

# Assessing the individual EXPosure of the Brussels population to urban AIR pollution: the ExpAIR project



# INTRODUCTION & METHODOLOGY



## The Brussels-Capital Region (BCR) presented in a few figures

Area	161 km <sup>2</sup>
Population density	1 x 10 <sup>6</sup> inhabitants
Average annual demographic growth (2010-2020)	1.2%
Number of commuters (2014)	544.277 commuters
Use of car as principal transport modus (2014)	39.1%
Total length of the regional road network	1.873 km

The BCR is characterized by an extremely dense road network



Traffic related air pollution



## ✓ Black Carbon (BC) - soot:

- Product of incomplete combustion of carbon-based fuels
- Present in the direct emissions from traffic exhaust (0.01-0.1  $\mu\text{m}$ )
- Stable, short-living & light-absorbing pollutant exhibiting spatial variability
- Traffic indicator

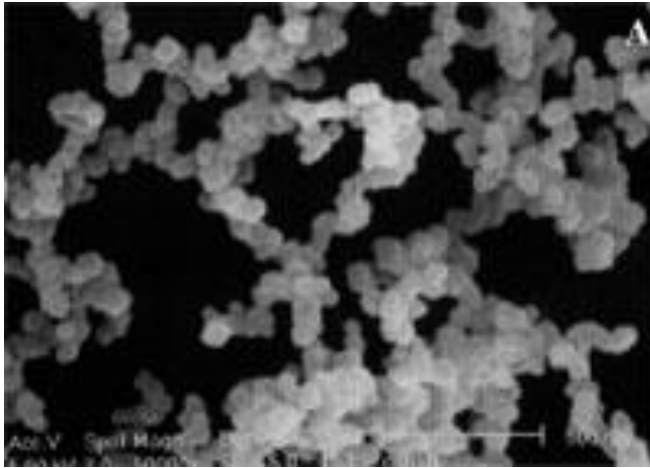


**2/3 of the  $\text{BC}_{\text{conc}}$  in the BCR is traffic related**

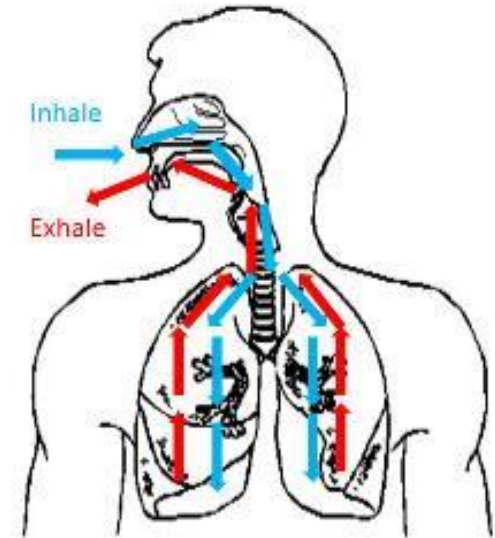
Pollutant	R
Black smoke	$\sim 0.96$
NO <sub>x</sub>	$\sim 0.92$
NO, NO <sub>2</sub>	$\sim 0.86$
CO	$\sim 0.75$



- Affecting human health



SEM picture of a soot sample



- Oxidative stress
- Asthma, cardiovascular problems, lung cancer and premature deaths
- Recent scientific and policy attention (WHO, 2013; Green Week 2013,...)



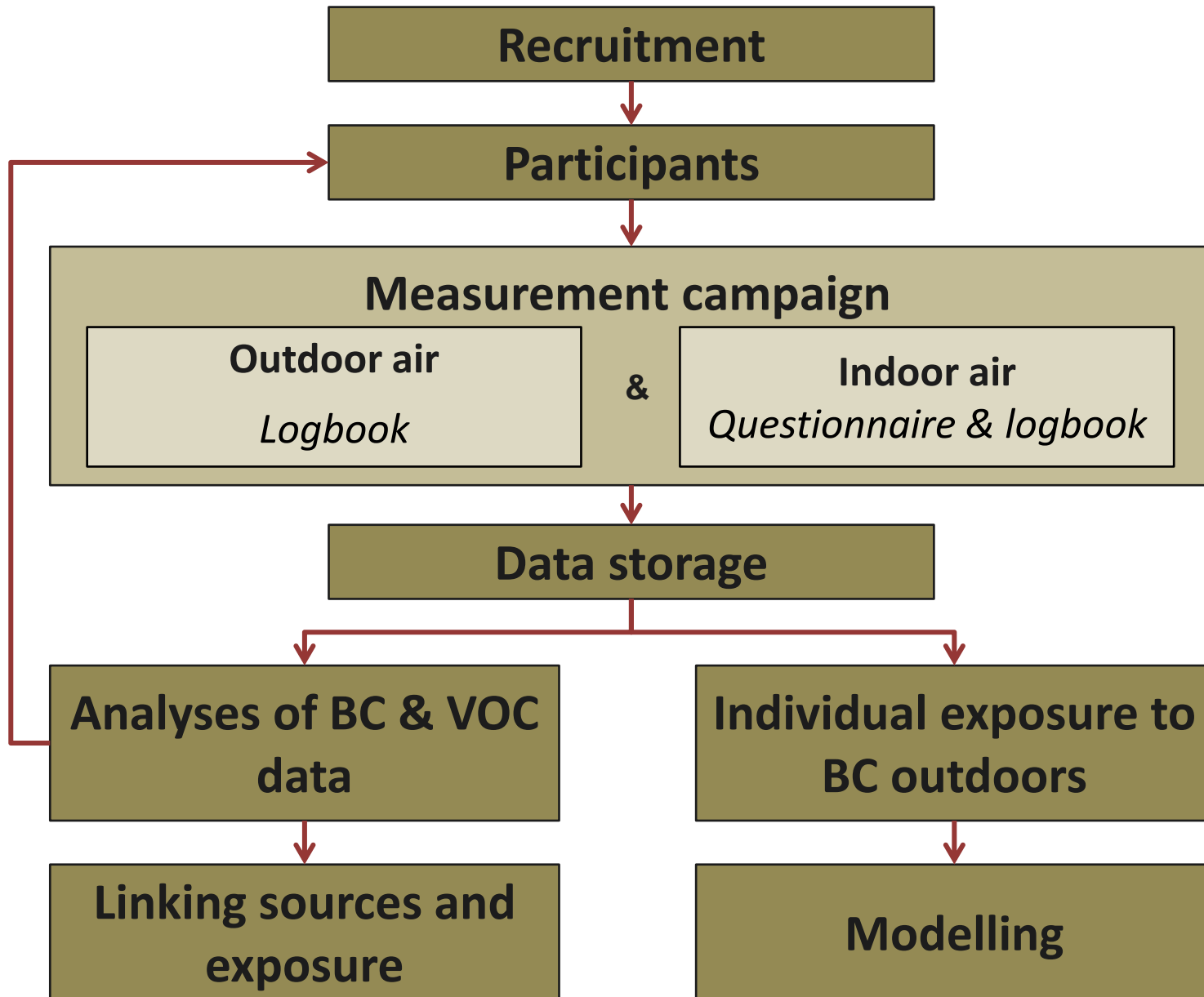
# Assessing the individual EXPosure of the Brussels population to urban AIR pollution

## ✓ AIMS

- **To assess** the individual exposure of the Brussels population to air pollution by measuring the pollutants most widely found in indoor and outdoor environments
- **To inform** and raise awareness among the Brussels citizens so that they can reduce their exposure to urban air pollution



# ✓ PROJECT SCHEME

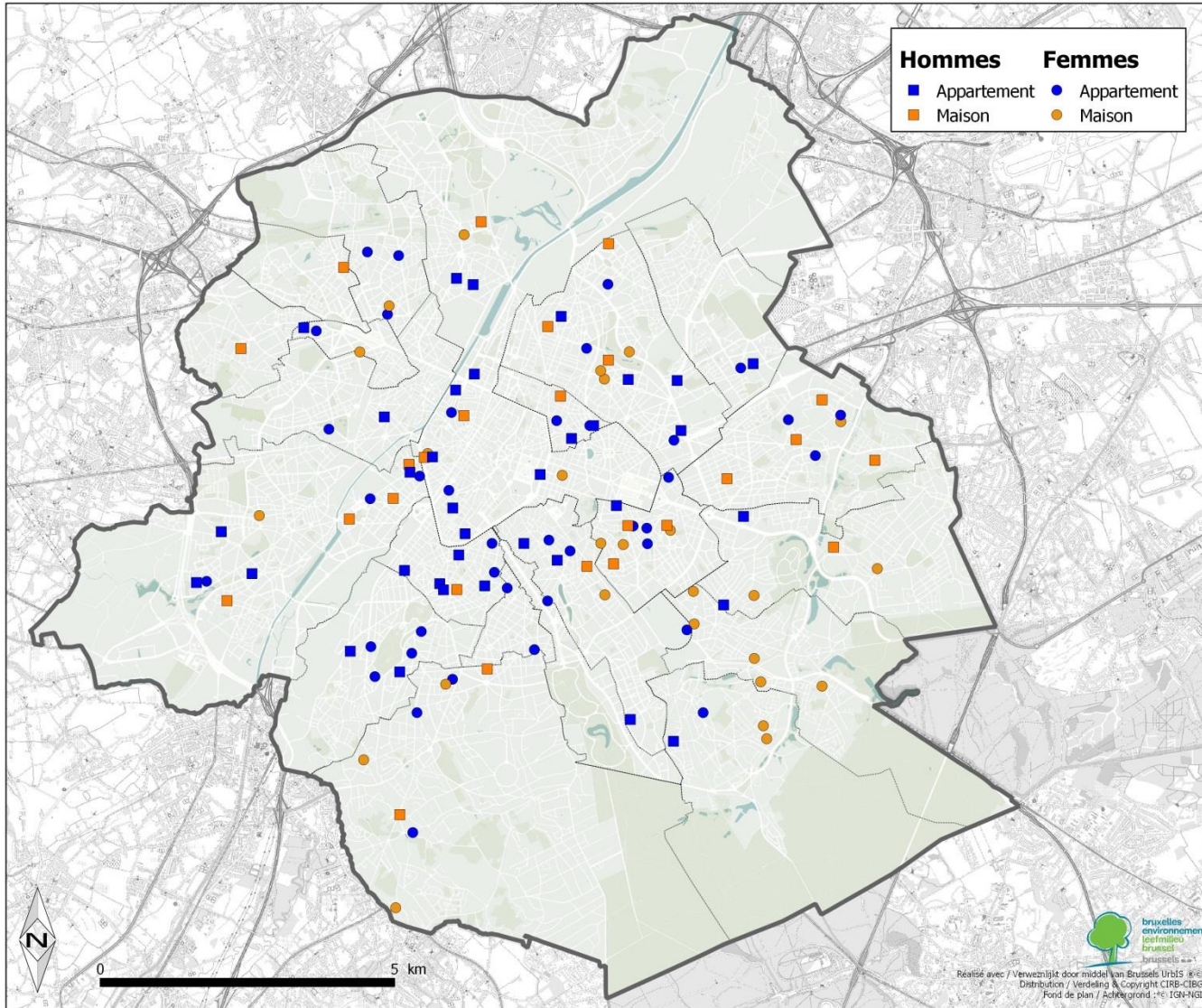


# Results





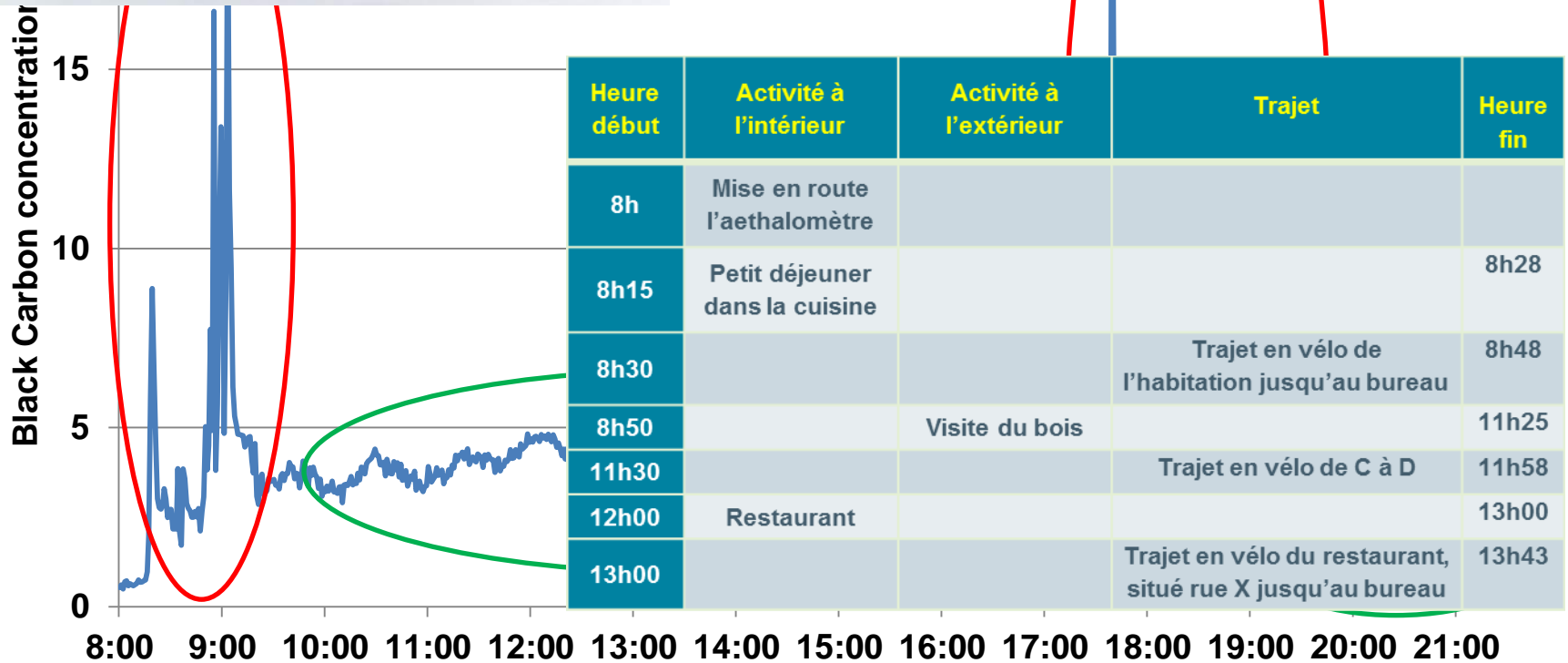
# ✓ RECRUITMENT - PARTICIPANTS




# ✓ ANALYSIS OF INDIVIDUAL RESULTS




ring – werk  
tion – travail



# ✓ ANALYSIS OF INDIVIDUAL RESULTS



**BRUXELLES ENVIRONNEMENT**  
IBEE - INSTITUT BRUXELLOIS POUR LA GESTION DE L'ENVIRONNEMENT


















## ExpAir

*Individual EXposure to urban Air pollution*

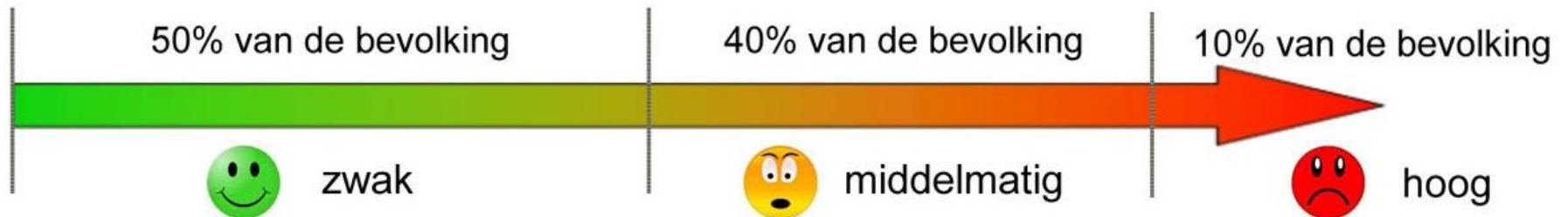
31/07/2012

Naam deelnemer: DECLERCK Priscilla 2

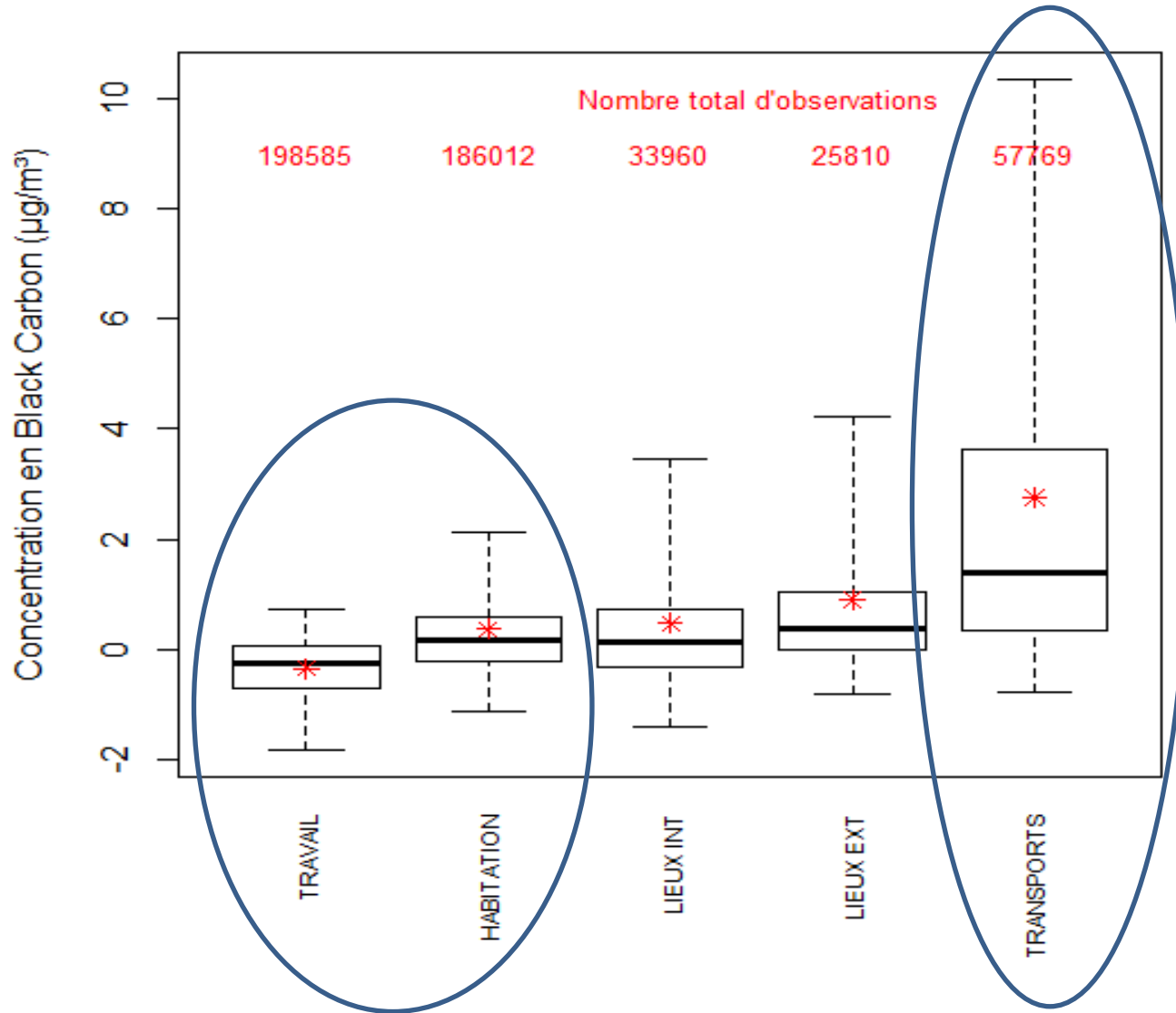
### 1. Blootstelling aan Black Carbon

Datum	Binnenlucht	Buitenlucht	Traject
1 mei 2013			
2 mei 2013			
3 mei 2013			
4 mei 2013			
5 mei 2013			

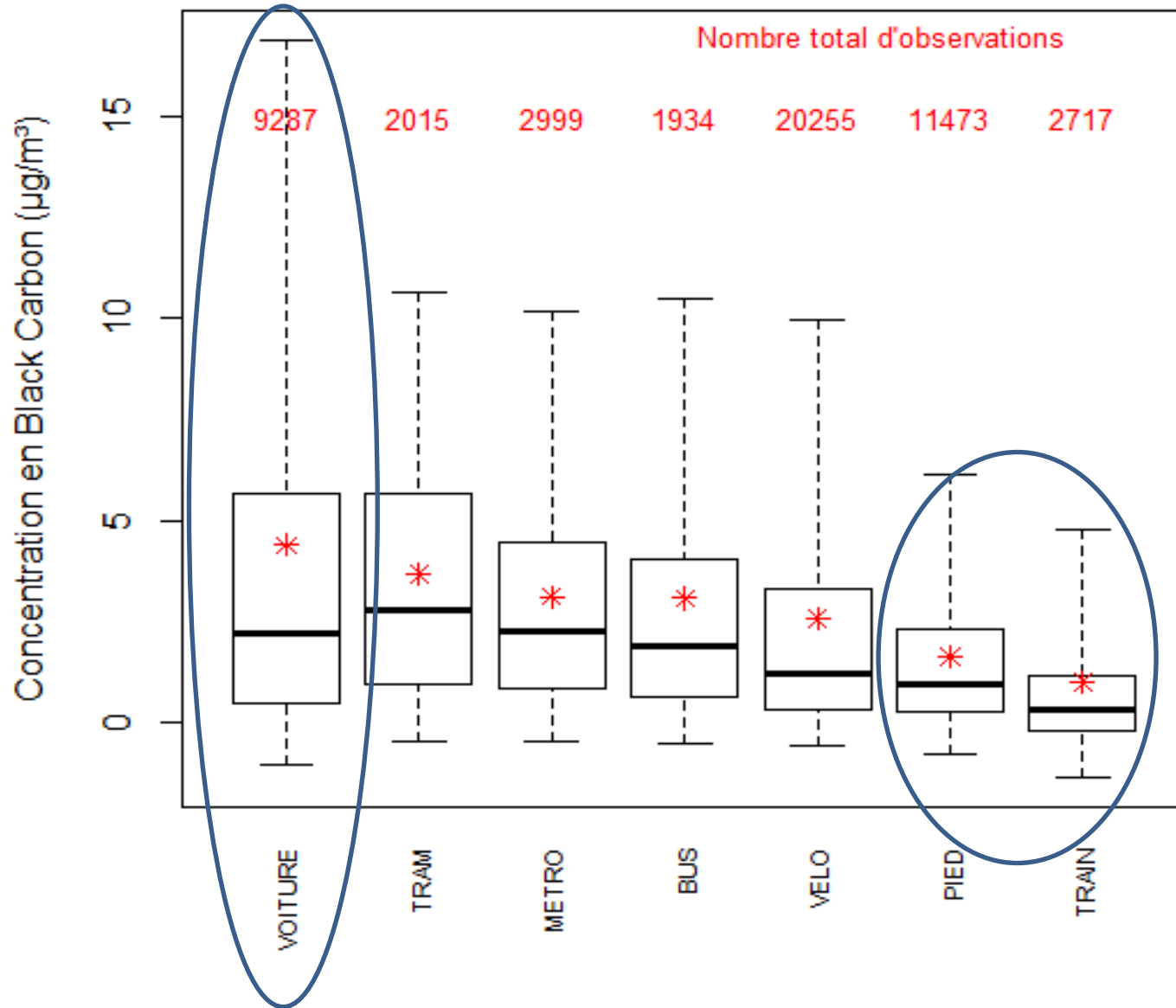
## Schaal van blootstelling aan pollutanten



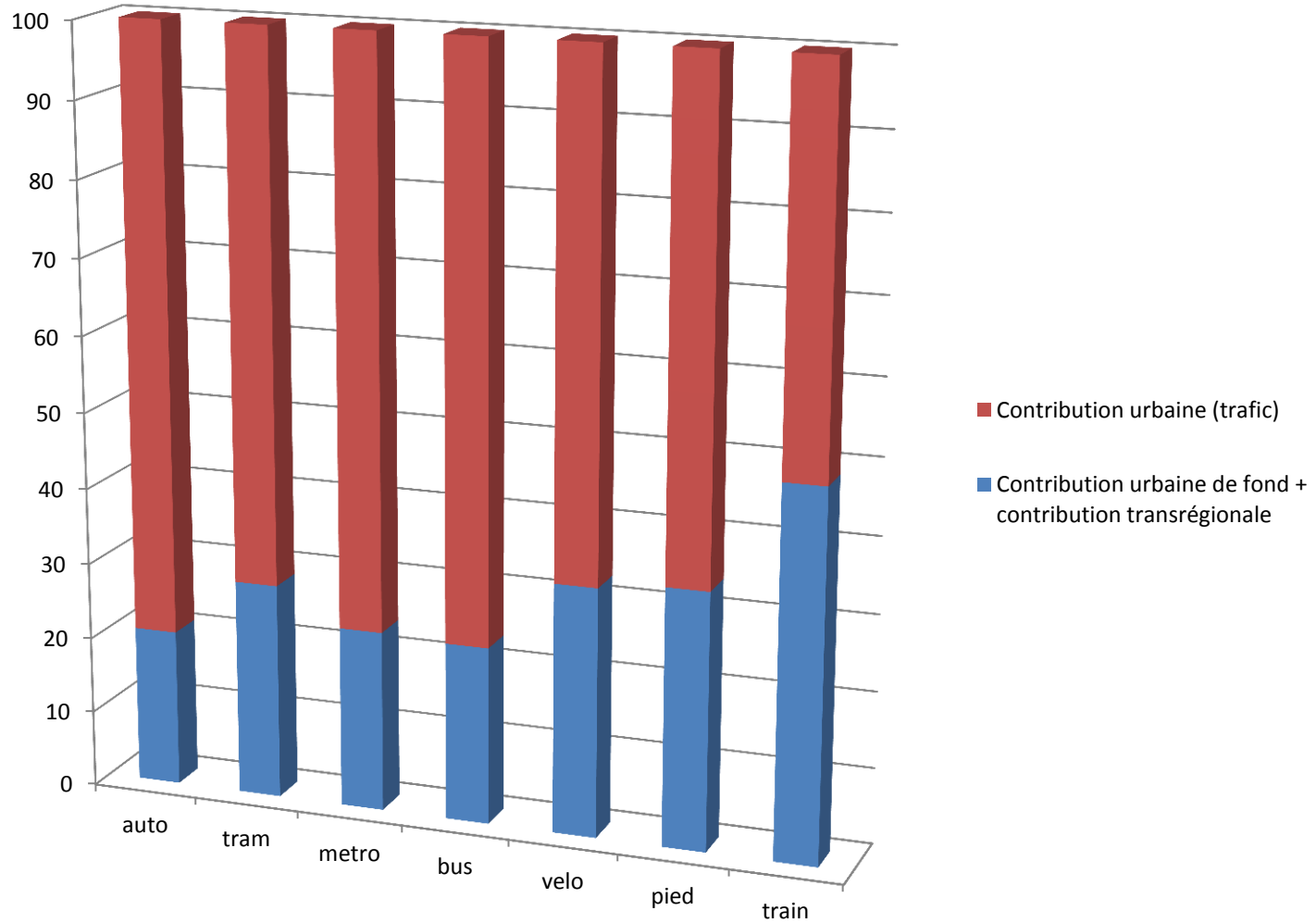
# ✓ ANALYSIS OF GROUP RESULTS



# ✓ ANALYSIS OF GROUP RESULTS

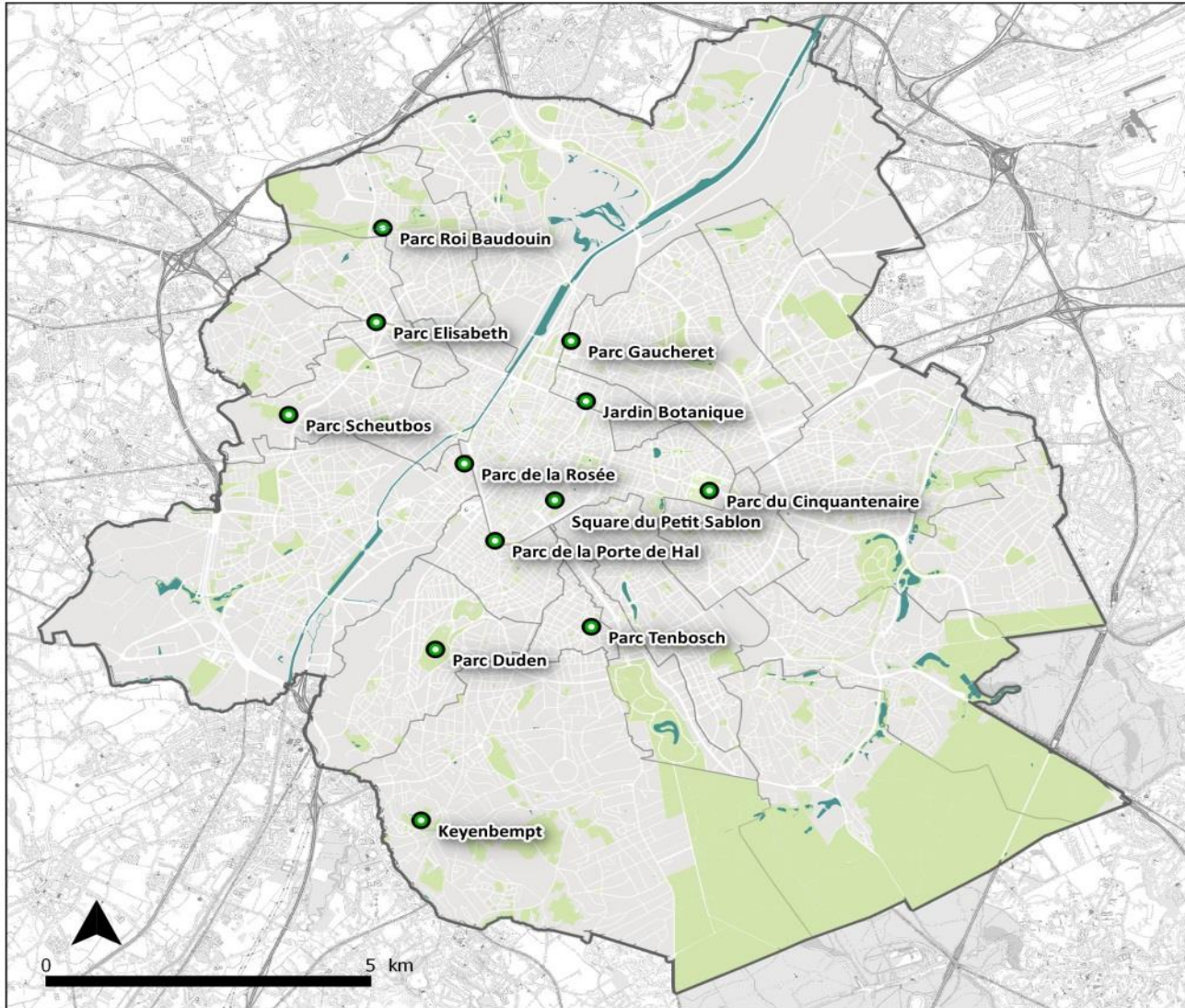


# ✓ ANALYSIS OF GROUP RESULTS

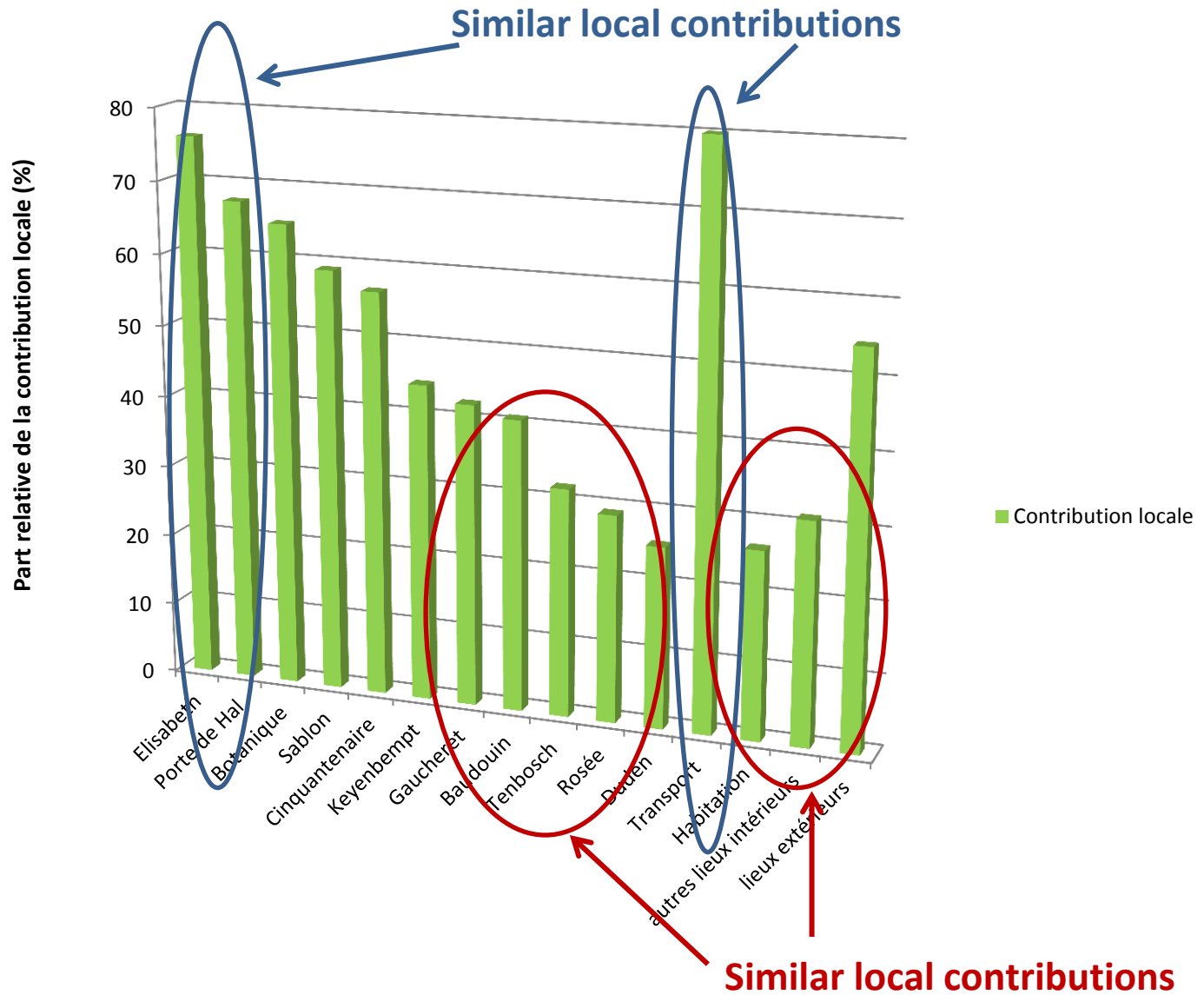




# ✓ ANALYSIS OF GROUP RESULTS



# ✓ ANALYSIS OF GROUP RESULTS





✓ BC exposure: individual exposure related to the job

	<b>Gardener (Parc Porte de Hal)</b>	<b>Gardener (Parc du Botanique)</b>	<b>Gardener (Parc de la Rosée)</b>	<b>Office worker</b>
Transport (1 h*3,43 µg/m <sup>3</sup> )	3,43	3,43	3,43	3,43
Parc Porte de Hal (7 h*2,22 µg/m <sup>3</sup> )	15,54			
Parc du Botanique (7 h*1,68 µg/m <sup>3</sup> )		11,76		
Parc de la Rosée (7 h*0,3 µg/m <sup>3</sup> )			2,10	
Indoor (2 h*0,49 µg/m <sup>3</sup> or 9 h*0,49 µg/m <sup>3</sup> )	0,98	0,98	0,98	4,41
<b>Total (10 h)</b>	<b>19,95 µg/m<sup>3</sup></b>	<b>16,17 µg/m<sup>3</sup></b>	<b>6,51 µg/m<sup>3</sup></b>	<b>7,84 µg/m<sup>3</sup></b>



INSTITUT SCIENTIFIQUE  
DE SANTÉ PUBLIQUE



# Projet IMPASTRA

«Impact assessment of  
traffic related air  
pollution: pilot project  
using persons with a  
high and low exposure»



# ✓ AIMS

## Exposure to air pollution

1

Measuring the (personal) exposure to:

- Black Carbon
- Polycyclic Aromatic Hydrocarbon
- Benzene

2

## Evaluation of the health status

Estimation of the associated health effects  
Focus on the pathologies:

- respiratory
- cardiac
- cognitive

## Sensibilisation

3

Sensibilisation of the general public  
concerning air quality problems

# ✓ PROJECT SCHEME



During 5 consecutive days the participant carries the aethalometer with him/her → Measuring personal BC exposure



Fill in two questionnaires → evaluation of the personal exposure to different pollutants and description of their health status



Fill in two logbooks → evaluation of the personal exposure to different pollutants and description of their health status



Deposit a urine sample → analyses of the exposure to PAH, to benzene and the measurement of oxidative stress



Measuring the NO fraction in the exhaled air → evaluation of the respiratory inflammation

# Conclusions



- ✓ Participants were exposed to enhanced BC concentrations that can induce on short or long term non-negligible health impacts
  - Presence and intensity of traffic
  - Meteorological conditions
  - Configuration of the environment
  
- ✓ Additional AQ-health studies are necessary
  - Period
  - Concentration

