

# Natural background levels in the groundwater bodies of Brussels Capital Region



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## OVERVIEW

"Natural background level (NBL) is the concentration of a substance in a groundwater body corresponding to no, or only very minor, anthropogenic alterations to undisturbed conditions" (2006/118/EC)

These NBLs have to be established by the Member States in order to comply with the European directives.

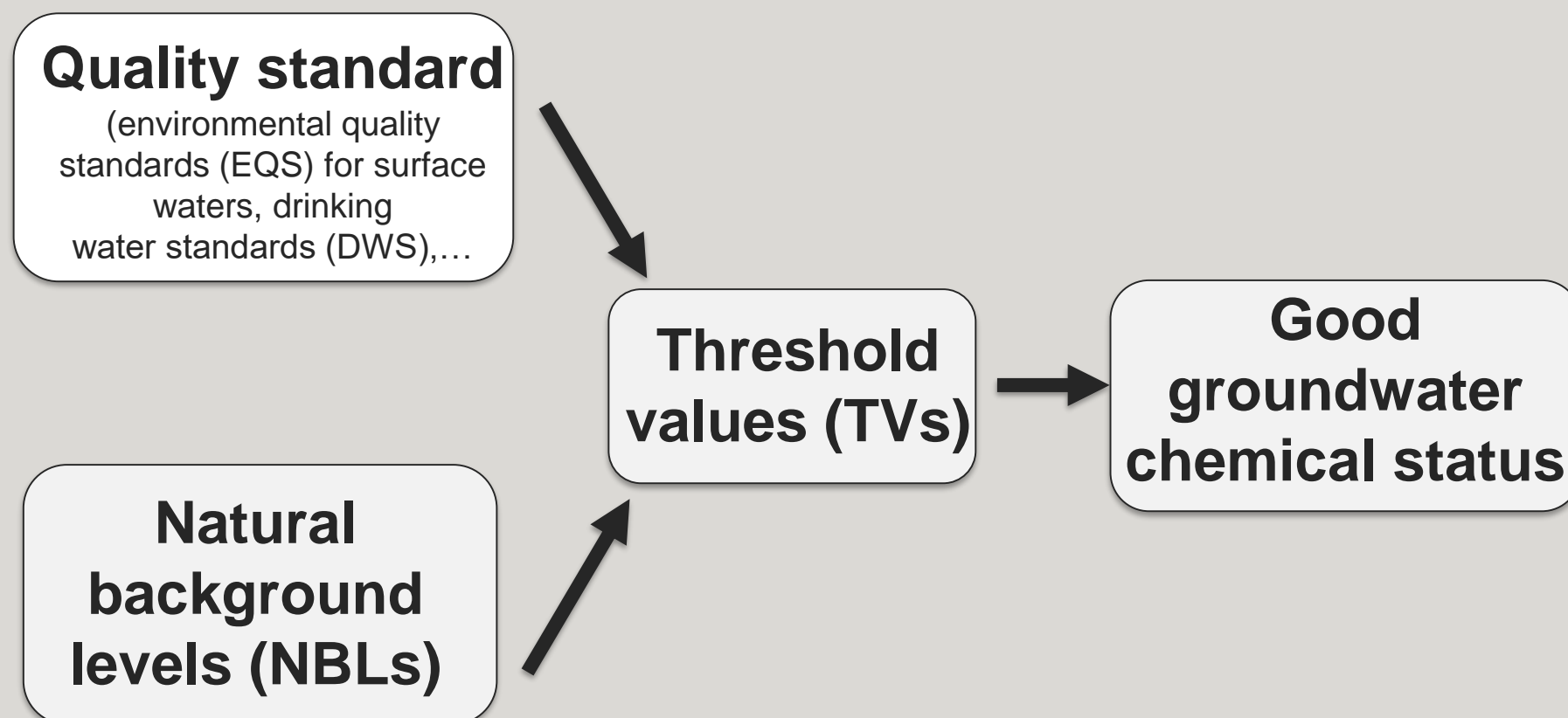
These NBLs were determined for the 5 groundwater bodies of the Brussels Capital Region in Belgium

### 1. WHAT IS THE USE OF NATURAL BACKGROUND LEVELS ?

One of the main objectives of the European Water Framework Directive (WFD 2000/60/EC) and its daughter directive (2006/118/EC) is to achieve "good status" in terms of quality and quantity for each groundwater body (initially by 2015)

Member States must set threshold values (TVs) for determining the good status of water bodies. Pollutant concentrations must generally not exceed these TVs to achieve good status.

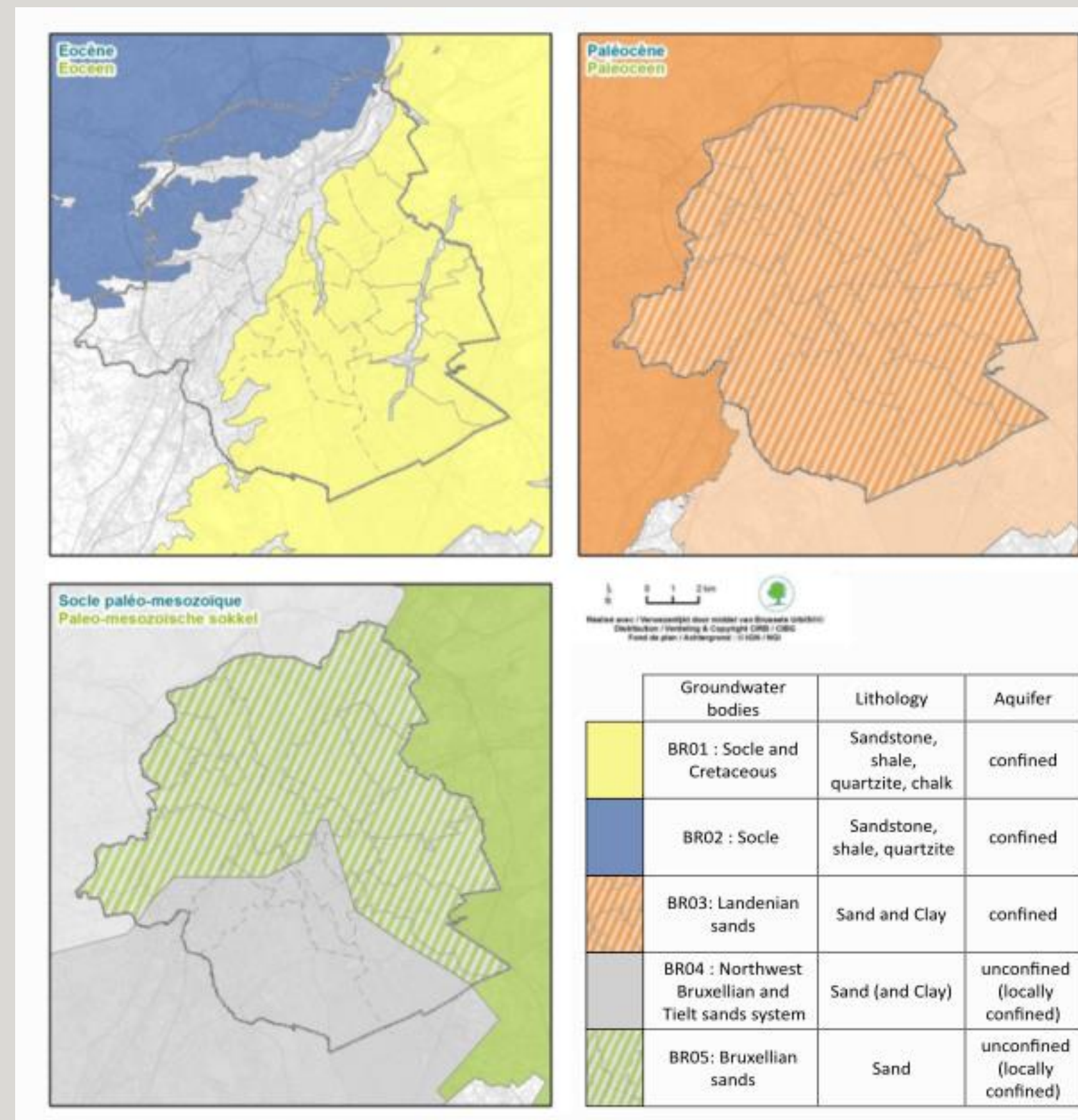
To establish threshold values, quality standards must be used. However, some pollutants may occur naturally in water, which is why **natural background levels (NBLs)** must also be taken into account



Minimum list of parameters with TVs : As, Cd, Pb, Hg, NH<sub>4</sub>, Cl, SO<sub>4</sub>, NO<sub>2</sub>, P<sub>T</sub>, PO<sub>4</sub>, EC, Trichloroethylene, Tetrachloroethylene

### 2. GROUNDWATER BODIES IN BRUSSELS REGION

In the Brussels-Capital Region, 5 groundwater bodies are defined. They have different lithology (sand, sand-clay, chalk and Paleozoic basement), some are unconfined and others are confined. 4 out of 5 groundwater bodies in the Brussels Region have a "good chemical status". The 5<sup>th</sup> groundwater body (Bruxellian sands) is contaminated with nitrates, pesticides and tetrachloroethylene.

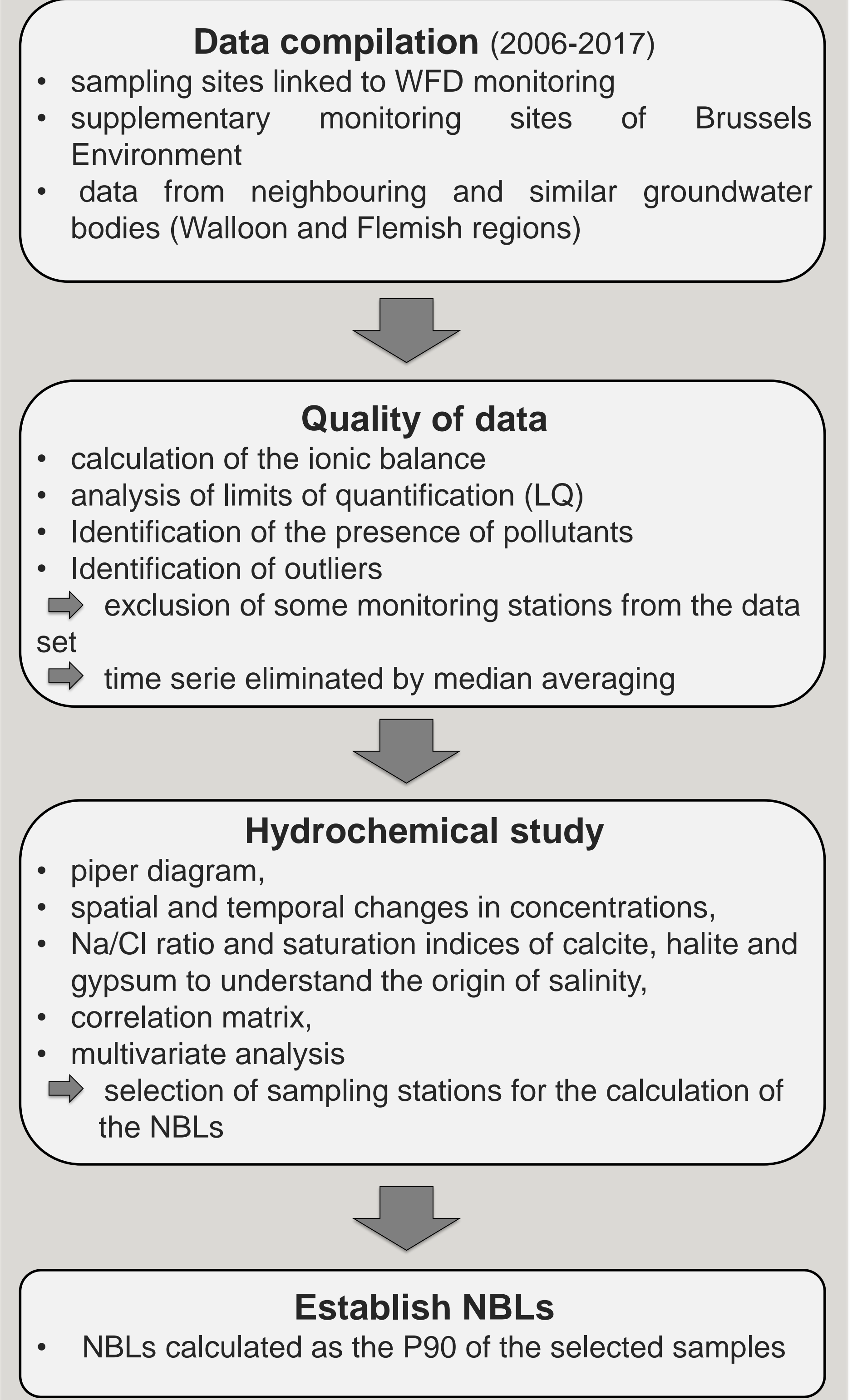


(Bruxelles Environnement, 2010)

Defining the NBL of these groundwater bodies is a challenge because :

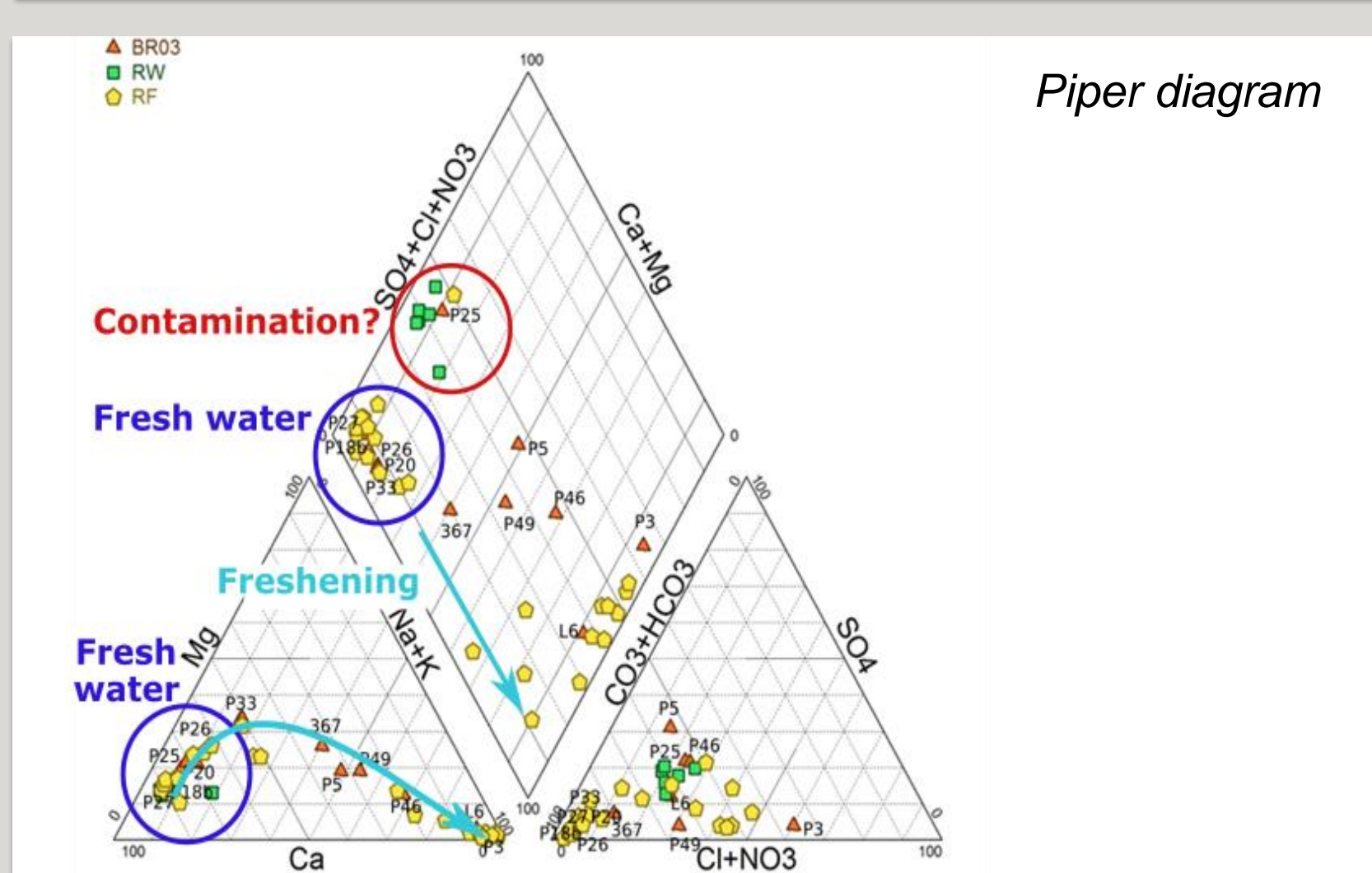
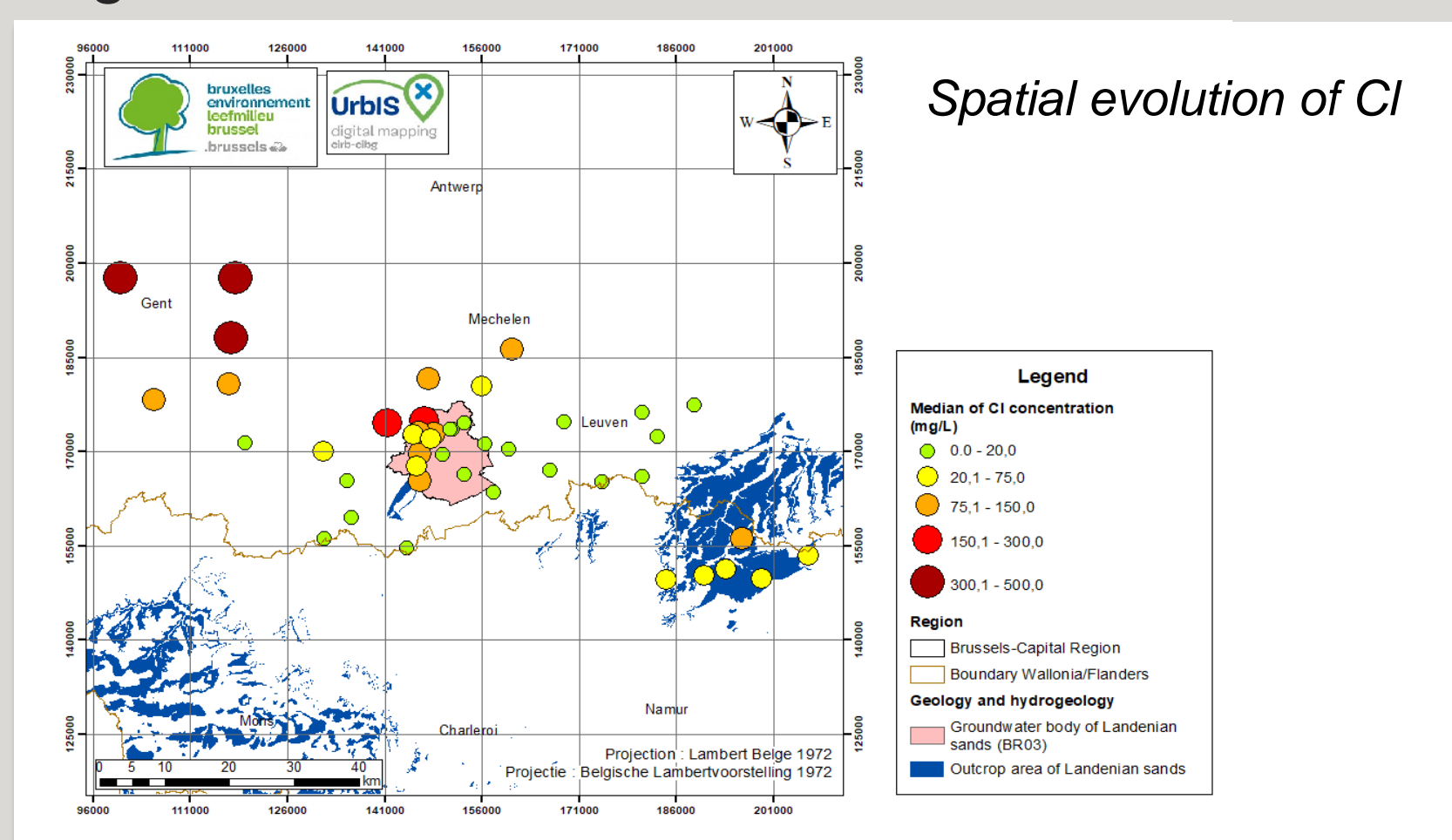
- surface area is highly urbanized
- area quite small → few monitoring sites
- transboundary aquifers

### 3. METHODOLOGY



### 4. Case study : Landenian sands

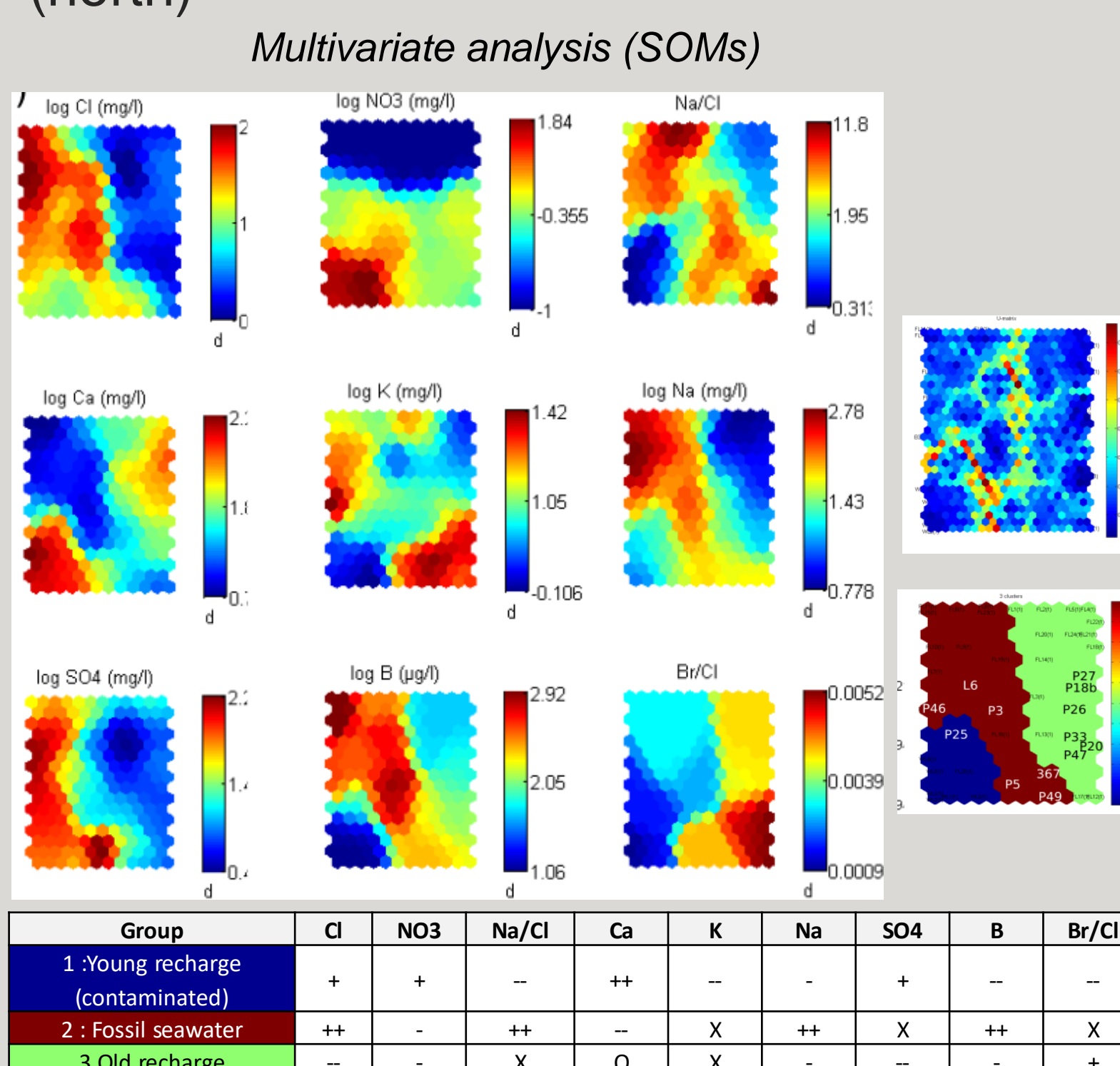
The groundwater body of the Landenian sands is mostly confined in the Brussels Region. There are 14 monitoring stations in Brussels and 31 have been added from neighbouring regions.



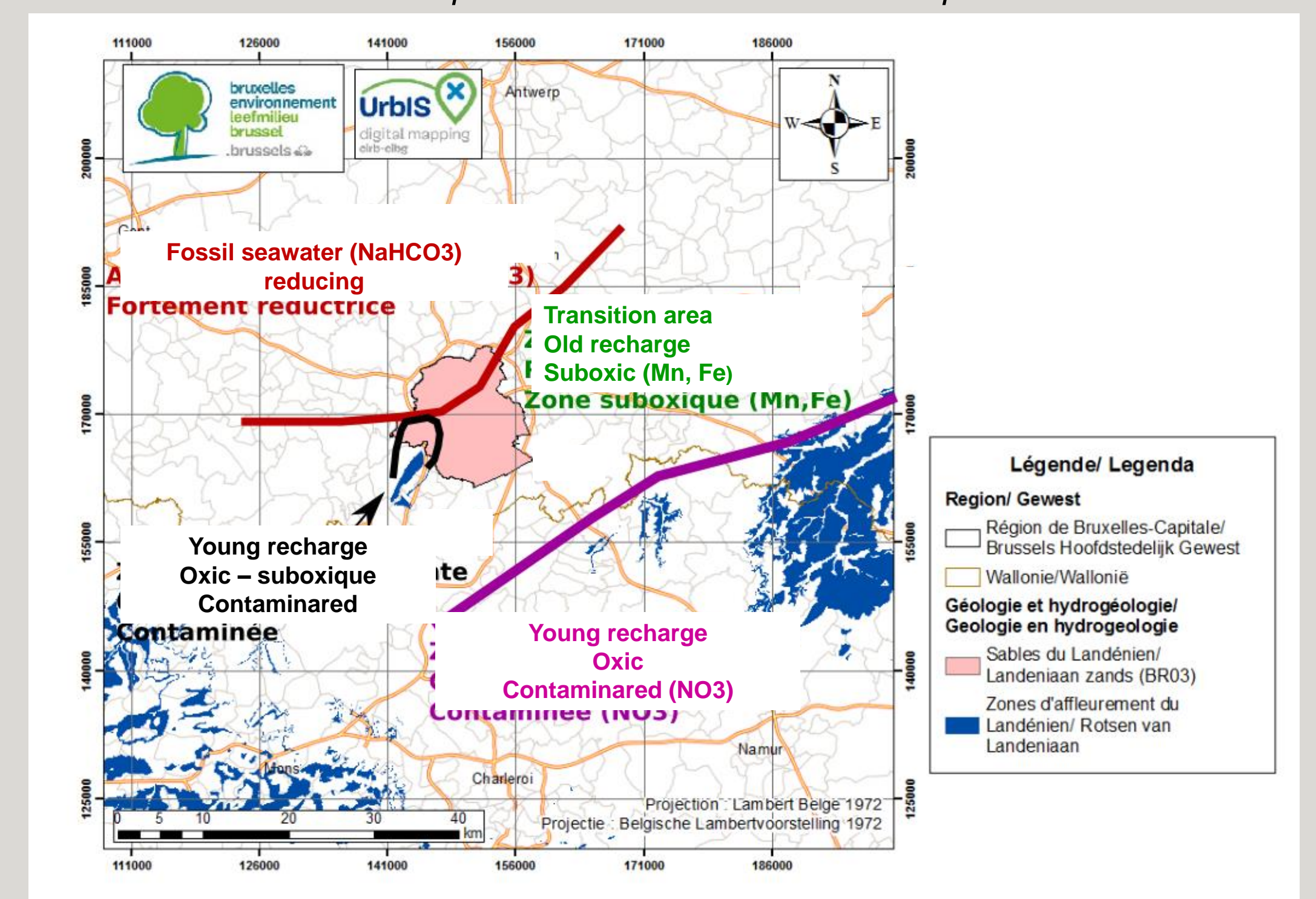
Cl concentrations increase globally from south to north. High concentrations in the north are related to fossil seawater.

The Piper diagram and the Na/Cl and Br/Cl ratios indicate a freshening process (displacement of saline water by fresh water).

The multivariate analysis highlighted 3 groups of water: young contaminated recharge (south), older recharge (middle) and fossil seawater (north)



Conceptual model of mineralization acquisition



Landenian sands NBLs

compound	Unit	Landenian sands (BR03) NBLs
As *	µg/l	5
Cd *	µg/l	0.5
Cl	mg/l	141.1
EC	µS/cm	836
Fe*	µg/l	606.4
Hg *	µg/l	0.05
Mn *	µg/l	114.5
NH4	mg/l	0.46
Ni *	µg/l	8
NO2	mg/l	0.07
P total	mg/l	0.69
Pb *	µg/l	1.75
SO4	mg/l	31.7

The conceptual model shows that the main processes influencing mineralisation are freshening, redox processes (unconfined/ confined aquifer) and anthropogenic contamination.

All the analyses lead to the selection of sites uncontaminated for the determination of NBLs calculated by P90