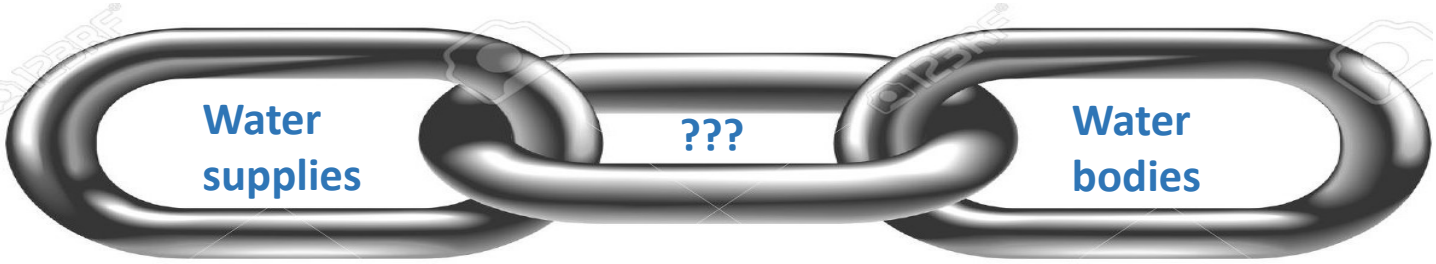
Joint workshop DWD WFD GWD - Helsinki – 16th October 2019



Terms & definitions

Identification of drinking water protected areas and related zones

Francis Delloye and Serge Brouyère

Contents

The questionnaire on better consideration of drinking water resource protection into river basin management plan (QDWP).

1st goal of the questionnaire: common understanding of Drinking Water Protected Areas (DWPA) and Safeguard Zones (SZ)

Distribution (2017/2018) to members of Working Group Groundwater (28 responses) and Drinking Water Expert Group (9 responses)

Summarizing report - main outcomes :

- **Clarification** is needed on the **terminologies for SZ/DWPA** used by some countries who delineated SZ before the implementation of WFD.

  Not all MS/PC appear to be following the definition of SZ and DWPA set out in Guidance Document (No16).
- **Unclarities** concerning the **understanding of DWPA's** and especially the **zones of potential abstraction**.
- Clarification needed for **WFD Art 7 and Guidance Document No16**

  MS/PC who delineated SZ before the implementation of the WFD should not be penalized.
- **Broad range of delineation methods** of (Groundwater) Safeguard Zones (SZ) :

  ➔ Smaller SZ with more stringent measures or wider SZ with less stringent measures?

The Water Framework Directive

Article 7

Waters used for the abstraction of drinking water

1. Member States shall identify, within each river basin district:

- all bodies of water used for the abstraction of water intended for human consumption providing more than 10 m3 a day as an average or serving more than 50 persons,
- and those bodies of water intended for such future use.

Member States shall monitor, in accordance with Annex V, those bodies of water which according to Annex V, provide more than 100 m3 a day as an average.

2. For each body of water identified under paragraph 1, in addition to meeting the objectives of Article 4 in accordance with the requirements of this Directive, for surface water bodies including the quality standards established at Community level under Article 16, Member States shall ensure that under the water treatment regime applied, and in accordance with Community legislation, the resulting water will meet the requirements of Directive 80/778/EEC as amended by Directive 98/83/EC.

3. Member States shall ensure the necessary protection for the bodies of water identified with the aim of avoiding deterioration in their quality in order to reduce the level of purification treatment required in the production of drinking water. Member States may establish safeguard zones for those bodies of water.

Terms and definitions

No definition for DWPA and SZ in the WFD but a common understanding is provided in the guidance document n°16 :

A. drinking water protected areas (DWPA)*

- are "bodies of water" designated as protected areas (article 6.2 WFD) and consequently were assigned to the stricter WFD objective 2015 (article 4.1.c WFD) !

- must be registered and reported -including location and map- in the RBMPs (annex IV WFD) !

- shall be identified by MS for bodies of water used for the abstraction of drinking water, and those bodies for such future use (article 7.1 WFD) !

- are DWPA definitely volumes or areas ? 2 interpretations were allowed:

  a. AREA: = a part of WB, or extending over parts of two or more WBs, or corresponding to WB boundaries
  -> safeguard zones ?

  b. VOLUME : the whole water body, covering actual and potential abstractions, not implying protection measures everywhere because that's the purpose of the safeguard zones

  -> Groundwater bodies, Surface water bodies (with or without their catchment ?)

+QDWP :

« *a majority of MS chose option b. (DWPA = GWB) -> registering often more than 80% of their territory as DWPA* »

*NOTE : here "drinking water" is a shortcut for "water used for the abstraction of drinking water" ; we deal obviously with raw water !

Terms and definitions

No definition for DWPA and SZ in the WFD but a common understanding is provided in the guidance document n°16 :

B. Safeguard zones (SZ)

1. normally(!), an area within a groundwater body (designated as DWPA),

2. that may be significantly smaller than this body,

Note : In some circumstances, for example in karstic aquifers, safeguard zones may be as large as or may extend beyond the boundary of a groundwater body . Safeguard zones may also cover the whole territory of a Member State (Recital 15 of Directive 2006/118/EC).

+QDWP: *"the most common criteria to delineate SZ is residence time in groundwater (RT), but the catchment area and vulnerability are frequently used (68% of resp)"*

3. where measures can be focused to protect from deterioration in quality,

Note : in order to reduce the level of purification treatment in the production of drinking water

4. the raw* water that is abstracted (to be intended after possible treatment) for human consumption.

Note : the water intended for human consumption (drinking water) is defined according to the drinking water directive (98/83/EC): it can be public or private supplies for drinking and the other domestic purposes, water used in food production undertaking (such brewing and bottled source water, but not mineral water !)

* surface water or groundwater

Terms (and definitions)

C. Other protection zones mentioned in the DW protection questionnaire

- source protection zones SPZ (tiered approaches)
  - Global framework orders in national regulation and then specific permits or rules by a regional/local authority
  - Source protections zones are in general larger than safeguard zones and defined with less territorial precision
  - In case of groundwater deterioration or new notified activities at risks, individual permits or rules are strengthen by the regional/local authority, and parts of the SPZ become safeguard zones
- drinking water protection files

A multi-party cooperation approach; it's a joint risk assessment between locally involved stakeholders to agree on measures to improve the water quality; priority is given to the most vulnerable sites; the approach leads to protection policy implementation: provincial and municipal spatial plans and regulations.

- areas of special interest:
  - UK : in karstic areas : surface water catchments that drains into the aquifer (extension of the SPZ) ;
  - DK (named OSD) : catchment areas of nearly all groundwater abstraction for DW (supplying more than 10 persons), OSD are considered as DWPAs

Additional terms and definitions

UNESCO : INTERNATIONAL GLOSSARY OF HYDROLOGY

- River basin:

Area (of land) having a common water outlet (river) for its surface runoff.

  - Syn. : Catchment, watershed (US)
  - Tr. : bassin hydrographique (FR), Einzugsgebiet (D), cuenca (ESP)

- Groundwater basin:

Physiographic unit encompassing one major aquifer, or several connected or interrelated aquifers, whose waters are flowing to a common outlet (part of river or springs) .

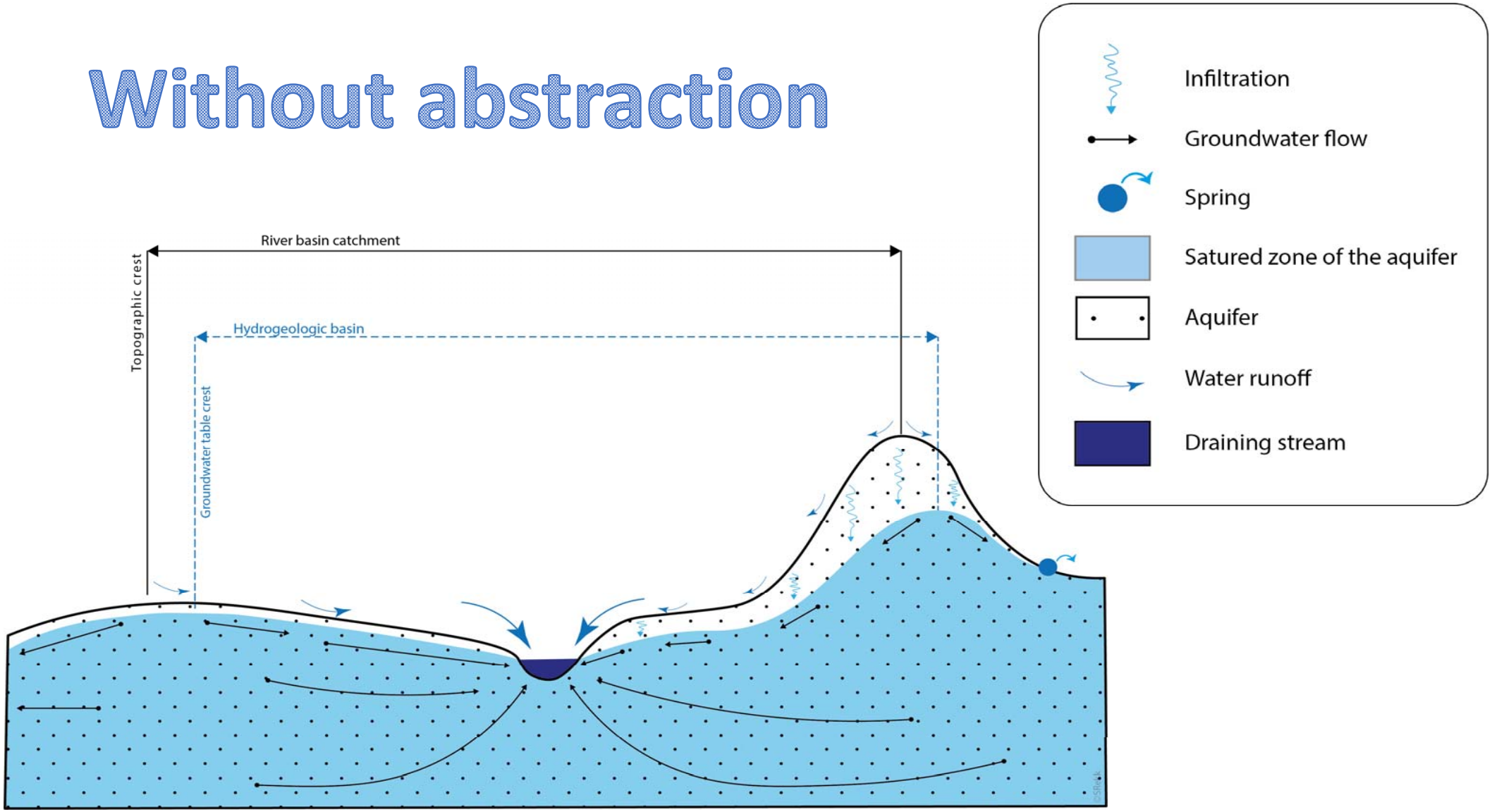
  - Tr. : bassin hydrogéologique (FR), Grundwassereinzugsgebiet (oder Grundwasserzustrombereich) (D), cuenca hydrogeologica(ESP)

- recharge area :

Area which contributes water to an aquifer either by direct infiltration or by runoff and subsequent infiltration.

  - Tr: zone (ou aire) d'alimentation (FR), (Grundwasser-)Neubildungsbereich (D), area de alimentacion (ESP)

Without abstraction



Additonal terms and definitions

UNESCO : INTERNATIONAL GLOSSARY OF HYDROLOGY

- <u>abstraction (~ action) :</u>

Removal of water from any source, either permanently or temporarily. (ISO 6107)

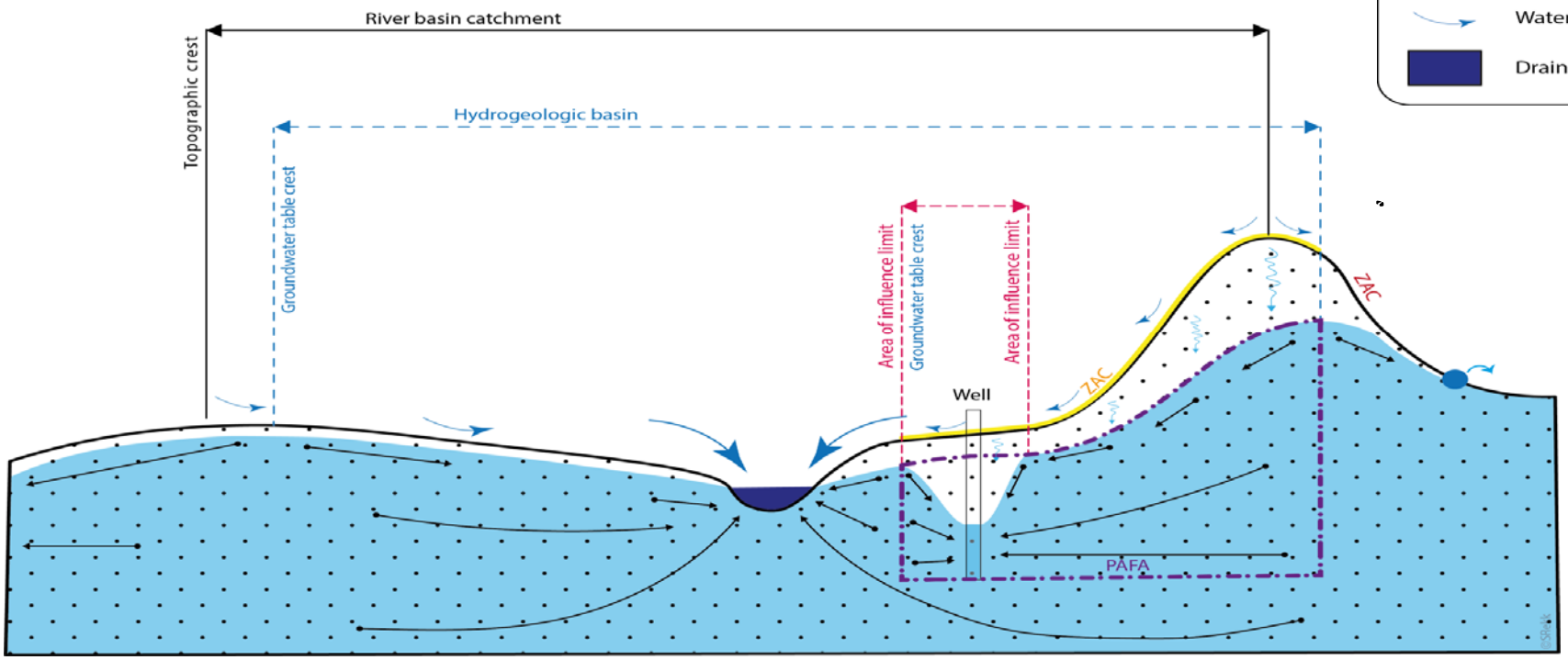
  - Syn. : withdrawal (more used in US)
  - TransL : prélèvement, captage (FR), (Wasser)Entnahme (D), captacion (ESP)
  - ! avoid confusion with : intake (~device, structure)

- <u>area of influence (of wells) :</u>

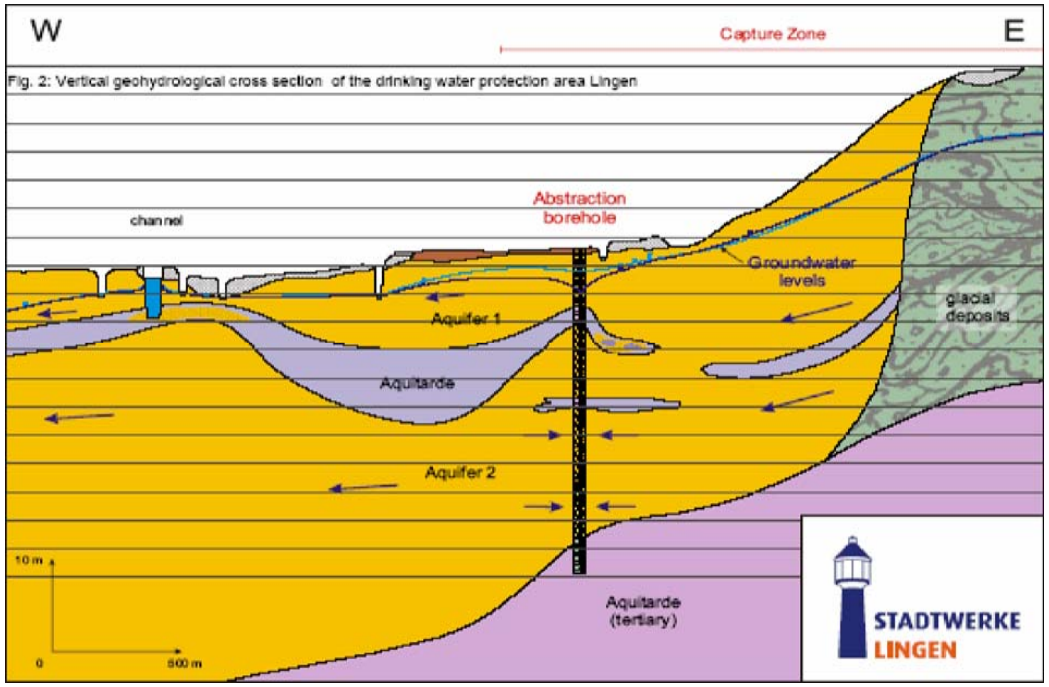
Area around a pumped well in which the piezometric surface (the groundwater table) is lowered to a significant degree;

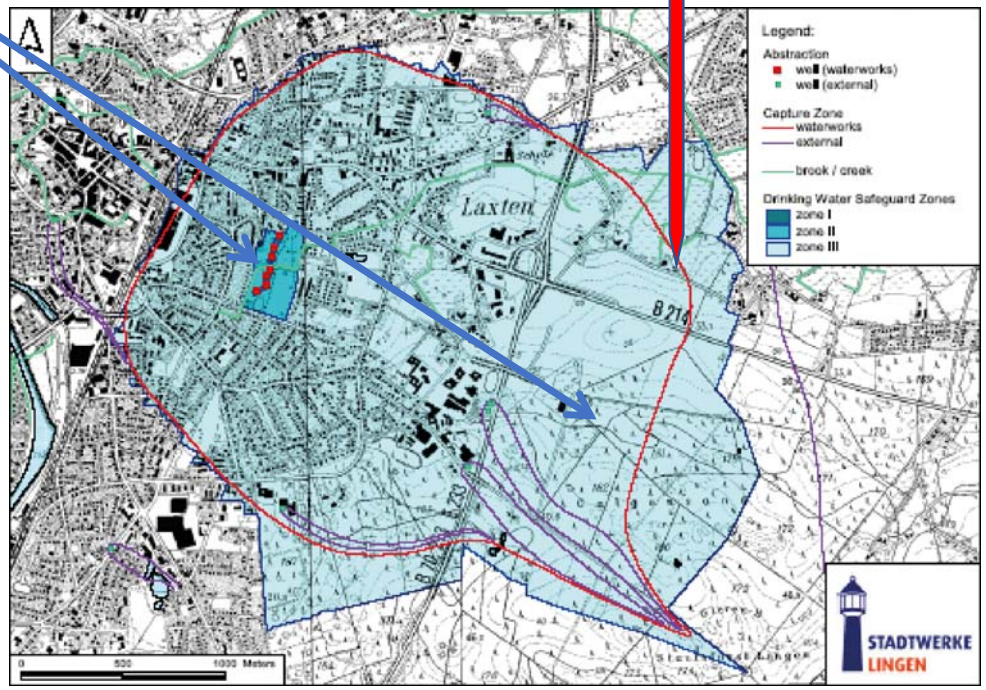
  - Syn: radius of influence
  - Transl: rayon d'influence, zone d'influence (FR), Einflussbereich (D) , area de influencia (de un pozo) (Esp)

With an abstraction
The simplest case :



Extension of safeguard zones to catchment areas





In many States (Fr, UK, D, IT…), the catchment area of the abstraction is the criterium for the largest safeguard zone established around the DW abstraction (usually the protection Zone III)

In addition of zones I (prohibited activities) or II (ruled activities), zones III are designed to protect against diffuse and persistent pollution (nitrates,…)

The zones III are often optionally established (in case of deterioration of the abstracted water)

The extend of catchment areas : 2 different situations in EU

- *Countries using the catchment area for the safeguard zones Z.III :*

Germany (with inner ZII = 50 days),
Austria (with ZII = 60 days),
Belgium/Wallonia (with ZII = 50 days),
France (with ZII = 50-60 days),
England & Wales (with ZII = 400 days and ZI = 50 days),
Italy (with ZII between 180 and 365 days according to vulnerability)

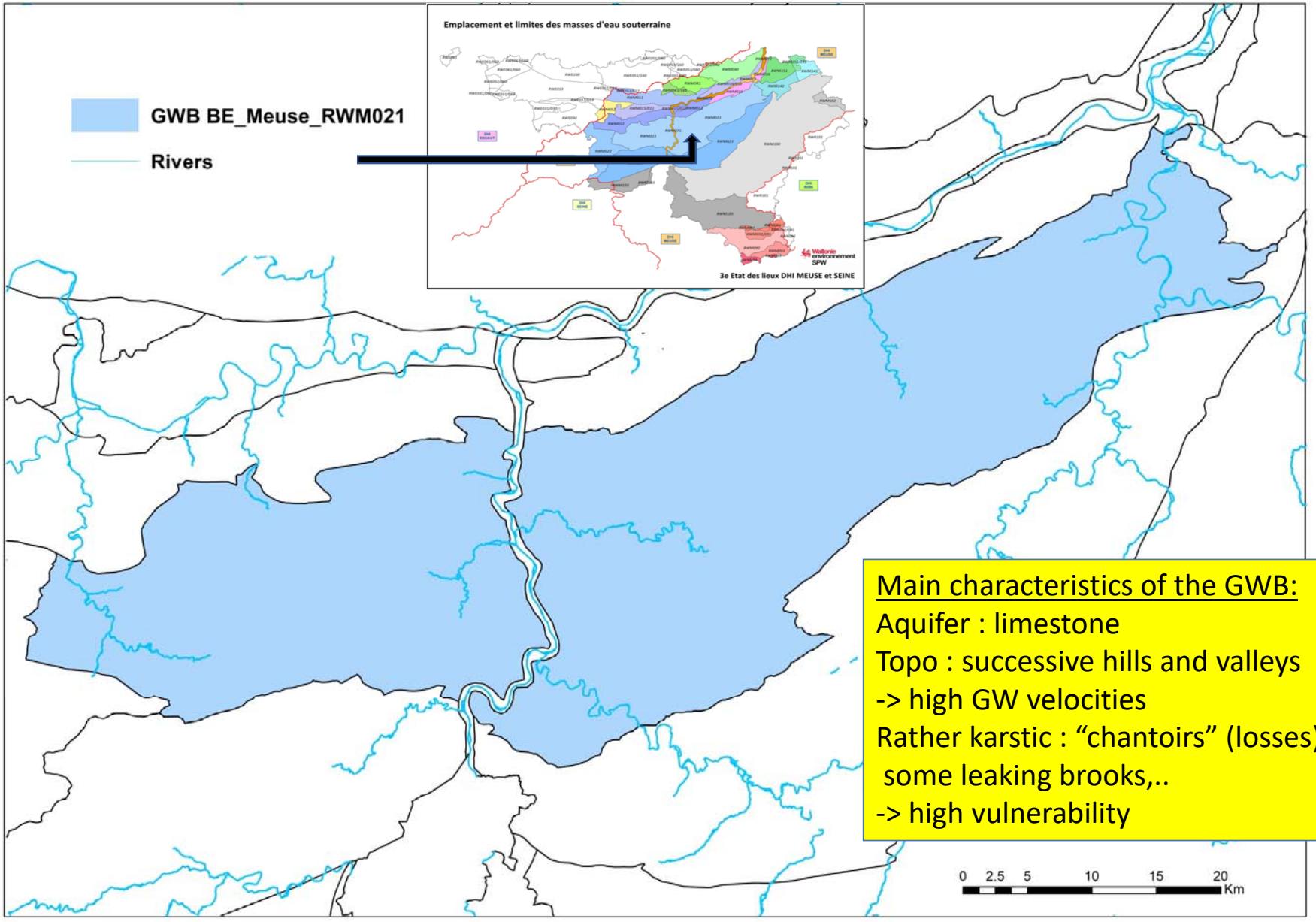
- *Countries limiting with residence time the catchment area to obtain the Z.III :*

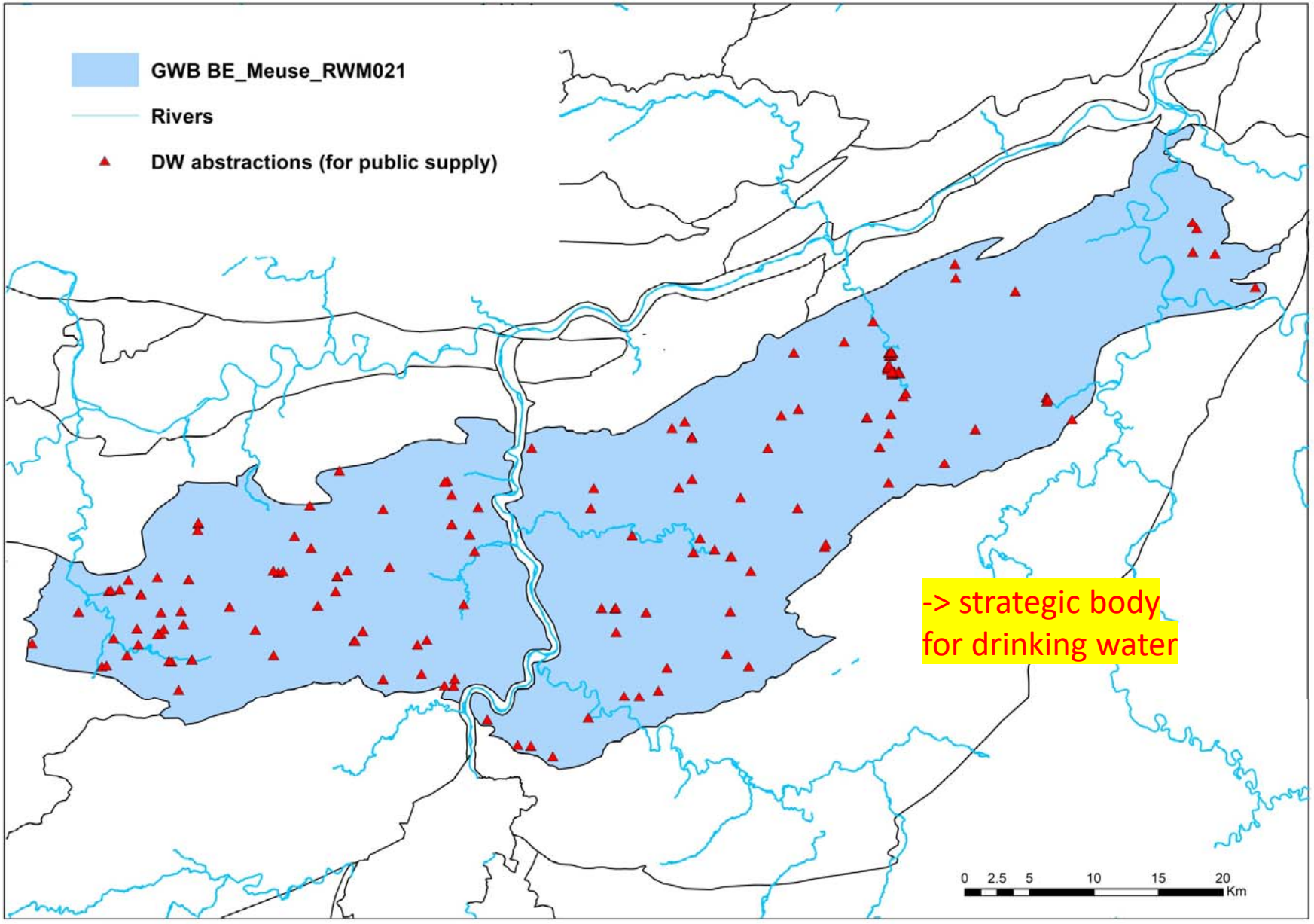
The Netherlands (ZIII = max 25 years),
Denmark (ZIII = max 10-20 years)
Portugal (ZIII = max 10 years)
Spain (ZIII = max 4 to 10 years)
United States (ZIII = max 15-20 years),…

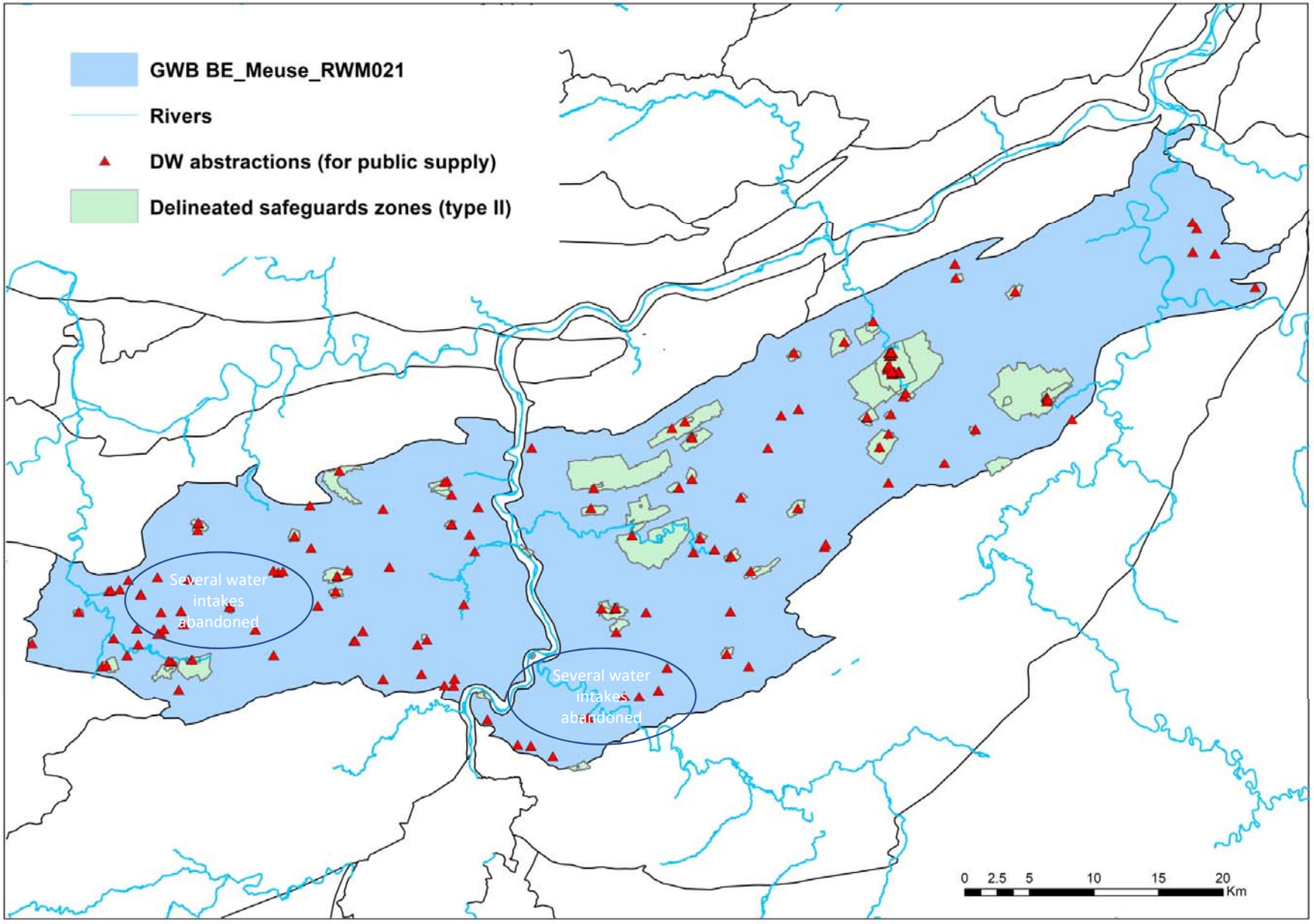
Sources : The common questionnaire on DW protection, WG_GW, 2018; Guidance document N°16 (case studies) ;
Comparative Protection of catchment areas of DW abstractions, International Office for Water (OIEau), 2015

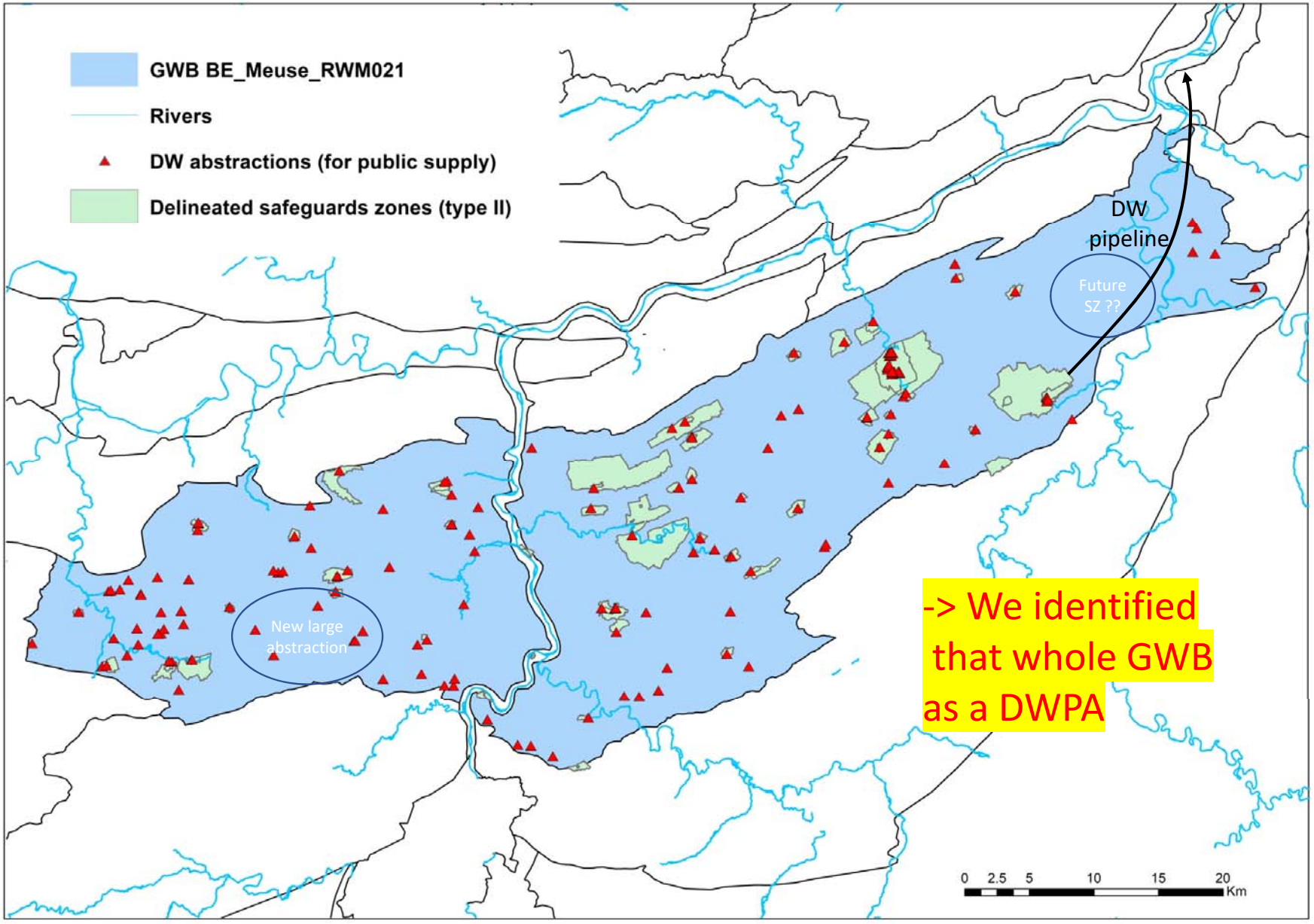
Experience in Belgium Wallonia

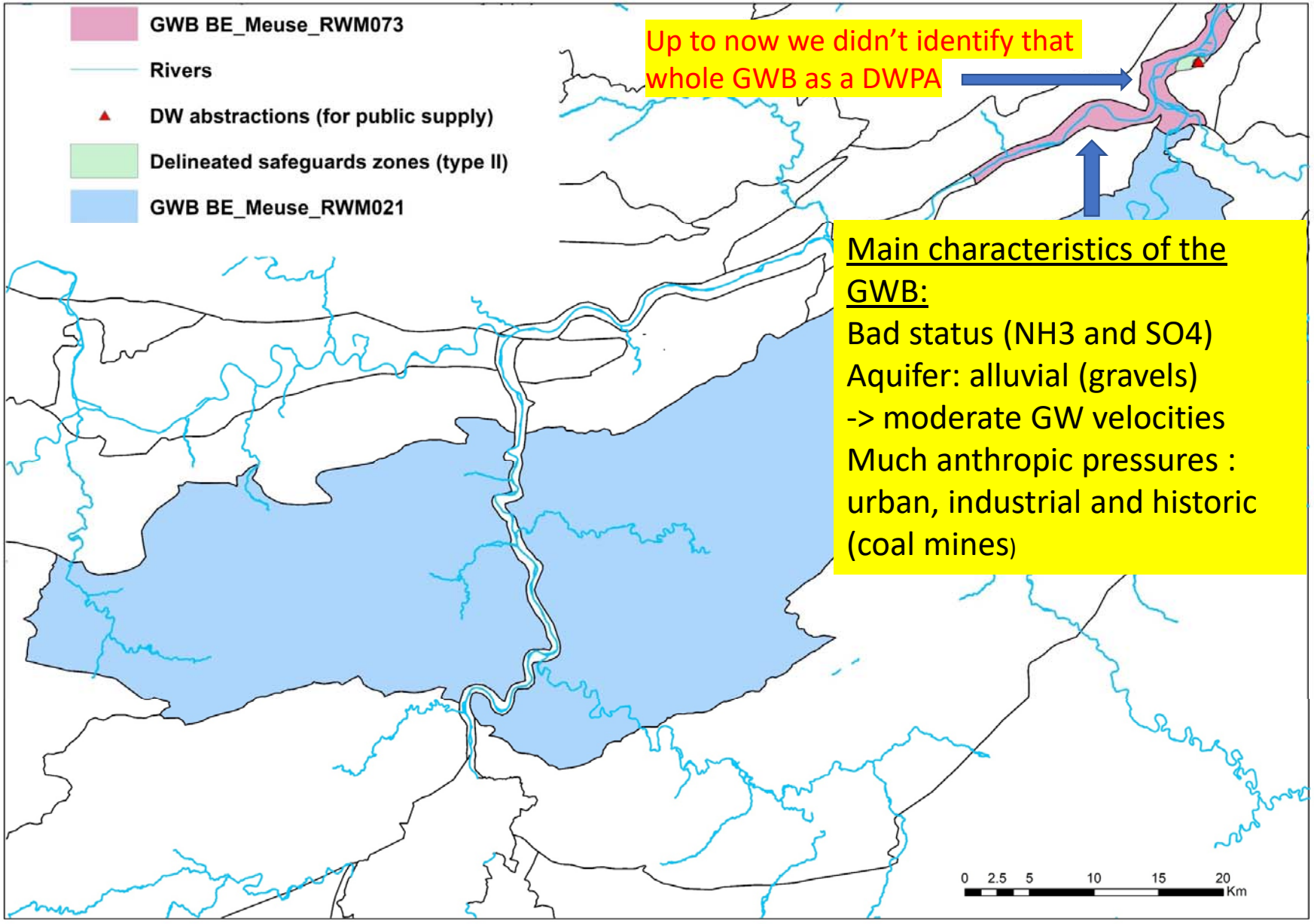
A. Identification of the DWPA


GWB BE_Meuse_RWM021
Rivers
Emplacement et limites des masses d'eau souterraine
3e Etat des lieux DHI MEUSE et SEINE
Main characteristics of the GWB:
Aquifer : limestone
Topo : successive hills and valleys
-> high GW velocities
Rather karstic : “chantoirs” (losses),
some leaking brooks,..
-> high vulnerability
0 2.5 5 10 15 20
Km


GWB BE_Meuse_RWM021
Rivers
DW abstractions (for public supply)
-> strategic body for drinking water
0 2.5 5 10 15 20
Km


GWB BE_Meuse_RWM021
Rivers
DW abstractions (for public supply)
Delineated safeguards zones (type II)
Several water intakes abandoned
Several water intakes abandoned
0 2.5 5 10 15 20
Km


GWB BE_Meuse_RWM021
Rivers
DW abstractions (for public supply)
Delineated safeguards zones (type II)
DW pipeline
Future SZ ??
New large abstraction
-> We identified that whole GWB as a DWPA
0 2.5 5 10 15 20 Km


GWB BE_Meuse_RWM073
Rivers
DW abstractions (for public supply)
Delineated safeguards zones (type II)
GWB BE_Meuse_RWM021
Up to now we didn't identify that whole GWB as a DWPA
Main characteristics of the GWB:
Bad status (NH3 and SO4)
Aquifer: alluvial (gravels)
-> moderate GW velocities
Much anthropic pressures : urban, industrial and historic (coal mines)
0 2.5 5 10 15 20
Km

Brief overview of the DW protection in Belgium/Wallonia

- History : Walloon Decree 1990 (groundwater) (but well before for mineral and thermal water : BE Law 1924)
  - classes of GW abstractions
  - new definition and delineation of safeguard zones
  - list of **preventive** measures to be implemented in these safeguard zones
- The 3 surrounding safeguard zones
  - Zone I (mandatory) ; min. 10 meters around the intake – fences – not other activity than DW abstraction
  - Zone IIa ("near prevention zone") ; min. 35 meters ; RT = 24 h (stronger preventive measures)
  - Zone IIb ("far prevention zone") ; RT = 50 days

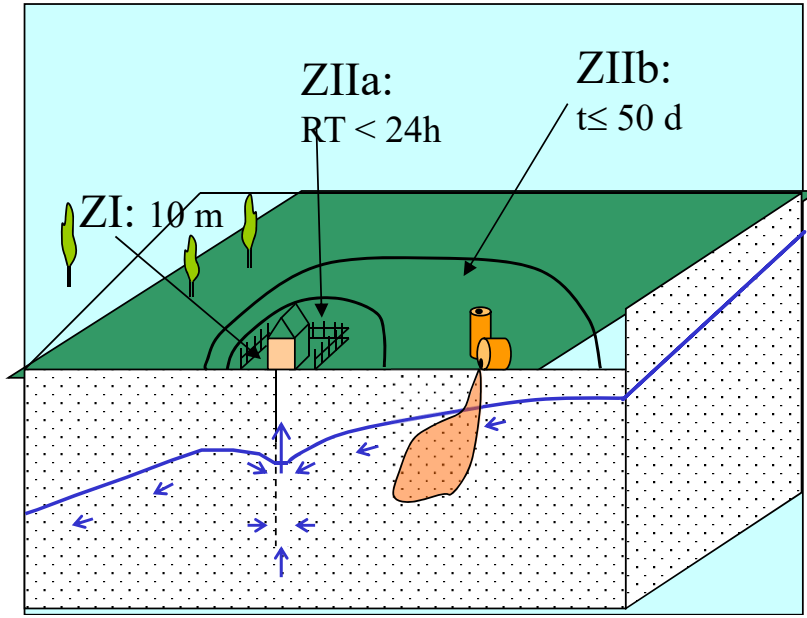
  Note : ZII are mandatory in free aquifers for public DW supply or beverage industry
  - Zone III (optional) : based on the abstraction catchment
- Main measures :
  - Zone II : prevent and limit : examples of ruled activities :

  Use and storage of fertilizers, pesticides and hydrocarbons.

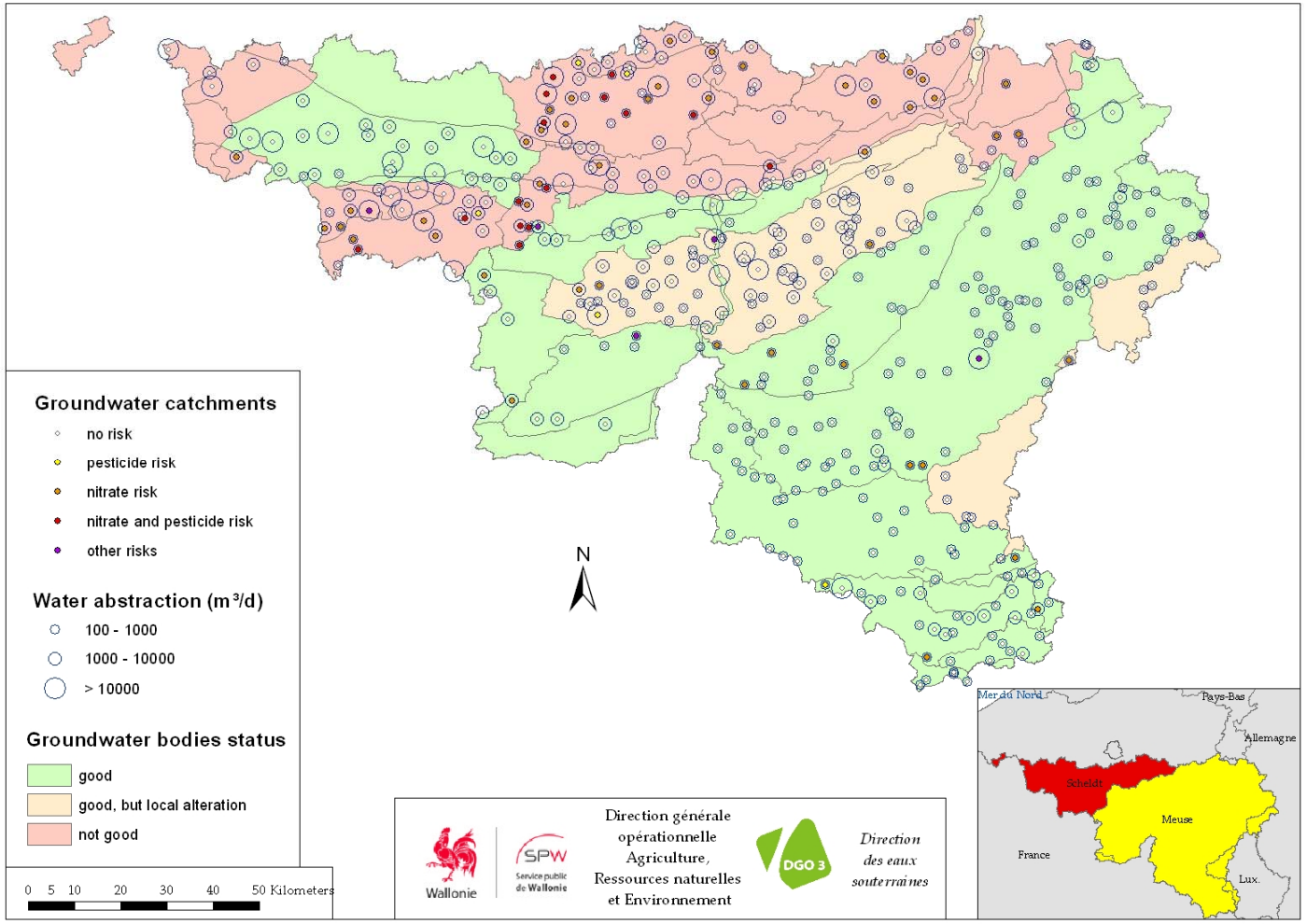
  Animal breeding, waste water sewage, landfills, car parks and races..

  (distinction between existing and new activity – since 1995)
  - Zone III: in case of not sufficient effect in zone II, our Minister

  can extend the measures in zone III (especially for NO3 and pesticides)

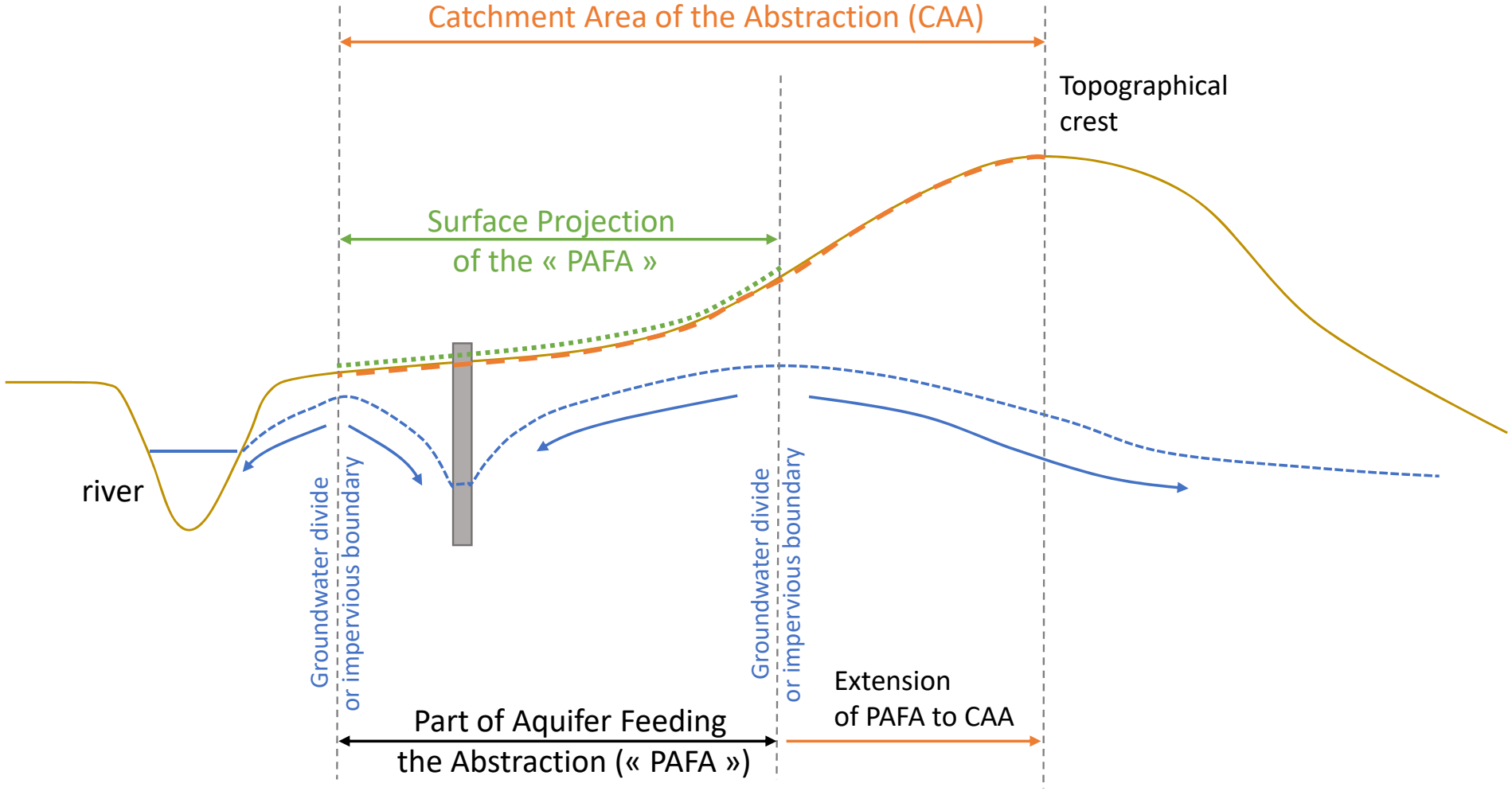


Response to diffuse pollution : the catchment area



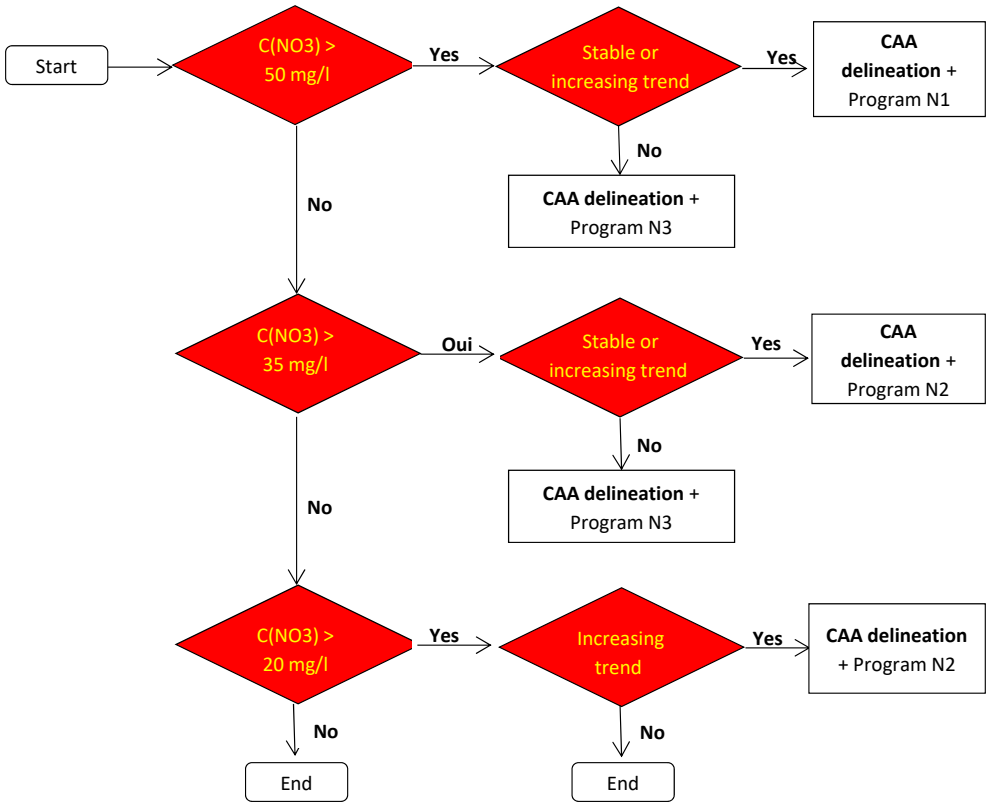
Delineation of the catchment area : BRGM approach

(Vernoux et al. 2007)

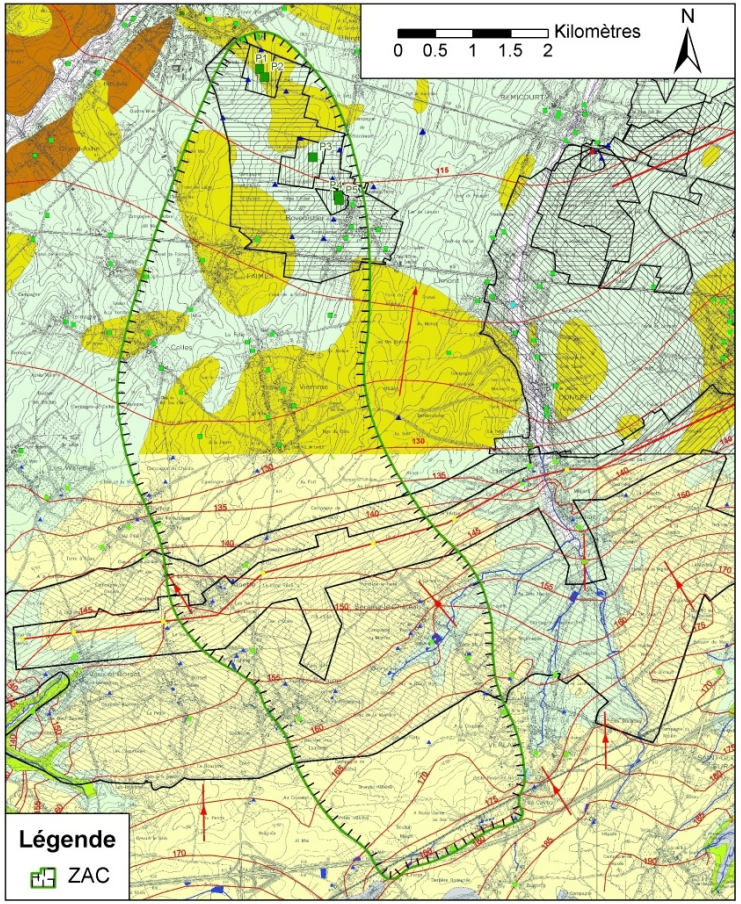


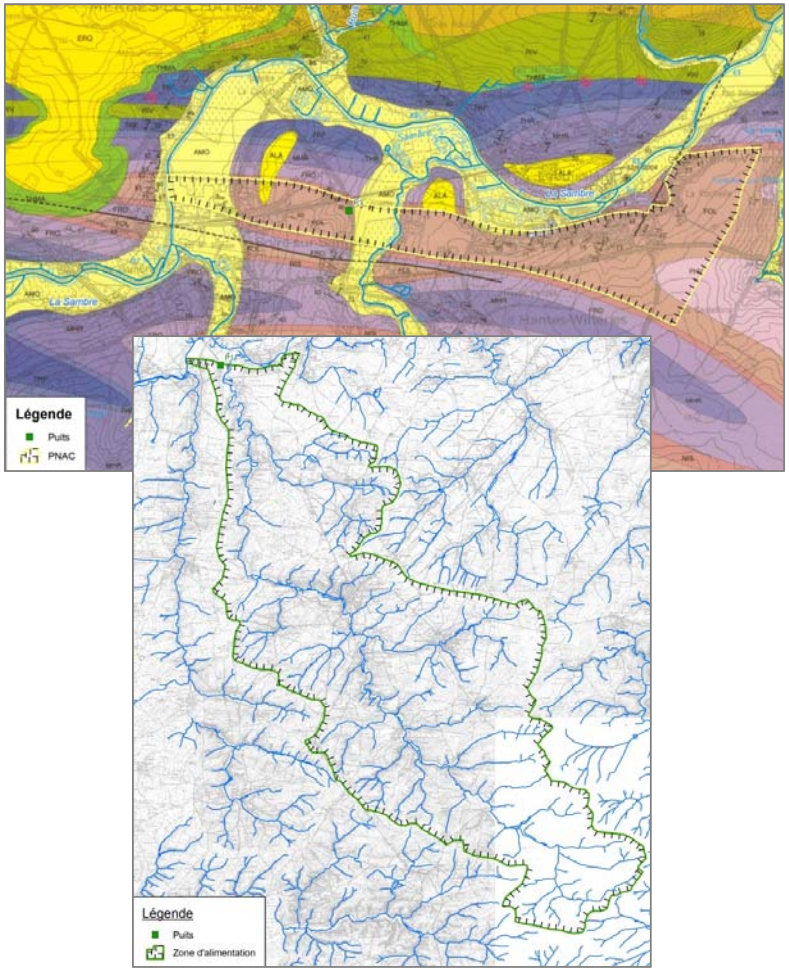
When do we start the catchment approach (for NO_3)?

- Comparison of NO_3 concentrations to threshold values at the abstraction
- NO_3 trend assessment at the abstraction
- Decision on the necessity to delineate the catchement area and on the programme of measure to be implemented

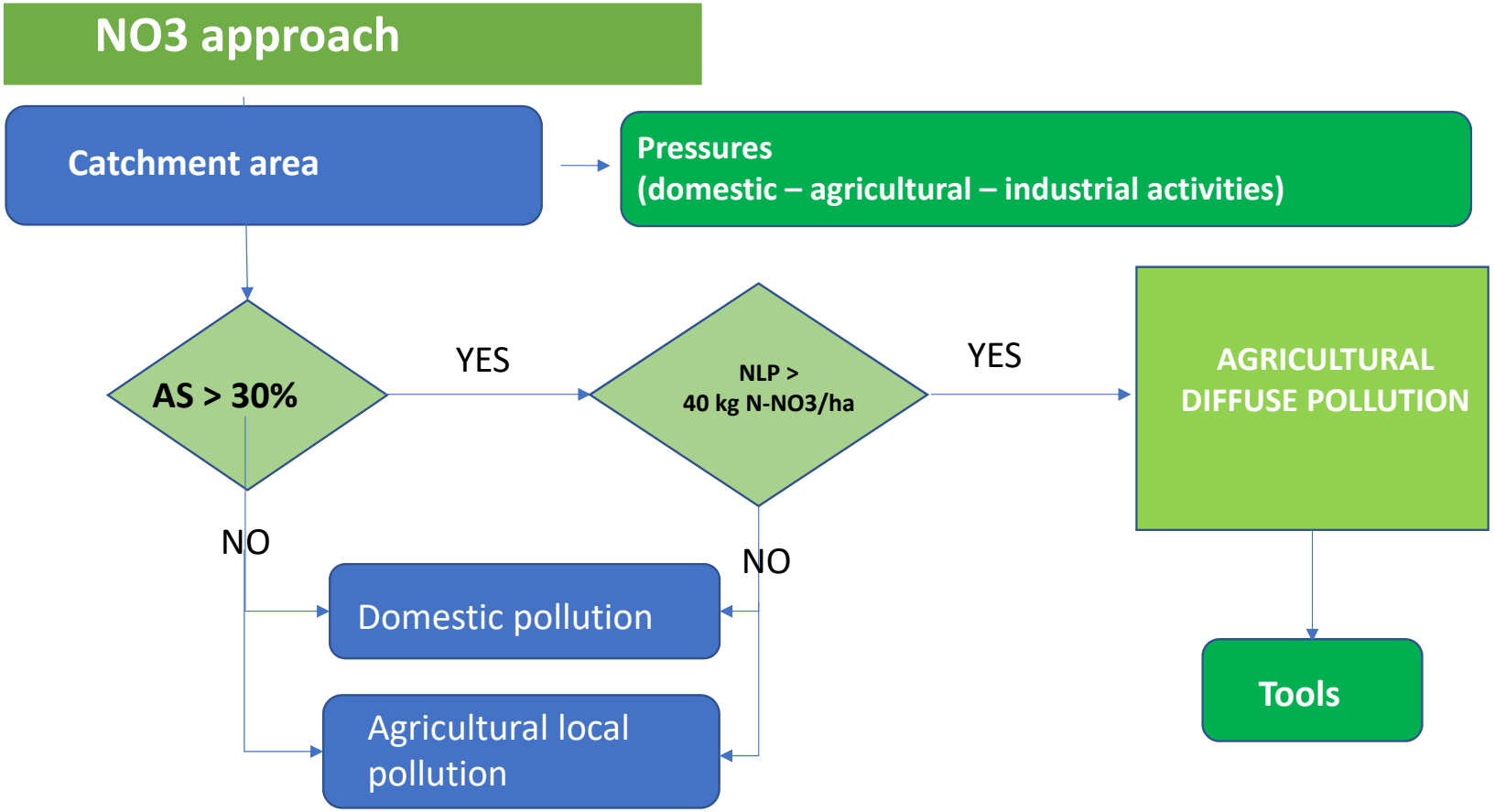


Examples of CAA in Wallonia





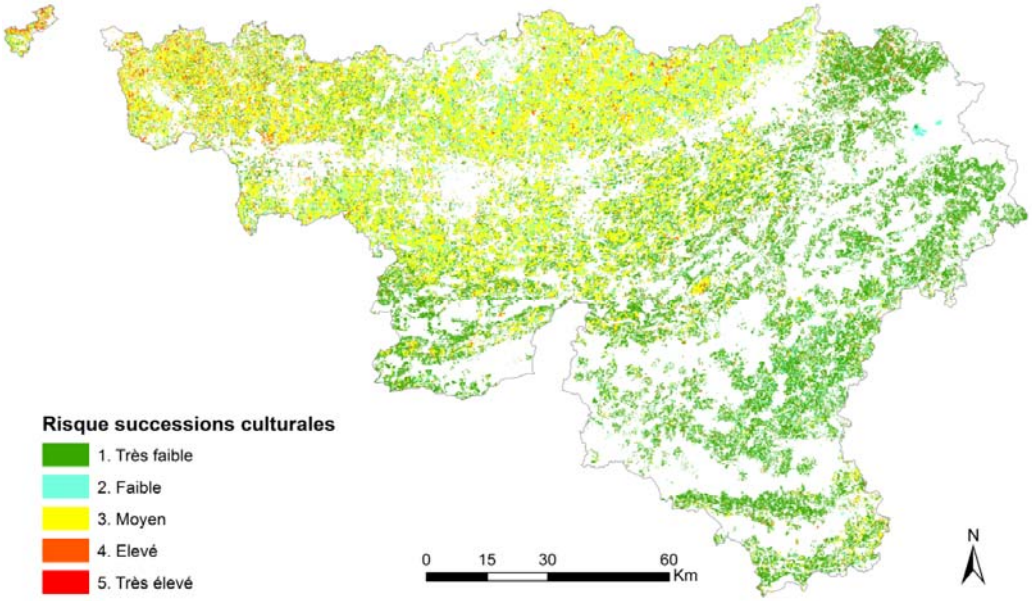
And when the CAA is delinated, what happens?

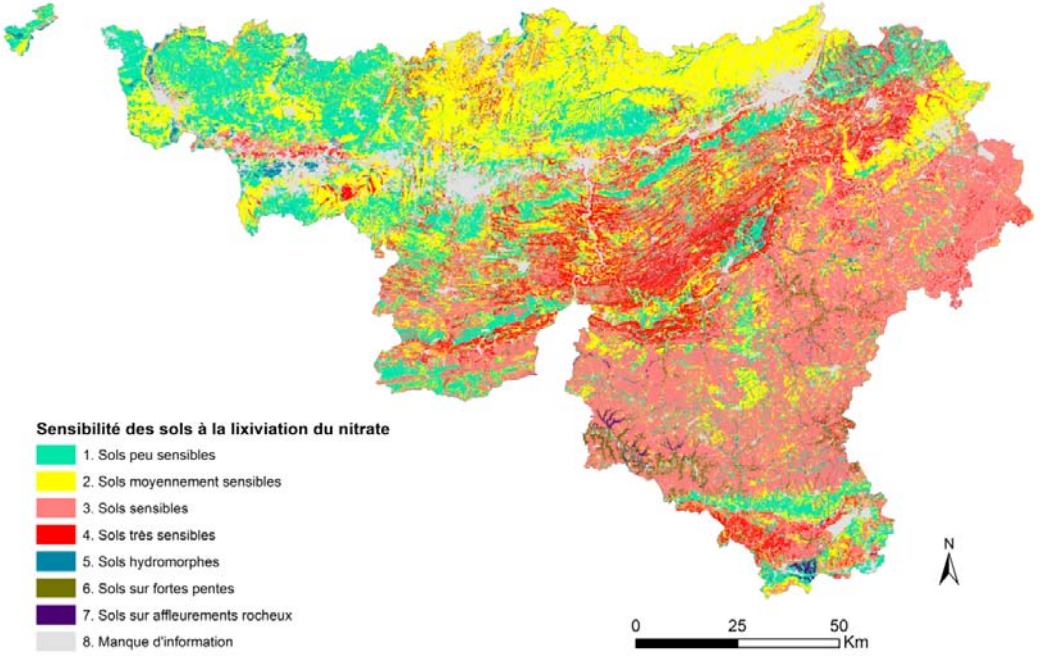


Identification of sectors more vulnerable to NO_3 in the CAA

Different tools available to evaluate the risk of NO_3 leaching

Leaching risk linked to crops succession





Map of Soil Sensitivity to Nitrate Leaching

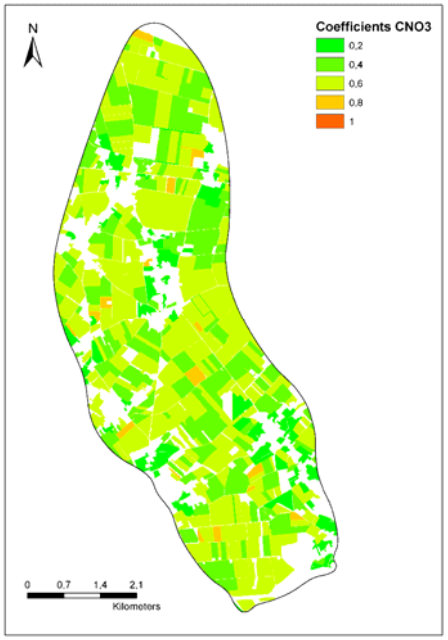
Identification of sectors more vulnerable to NO_3 in the CAA

And possible combination with a groundwater vulnerability index based on infiltration / runoff coefficients

PRESSURE NO_3 x **INFILTRATION COEFS** = **VULNERABILITY NO_3**

Map for **NO3 lixiviation risk**

- **Digital elevation model**
- **Land use**
- **Soil type**



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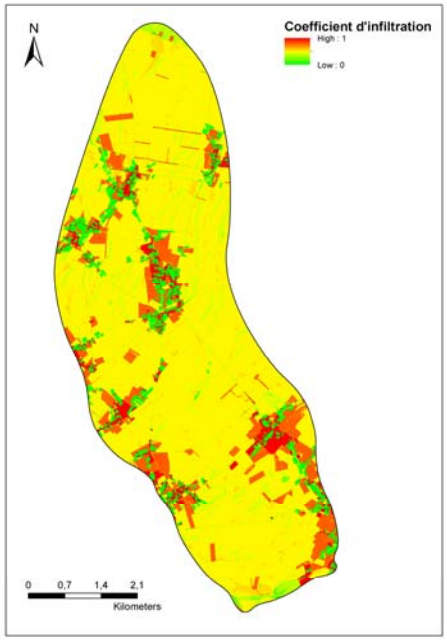

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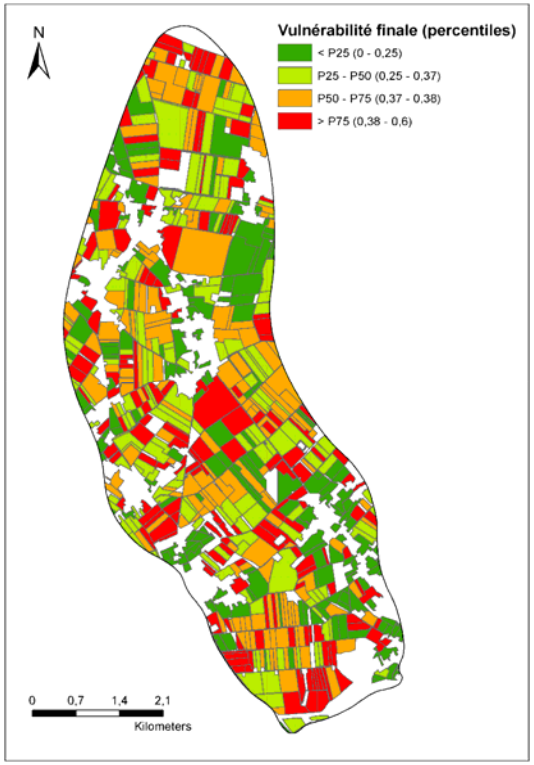

Conclusions

1. **The identification of DWPA is not an easy process, especially for future abstractions (depending on water demand trends, climate change, existing aqueducts and connections between drinking water supplies..). Resource protection is somewhere a strategy**

   The 2 interpretations allowed by the guidance document N°16 are both suited.

2. **The different sizes of SZ in Europe are explained by various EU hydrogeological contexts**

   Other protection terminologies reported (source protection, protection files) lead also to safeguard zones when measures are applied;

   These measures are also various, and their strength also depends on the SZ size :
   - **preventive (activities at risk) or corrective (raw water deterioration)**
   - **statutory, specific mandatory, voluntary, risk management…**

3. **To protect any DW abstraction**
   - **against deterioration with relevant pollutants (diffuse and persistent)**
   - **in the long term**

   safeguards zones should be extended to catchment areas (possibly limited with residence times)

   and it seems to be <u>progressively</u> the case…

Thank you for your attention !