Inventory of Air Emissions Nitrogen

Cost 729, Lisbon, 24 April 2008

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Contents

- Overview of the Air Emission Inventory in Portugal (INERPA)
  - Focus in NH3
- Objectives of the joint Efforts APA-FCUL
  - Improvement of the Inventory NH3
- Methodologies for spatial allocation
  - State of the Art
  - Ways ahead
  - e.g.
    - Agriculture
    - Road

Overviem of the Inventory

Ammonia

Portuguese Air Emission Inventory INERPA

▸ National System set by law
  ▸ Following UNFCCC, KP
  ▸ But also covering CLRTAP, NEC, Stockholm

▸ 3 tier structure
  ▸ Responsible entity: produces the inventory
  ▸ Focal Points: Co-operate in Methodological Development and Data Gathering
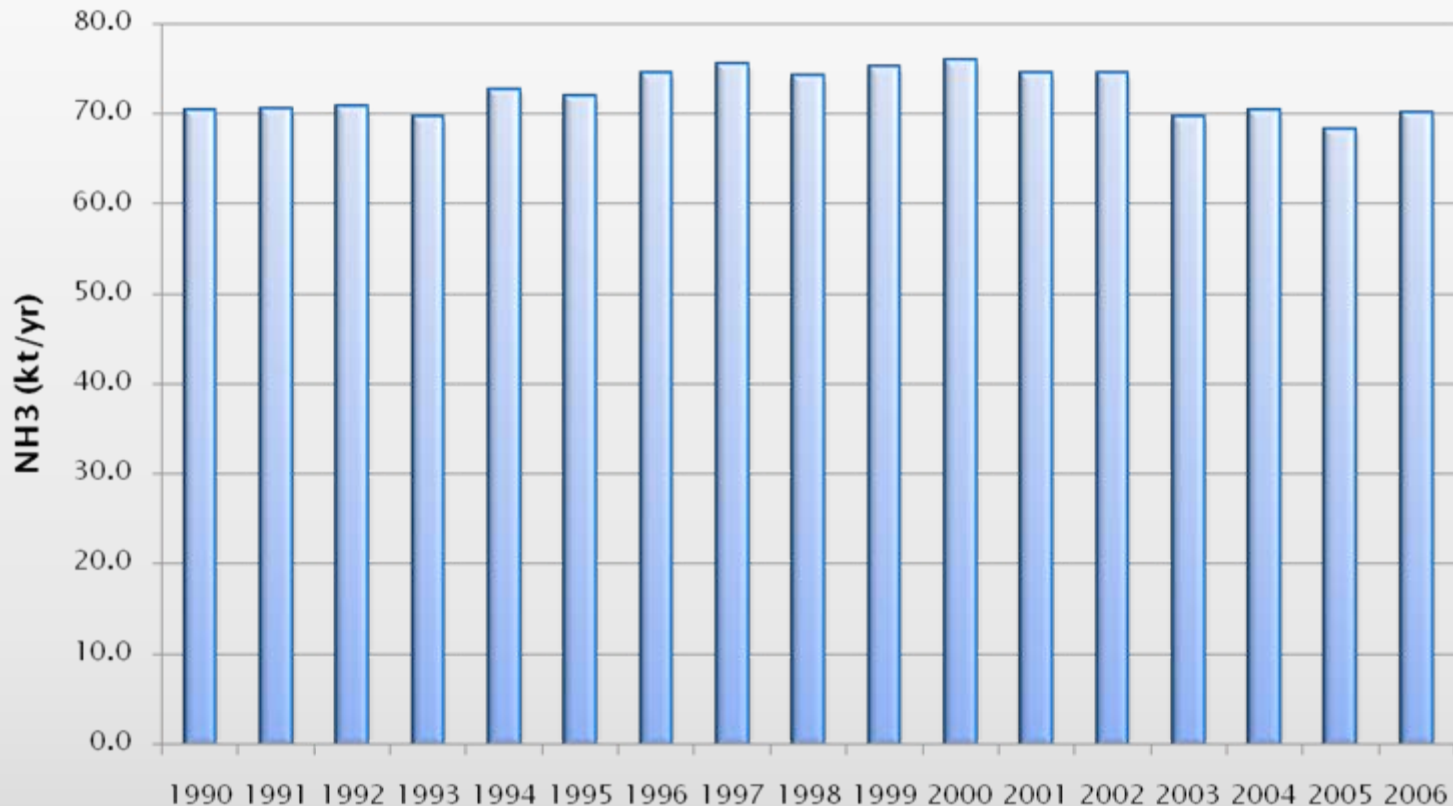 ▸ Entities (data providers, public or private)

Portuguese Air Emission Inventory INERPA (e.g. Agriculture)

Source: APA, Ecoprogresso
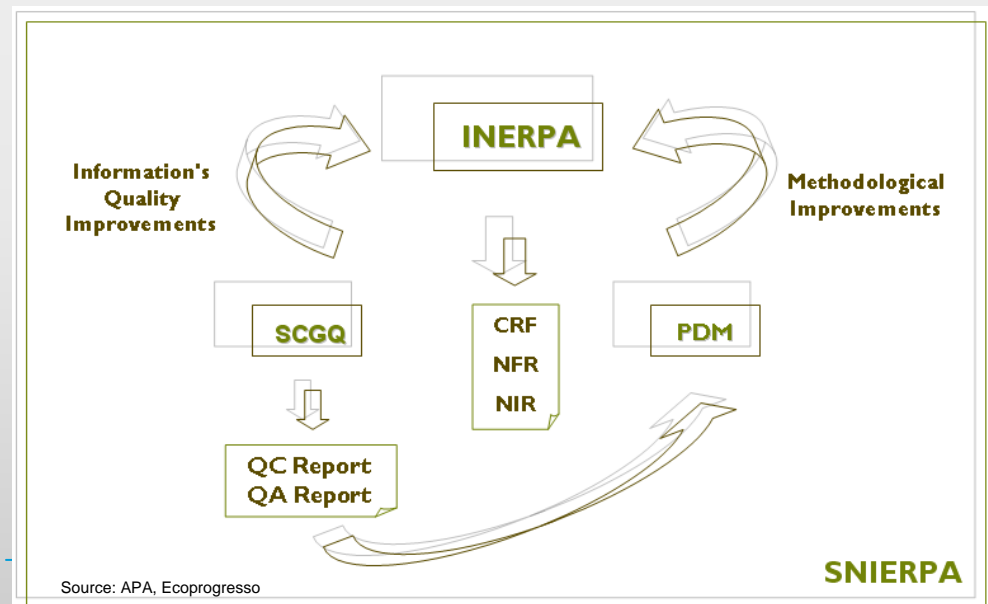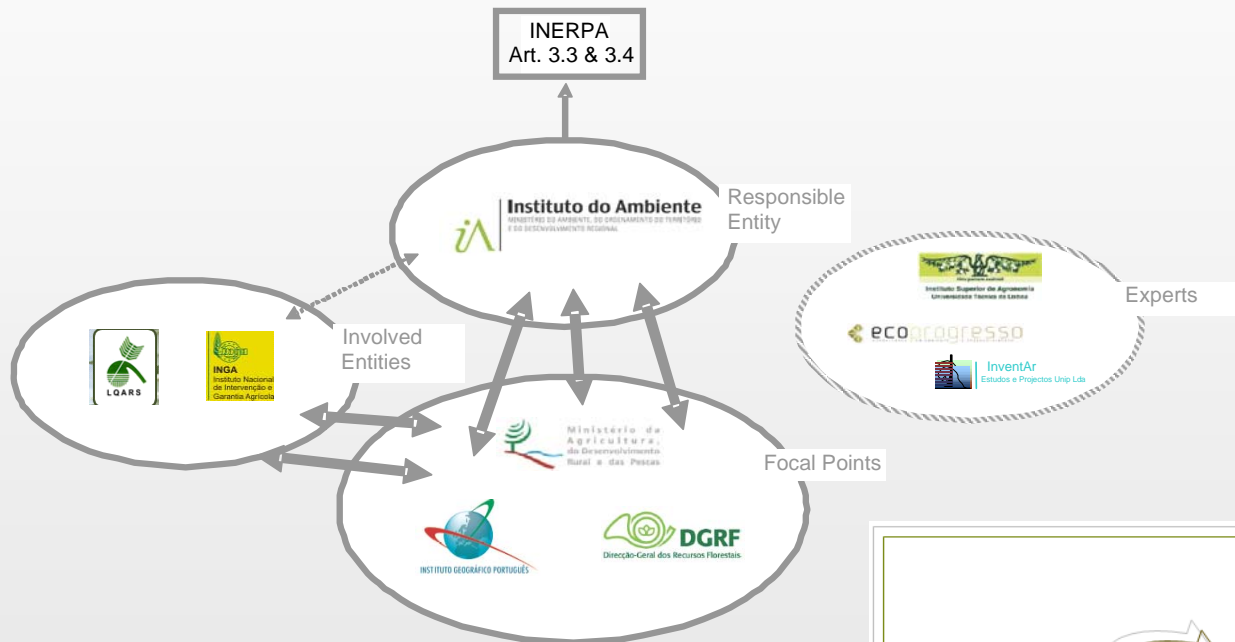
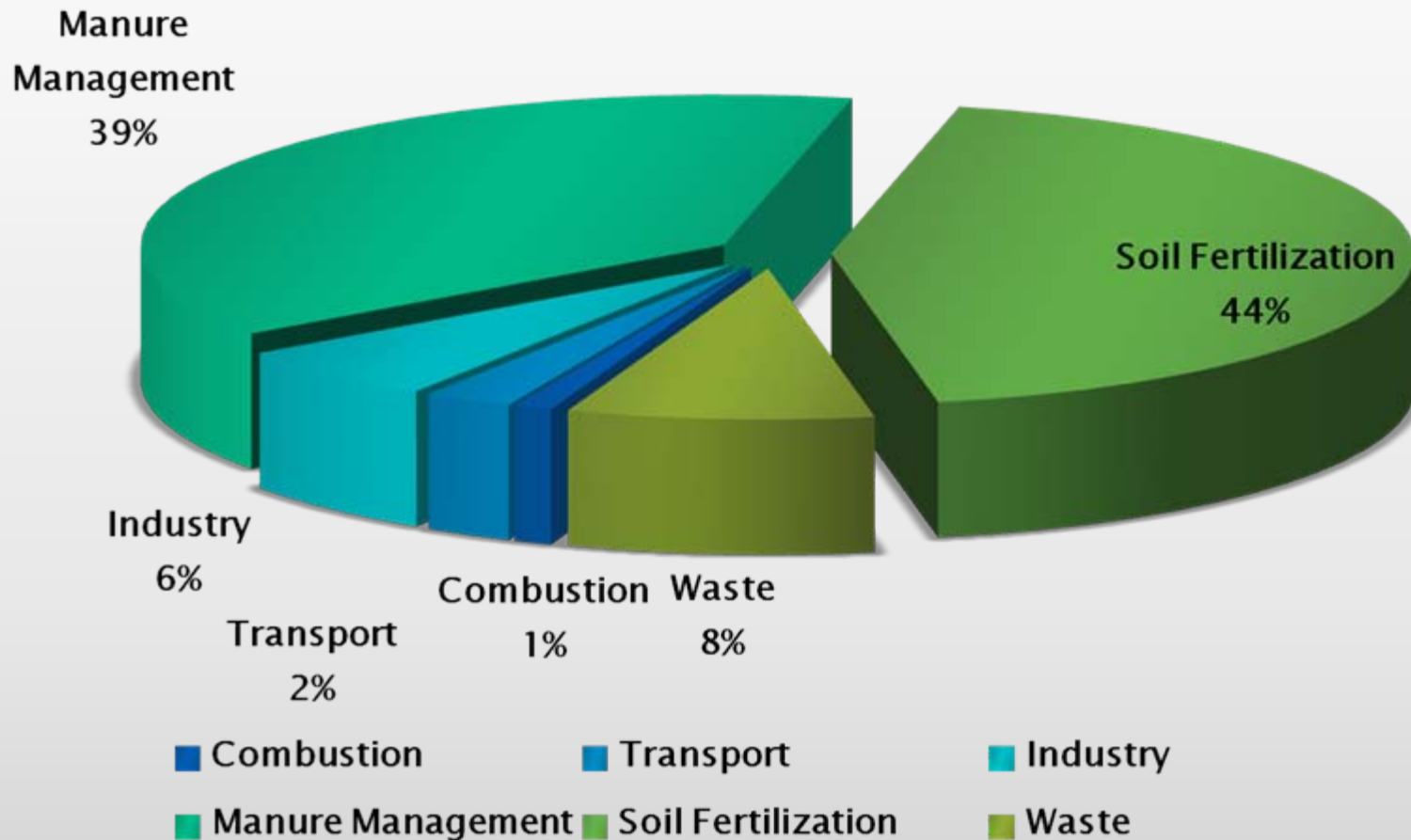# Overview of Results
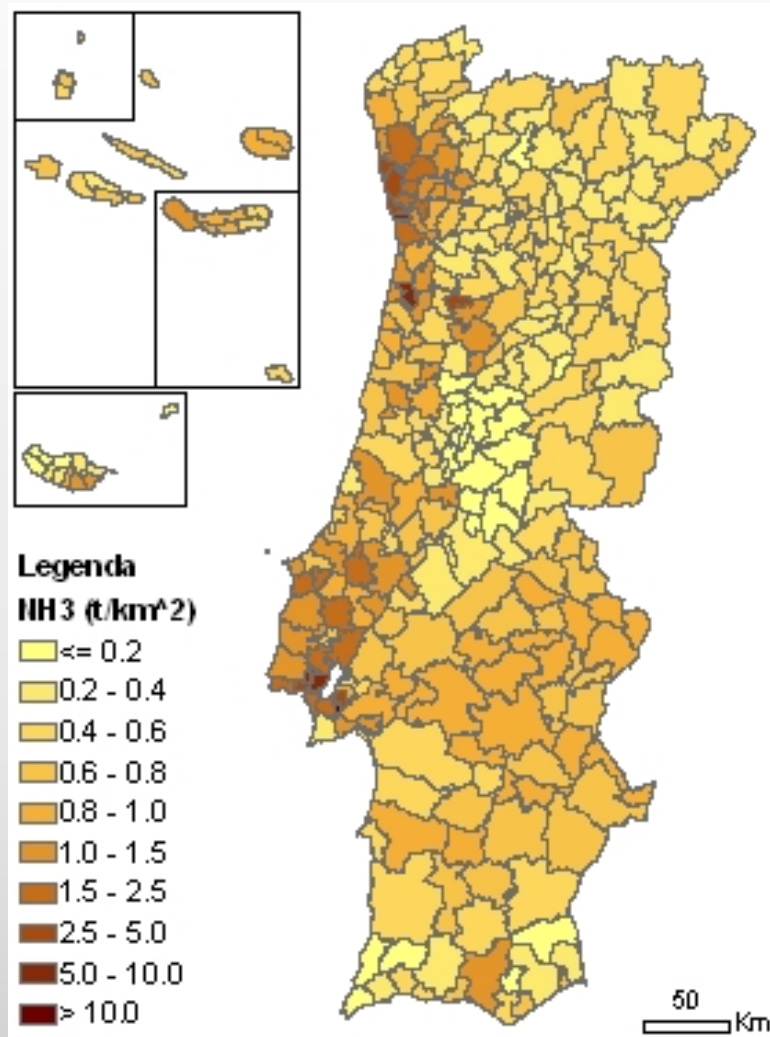## Trend of Total National Emissions NH3

Overview of Results
Emissions by sector NH3 2006

Overview of Results
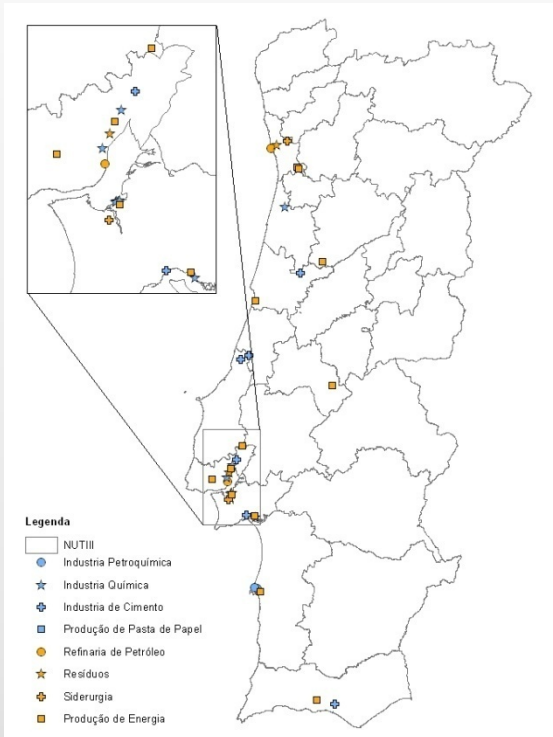# Distribution of NH3 Emissions in PT 2003

Source: APA

Spatial Allocation of Emissions

Source: APA

Exemplo de Alocação Espacial das Emissões da Categoria NFR 3A (Aplicação de Tintas) ao Concelho A

$$PAE_{\text{população[Concelho A]}} = \frac{N^{\text{o}} \text{Residentes}_{\text{[Concelho A]}}}{N^{\text{o}} \text{Residentes}_{\text{[Total]}}}$$

$$\text{Emissões}_{\text{[3A;Concelho A]}} = \text{Emissões}_{\text{[3A; Total]}} \times PAE_{\text{população[Concelho A]}}$$
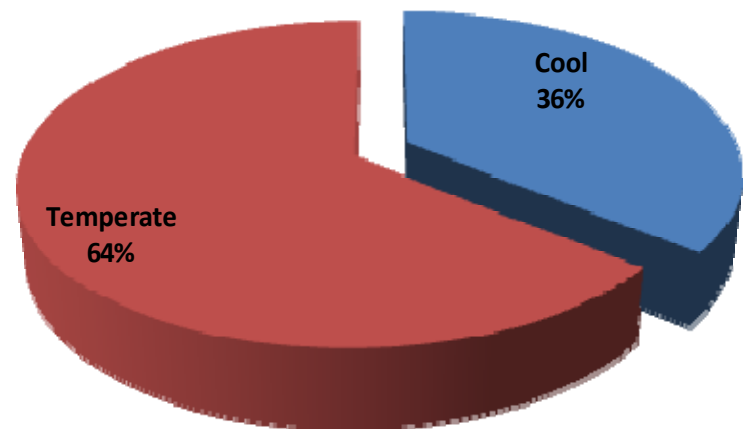
Exemplo de Conversão de Emissões em Linha para Emissões em Área

Troço	Comprimento (km)	Emissão NOx (kg/km)
A	7.5	8.3
B	9.6	8.5
C	2.9	13.4
D	5.4	12.0
E	9.2	15.6

Emissão NOx (em kg) no Concelho X (Emi_X):

$$Emi\_X = 1.2 \times 8.3 + 9.6 \times 8.5 + 2.9 \times 13.4 + $$
$$+ 5.4 \times 12.0 + 5.7 \times 15.6$$

Detailed Analysis of Agriculture Sector

Top-left pie chart:
- Manure Management 41%
- Syn. Fert. 17%
- Man. Fert. 30%
- Grazing 12%

Top-right pie chart:
- Dairy 21%
- Non-Dairy 20%
- Sheep 5%
- Goats 1%
- Mules and Asses 0%
- Horses 2%
- Swine 17%
- Poultry 31%
- Other 3%

Bottom-left pie chart:
- Lagoons/WWTP 15%
- Storage pits 12%
- Solid Storage 50%
- Grazing 23%

Bottom-right pie chart:
- Cool 36%
- Temperate 64%
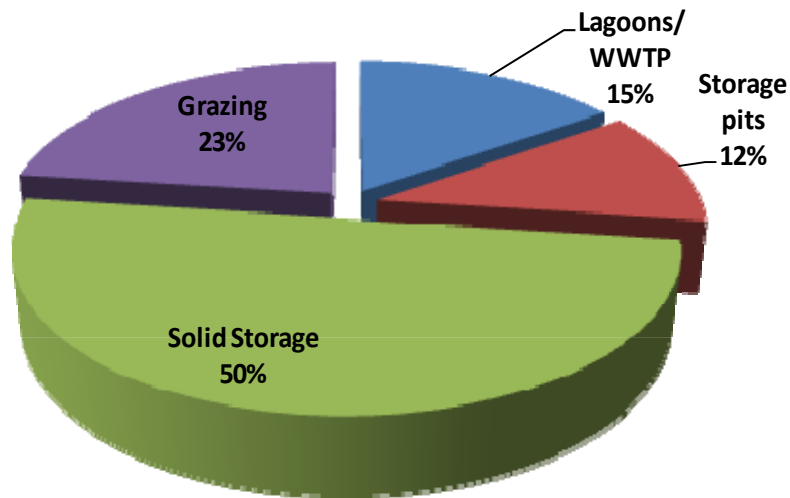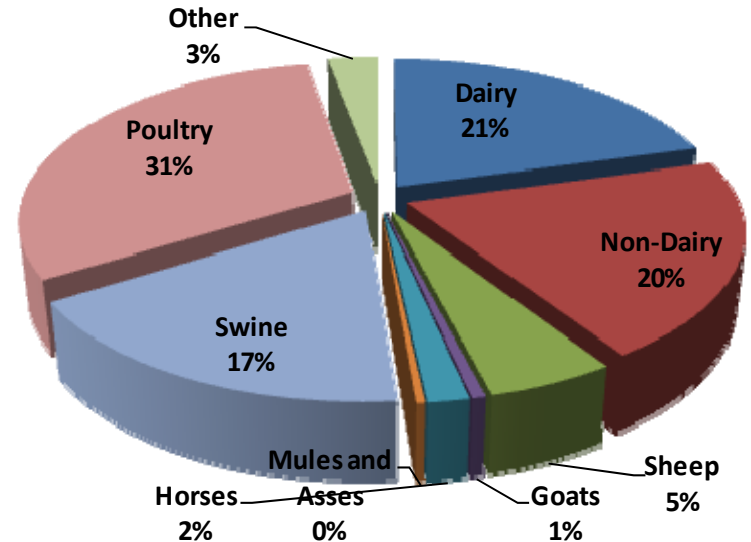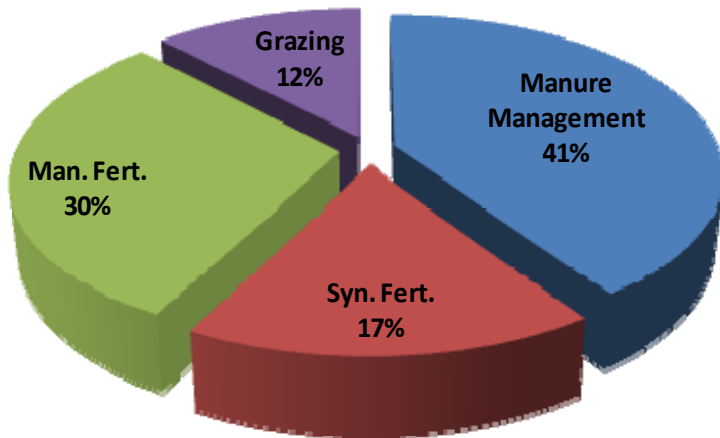
Task: Methodology Improvement

State of the Art and Development Plan

Objectives

- FCUL Demand: Allocation of emissions of NH3 with fine detail
  - 5*5 km grid
  - Identification of point sources

- Technology allocation of emissions
  - E.g. Emissions per Manure Management
  - Usefull for policies

Agriculture

NH3 from Synthetic Fertilizers

▸ Total Emissions

  ▸ $NH_{3\ (t/yr)} = N_{fertUse}^{f}\ {}_{(t/yr)} * Vol_{Ratio}^{f}\ {}_{(kg\ NH3-N/kg\ N)}$

▸ Spatial allocation

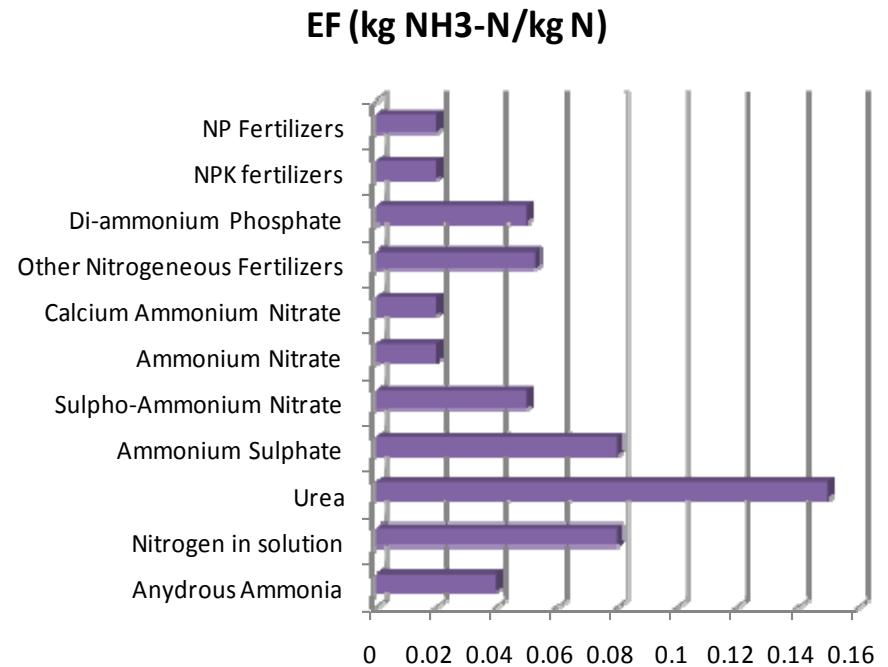 ▸ $Munic_{NH3} = National_{NH3} * Munic_{AgArea}$

▸ Expected Improvements
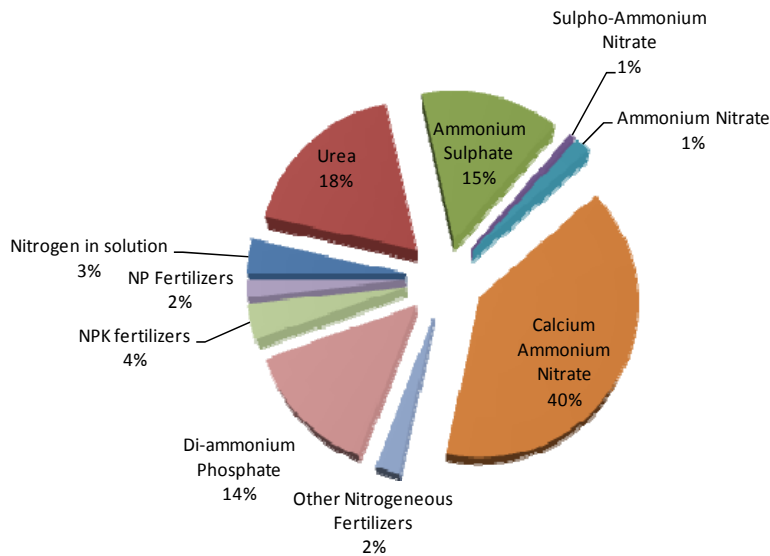
  ▸ Improvement of the Spatial Allocation Factor

  ▸ For each crop

    ▹ Use of recomended use of nitrogen as fertilizer for each crop in the municipal area

    ▹ Subtration of animal manure

    ▹ Allocation of remaining synthetic fertilizers (crop specific)

NH3 from Synthetic Fertilizers

NH3 from Manure

- Emissions per animal type
  - EMEP/CORINAIR simplified methodology with CS Nexc
    - Loses of Nitrogen during Manure life-time
      - Housing
      - Storage
      - Application as fertilizer
      - Grazing
- Spatial allocation
  - Livestock Numbers

- Expected Improvements
  - Use of the detailed methodology
    - New EMEP/CORINAIR Guidebook?
  - Use of more country-specific data
    - Manure Treatment
    - Control Measures
    - Climateric Effect (water in soil/precipitation?)
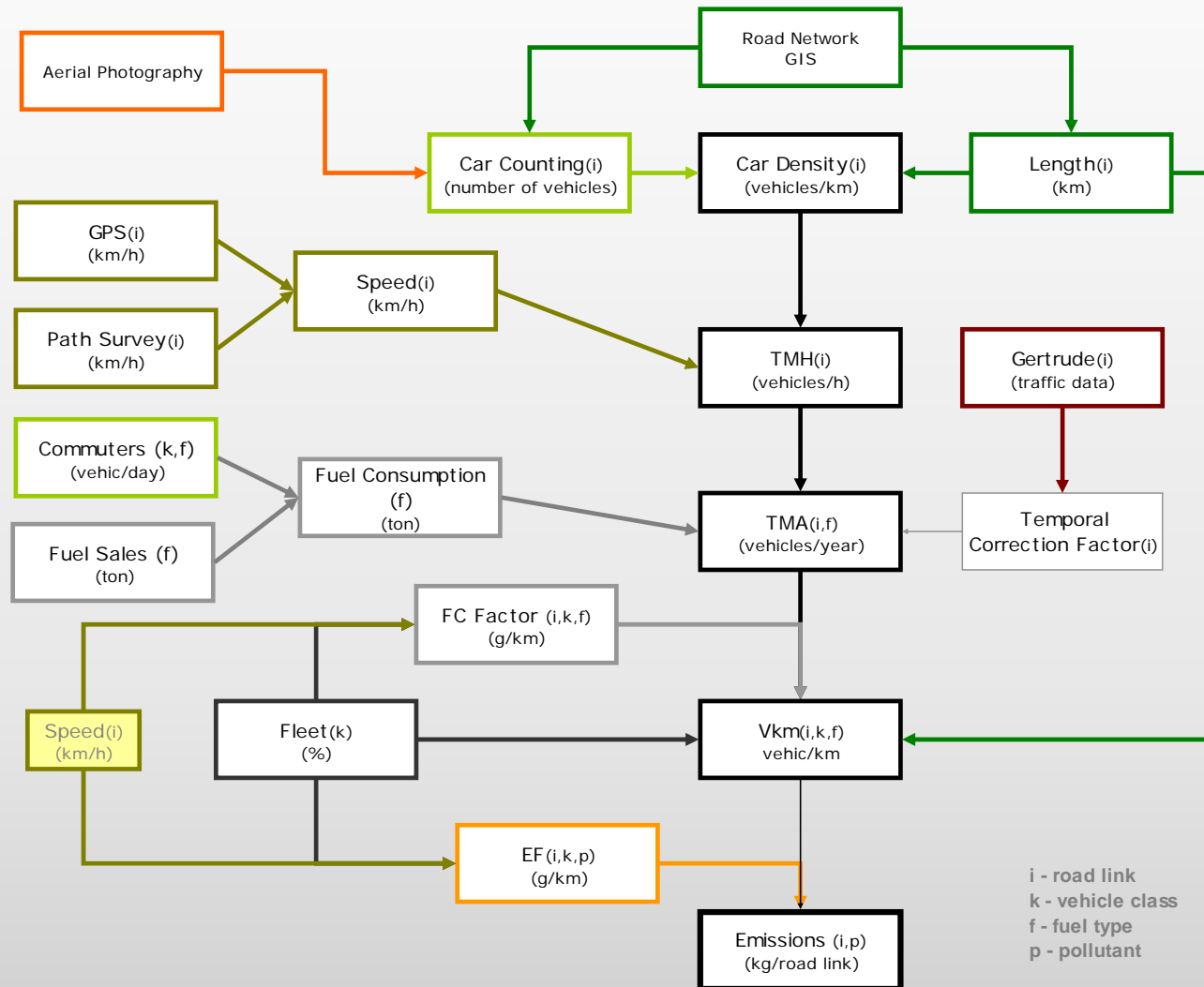 - Use of IPPC data as point sources

NH3 from Manure
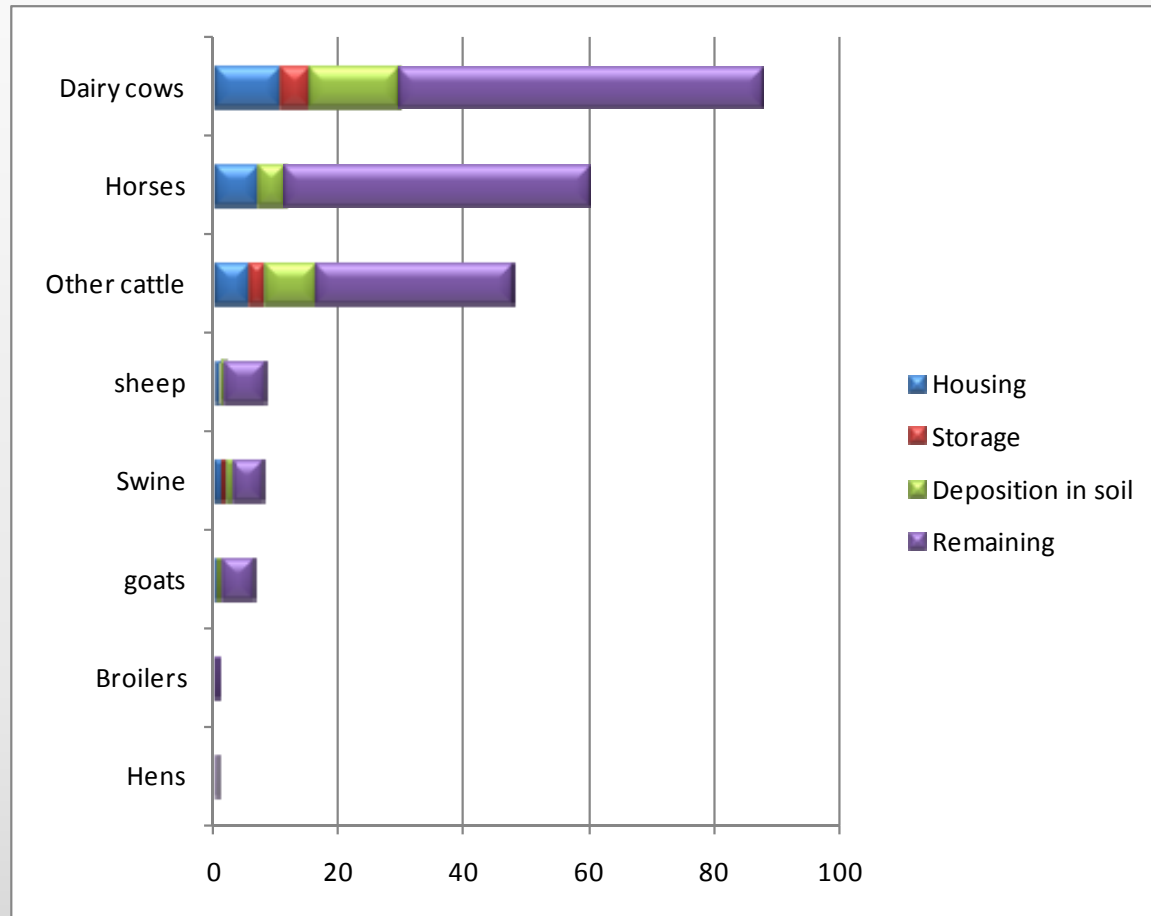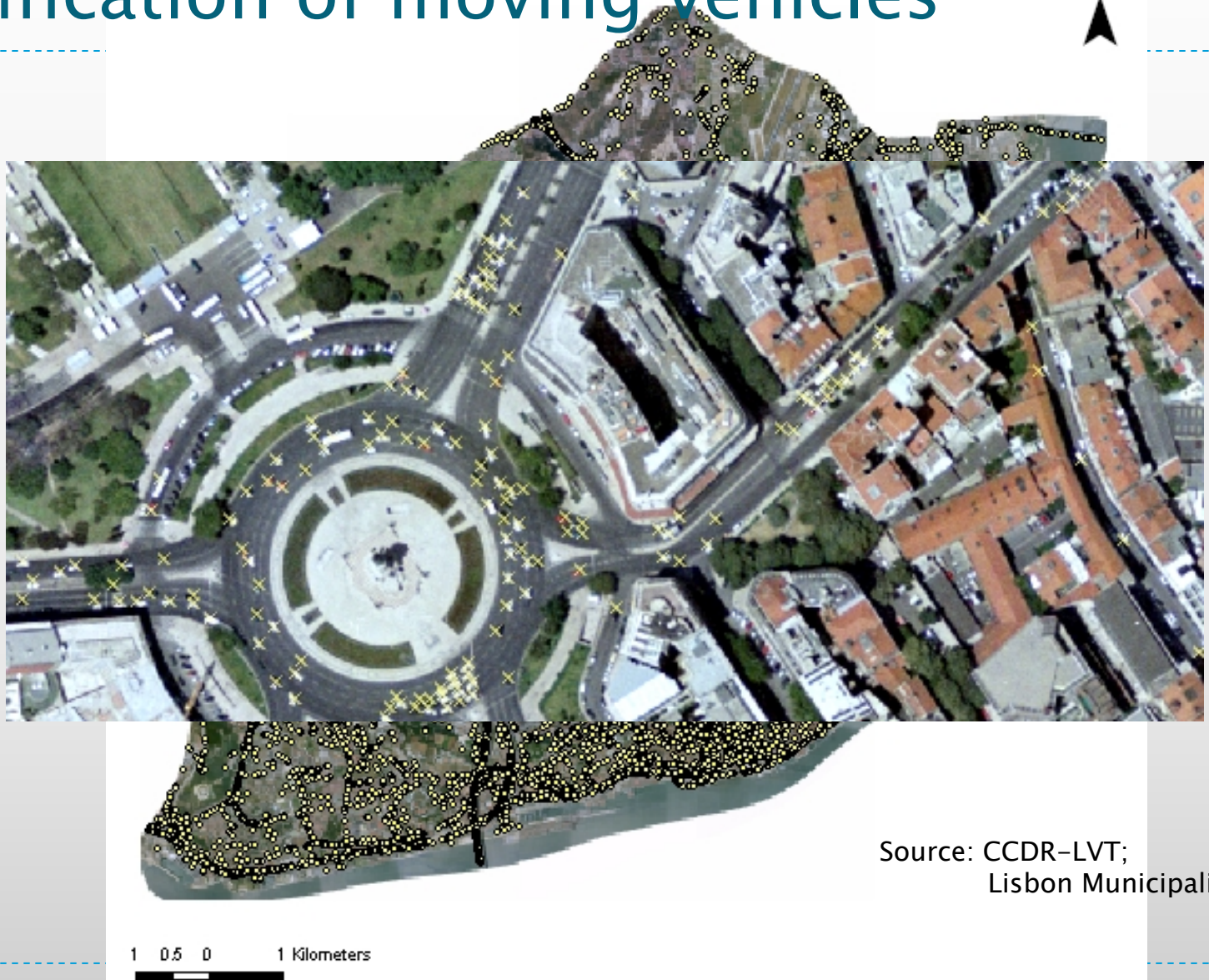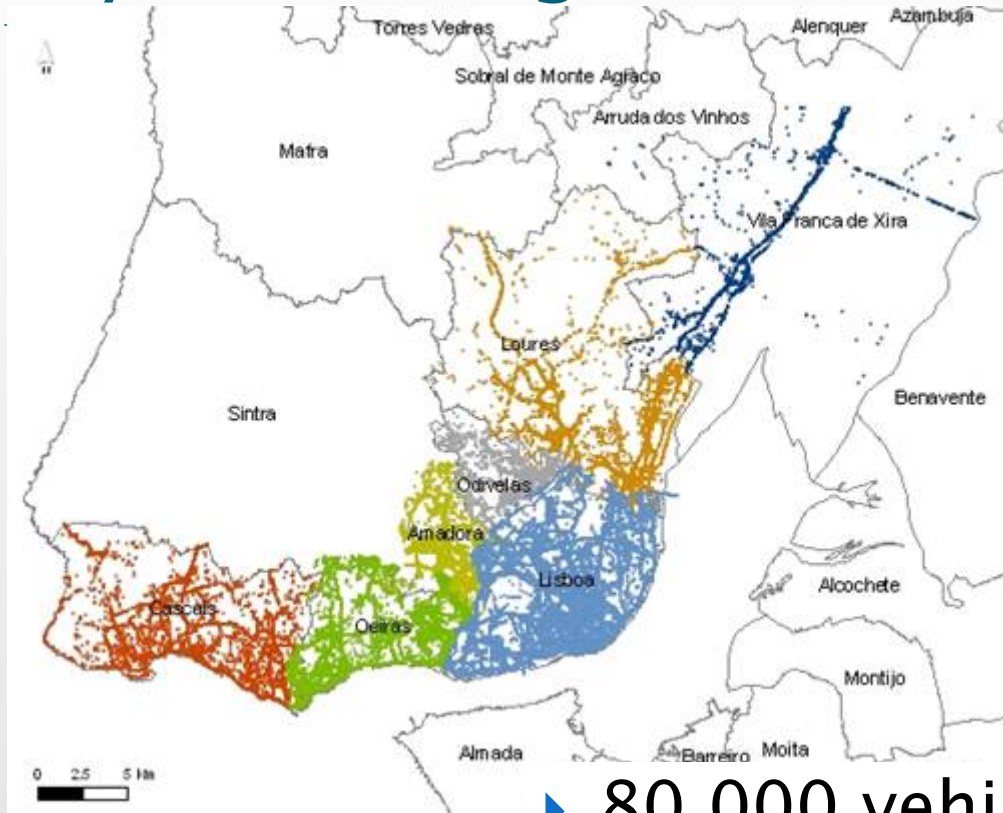
Road Traffic Emissions

Road Traffic Emissions

Identification of moving vehicles

Source: CCDR–LVT;
Lisbon Municipality

Density of moving vehicles

▸ 80 000 vehicles identified
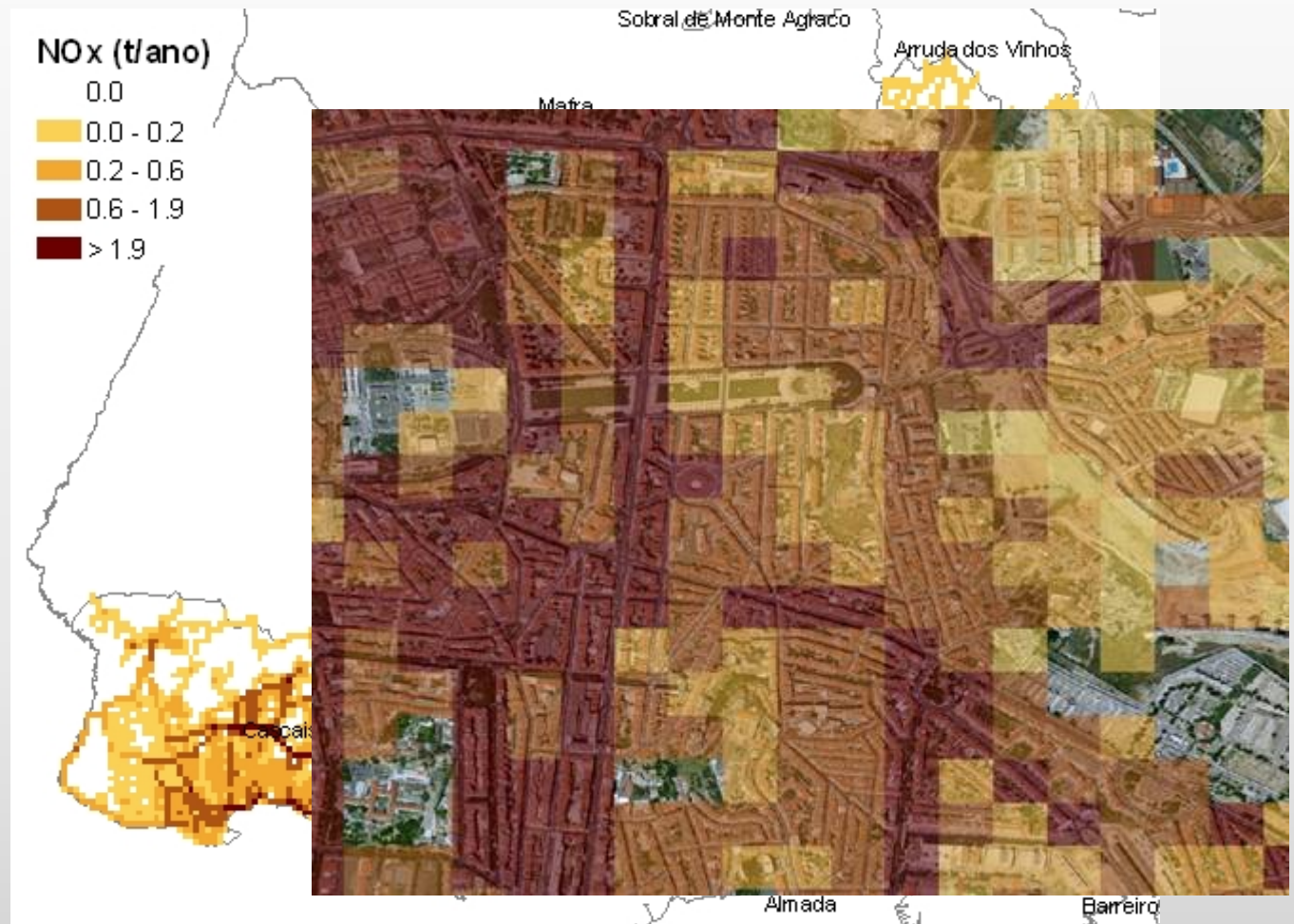 ▸ 15 % total licenses (Insurance data) in the area

Speed:
Method 2 – GPS

- GPS in vehicle
- Rules for test driver
  - Keep with main flow
  - but copy driver behaviour -> objective oriented travel
    - E.g. Service Stations, Museums
- Data acquisition problems in narrow roads with tall buildin

Results: NOx

Evaluation: traffic

(*Gestion Electronique de Règulation en Temps Réel pour L'Urbanisme, les Déplacements et l'Environnement*)

▶ Lisbon Municipality

▶ local groups: 10

▶ 110 counters (2000)

▶ Restricted to central/busy areas

▶ Objective: Traffic Control

$y = 1.3114x + 9989.5$
$R^2 = 0.3386$

$y = 0.5068x + 3867.6$
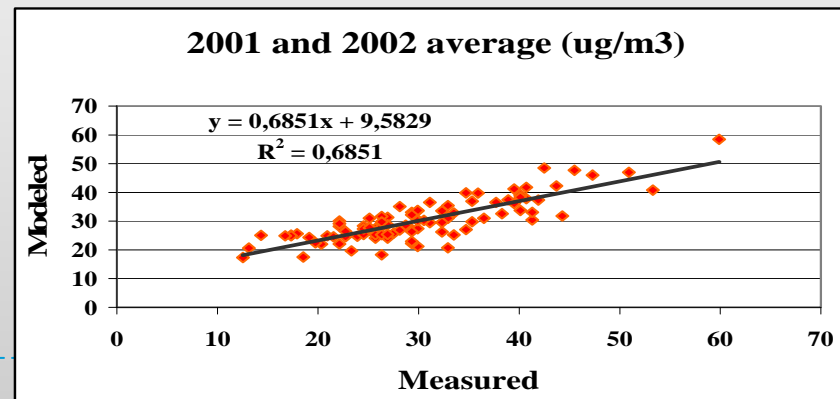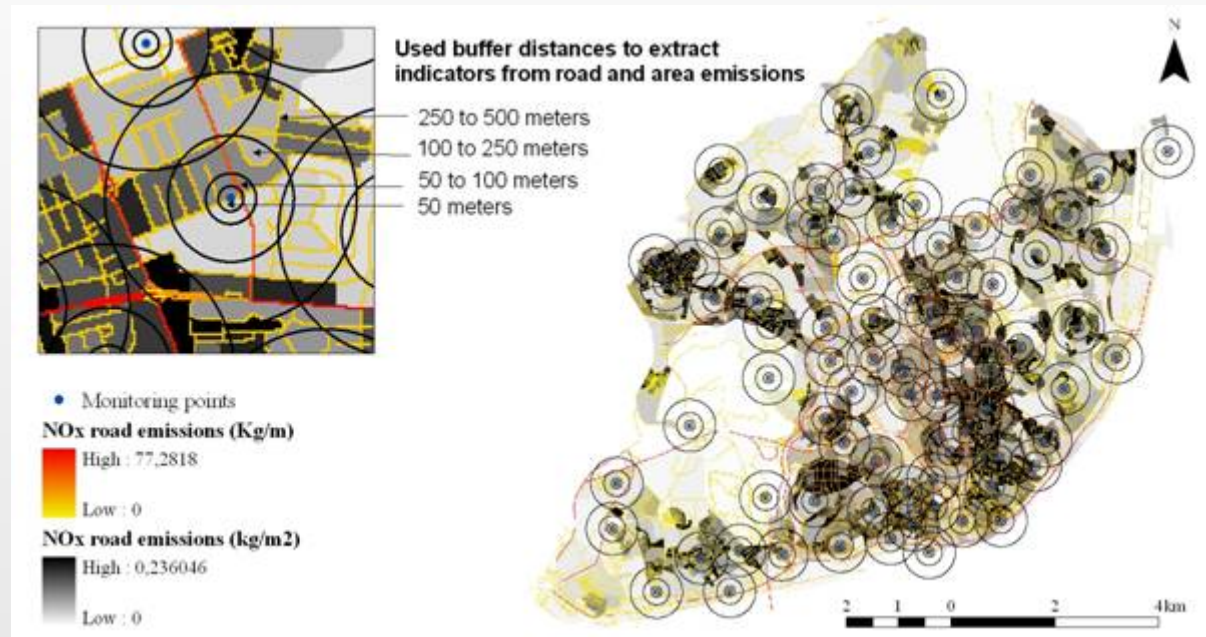$R^2 = 0.3386$

Veic/day
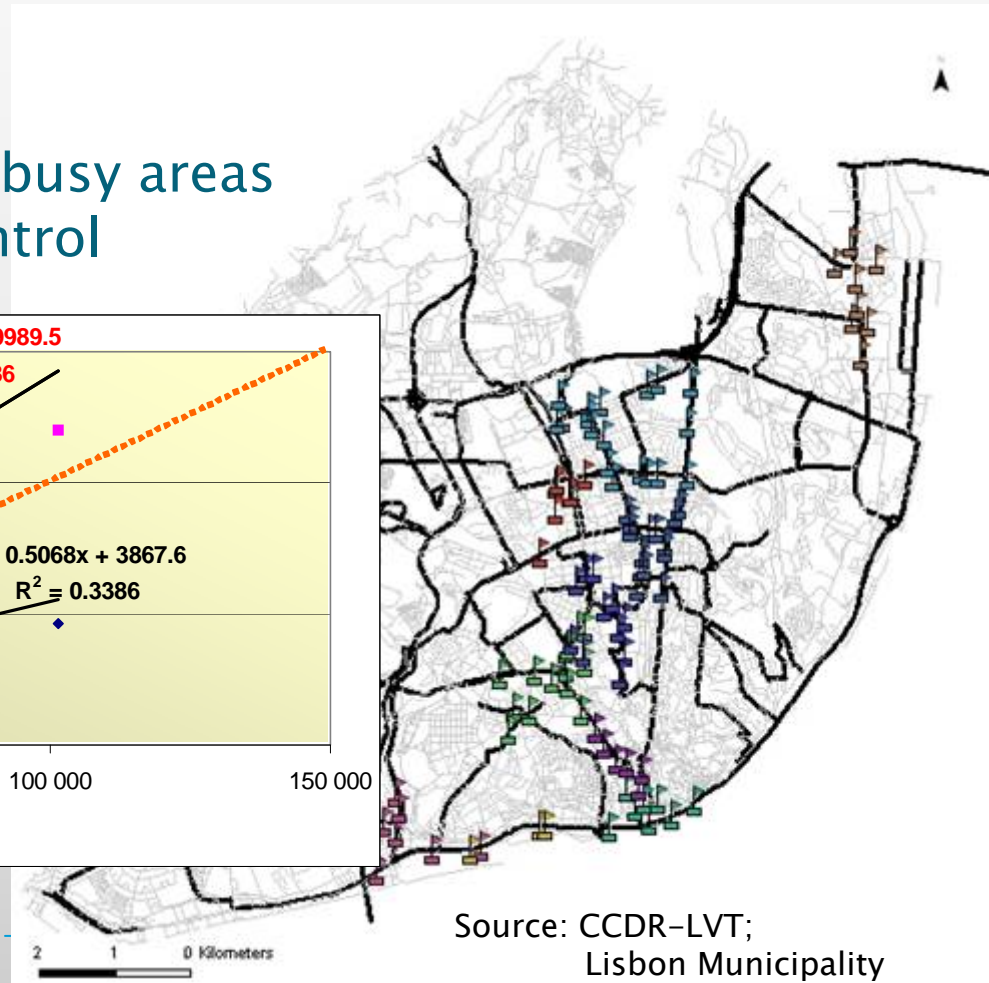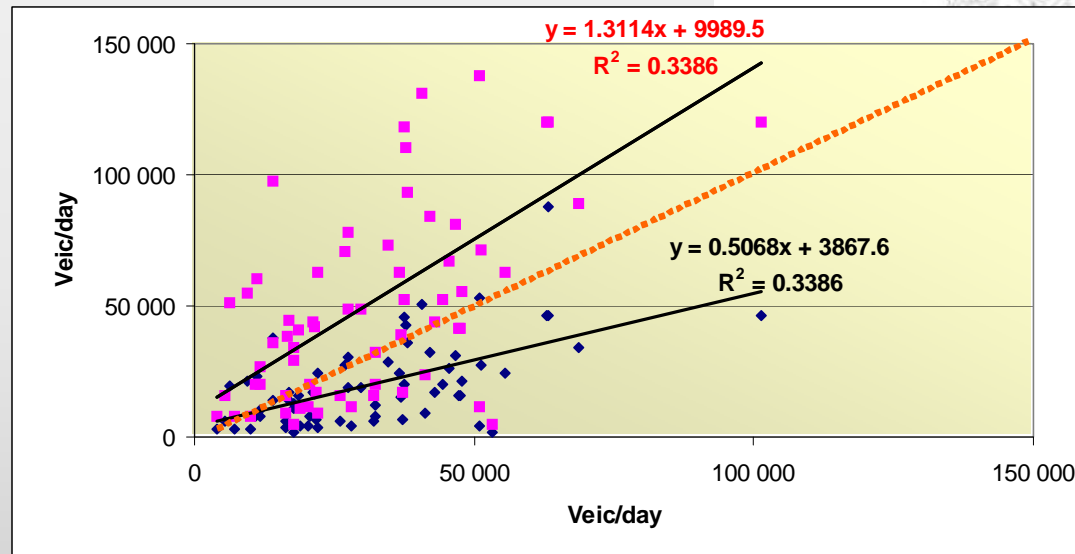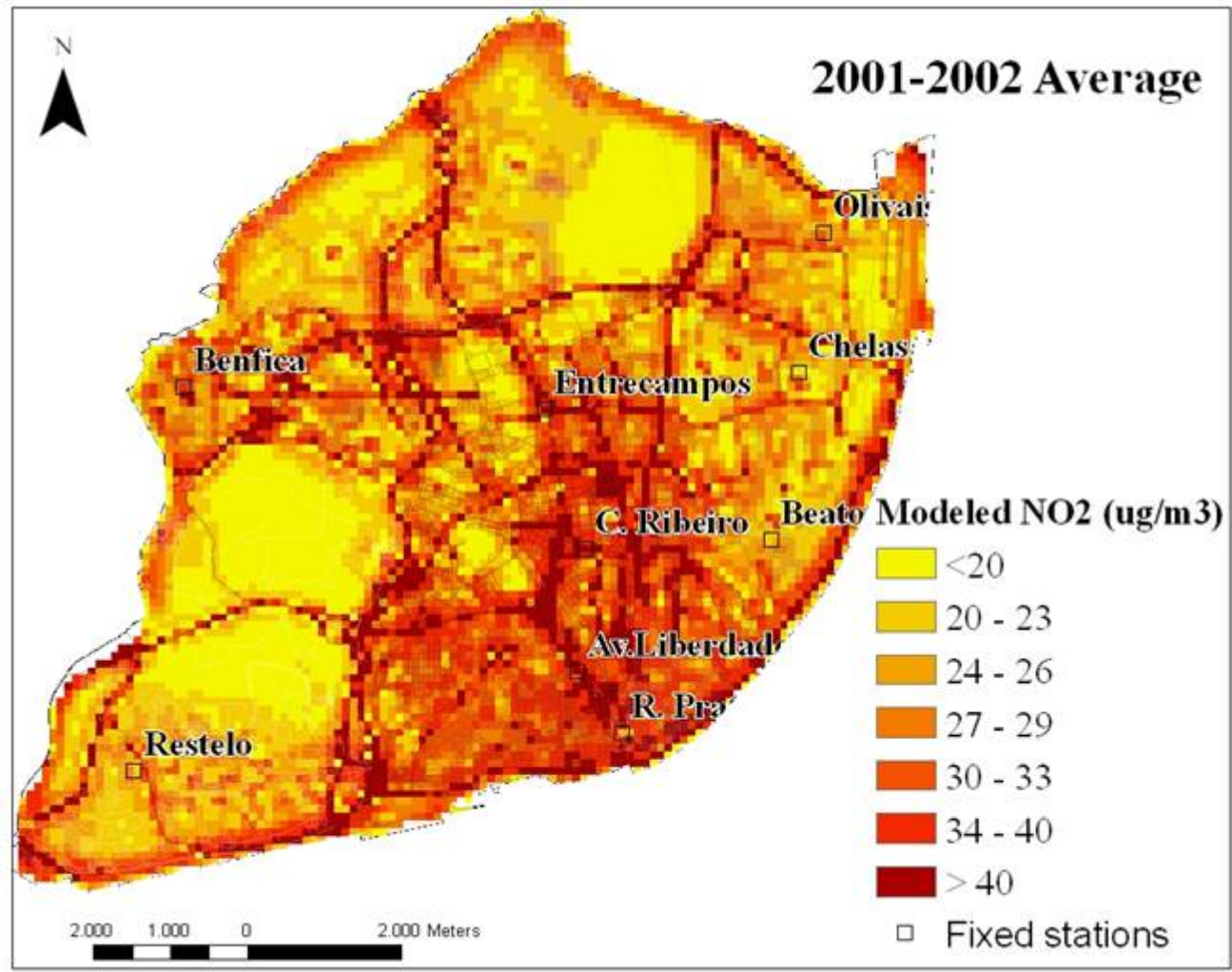

Source: CCDR–LVT;
Lisbon Municipality

Model Validation
Comparison with air quality surveys

Source: CCDR–LVT; FCT–UNL

Final Results: Air Quality Mapping

Source: CCDR–LVT; FCT–UNL

Thank you

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