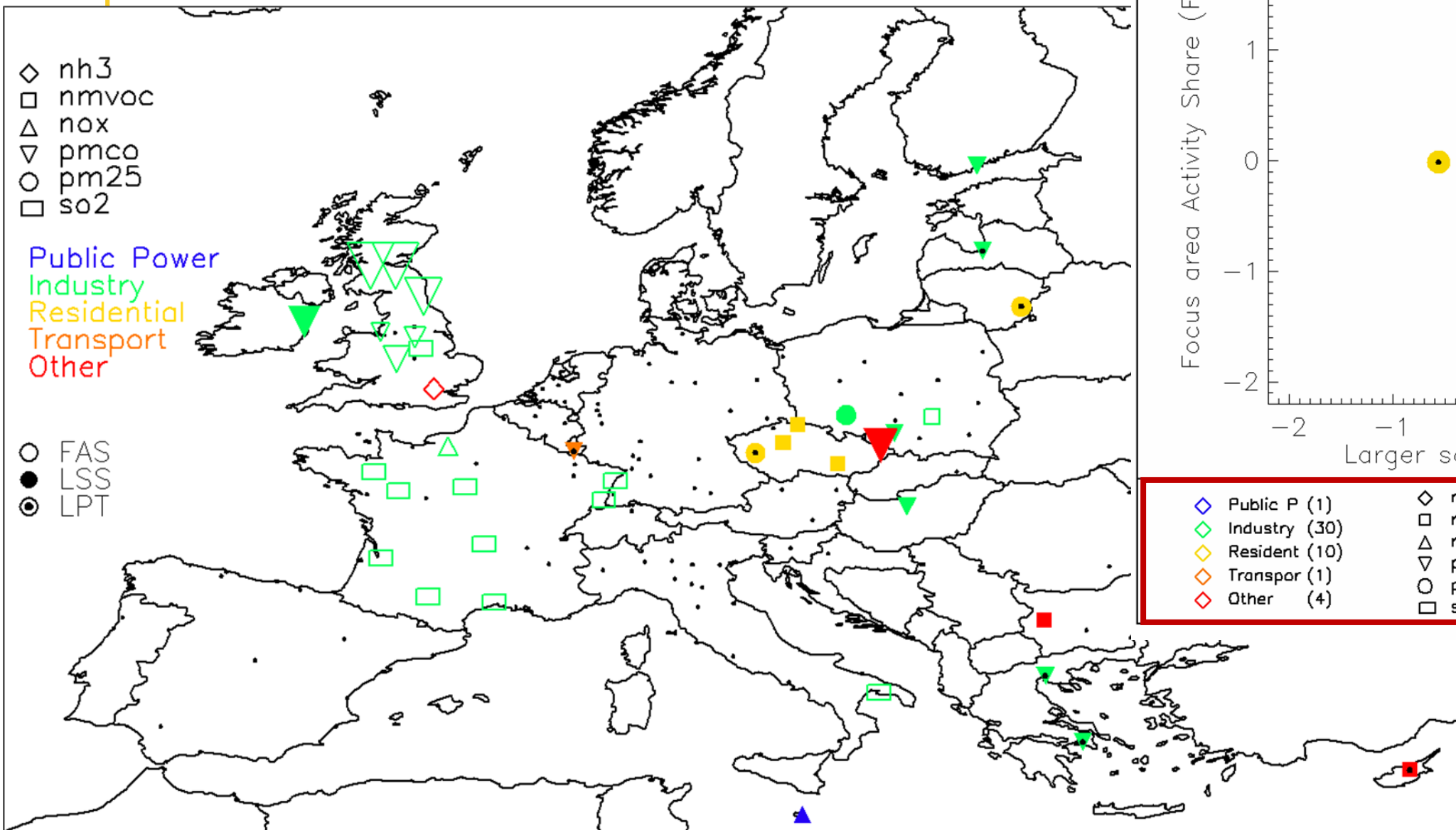
Only (p,s) that fulfill $\gamma > \gamma_t$ & $\beta > \beta_t$ are shown



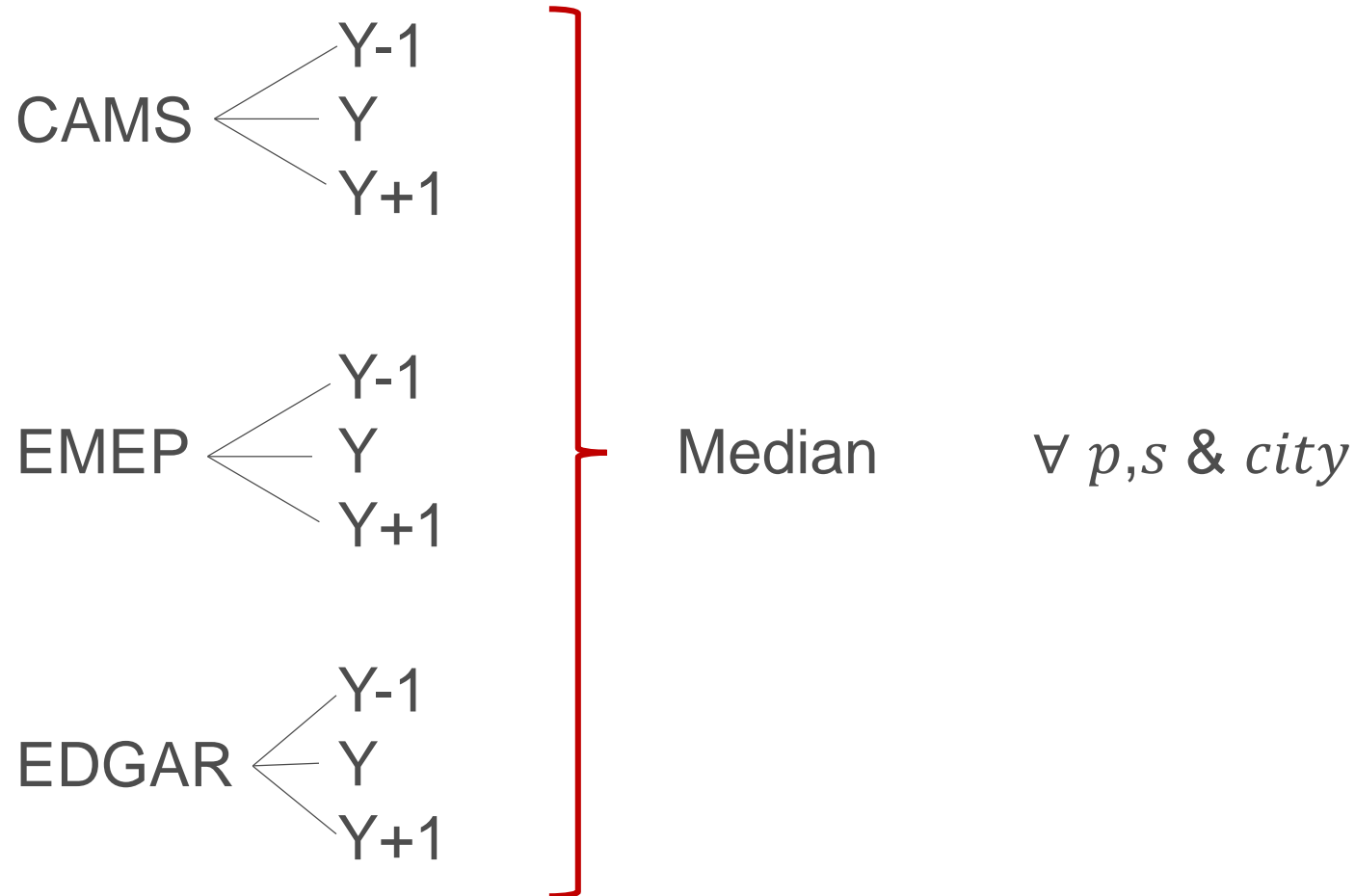
Application: CAMS v22 vs. V42 (2015)

- **Spatial coverage:** EU
- **Focus areas:** 150 Atlas cities
- **Sectors:** Transport (F), Residential (C), Industry (B), Power-plant (A), Other [(J) Waste + (D) Fugitives + (E) Solvents + (I) OffRoad]
- **Pollutants:** SO₂, NH₃, PPM_{2.5}, PPM_C, NO_x, NMVOC
- $\gamma_t = 0.5$ and $\beta_t = 2$

Application (CAM542 vs CAM522 (2015))



Building an “ensemble reference”



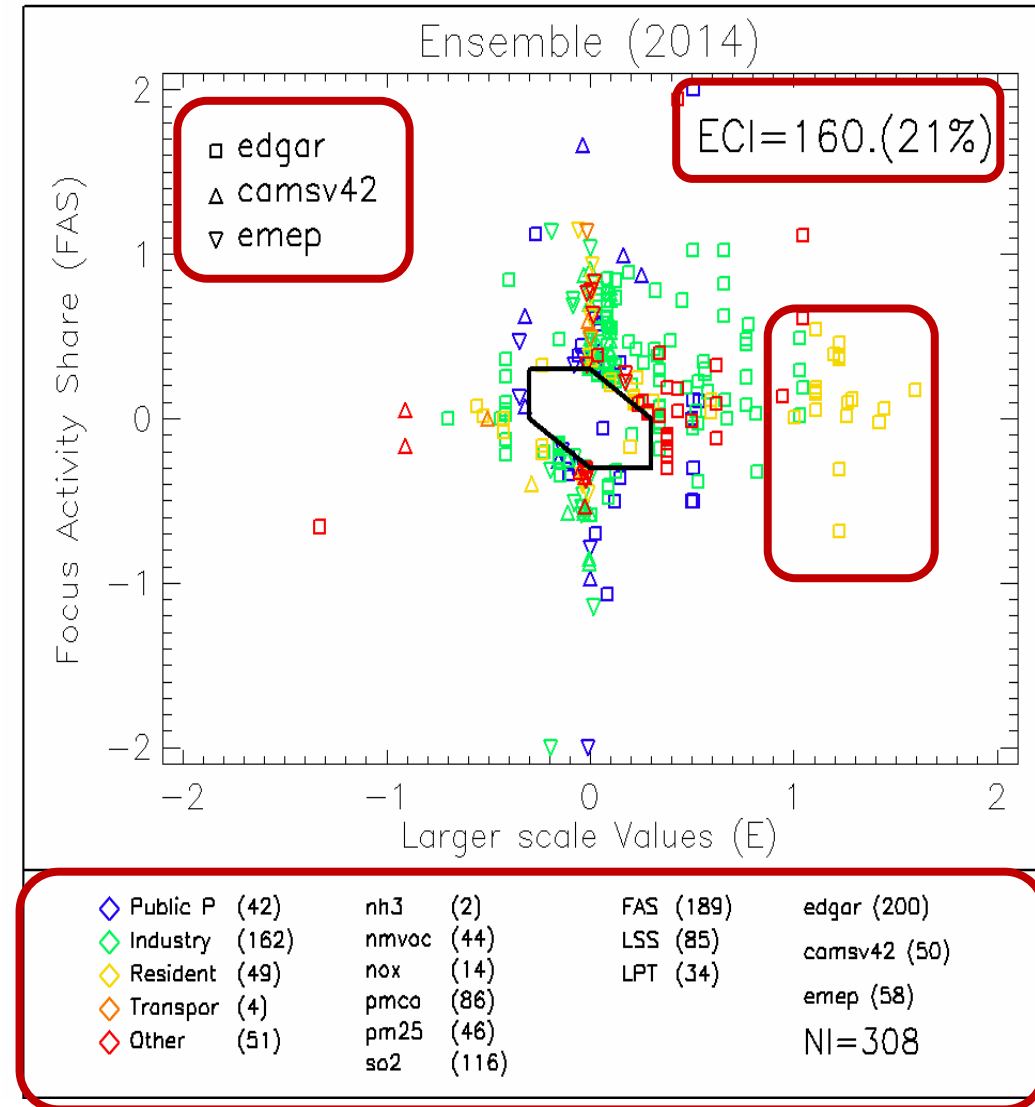
Monitoring status via the ensemble benchmark

Status of variability of the ensemble

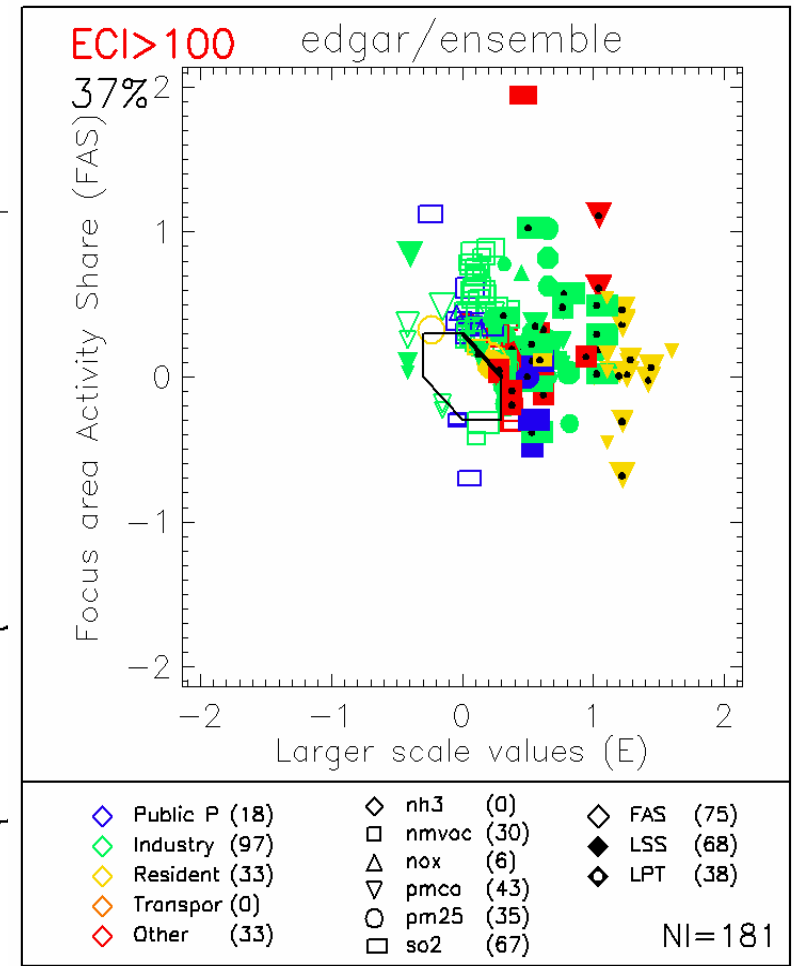
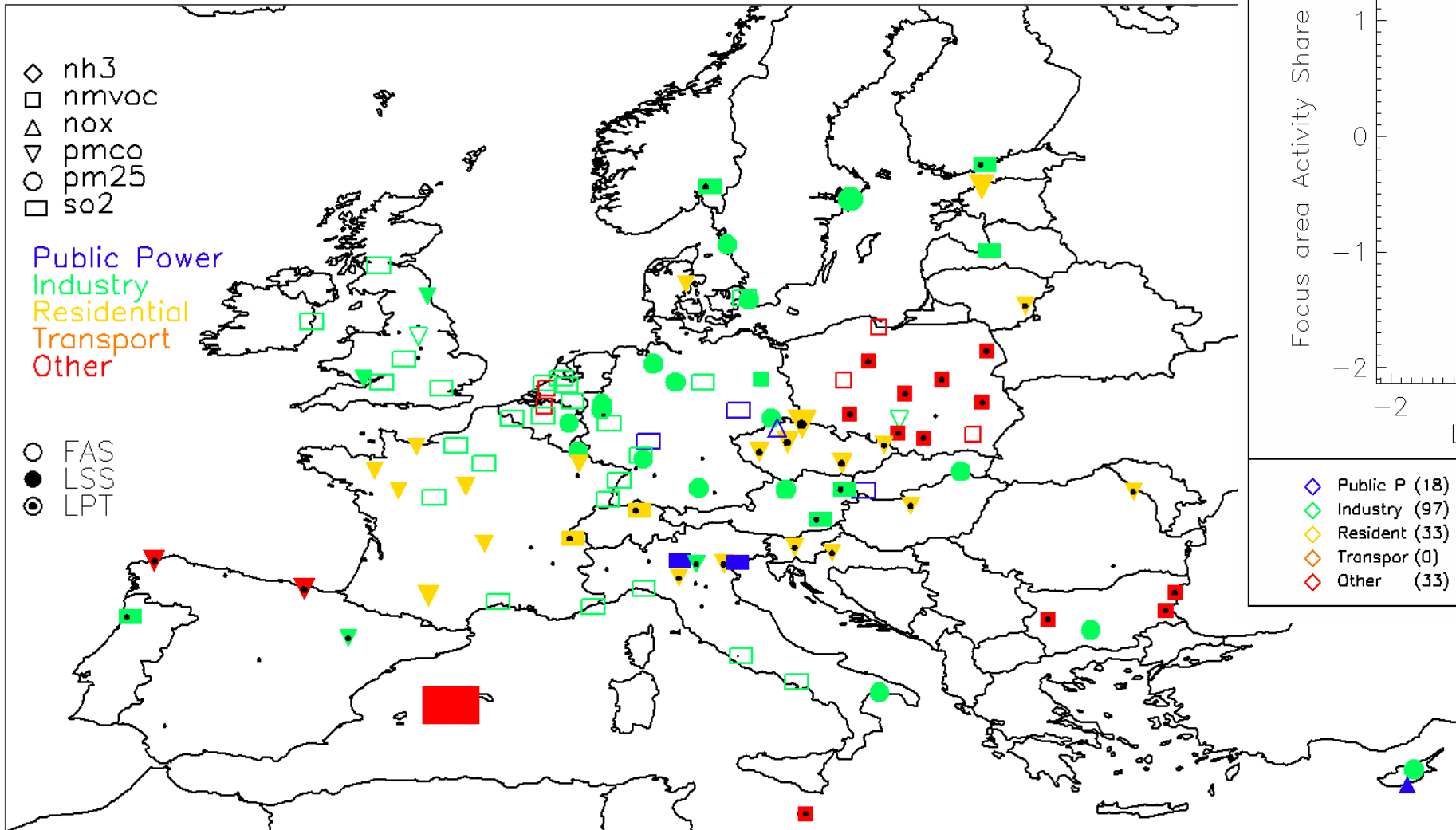
Identification of the inventory to check

Main sectors concerned by inconsistencies

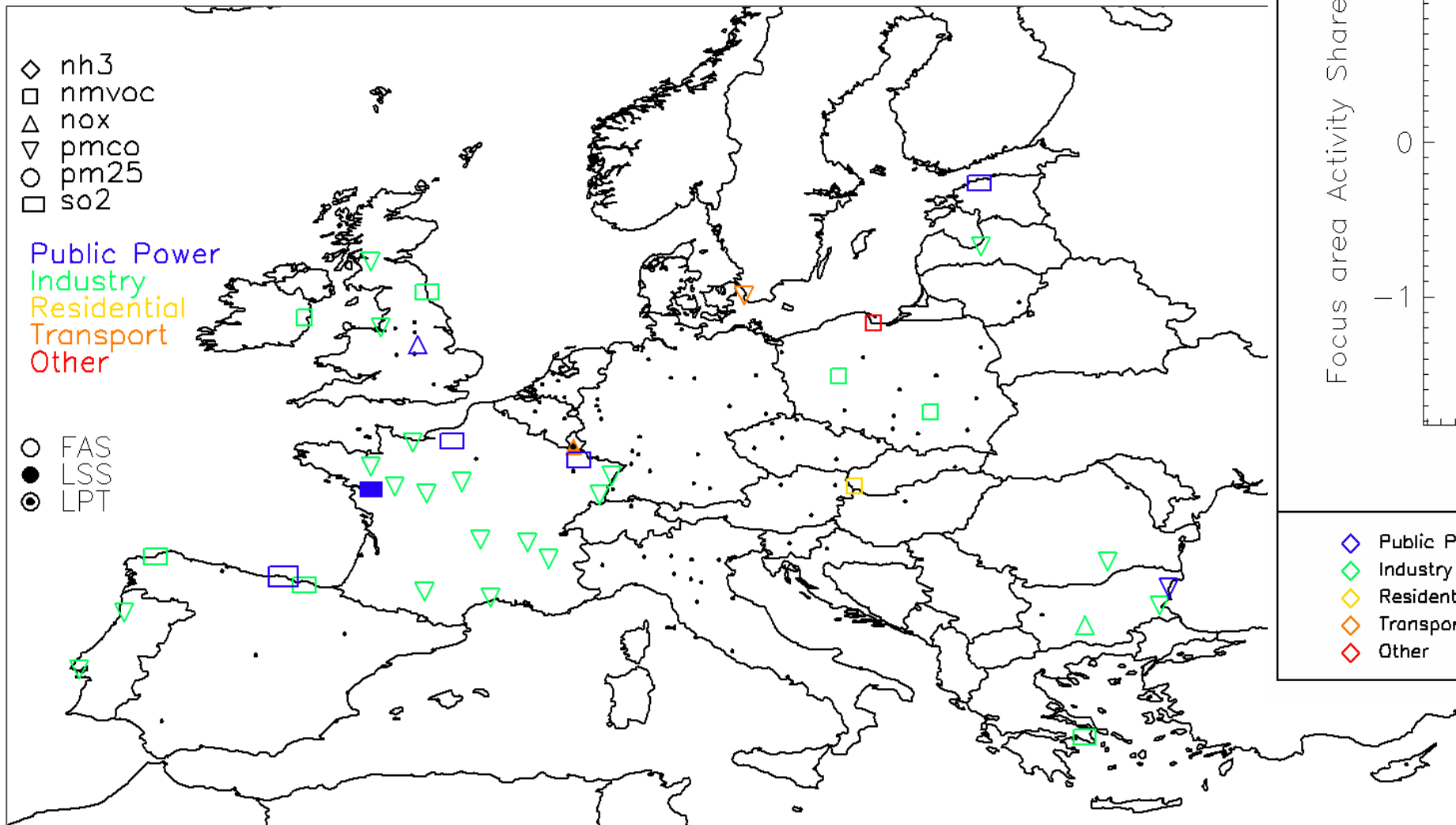
Overview of main inconsistencies



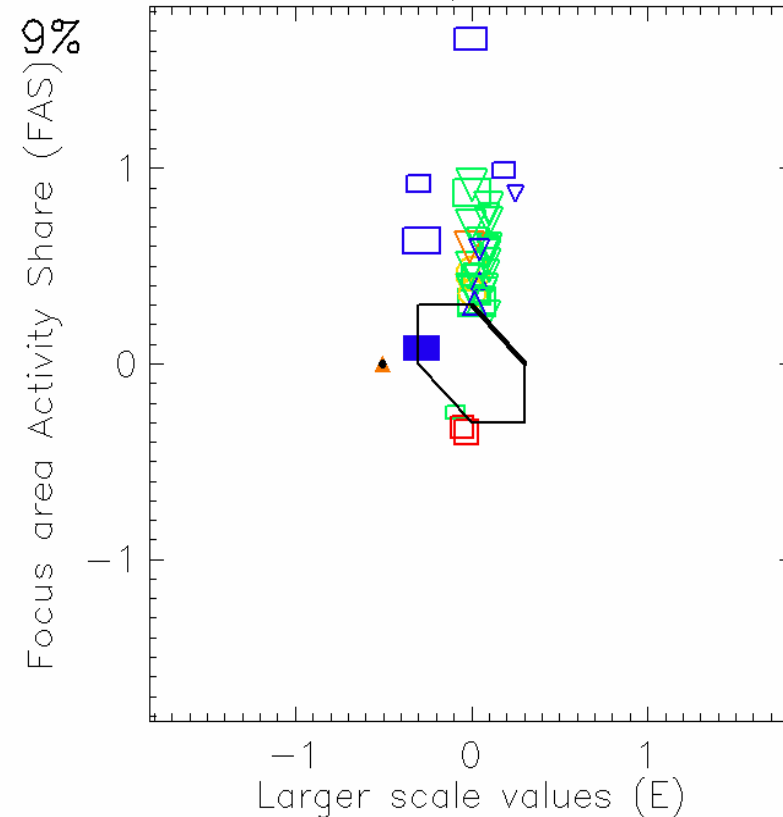
EDGAR vs. Ensemble



CAMS vs. Ensemble



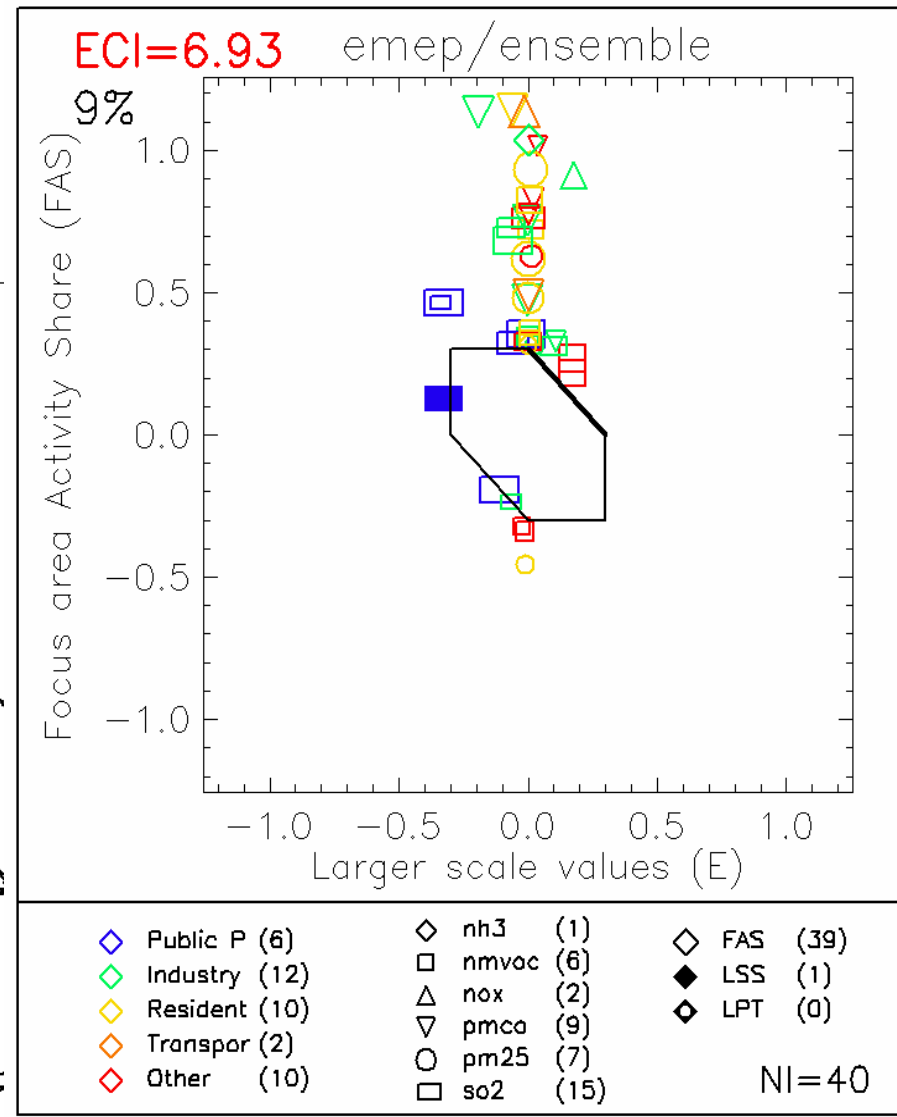
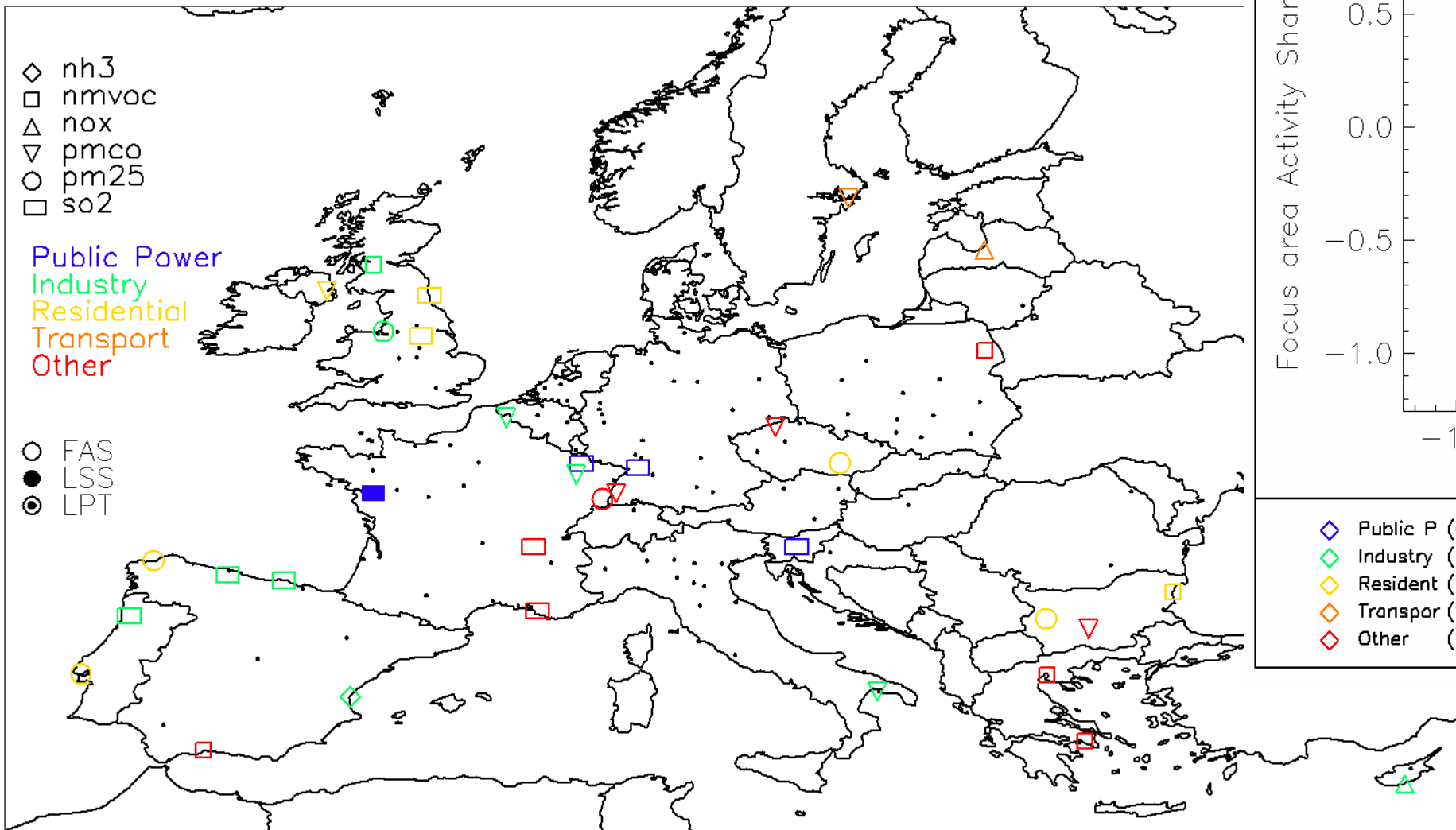
ECI=22.9 camsv42/ensemble



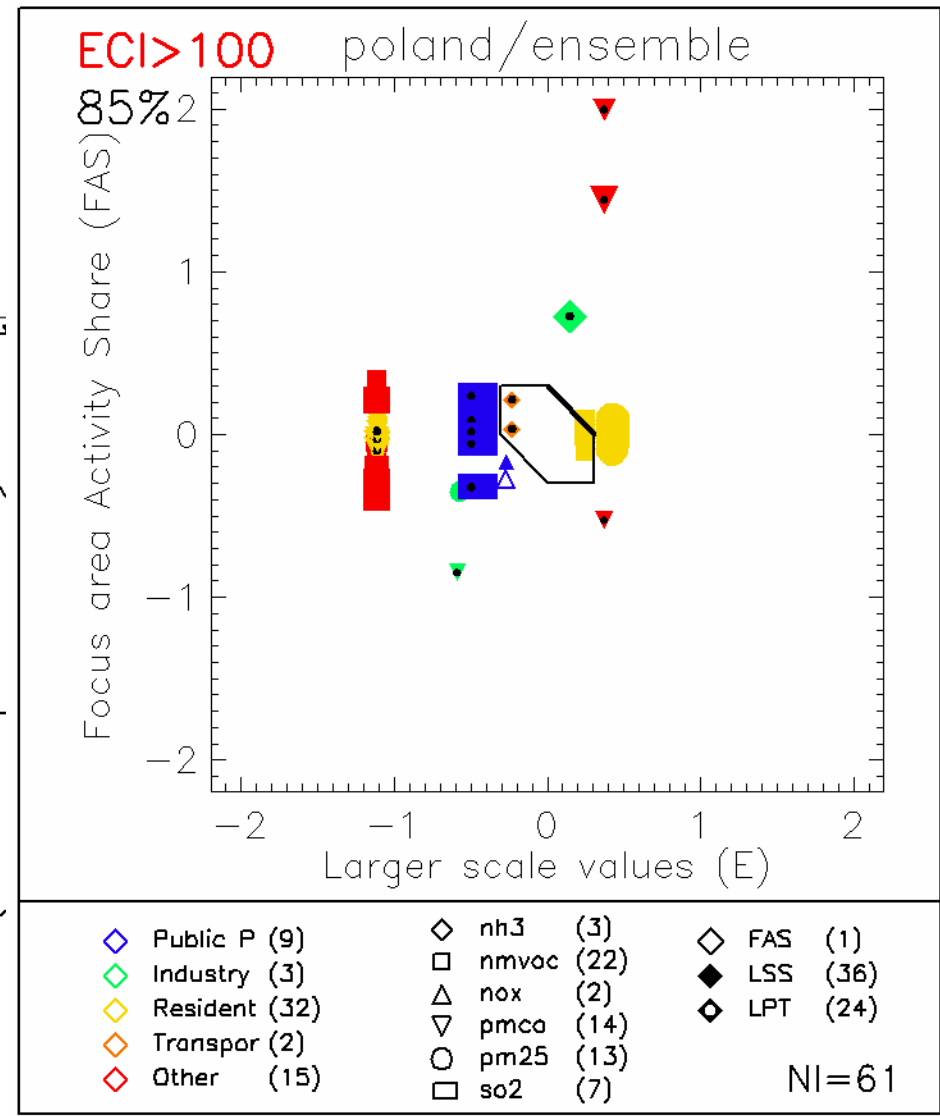
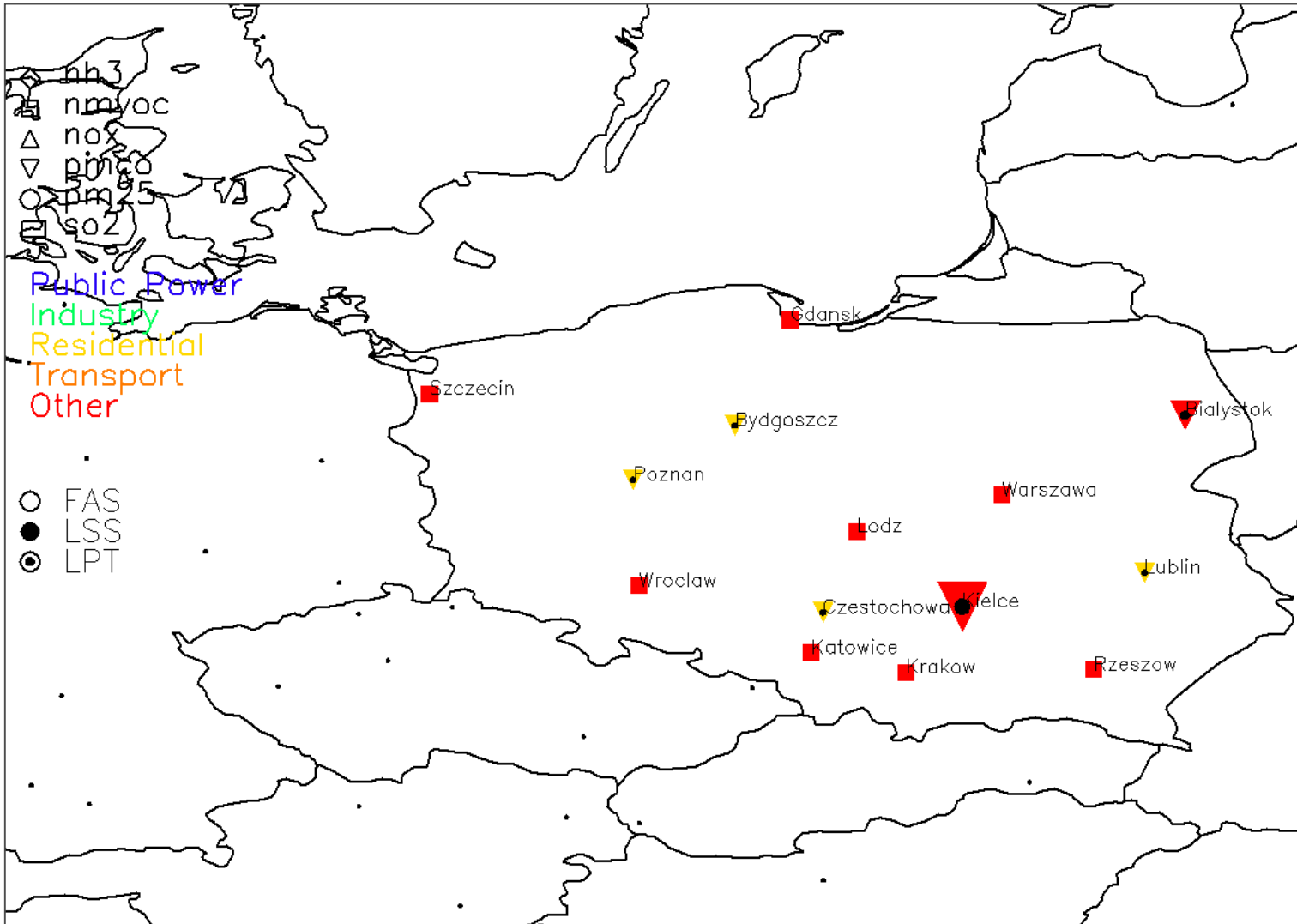
◇ Public P (9)	◇ nh3 (0)	◇ FAS (41)
◇ Industry (27)	□ nmvoc (6)	◆ LSS (2)
◇ Resident (3)	△ nox (4)	◆ LPT (0)
◇ Transpor (2)	▽ pmco (22)	
◇ Other (2)	○ pm25 (2)	
	□ so2 (9)	

NI=43

EMEP vs. Ensemble



Poland inv. vs. Ensemble (I)



Conclusions

- This method is a screening approach
 - Among relevant emissions, only large differences are detected ($>\beta_t$).
 - These differences, named inconsistencies are large enough to ensure that a “better” inventory can be identified despite no truth is known.
 - These inconsistencies can be justified (methodological choices) or should be corrected (errors).
 - Feedback of these inconsistencies to emission developers as a step to improvements
- The methods settings are flexible (focus areas, pollutants, sectors...)
- The method allows for a systematic QA/QC (e.g. testing of new version...), and can facilitate comparisons between inventories (e.g. top-down vs bottom-up) according to a harmonized template.

Proposal for application within FAIRMODE

- Create of a top-down EU “Ensemble” to facilitate bilateral comparisons
- Via QA/QC systematic screening, improvements (understanding major methodological choices and resolving major errors) can be made to each inventory and the ensemble be updated → new benchmark
- The ECI indicator and diamond inform on the current status of variability and inform about remaining inconsistencies (type and magnitude).
- Each FM meeting: discussion on major inconsistencies and explain how they have been (or should be) tackled
- Include comparisons with bottom up inventories to support the improvement process