

PRTRVal: A SOFTWARE TOOL FOR THE VALIDATION OF EUROPEAN POLLUTANT RELEASE AND TRANSFER REGISTER EMISSIONS DATA

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XUNTA DE GALICIA

Overview

- **Introduction**
- **Methodology**
 - Objectives
 - Description of PRTRVal
 - Scope
- **Results and discussion**
 - Analysis of the E-PRTR emissions
 - PRTRVal: Analysis of E-PRTR emissions errors
 - Validated PRTR inventory vs. EMEP
- **Conclusions**

Introduction (I)

EMEP and PRTR emissions inventories

EMISSIONS DATA



Convention on Long-range Transboundary Air Pollution
emep Co-operative programme for monitoring and evaluation of the long-range transmissions of air pollutants in Europe

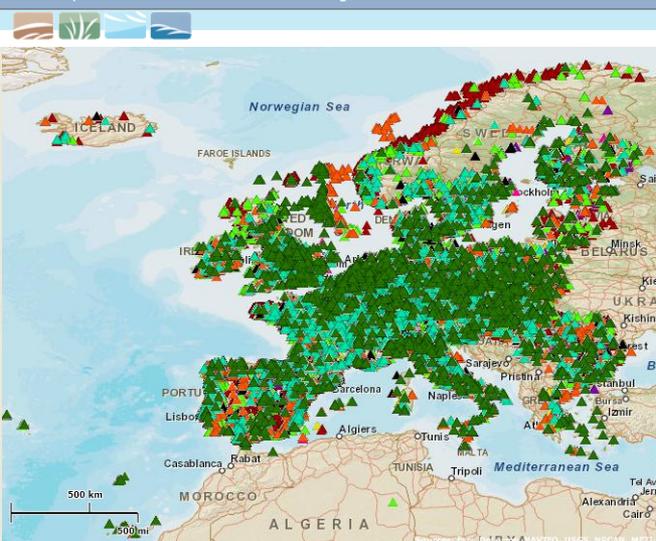
- 2001 EUROPEAN POLLUTANTS EMISSIONS REGISTER (EPER)
- 2008 EUROPEAN POLLUTANT RELEASE AND TRANSFER REGISTER (PRTR)

- 91 pollutants
- Point and diffuse sources
- Normal operation and accidental releases
- Off-site transfers of waste

- ▲ Energy sector
- ▲ Production and processing of metals
- ▲ Mineral industry
- ▲ Chemical industry
- ▲ Waste and wastewater management
- ▲ Paper and wood production processing
- ▲ Intensive Livestock and aquaculture
- ▲ Food and beverage sector
- ▲ Other activities

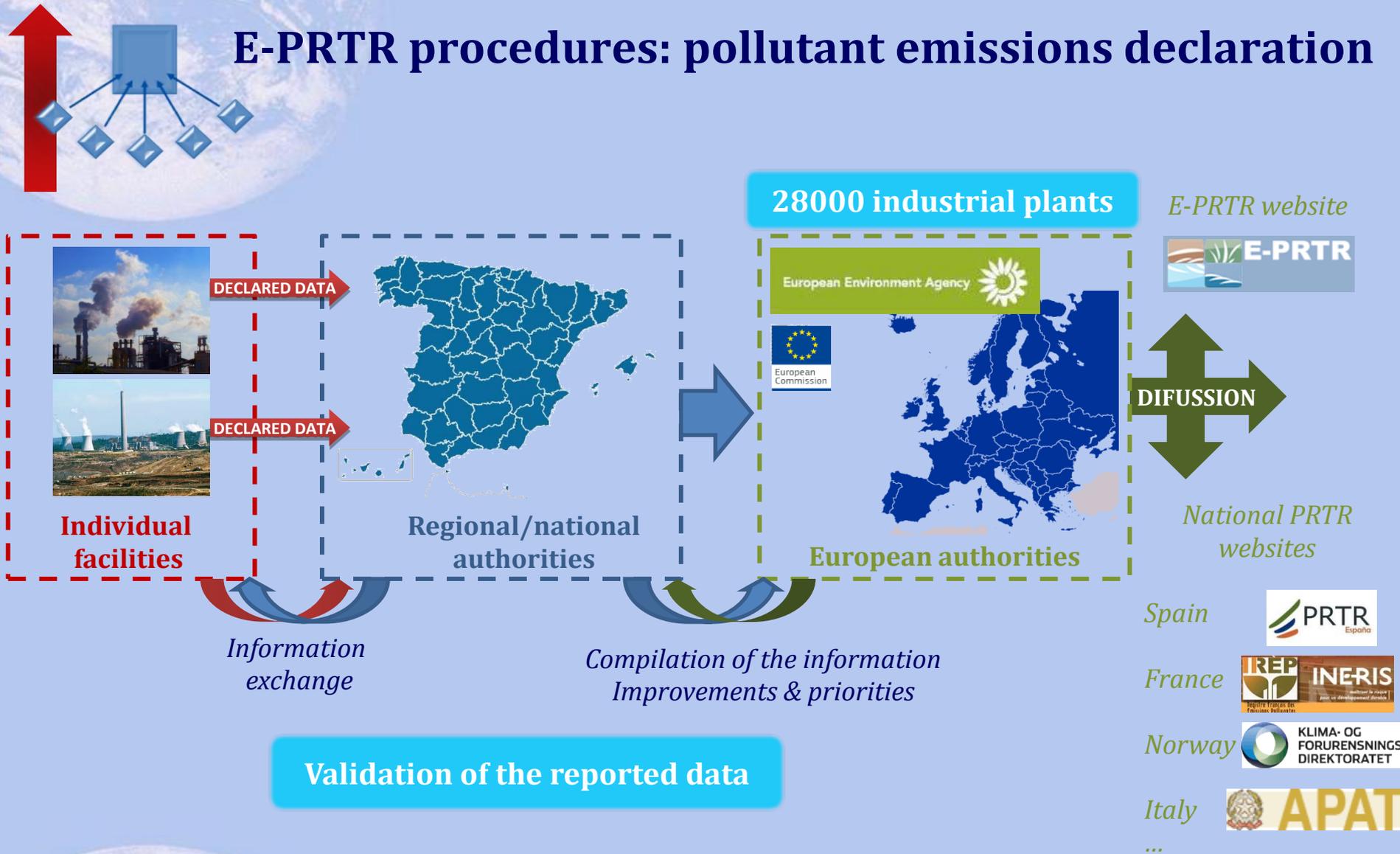
Obligatory declaration

E-PRTR The European Pollutant Release and Transfer Register



Introduction (III)

E-PRTR procedures: pollutant emissions declaration



Introduction (IV)

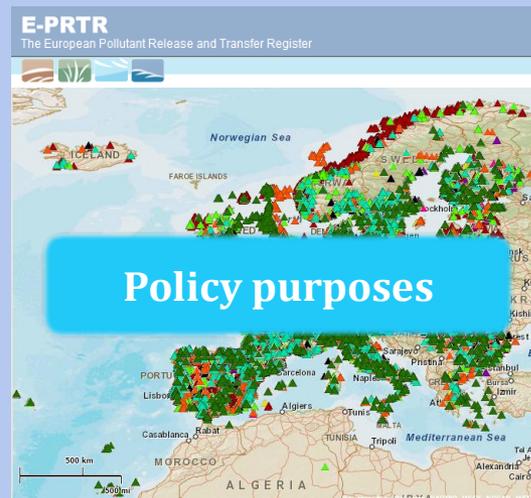
Bottom-up vs. top-down approaches

BOTTOM-UP

Detailed and local calculation
Total emissions = Σ Individual emissions

- + Higher accuracy (if validated)
- Higher difficulties in emissions calculation

➤ E-PRTR INVENTORY

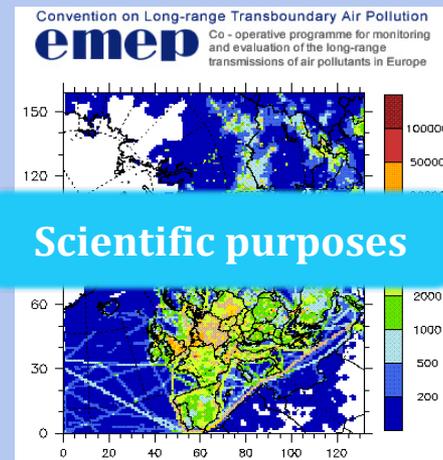


TOP-DOWN

Global calculation
Desagregation of emissions to local level by means of distribution patterns

- + Lower difficulties in emissions calculation
- Lower accuracy

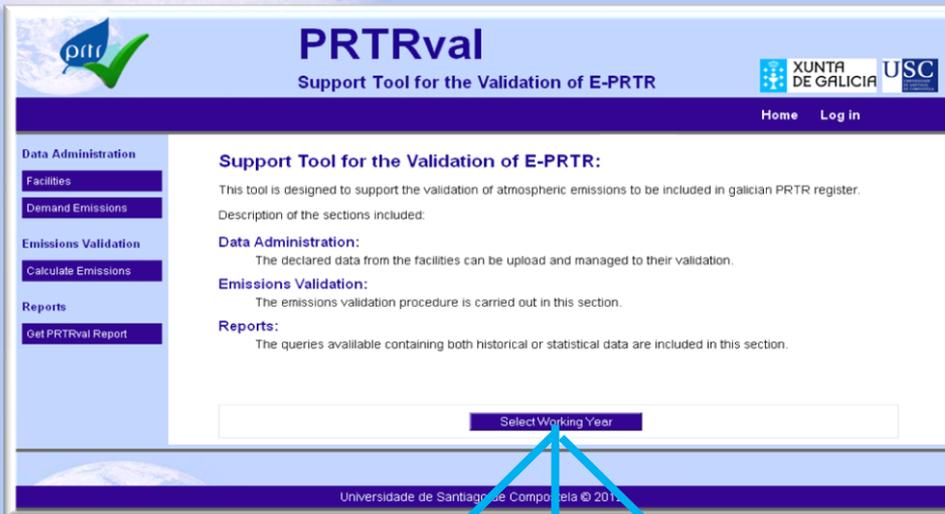
➤ EMEP INVENTORY



Methodology: Objectives

PRTRVal: Software tool for E-PRTR register validation

■ Methodology for the systematic validation of PRTR register

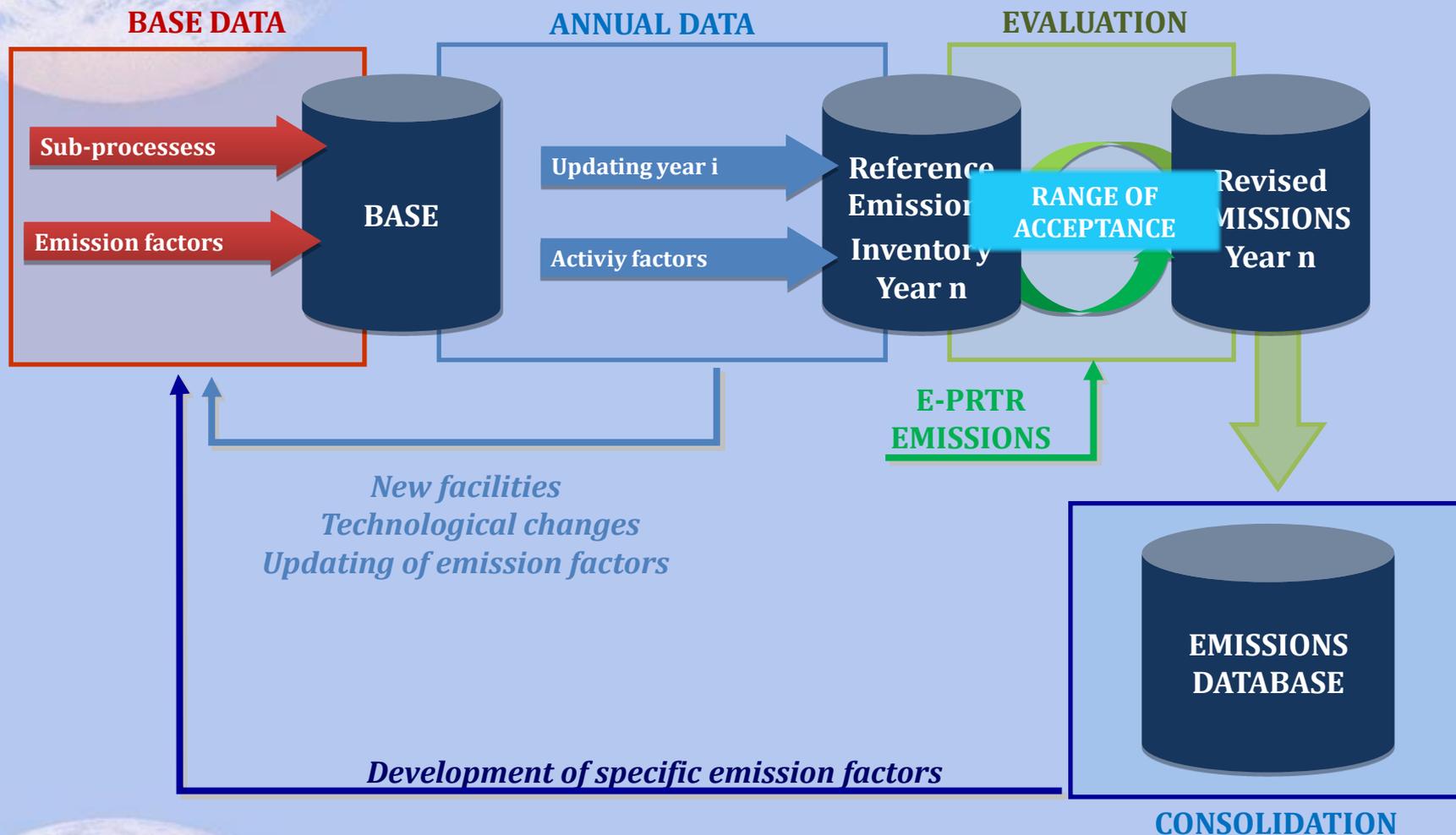


- Windows, Linux & Mac OS
- Data base: MySQL server 5.1.52
- JSTL, JSP, Servlets and Java Beans
- NetBeans IDE 6.8
- Java 1.6.0_22
- Web server: Apache Tomcat 6.0.20
- Internationalization support

- ✓ **BEFORE** emissions data were submitted to correct possible mistakes
- ✓ **AFTER** as a verification procedure prior to the use of the emissions

Methodology

Validation Procedure: E-PRTR vs. Reference Emissions Inventory



Methodology: PRTRVal (III)

Validation procedure. Validation Flow Diagram

i : Pollutant

j : Sub-process

AF_j : Activity factors matrix

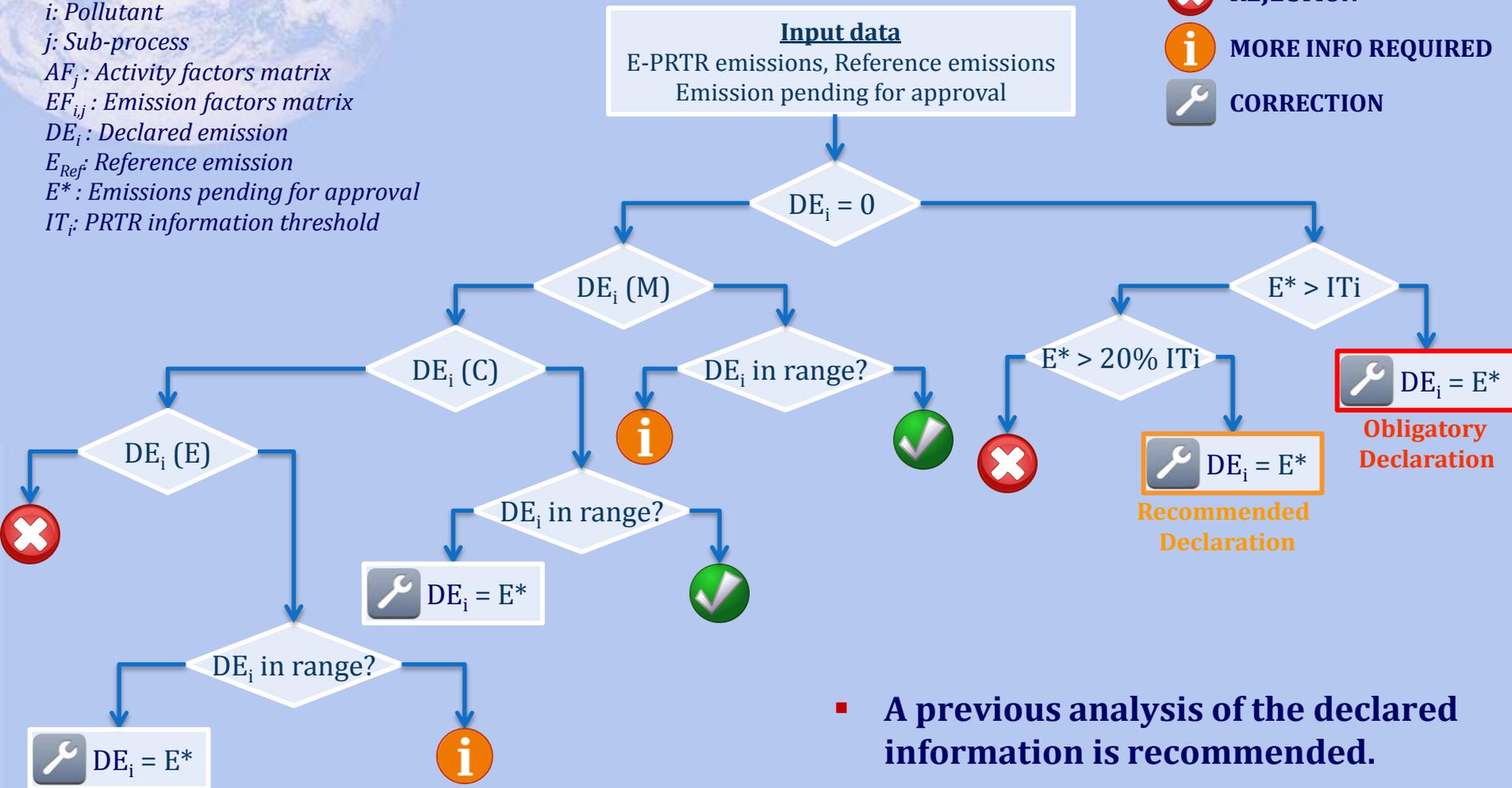
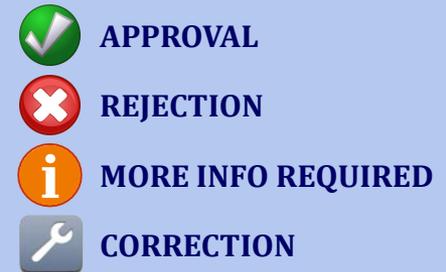
EF_{ij} : Emission factors matrix

DE_i : Declared emission

E_{Ref} : Reference emission

E^* : Emissions pending for approval

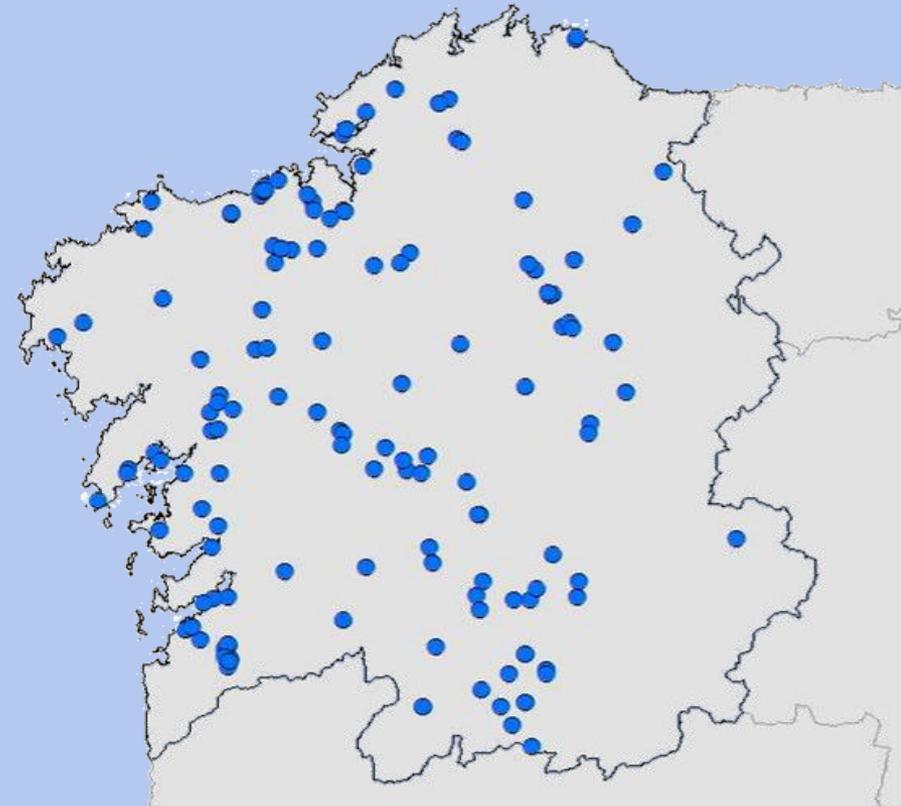
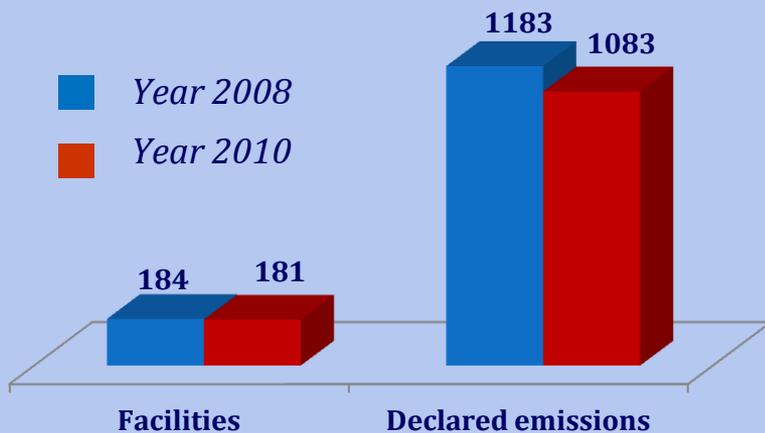
IT_i : PRTR information threshold



- A previous analysis of the declared information is recommended.

Methodology: Scope

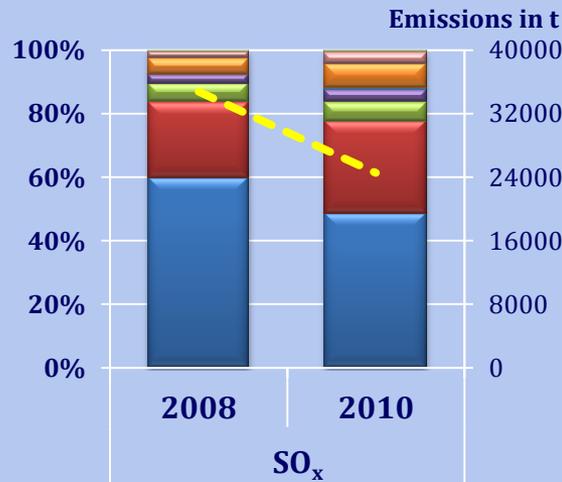
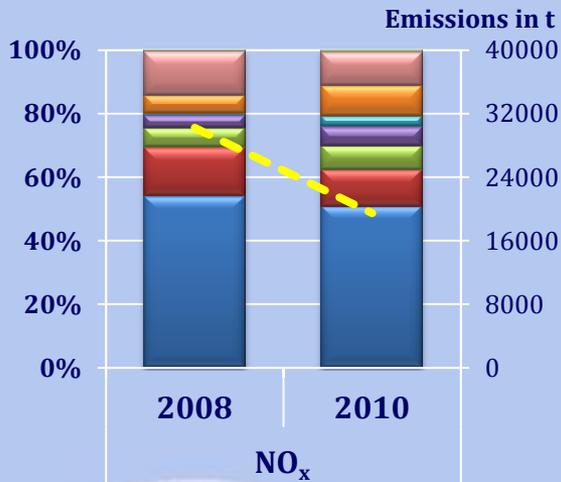
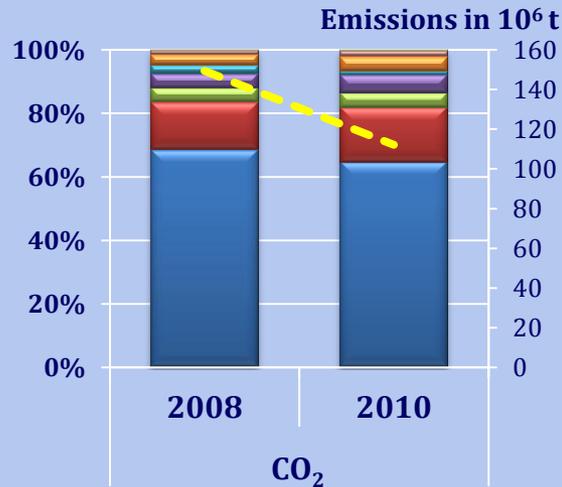
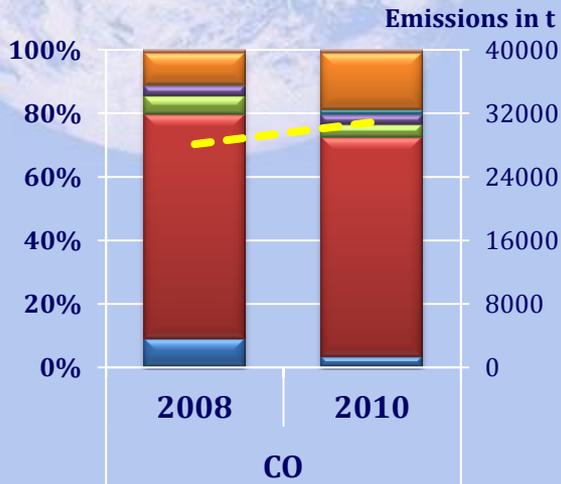
- Galicia (NW of Iberian Peninsula) PRTR emissions for 2008 & 2010



Galicia E-PRTR industrial sources

Results and Discussion

Galicia E-PRTR emissions

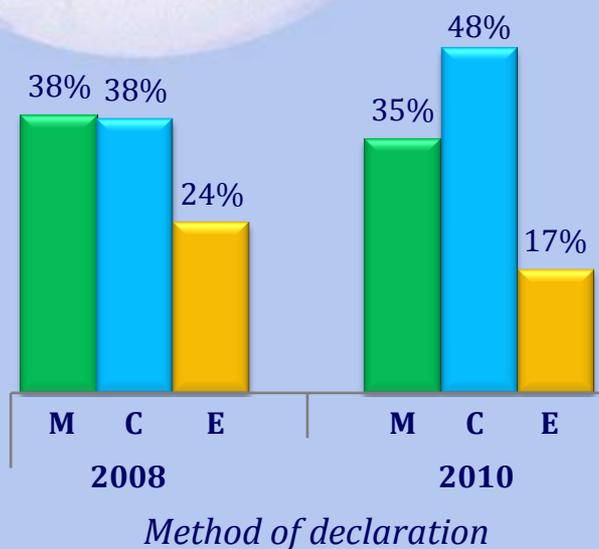


Distribution by E-PRTR sector

-  1. Energy
-  2. Metal prod.
-  3. Mineral ind.
-  4. Chemical ind.
-  5. Waste & wastewater
-  6. Paper & wood
-  7. Intensive livestock
-  8. Food and beverage sector
-  9. Other activities.
-  Emissions

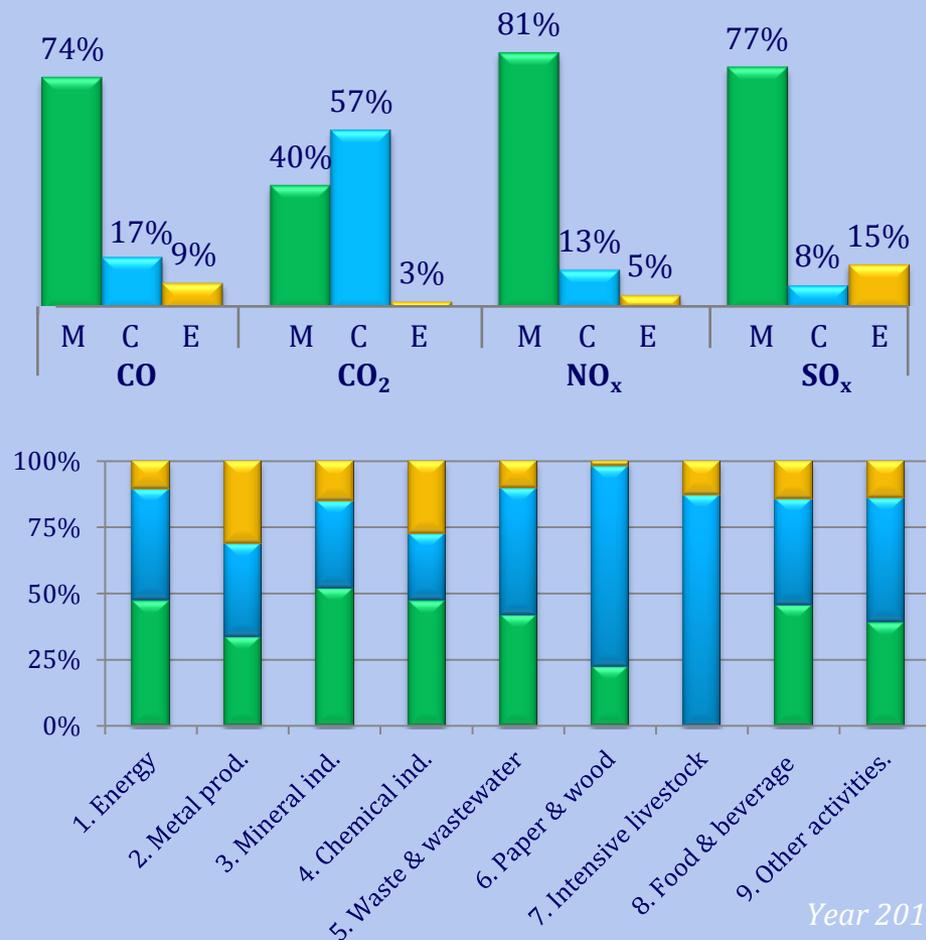
Results and Discussion

Galicia E-PRTR emissions



■ M Measured
 ■ C Calculated
 ■ E Estimated

Method of declaration



Year 2010

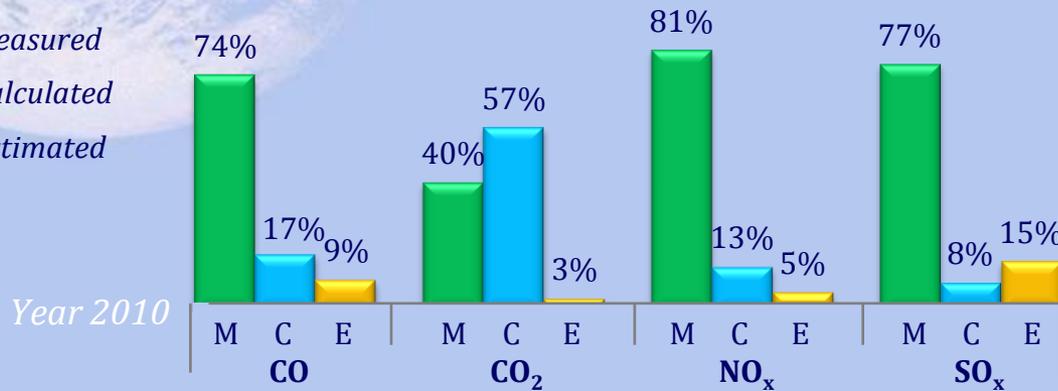
- **The number of estimated pollutants decreased, although a slight decrease in measurements was also detected**

Results and Discussion

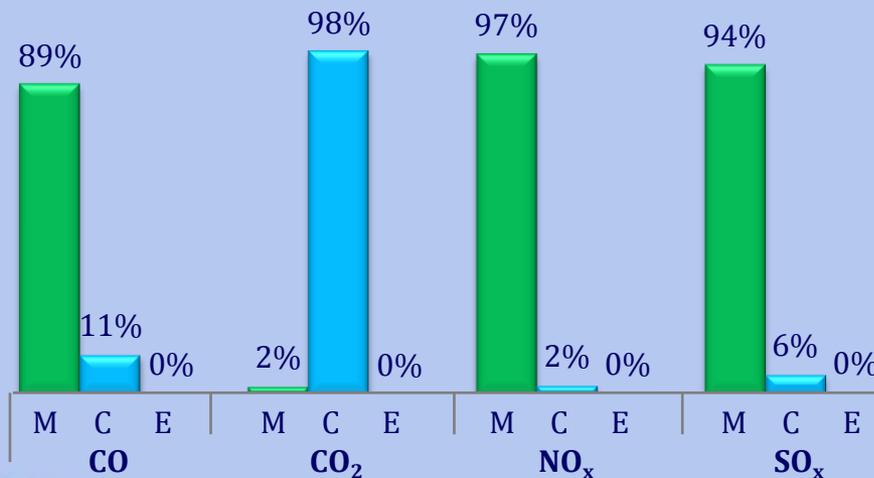
Galicia E-PRTR emissions

Method of declaration

■ Measured
■ Calculated
■ Estimated



■ Measured
■ Calculated
■ Estimated



Contribution of emissions

Pollutant i declared M, C or E (t)

Total pollutant i (t)

Over 90%

Results and Discussion: Applying PRTRVal

PRTRVal : Analysis of E-PRTR errors

Definitions

■ Classification of errors

Type of Error	
Type 1	Errors related to non-declaration
Type 2	Lack of information
Type 3	Calculation errors
Type 4	Minor errors
Type 5	Null / Zero declaration
Type 6	Other

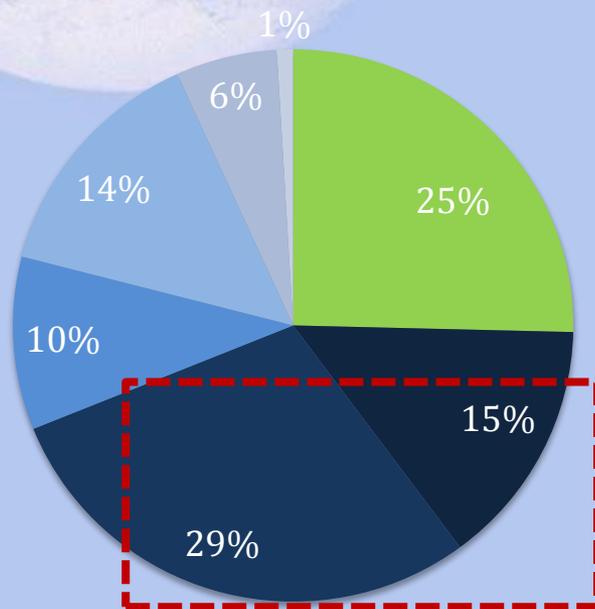
- 1.1. The facility wrongly declares not to be affected by E-PRTR
- 1.2. Non-declared sources (chimneys, diffuse sources, etc.)
- 1.3. Omission of pollutants with over threshold emissions.
- 2.1. Lack of operation parameters: production, concentrations...
- 2.2. Emission calculations not correctly justified.
- 2.3. Lack of information about measurement methods.
- 2.4. Absolutely lack of information.
- 3.1. Misidentification of emission with f.i. concentration
- 3.2. Units error.
- 3.3. Error in the combination of several emission sources.
- 3.4. Specific errors: i.e., identify PM10 as PST, or COT as NMVOC.
- 3.5. Wrong emission factor.
- 3.6. General calculation error.
- 4.1. Limit of detection (LOD) of the experimental method is not reached. The emission is declared as 10-50% of the LOD value.
- 4.2. Variation of the LOD among measurements.
- 4.3. Wrong declaration of the emissions method code (M/C/E).
- 4.4. Experimental measurements not representative of other year.
5. No measurements or calculations were set up: Declaration of emission as zero is directly rejected
6. Uncorrected errors after the submission of complementary information. The reported emissions are directly rejected.

- Accepted deviation range: 33 to 300% of the reference emissions

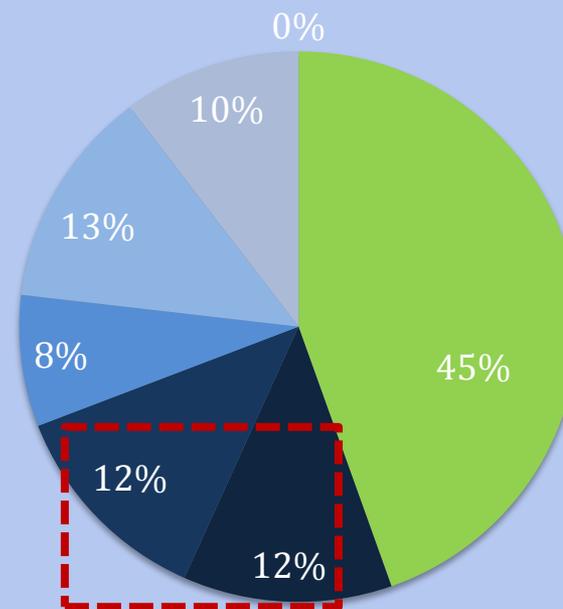
Results and Discussion: Applying PRTRVal

PRTRVal : Analysis of E-PRTR errors

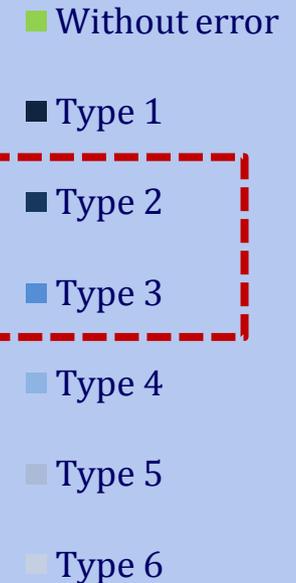
Global results



Year 2008



Year 2010



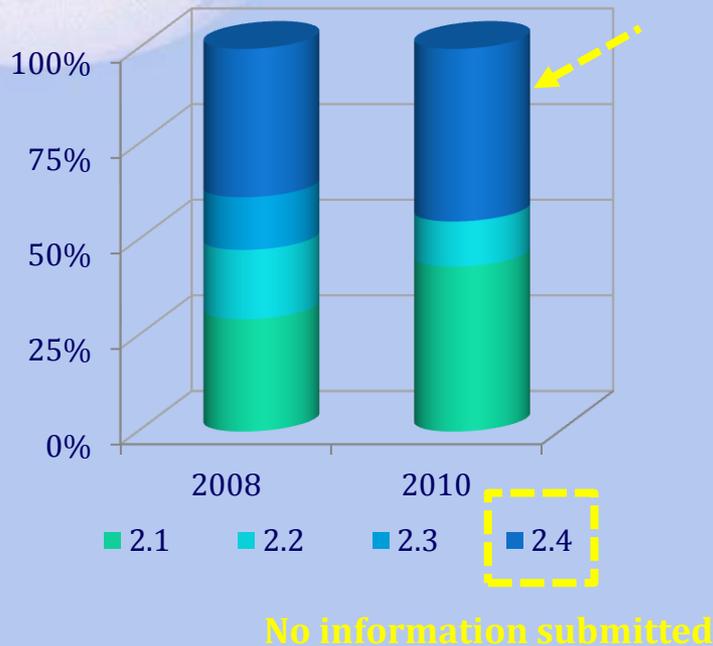
- A general improvement can be noticed due to accumulated experience in the declaration procedure and, also, a higher environmental conscience.

Results and Discussion: Applying PRTRVal

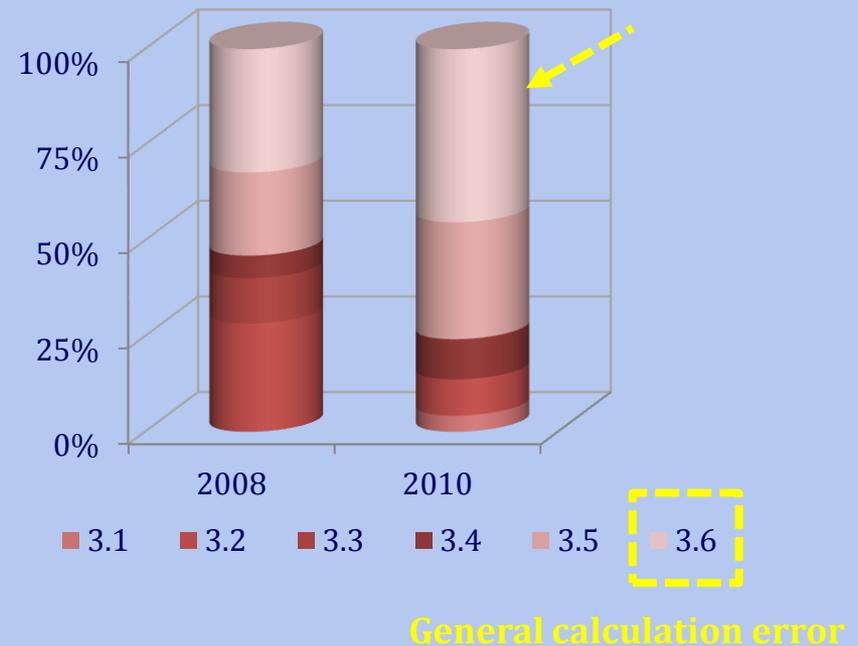
PRTRVal : Analysis of E-PRTR errors

Specific results

Type 2. No information



Type 3: Calculation errors



- All these errors could be easily avoided by the facilities with a previous and careful verification of the information submitted

Results and discussion

Validated E-PRTR inventory vs. EMEP inventory

EMEP Industrial sectors = S1 + S3 + S4:

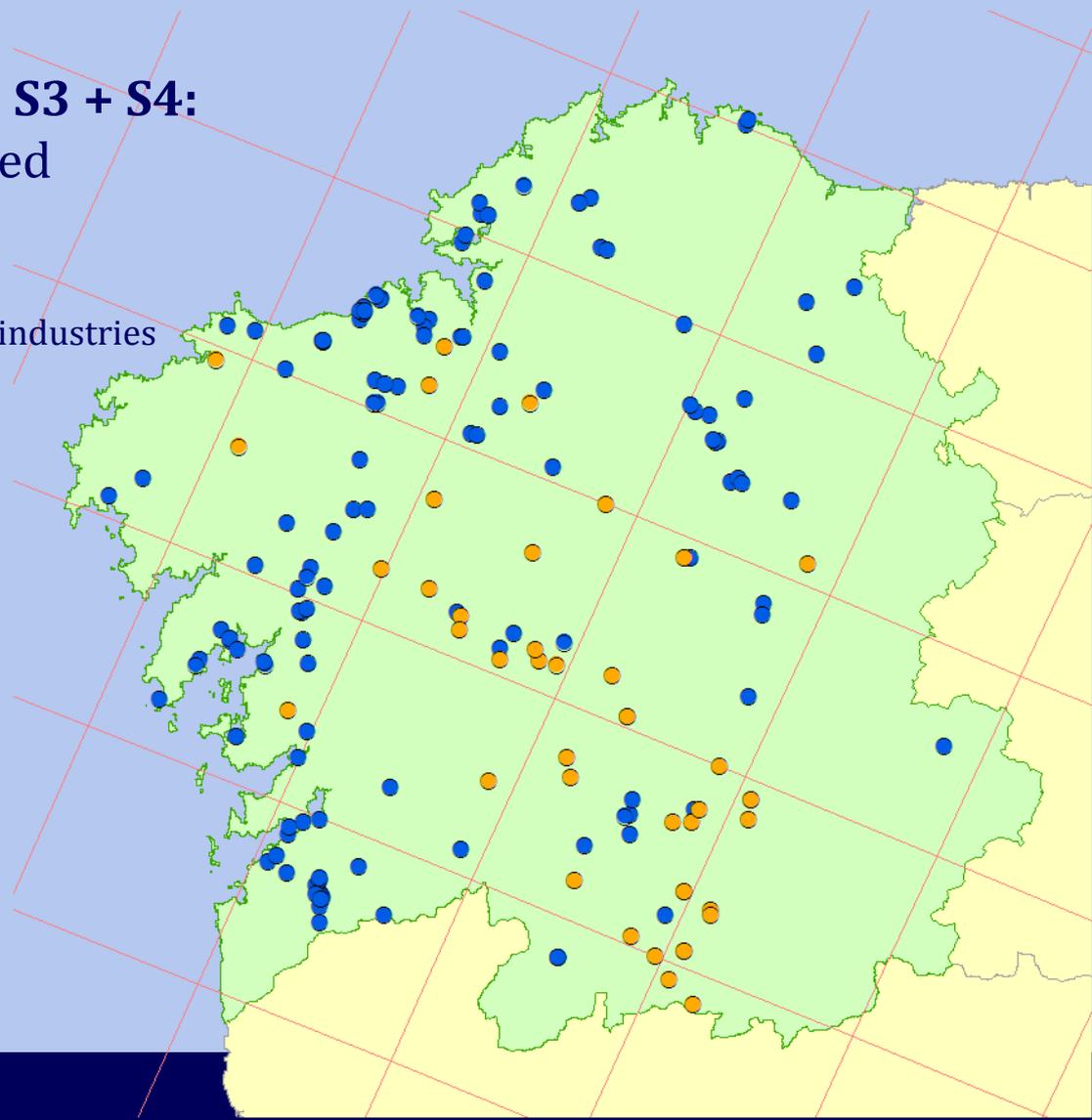
All the facilities should be included

S1 Combustion in energy and transformation industries

S3 Combustion in manufacturing industry

S4 Production processes

- Industrial plants
- Farms
- 50 x 50 km² EMEP grid



Results and discussion

Validated E-PRTR inventory vs. EMEP inventory

- **E-PRTR limited industrial inventory:**

Only facilities above production capacity thresholds; therefore, in theory,

E-PRTR emissions < Industrial EMEP < Total EMEP

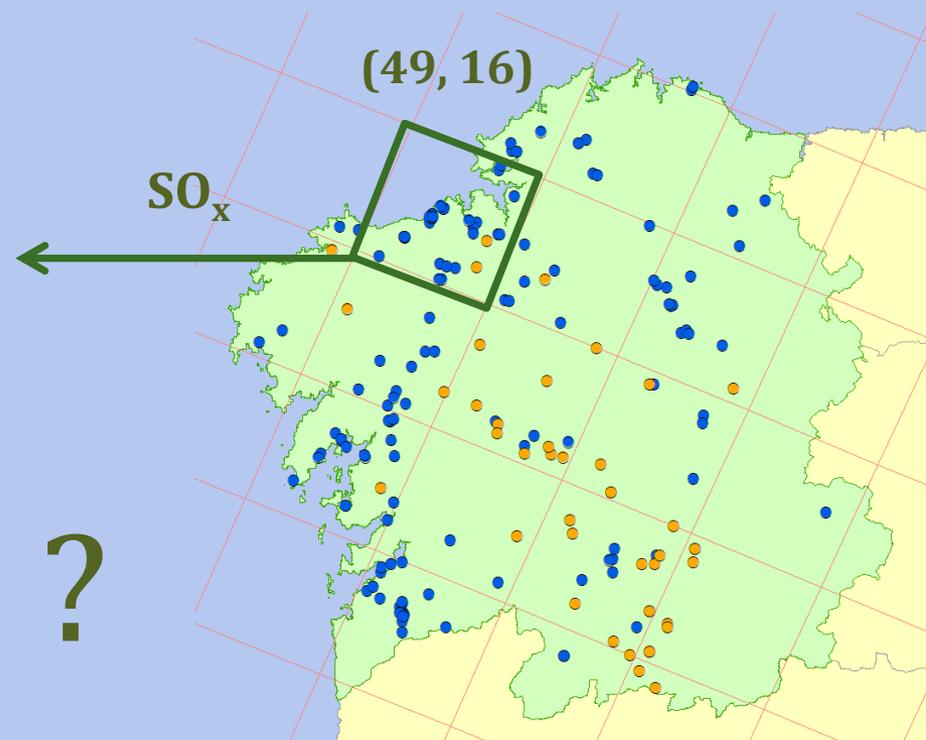
- **Checking SO_x 2008 emissions:**

Repsol YPF refinery (A Coruña)	6800 t
Meirama Power Plant	4160 t
Sabón Power Plant	1500 t
Ferroatlántica Sabón	360 t

E-PRTR (Over threshold info) 12766 t

Industrial EMEP 8977 t

Total EMEP 10148 t



Results and discussion

Validated E-PRTR inventory vs. EMEP inventory

- **E-PRTR limited industrial inventory:**
Only facilities above production capacity thresholds; therefore, in theory,

E-PRTR emissions < Industrial EMEP < Total EMEP

- **Checking SO_x 2008 emissions:**

E-PRTR

CEDIE (Chemical industry) 19.5 t

E-PRTR 19.5 t

EMEP

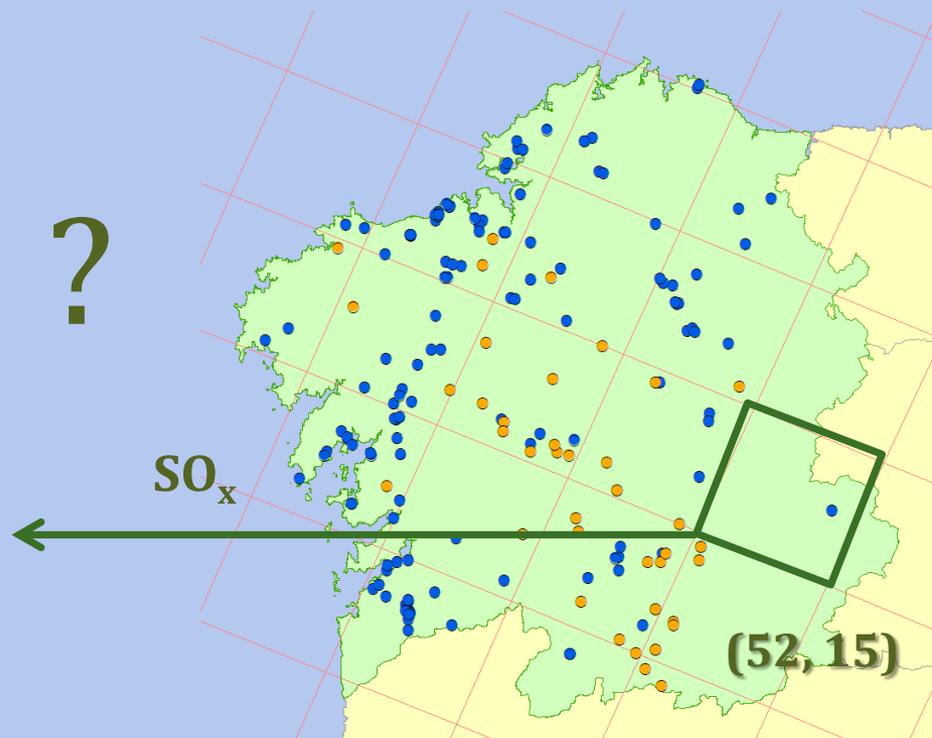
Industrial EMEP 368.2 t

Total EMEP 455.8 t

?

SO_x

(52, 15)

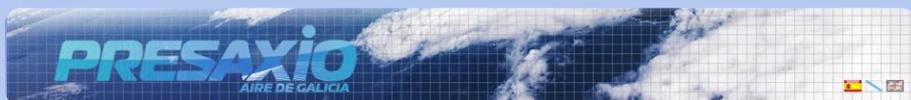


Conclusions

- ✓ A methodology for the validation support of the E-PRTR inventory is presented, based on a bottom-up reference inventory
- ✓ This methodology was coded in PRTRVal software tool, and tested over Galicia region (NW of Iberian Peninsula) in 2008 and 2010 years
- ✓ Applying PRTRVal, most of E-PRTR declared emissions by these facilities required corrections: 75% in 2008 and 55% in 2010
- ✓ A trustworthy verification by the facilities of their declared emissions, before being submitted, could avoid most of these corrections
- ✓ Experience gained along the years with E-PRTR and, previously, EPER and IPPC inventories, reduced errors in declared emissions. Also, a growing environmental conscience of the industrial sector improves these results.
- ✓ Strong inconsistencies were found between validated E-PRTR and EMEP inventories
- ✓ With PRTRVal, European extension of E-PRTR inventory validation should be feasible, with benefits to other European emissions inventories

Conclusions

- ✓ As most of E-PRTR data are based on measurements (either continuous or sporadic) and other specific information, E-PRTR validated data can improve the accuracy of the emissions inventories currently applied in European air quality modeling, i.e.,



<http://www.presaxio.es>



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