



**Jardins familiaux et proximité routière :
impacts sur les compartiments
sol, air, végétaux**

***Allotment gardens in road proximity : impacts
on air, plants and soils***

Philippe Branchu, Jean-François Castel, Amélie Charnoz, Virginie Dunez,
Gaétan Lefebvre, Renaud Martin, Laurent Meffray, Jean-François Petit



SEVERAL RESEARCH PROJECTS SINCE 2010



Jardins associatifs urbains :
Pratiques, fonctions et risques



Jardins de bord de voies



JAFARR

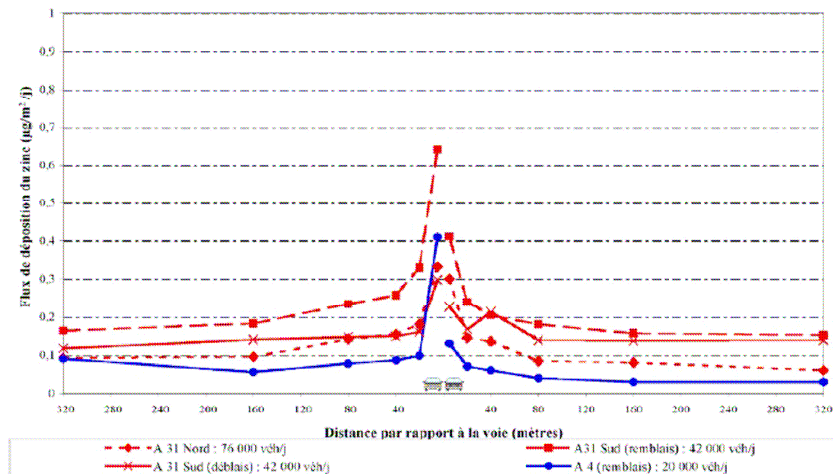
Jardins associatifs et
proximité rail route



10 & 11 octobre 2017
Lyon, France

CONTEXT

- A real attraction for inhabitants to urban gardening
- A picture : *allotment groups are located in unused area in city entrances near transport infrastructures (major roads and railways)*
- Roads are a major source of pollution (NO_2 , PM) for air in town



Setra

Figure 6 : évolution des charges de zinc déposées en fonction de la distance à la voie et des niveaux de trafic.

OBJECTIVES

- ❖ Is there a determinant between road proximity and the state of environment (air / soil / plants) in allotment gardens ?
- ❖ What recommendations for urban gardening / urban agriculture :
 - Establishment of new gardens
 - Older gardens management



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METHOD

Investigation in a large number of gardens

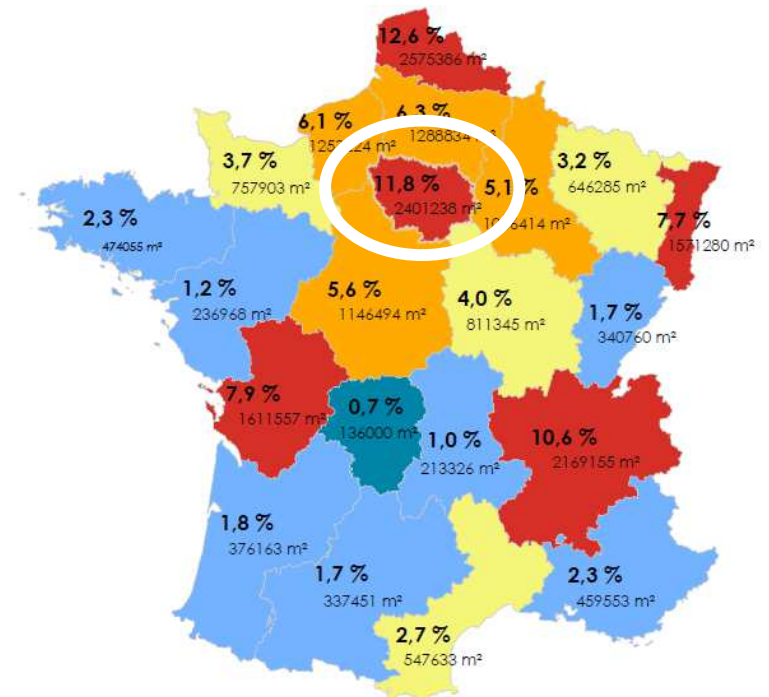
⇒ statistical view

- Perform a detailed study in one « extreme » garden

⇒ the worst situation

WHERE ?

In Ile de France area : high population, road (with high traffic) and garden densities



HOW

- Dedicated GIS construction
- *ca* 30 allotment group selection : soil analyses (Pb, Cu, Zn) following transects perpendicular to road
- 1 site : Air analyses, biomonitoring (cabbage)

Air = Instantaneous indicator (<day)

Plants = intermediate time indicator (> week)

Soil = Integrated time indicator (> x years)

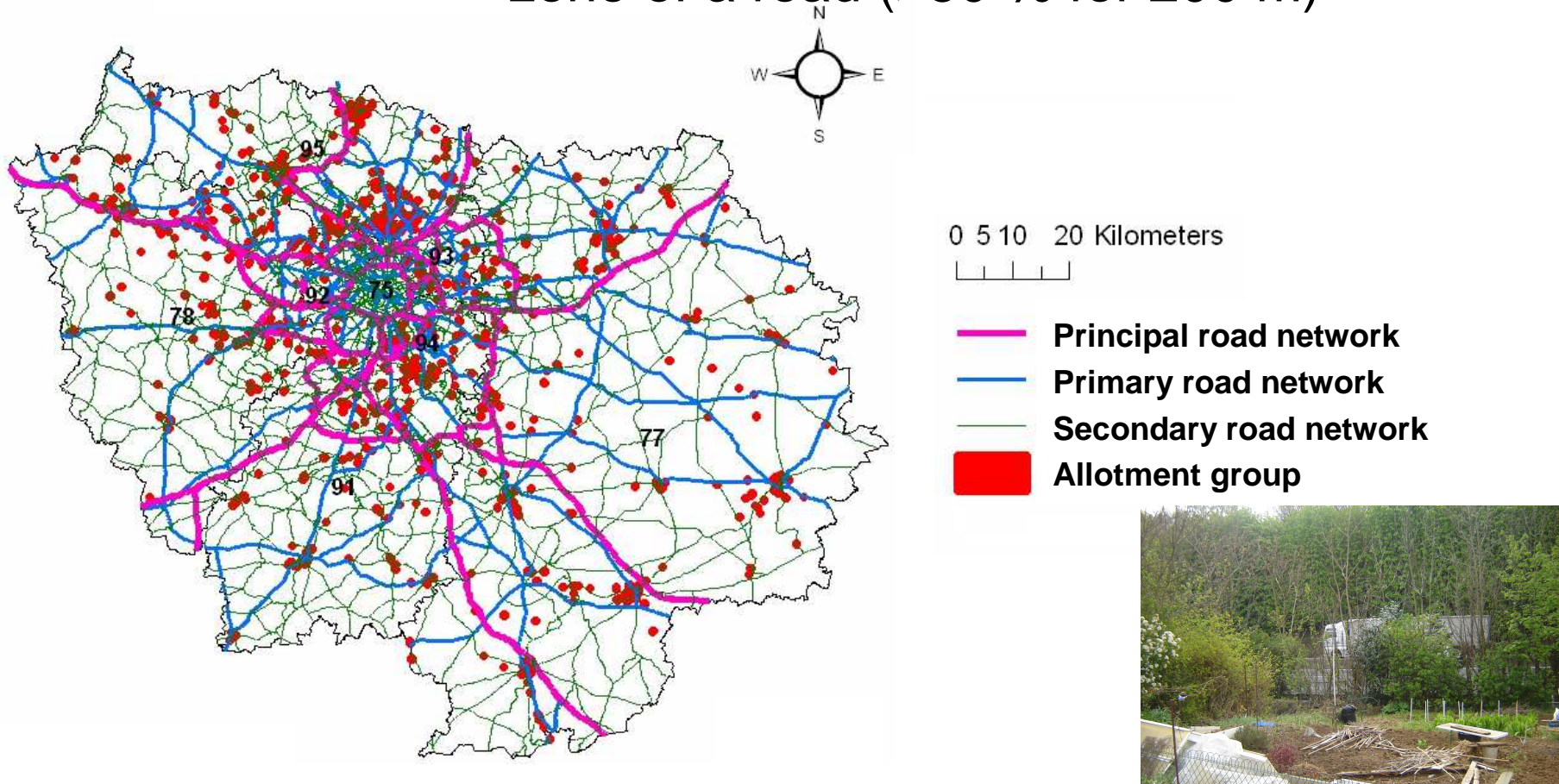


RESULTS

1. Statistical view A. GIS

In Ile de France :

- ✓ 1061 allotment groups :
879 ha
- ✓ 21 % of this surface in the 100m vicinity zone of a road (>50 % for 200 m)



RESULTS

1. Statistical View

B. Allotment soils quality

Regional database
(612 samples)

⇒ Selection of 27 allotment groups only associated with road proximity and 5 reference allotments (free of any contaminant source) for field investigations

Soil Chemical database

Near road allotments

	Pb	Zn	Cu
1st decile	13	46	24
mediane	41	84	37
9th decile	113	200	65
Max.	559	565	329
standard deviation	56	77	27

Reference allotments

	Pb	Zn	Cu
1st decile	18	63	30
mediane	44	117	47
9th decile	119	204	78
Max.	188	327	113
standard deviation	44	59	20

Ile de France agricultural soils (Aspitet, 1993)

	Pb	Zn	Cu
1st decile	16	40	9
mediane	19	49	12
9th decile	33	70	21
Max.	742	274	85
standard deviation	20	18	7

At the global scale : no difference between near road an reference allotments

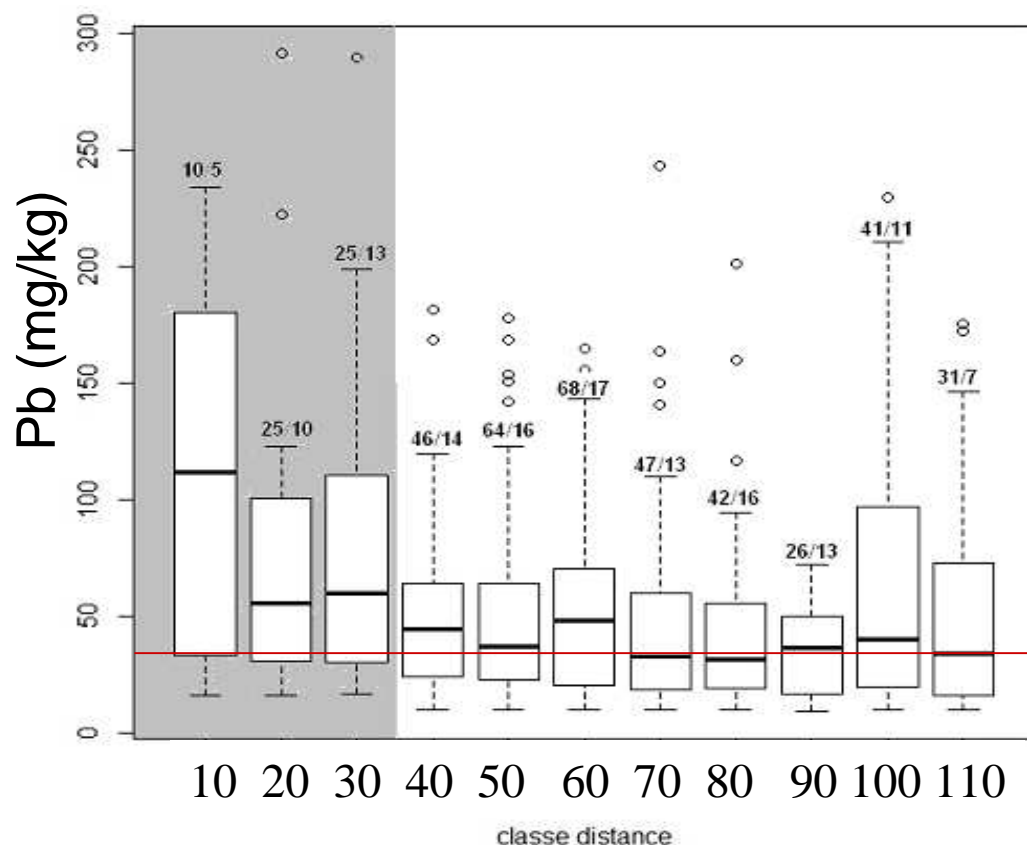
A significant difference between allotment and agricultural soils

⇒ Influence of gardener's practices

RESULTS

1. Statistical view

B. Road impact on soil quality



At the regional scale :

➤ Significant impact of Road proximity in a 30 m trip

➤ Pb & Zn (not for Cu)



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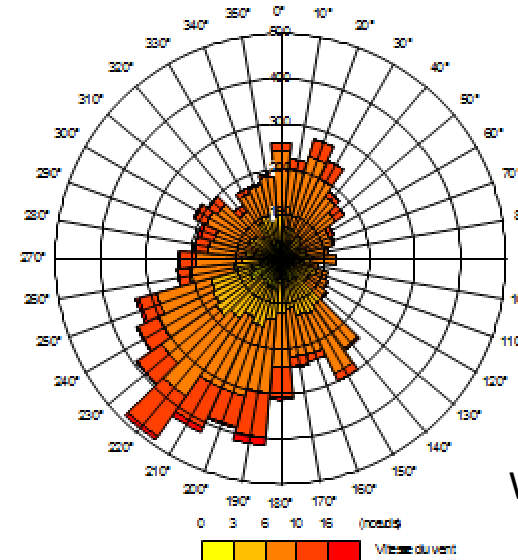
RESULTS

2. Site Investigation

A. Site presentation

70 years

Old gardens in proximity of old highway with high traffic (145 000 veh/d with 4% of trucks). Gardens downwind of the road, without height difference between road and gardens = high impact factors



Wind rose

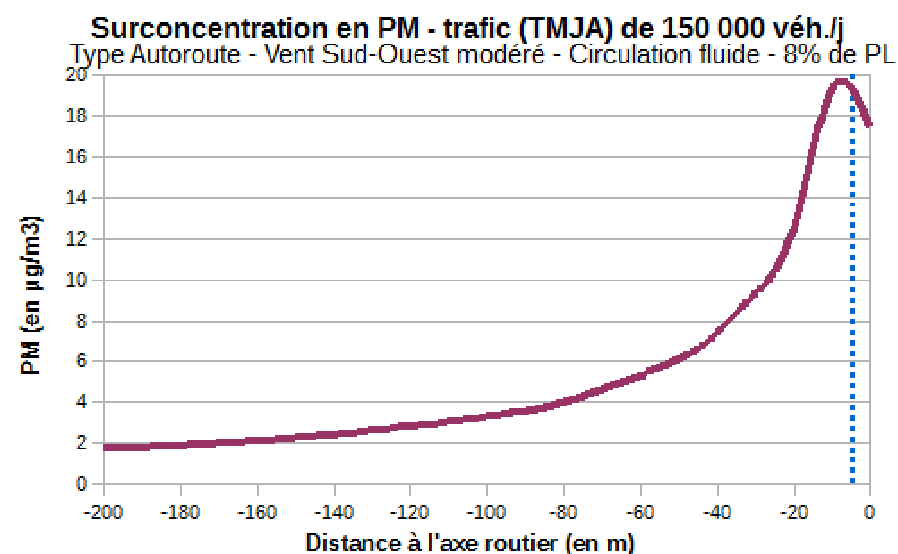
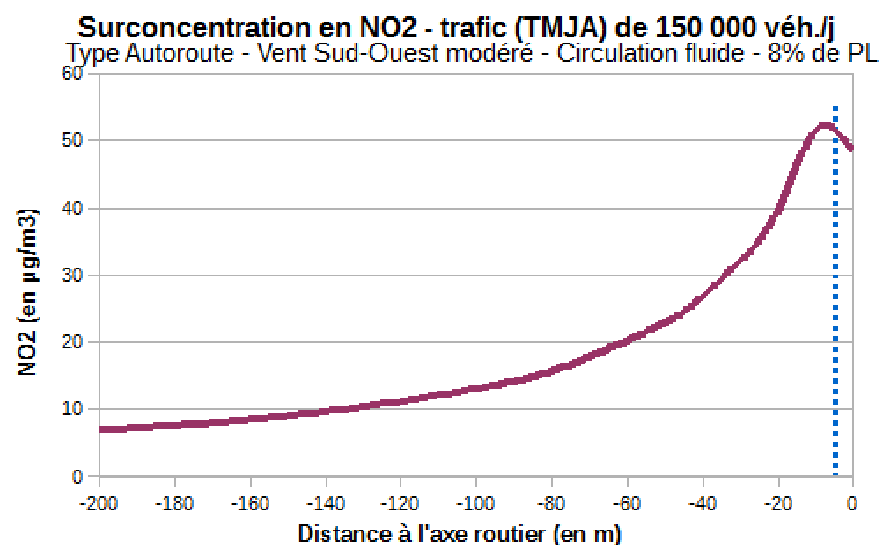
RESULTS

2. Site investigation

A. Air quality

Theoretical dispersion from the road emissions

daily mean over-concentrations



(Cerema NP, 2017)

Emissions : Copert

Dispersion : ADMS urban

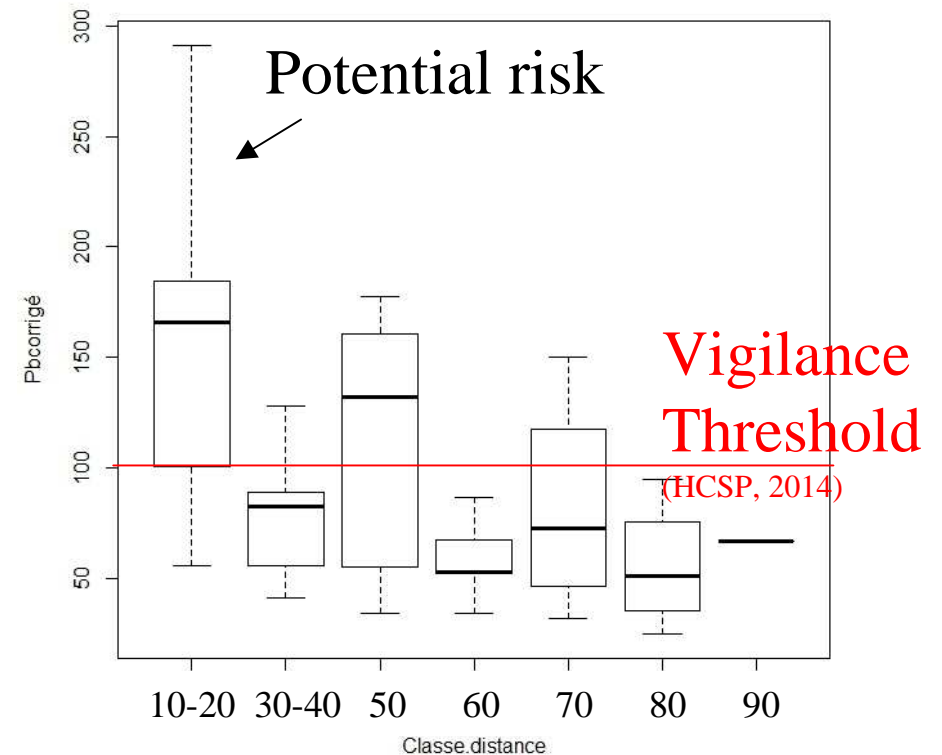
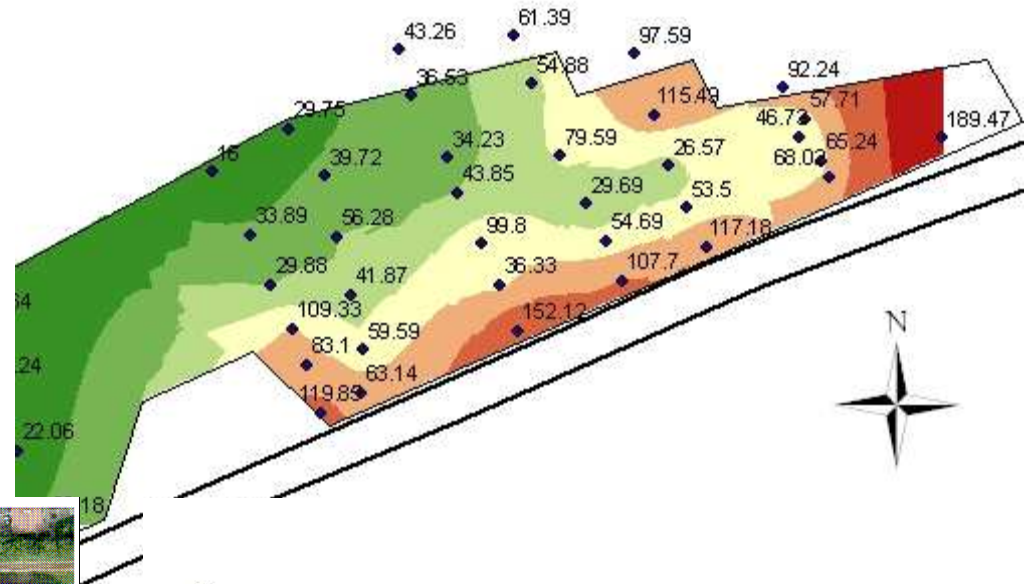


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RESULTS

2. Site investigation

A. Soil quality



Lead soil concentrations

RESULTS

2. Site investigation

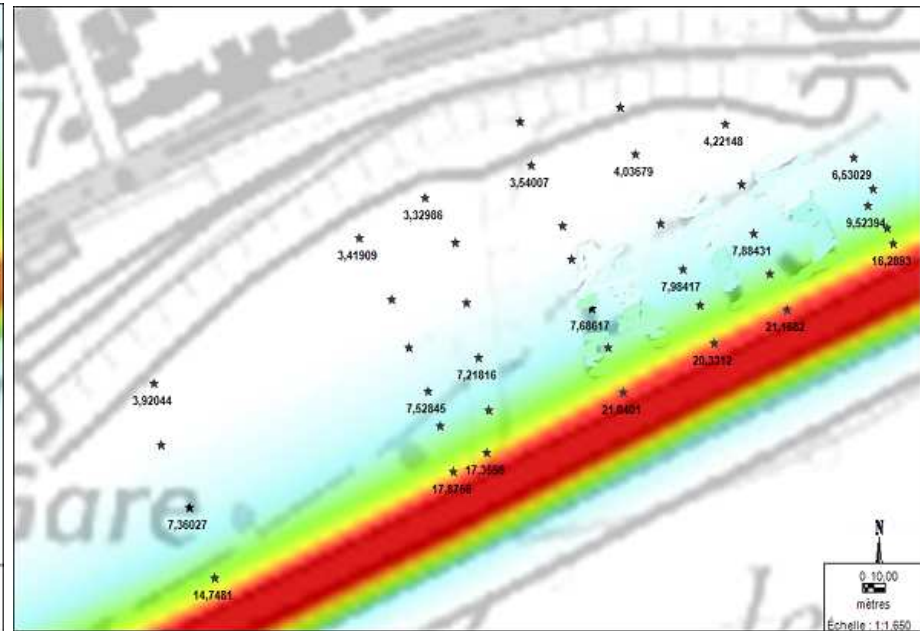
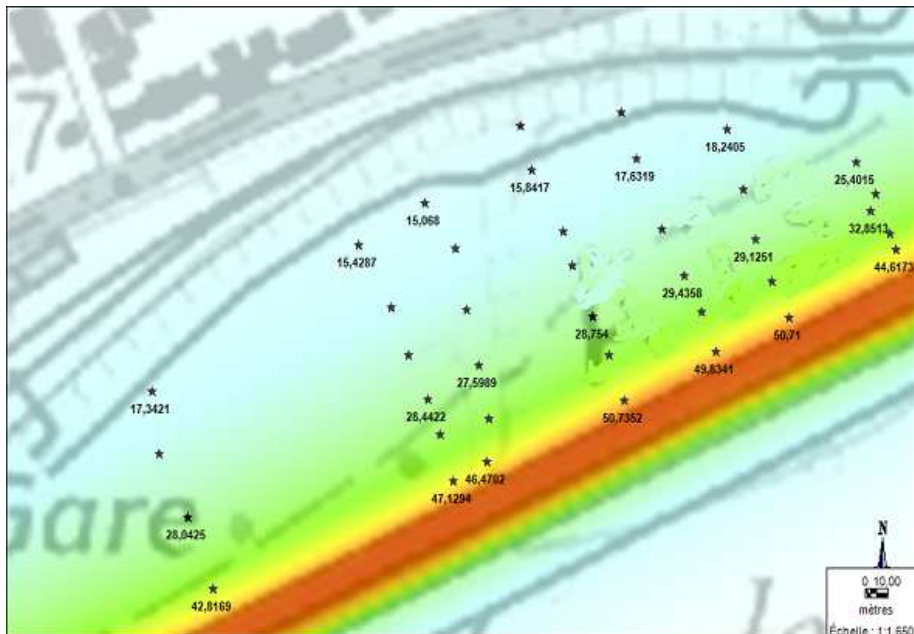
A. Air quality

Spatial view

daily mean over-concentrations (using local traffic and meteorological data)

Qualité de l'air : surconcentrations en NO₂ (en µg/m³)

Qualité de l'air : surconcentrations en PM (en µg/m³)



Emissions : Copert

Dispersion : ADMS urban

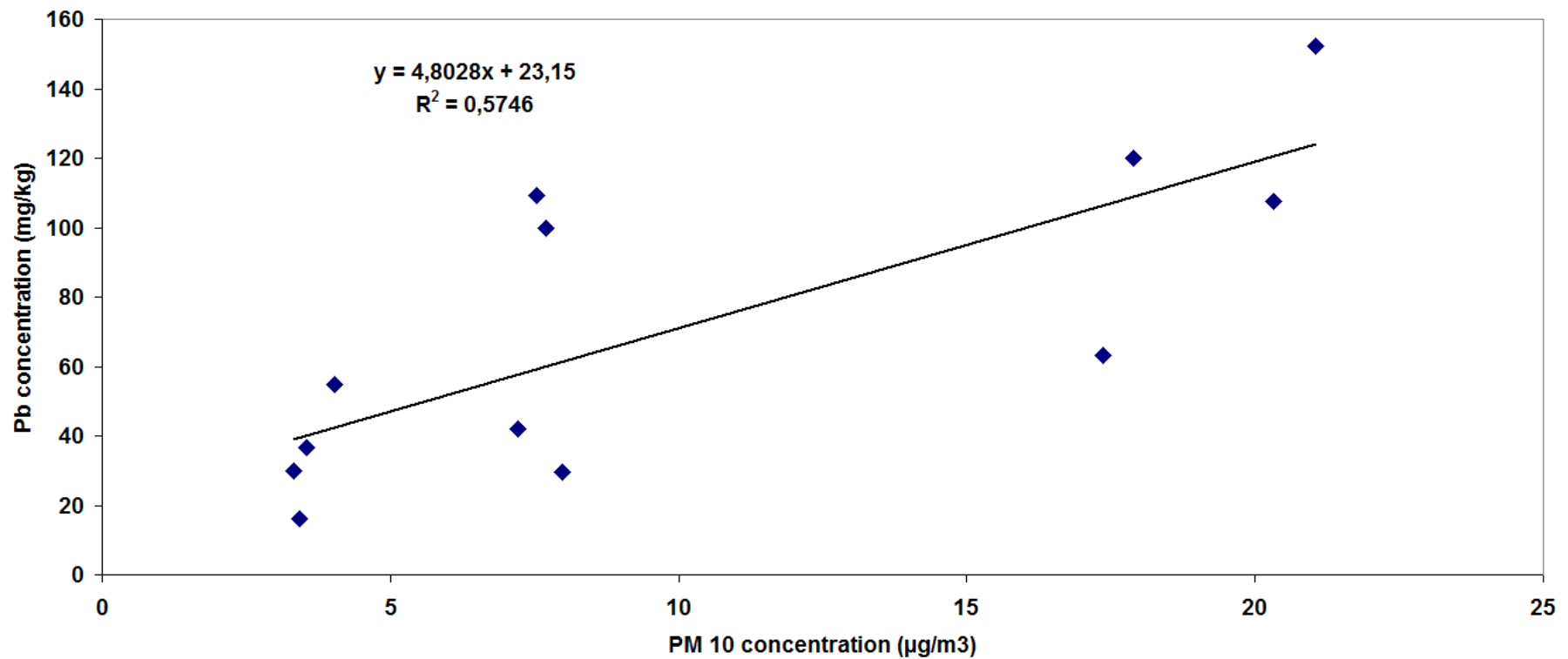


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Global correlation between **PM air concentration** and **Pb soil concentration**

Instantaneous indicator
day

Time integrator indicator
70 years



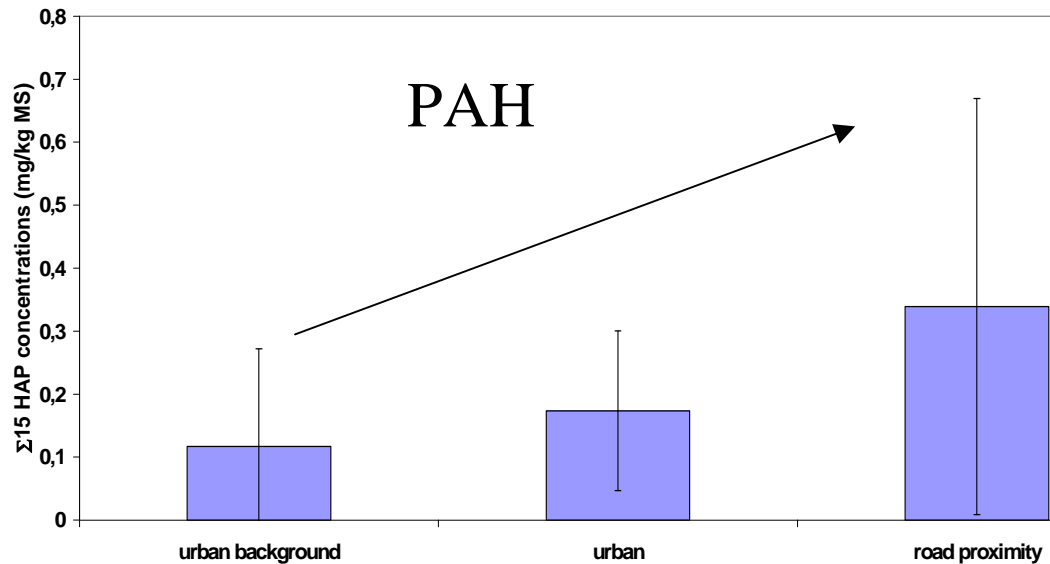
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RESULTS

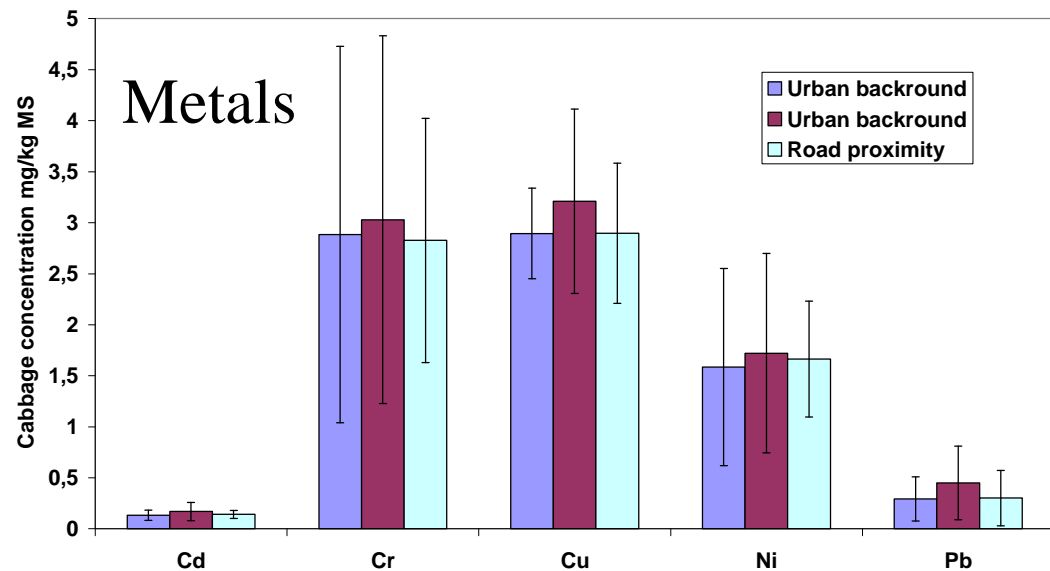
2. Site investigation

A. Biomonitoring

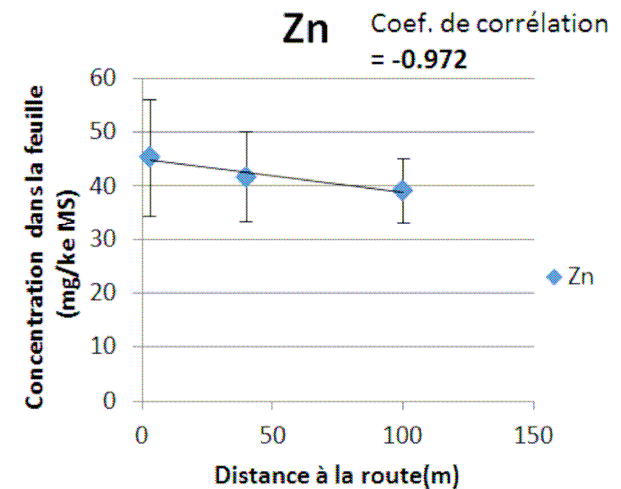
Cabbage concentrations



Very few regulatory threshold
(european regulation)
exceeding concentrations for
Pb



Road proximity impact Zn, Cd



CONCLUSIONS

- Statistical impact of road proximity on soil quality (30 m)
- Relation between time integrator and instantaneous indicators
- A detailed monitoring on a specific site with aggravating factors: the worse situation, with soil risk factor (Pb)

RECOMMENDATIONS

- ⇒ Management measures for actual allotment groups :
In the first 30 meters to prevent risks from soil: no edible vegetables
(tree lines, ornamental cultures, ...)
- ⇒ For future gardens : setback distances from road



