

Monitoring of urban stormwater pollutants in both particulate and dissolved phases in separate sewers

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Overview

I- Introduction

II- Selection of Urban Priority Pollutants

III- Experimental sites

IV- Screening methodology

V- Conclusion

Overview

I- Introduction

II- Selection of Urban Priority Pollutants

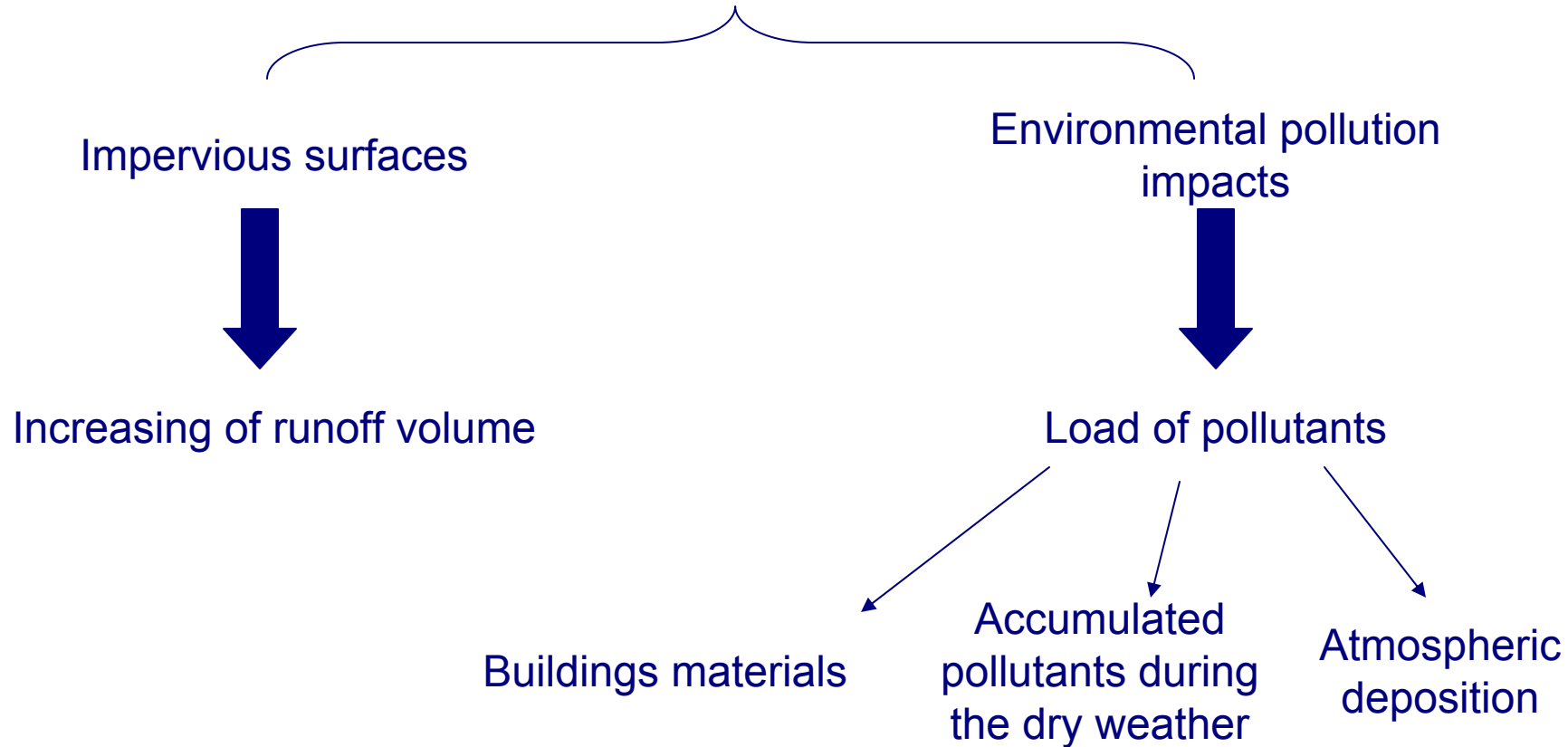
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Introduction

Environment vs. Urban Land Development



Potential sources of non point pollution

Introduction

- Urban Areas:
 - Different kind of sewer or drainage system
 - Specific properties for each type
 - Separate storm sewer → short residence time of stormwater
→ Watercourse ending without treatment

Requirement of stormwater contamination knowledge

- Water Framework Directive (WFD): 33 priority pollutants list
 - Progressive reduction of discharges
 - Cessation of discharges of priority hazardous substances
 - Choice of these pollutants : specific industrial sources (COMMPS procedure)

Extension of this list → Including urban pollutants

Introduction

- Aims of this research:
 - Extension of the WFD pollutants list → List of urban pollutants
 - Innovative screening methodology → Dissolved & particulate pollutants
 - Assessing of pollutants load of 3 watersheds with 3 different land use pattern

Optimisation of water BMPs

&

Contribution to reach the WFD goals

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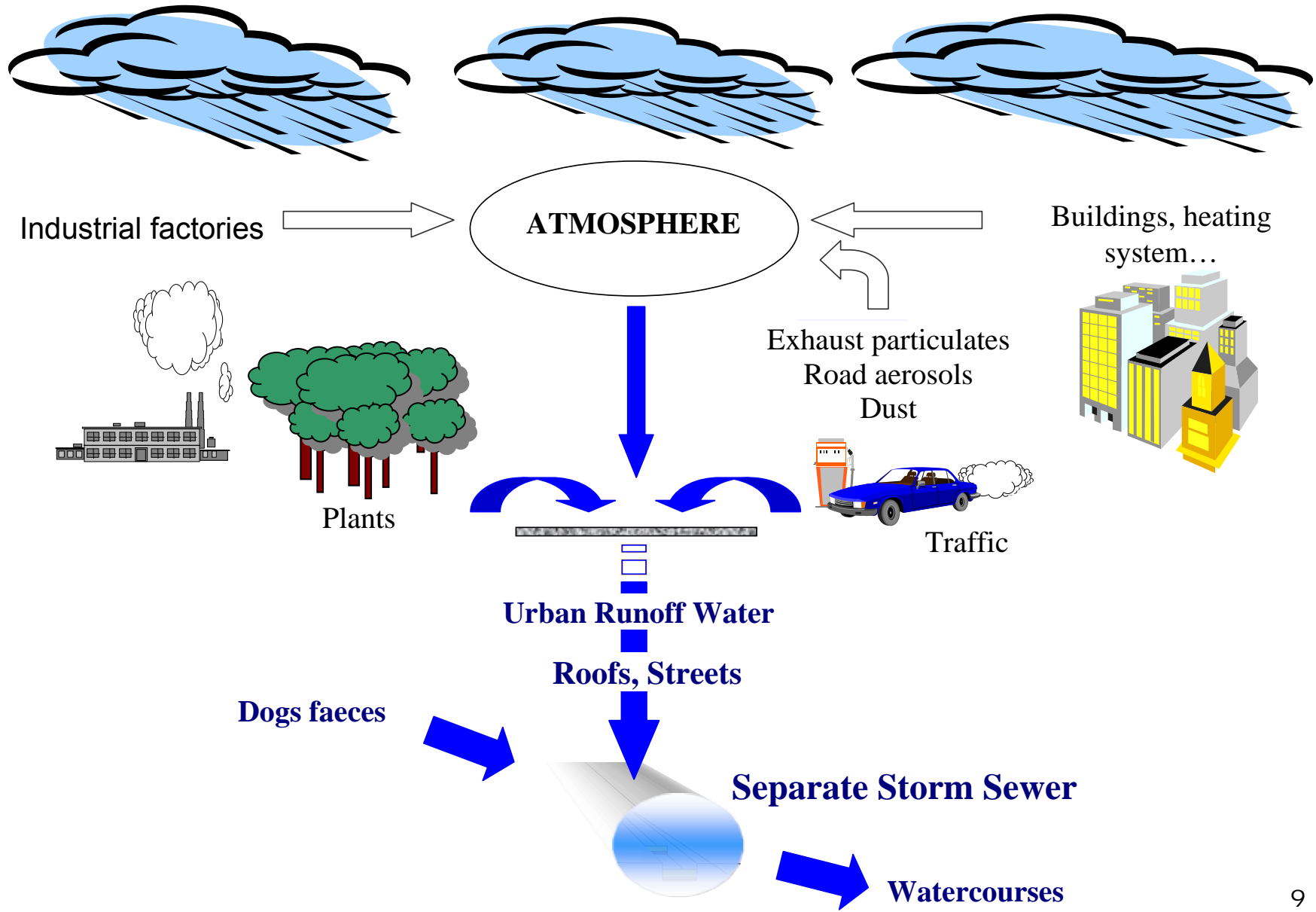
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Selection of urban priority pollutants

- Emissions of environmental hazardous substances in urban areas:
 - Toxicity, bioaccumulation & persistence in the Environment
 - Sources, production & uses

Selection of urban priority pollutants



Selection of urban priority pollutants



■ Atmosphere deposition

- Organic substances:
- Volatiles substances:
- Flame retardants:
- Metals

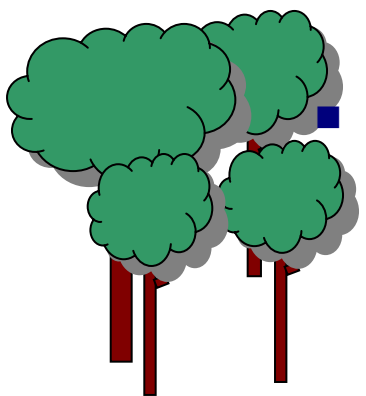
PAHs, PCBs, pesticides & alkylphenols

BTEX & VOCs

PBDEs, PCBs, chloroalkanes

■ Traffic

- Metals (Zn, Cu, Pb, Pt, Cd)
- Alkylphenols
- PAHs....

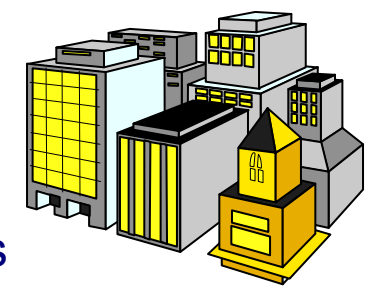


■ Gardens

- Pesticides & additives (alkylphenols, organotins)

■ Buildings

- Metals
- Nonylphenols, PBDEs
- Phtalates



Selection of urban priority pollutants

- **SSPPs list (Selected Stormwater Priority Pollutants)** (*Erickson et al., 2007*)
 - Theoretical methodology
 - No experimental tests on samples

- **European Regulations for water policy field:**
 - WFD 2000/60/CE (33 priority substances list)
 - WFD 76/464/CEE (132 dangerous substances)

Selection of urban priority pollutants

33 priority substances WFD 2000/60/CE

List I
WFD 76/464/CE
18 substances

PentaBromoDiphenylEthers
Di-(2-ethylhexyl)-Phtalates
Pentachlorobenzene
Chloroalkanes C10-13
Nonylphenols (4-para
nonylphenols),
Octylphenols (para-tert-
octylphenols)
Fluoranthene
Alachlor, Chlorfenvinphos,
Chlorpyrifos, Diuron,
Isoproturon,
Tributyltin

1,2-Dichloroethane
Carbon tetrachloride
Trichlorobenzenes (1,2,4-
trichlorobenzene)
Hexachlorobenzene
Hexachlorobutadiene,
(Lindane)
Hexachlorocyclohexane
Pentachlorophenol
Cadmium, Mercury

DDT, DDD, DDE
Aldrin
Dieldrin
Endrin
Isodrin
Tetrachlorure de Carbone
tetrachloroethylene
Trichlorethylene

list II
WFD 76/464/CE
99 substances

5 PAHs, Anthracene, Naphthalene
Nickel, Lead
Methylene chloride, Benzene,
Atrazine, Endosulfan alpha,
Simazine, Trifluralin

Selection of urban priority pollutants

- 46 individuals substances from WFD lists
- 42 others individuals substances:
 - SSPPs lists
 - Pollutants emissions from urban

88 substances

13 chemical pollutants families:

Metals (8)

Organotins (3)

Pesticides (24)

Alkylphenols (5)

PAHs (16)

Chlorobenzenes (5)

Chlorophenols (2)

Flame retardants (11)

VOCs (7)

BTEX (5)

Phtalates (1)

Others (1)

General water quality parameters

Overview

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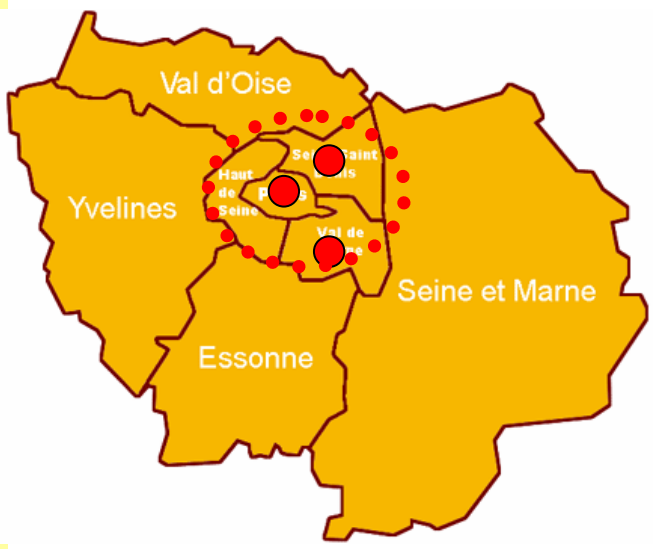
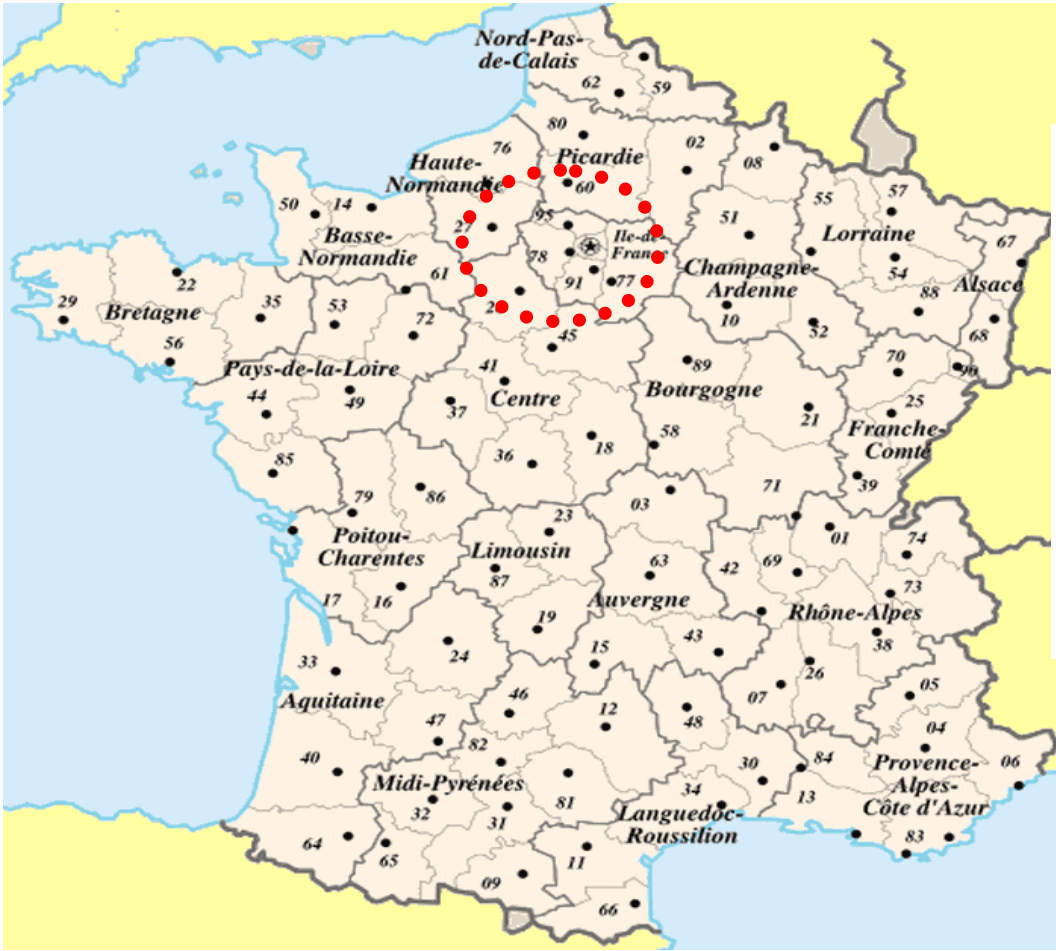
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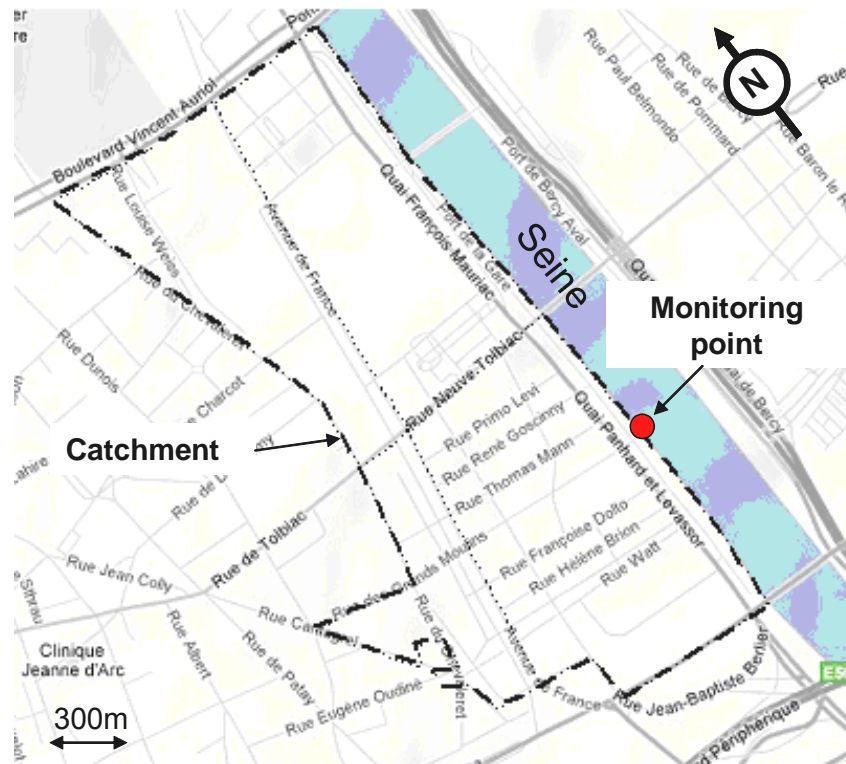
Experimental sites



Experimental sites

I- Tolbiac-Massena: urban dense area in Paris (75)

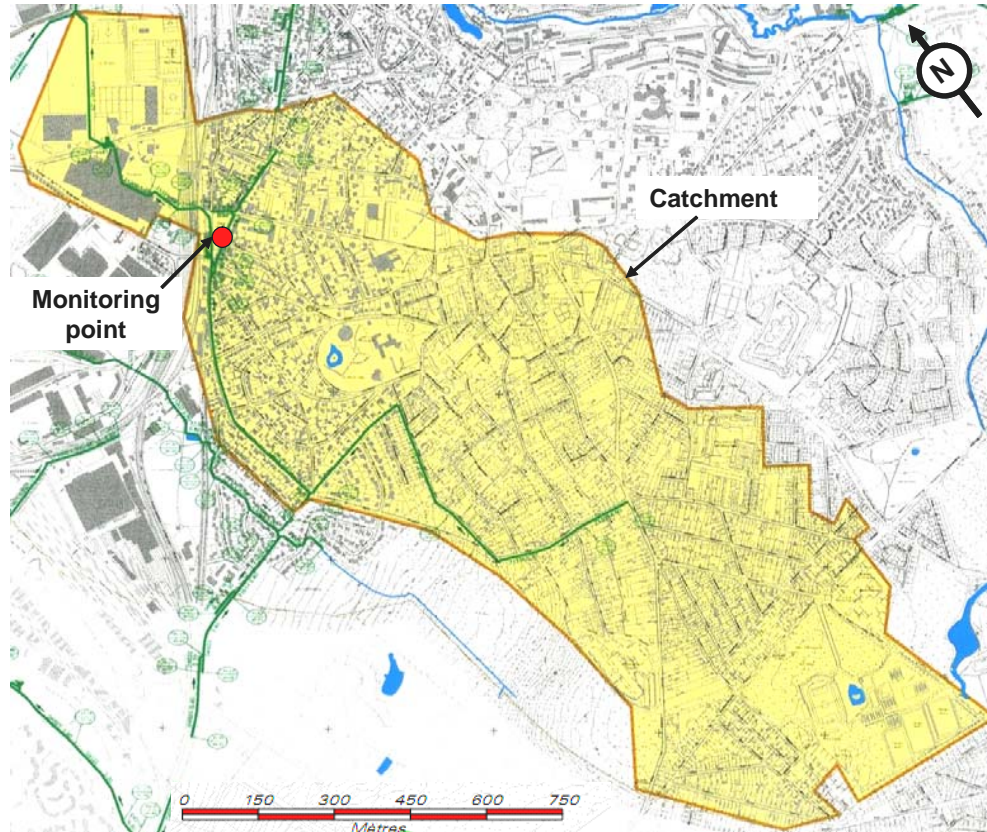
- Surface: 0.64 km²
- Impervious Surface Coefficient (ISC) : 80%



Experimental sites

II- Sucy-en-Brie : residential area in Paris suburb (Val de Marne 94)

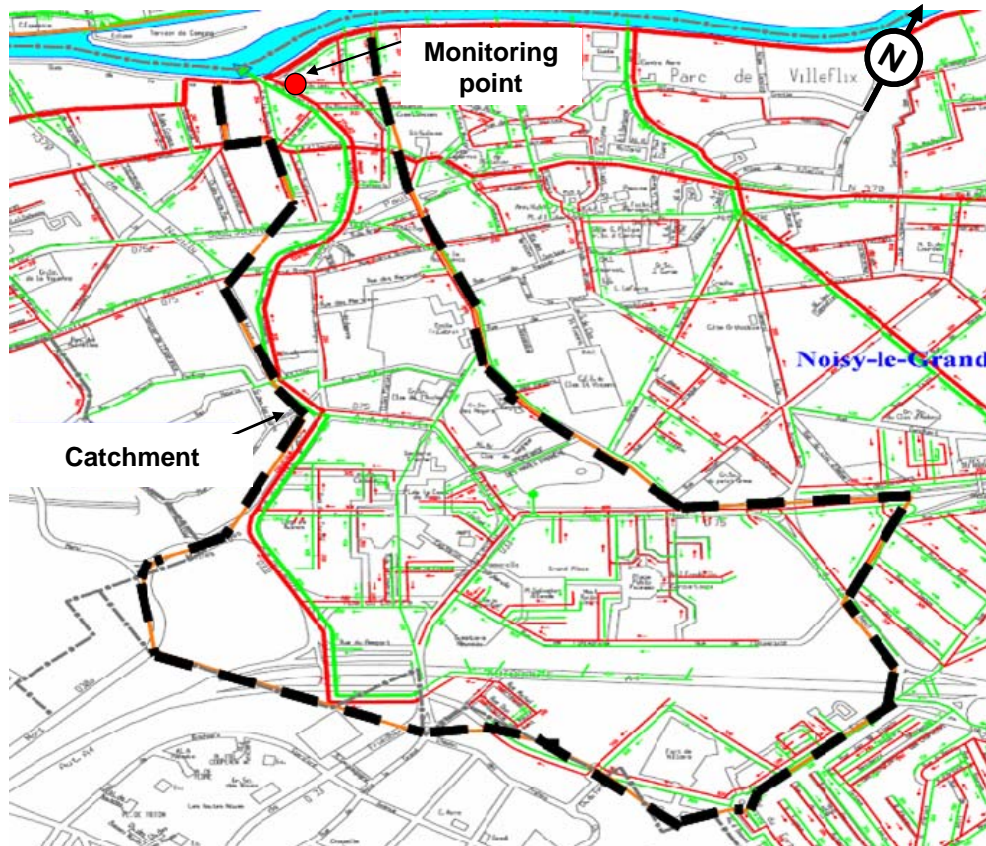
- Surface: 2.61 km²
- Impervious Surface Coefficient (ISC) : 27%



Experimental sites

III- Noisy-le-Grand : urban centre area in Paris suburb (Seine Saint Denis 93)

- Surface: 2.30 km²
- Impervious Surface Coefficient (ISC) : 65 %



Experimental sites

Site equipments



- Two refrigerated automatic water samplers (Bühler 1029)
- Pluviometer (gauge precipitation)
- Flowmeter

Sampling of:

- Organic pollutants: Pyrex amber glass bottles + Teflon sampling tubes
- Minerals substances: polyethylene (PE) bottles + PVC sampling tubes



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An innovative Screening methodology?

Analyses carried out on **bulk samples** will provide:

- Poor-quality data of the contamination representativeness in water
- Organic pollutants with $\log K_p > 3$: concentration should be measured in SS rather than in the bulk water sample or dissolved phase

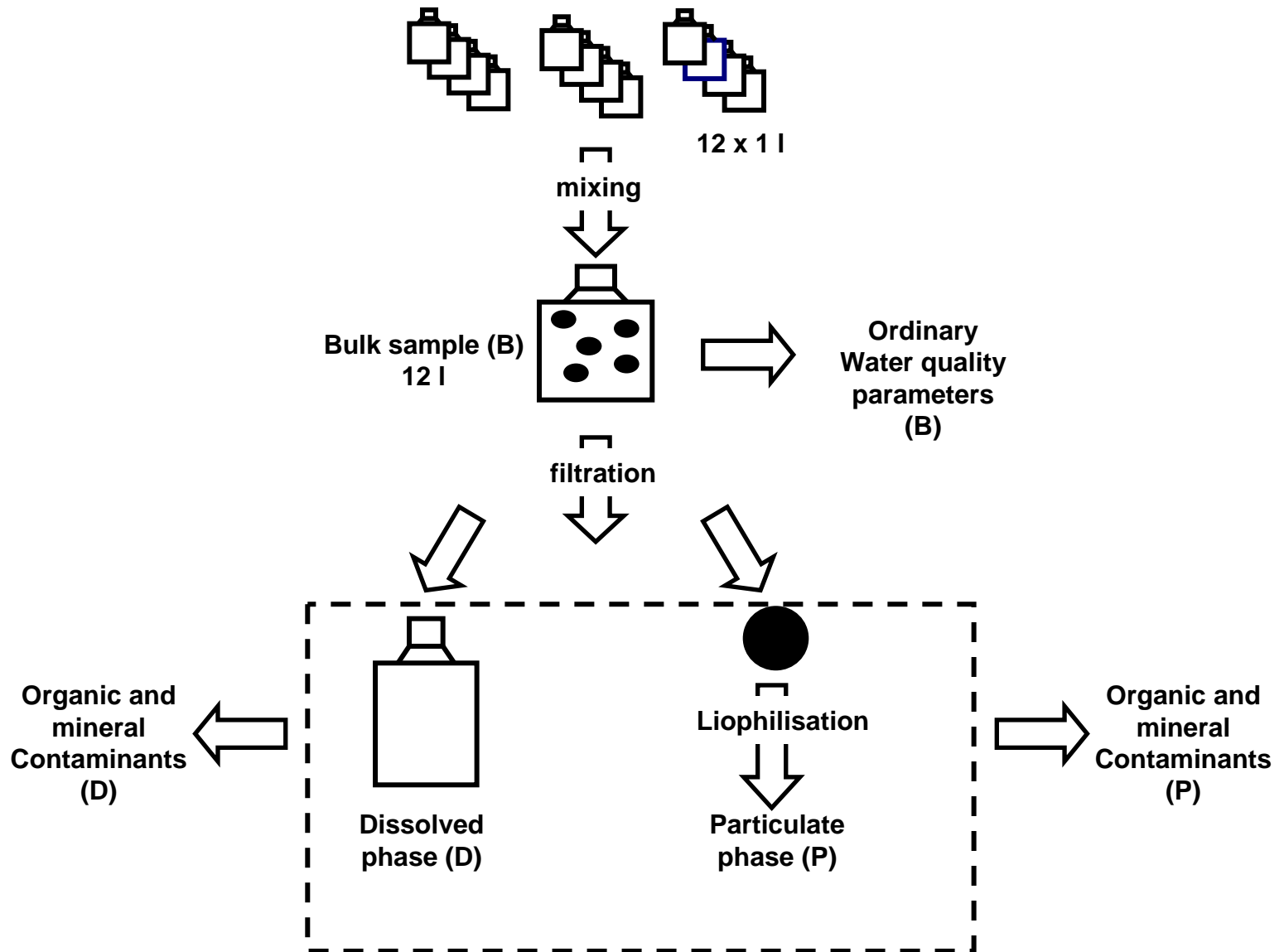
Analyses on both particulate & dissolved phases

To show the difference between:

- Bulk samples analyses
- Particulate / dissolved phases analyses

Comparison of these analytical methodology on a same sample

An innovative Screening methodology?



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Conclusion

- Research work started in November 2006
- All sampling equipments are installed
- Sampling procedures are fully validated
- Analyses are carried out by a French certified laboratory: not only on bulk sample but also on both the particulate and the dissolved phases.
- Application of this screening methodology on different types of water samples:
 - Wastewater from combined sewers collected at the outlet of urban watersheds,
 - Runoff from the different types of urban surfaces
- Effective monitoring campaigns have started on these sites

Thank you for your attention!

Any Questions?

