



Waterprotect: Innovative tools enabling drinking WATER PROTECTion in rural and urban environments

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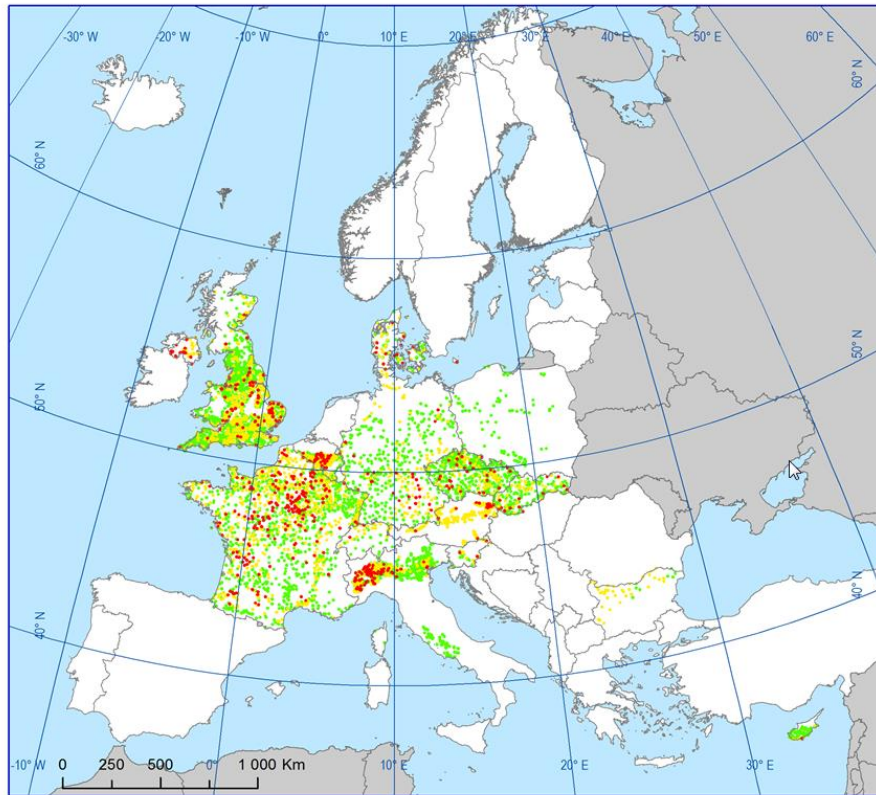


**CKB WORKSHOP: Monitoring and modelling pesticide fate at the landscape scale
Uppsala, 17 August 2017**



PESTICIDE AND NUTRIENT POLLUTION OF DRINKING WATER SOURCES IS A CONTINUING CONCERN ...

Occurrence and exceedance of selected pesticides in groundwater monitoring stations, 2010-2011 (Source: Eurostat)



● < limit of quantification ● > quality standard
● >= limit of quantification and <= quality standard ■ outside coverage

Points of concern:

- Hot-spots of exceedance across Europe ($>0.1 \mu\text{g/l}$)
- Hot-spots = intensive agriculture
- Pollution sources are diffuse, monitoring and treatment costly
- Poor information across Europe
- **Mitigation measures are not in place, or not effective and need farmer engagement**

OBJECTIVES OF WATERPROTECT

- “Contribute to *effective uptake and realisation of management practices and mitigation measures to protect drinking water resources*”



Action ! In local “action labs” across EU (BE, IE, DK, IT, ES, PL, RO)

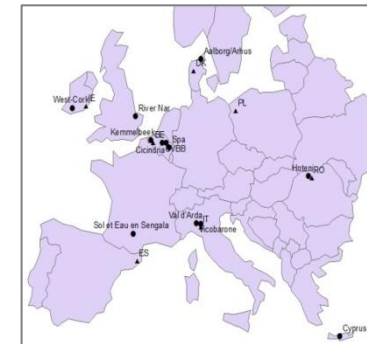
New governance: alternative financing

Share data: participatory monitoring

Best management into practice

Bring information close to actor

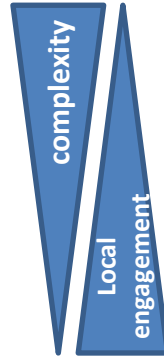
▲ action lab
● desk case



- “Upscale findings from action labs to other regions”
- “Advise policy makers: WFD, CAP, nitrate and pesticide directives”
- “Strategic communication to stakeholders and dissemination to the public”

Designing, aligning and bringing together monitoring data from:

- Scientists
- Environment agencies
- Drinking water companies
- Local farmers
- Local citizens



Local actors become more engaged in the monitoring and they trust the results.

BEST MANAGEMENT PRACTICES

- *Engage actors to implement measures !*

Diffuse sources:
Bufferstrips
Mgt practices
Dams, pools



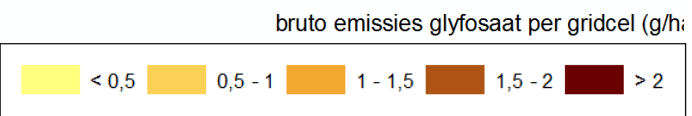
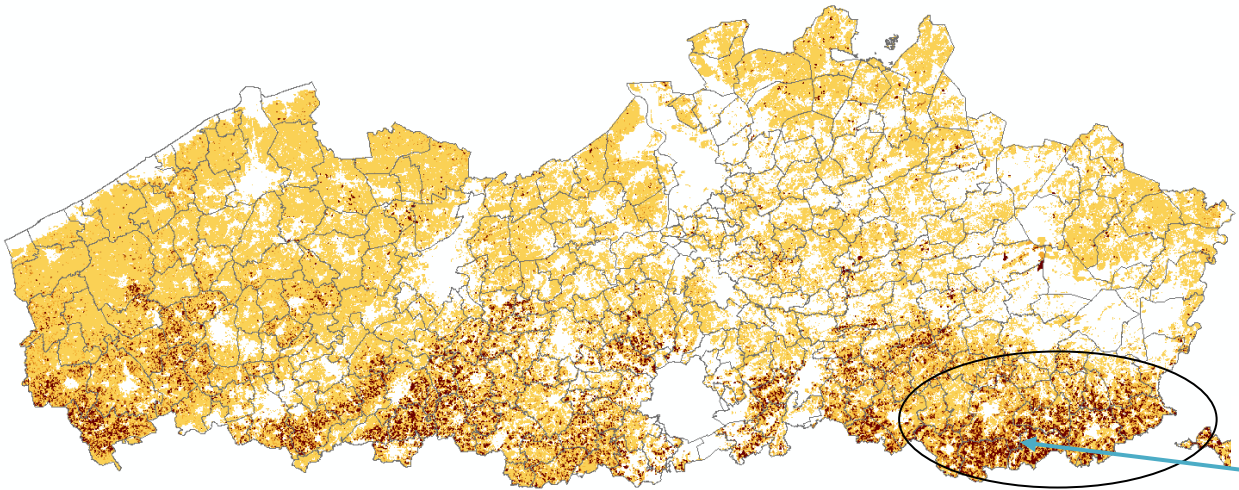
Treatment point
sources



Inspiration ? Running pilot study catchment !

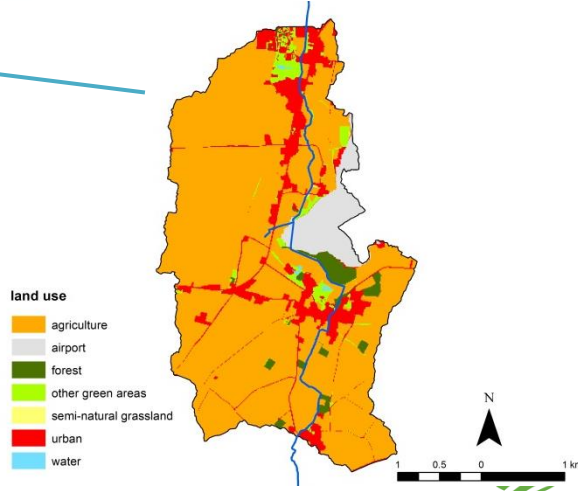


- Monitoring study (2014-2018) with implementation of measures (2016-2018)
- area of interest = the Haspengouw region in southern Limburg, agriculture, mixed with residential landuse
- multiple pesticides detected in headwaters



<http://www.vmm.be/nieuwsmap/mira-pesticidegebruik-en-emissie-naar-oppervlaktewater>

Cicindria catchment
area: 1075 ha
72% agriculture



Cicindria catchment

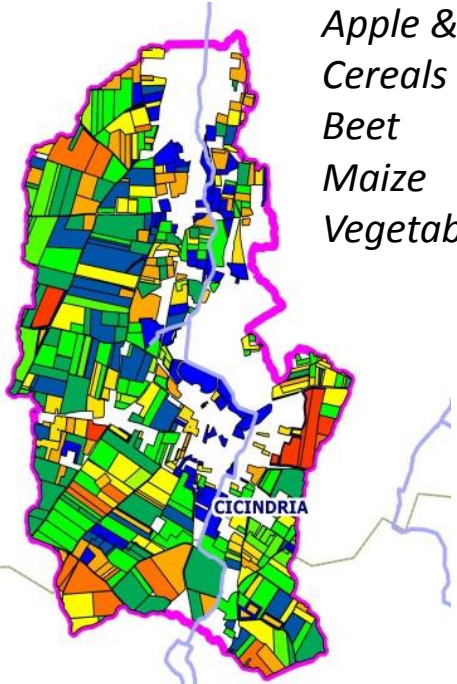
Legenda
waterloop

Teelten

- weiden en grasland
- bieten
- appelen
- graan
- aardappelen
- aardbei
- mais
- ander fruit
- sierteelt
- peren
- groenten
- overige gewas

geselecteerd afsroomgebied

gemeente



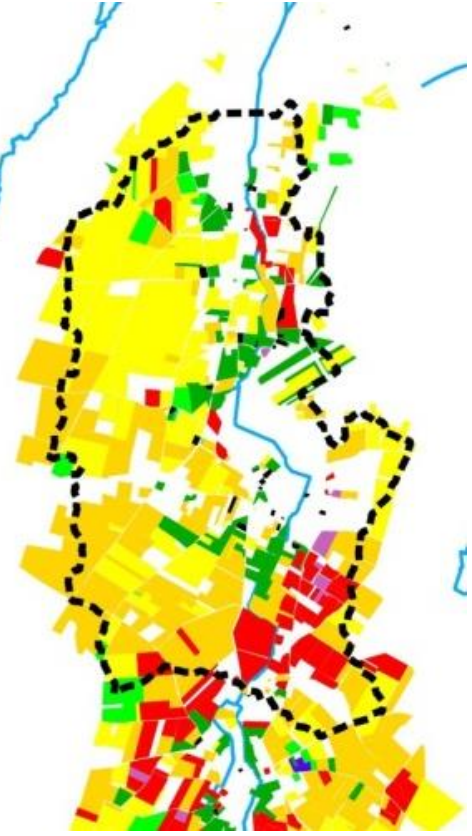
Apple & pear 19%
Cereals 14%
Beet
Maize 8%
Vegetables 4%

Legenda
CICINDRIA selected area

Erosion map (Watem-Sedem calculation)

- Building
- Grass
- erosion <1 ton/ha.y
- erosion 1 - 2 ton/ha.y
- erosion 2 - 5 ton/ha.y
- erosion 5 - 10 ton/ha.y
- erosion 10 - 20 ton/ha.y
- erosion >20 ton/ha.y

River



Monitoring 2014-2018

- Flow sensor ↘
- Rain sensor ↑

- Modem (enkel event sampler)
- Electricity 230V



downstream location

Wat St Truiden

VMM Muizen

- Sampler 2 event paced no cooling
- Sampler 1 time paced + cooling

- Sampler 3 flow paced no cooling
- Sampler 4 time paced + cooling

Agricultural catchment

upstream location



Vito : flowlink software



27/06/2014
©2013, VITO NV

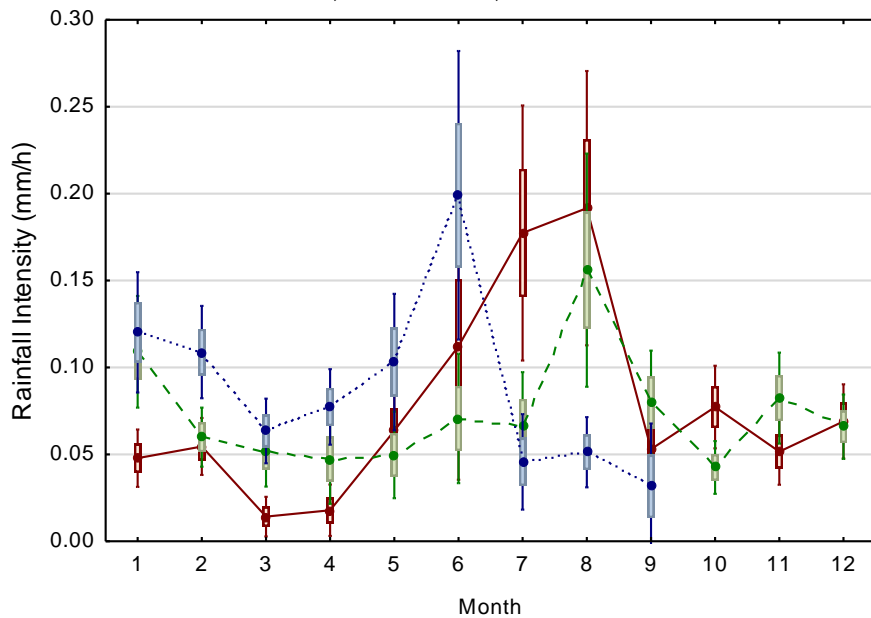
Precipitation & Discharge

- 2014 – 2015 – 2016
 - Precipitation: VMM station, Niel-bij-Sint-Truiden
 - Discharge: VMM station, Muizen

Monthly Rainfall intensity

2014 - 2015 - 2016

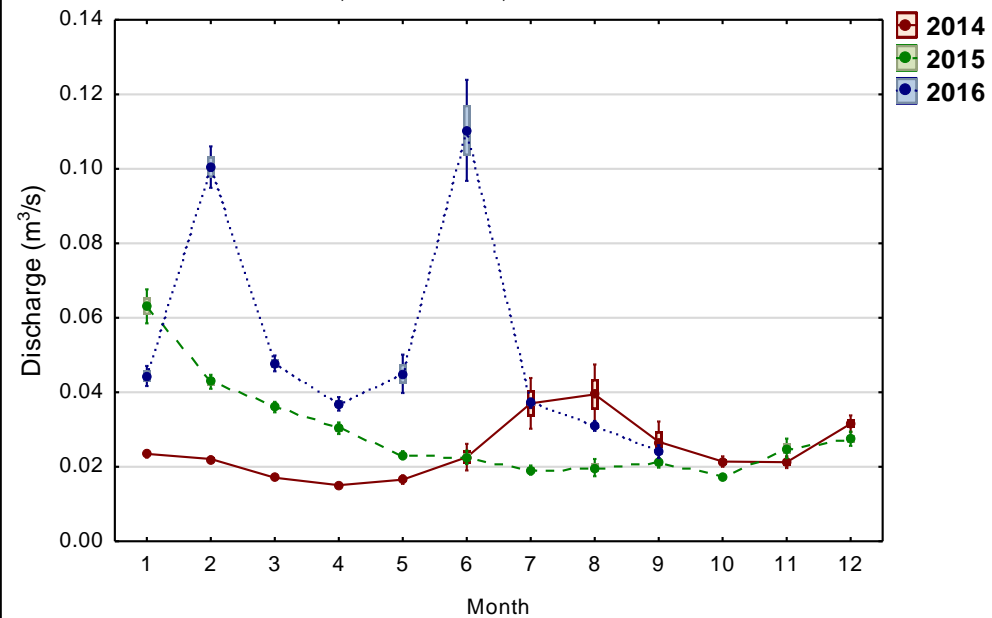
Mean; Box: Mean±SE; Whisker: Mean±2*SE



Monthly Discharge

2014 - 2015 - 2016

Mean; Box: Mean±SE; Whisker: Mean±2*SE



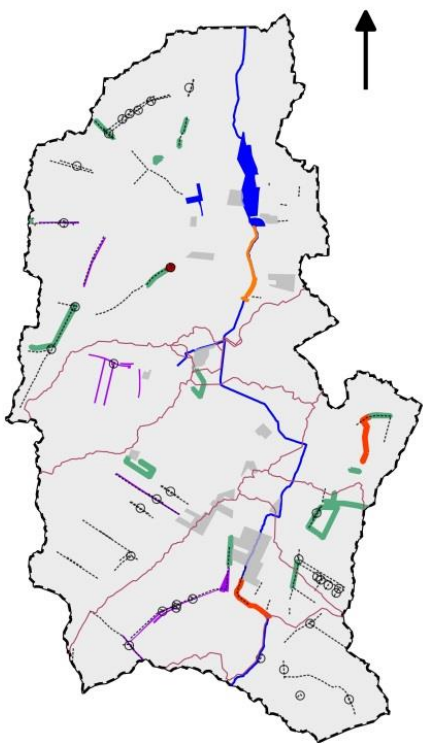
Proposed, planned & implemented measures (regardless pesticides)



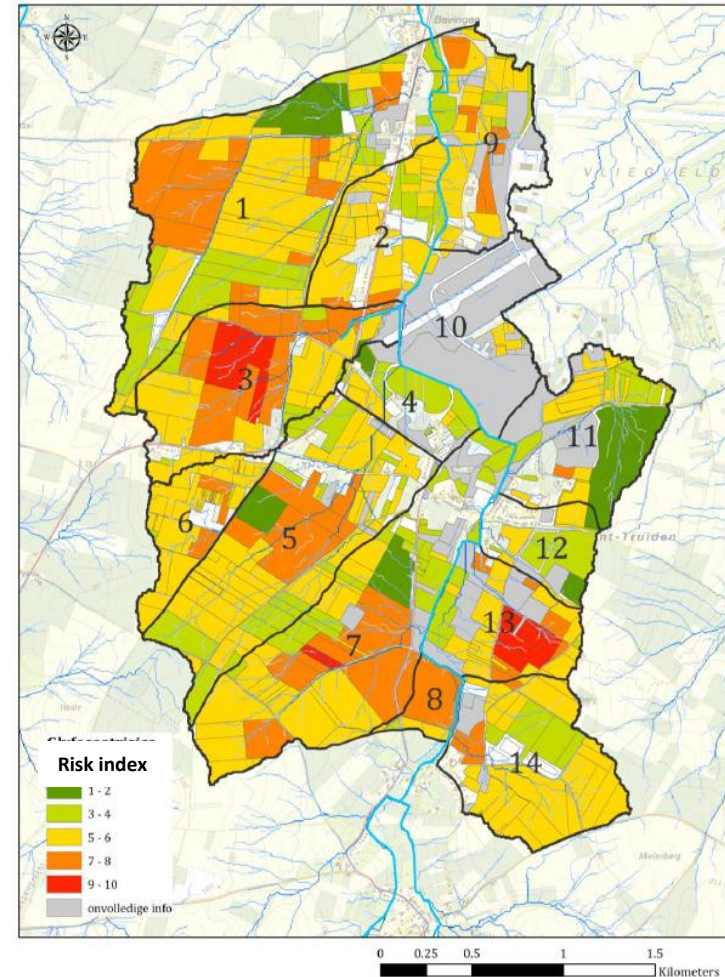
Legend

- Planned point measures
○
- Planned line measures

- Planned strategic grassland
■
- Active management contracts
 - erosion mitigation (green)
 - field border management (orange)
- Integrated water management projects
 - retention basin (blue)
 - riparian zone (yellow)
- Installed erosion measures (red)
- Proposed erosion measures (purple)
- Rivers (blue line)

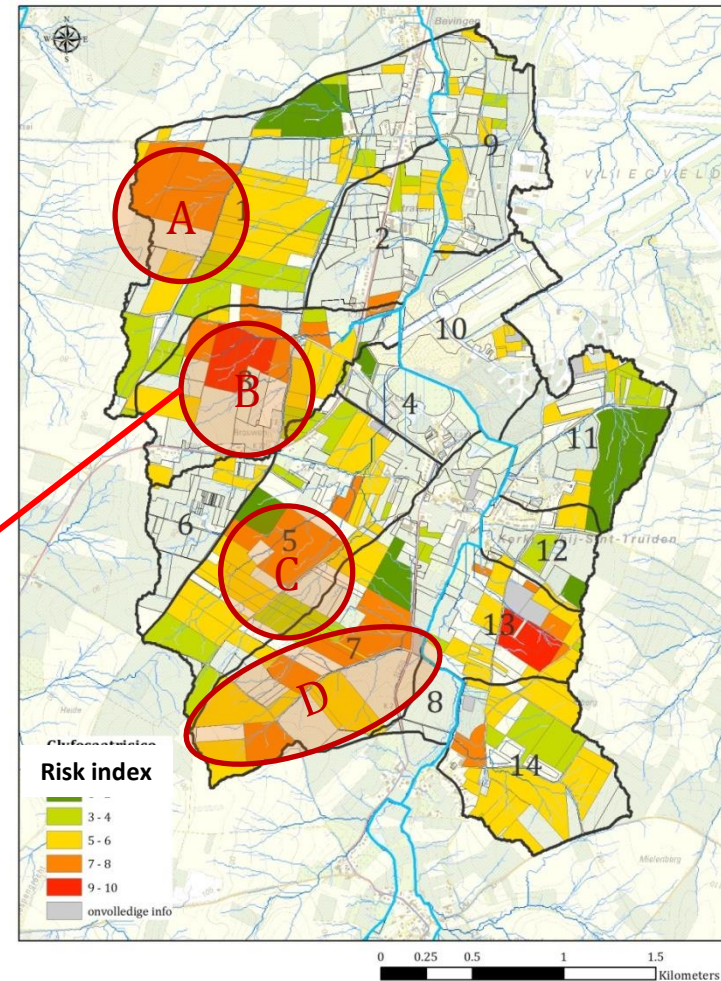


- **risk map** including information on
 - topography
 - crop cover
 - estimated pesticide use
 - potential erosion risk
 - connectivity of the agricultural parcels to the river
- **field validation** using **observations**
 - runoff during stormflow events
 - roads short-circuiting runoff to the river
 - erosion
 - installed mitigating measures



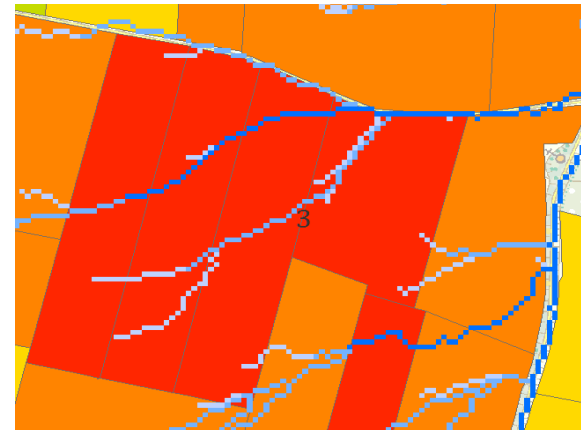
From risk map to priority zones

- **priority zones** for measures of erosion control
- target farmers with a significant impact on the pesticide load to surface water
- encourage farmers to enter a voluntary erosion control program supported by the local government



Done (spring 2017): Installation of 11 grass bufferstrips in the catchment (8,46 ha).
Most of the bufferstrips are 9 m, 3 of them are 21 m wide

Example: zone B



- **Sugar beet farmers:** chose not to do anything because they use edge of field for beet storage. Searching for a solution between farmers union and Flemish Land Agency
- **Farmers themselves contacted** the Flemish Land Agency during or after **heavy rain period** of May-June 2016. The Flemish Land Agency has confirmed that for 2017 more bufferstrips will be installed on very crucial (erosion) places in the catchment.
- Meeting with the local farmer union to explain the situation and the problem of **point sources**
 - *Workshop building biofilter at the local farmers advisory (PCFruit):
 - 8 biofilters built in December 2015
 - 8 biofilters built in March 2016
 - *App for fruit growers (almost 150 fruit growers)
 - *Articles in monthly magazines of the local communities
- **Contractor** Porta: Fill and rinsing place is installed before the beginning of May 2016
- From 2017 use of **drift reducing nozzles** is obligatory
- Information to **local inhabitants**

MILIEU

Waterkwaliteit: ook u kunt helpen!

De lente is volop bezig, alles groeit en bloeit. Het ideale moment om de tuin, de paden en/of de oprit een oprisbeurt te geven. Niet daarom willen we iedereen wijzen op het verantwoord omgaan met onkruidbestrijdingsmiddelen. We moeten nog altijd vaststellen dat er bestrijdingsmiddelen worden teruggevonden in beken en andere waterlopen.

Bestrijdingsmiddelen kunnen bij huis- en tuingebruik op twee manieren in het oppervlaktewater terecht komen. Enerzijds rechtstreeks door het gebruik van deze middelen op de taluds van de beek en anderzijds via het rioleringsnetwerk. Wat veel mensen niet weten is dat het rioleringsnetwerk in Vlaanderen niet overal gesloten is. Dit betekent dat op verschillende plaatsen rioleringsbuizen niet zijn aangesloten op een zuiveringsstation, maar rechtstreeks in de beek terecht komen. Concreet komen dus middelen die afspoelen van verharde oppervlakten (straten, opritten,...) of middelen die rechtstreeks in de straatkolk, het terrasputje of de gootsteen worden uitgooten, ongezuiverd in het oppervlaktewater. Het is de openbare diensten verboden van nog bestrijdingsmiddelen te gebruiken, mits enige uitzonderingen. Ook de gemeente Gingelom is overgeschakeld naar een pesticidenvrij beheer van de openbare ruimte sinds 1 januari 2015. Maar ook u als particulier kan uw steentje bijdragen. Bewuster omgaan met chemische middelen of alternatieven gebruiken, kunnen een bijdrage leveren aan een betere waterkwaliteit van onze beken.

Bewuster omgaan met chemische middelen

- Het is verboden om de talud van de beek te sproeien met onkruidbestrijdingsmiddelen. U dient **minstens 1 m van de taludinsteeek** (zie fig.) te blijven
- **Lees goed het etiket** op het middel en leng conform het etiket aan met water: **Een hogere concentratie geeft geen beter effect.**
- Voor kleinere oppervlakten, koop een **'klaar voor gebruik'** middel, dat al gedoseerd is voor het juiste gebruik.
- Gebruik **de juiste hoeveelheid** voor het overeenkomstig te behandelen oppervlak. Op die manier vermijdt u overmatig of te veel product in de ruggroeper.
- De reiniging van de ruggroeper dient te gebeuren op een onverhard oppervlak. Het water waarmee het toestel is gereinigd kunt u verspreiden over het behandelde oppervlak. **Vermijdt ten allen tijde een afloop naar de straatkolk, het putje of de riolering.**

Voor meer informatie kunt u altijd terecht op www.phytofar.be/nl/Huis-en-tuinproducten.

Alternatieven

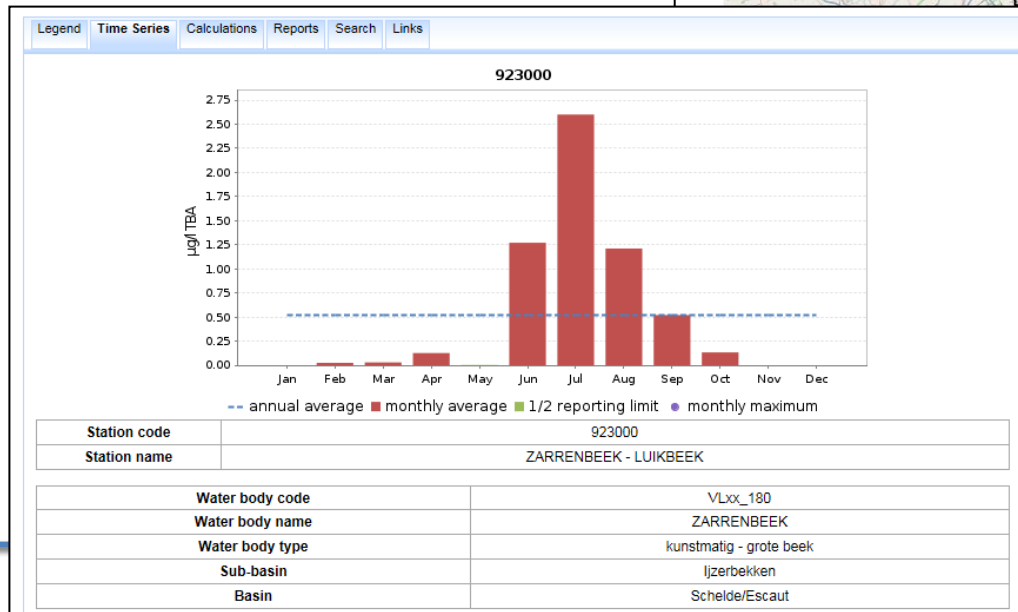
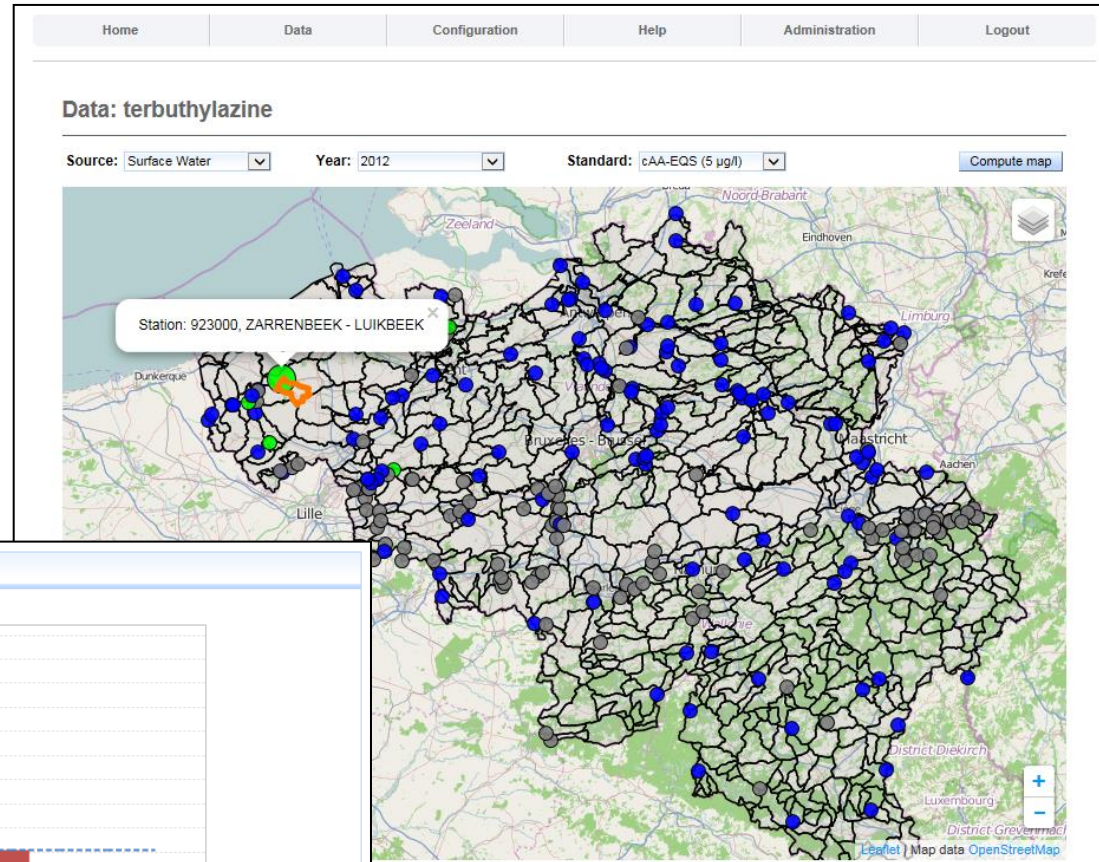
- **Voorkomen is beter dan genezen.** Bepaalde keuzes bij het ontwerp en de aanleg van de tuin zorgen ervoor dat men nadien minder last heeft van ongewenste kruidgroei.
- Onderhoud: **regelmatig vegen** voorkomt opstapeling van organisch materiaal en dus ongewenste kruidgroei.
- **Mechanische alternatieven** zoals borstelen, maaien of waterstralen.
- **Thermische alternatieven** zoals hete vlam, hete lucht, heet water, stoom,... De temperatuur moet boven de 58°C liggen.

Voor meer informatie kunt u altijd terecht op de website www.zonderisgezonder.be.



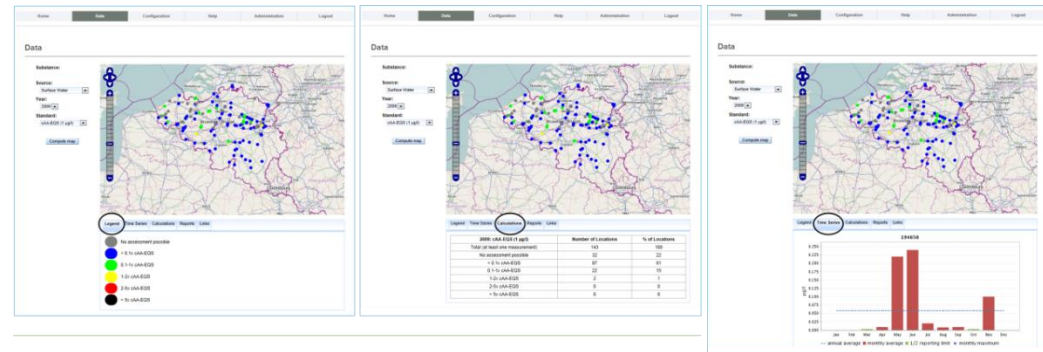
COLLABORATIVE TOOLS (GIS + MODELS)

- *Harmonised data*
- *Easy access*
- *Link action to water quality*
- *Visualise landscape*
- *Show impact of behaviour*

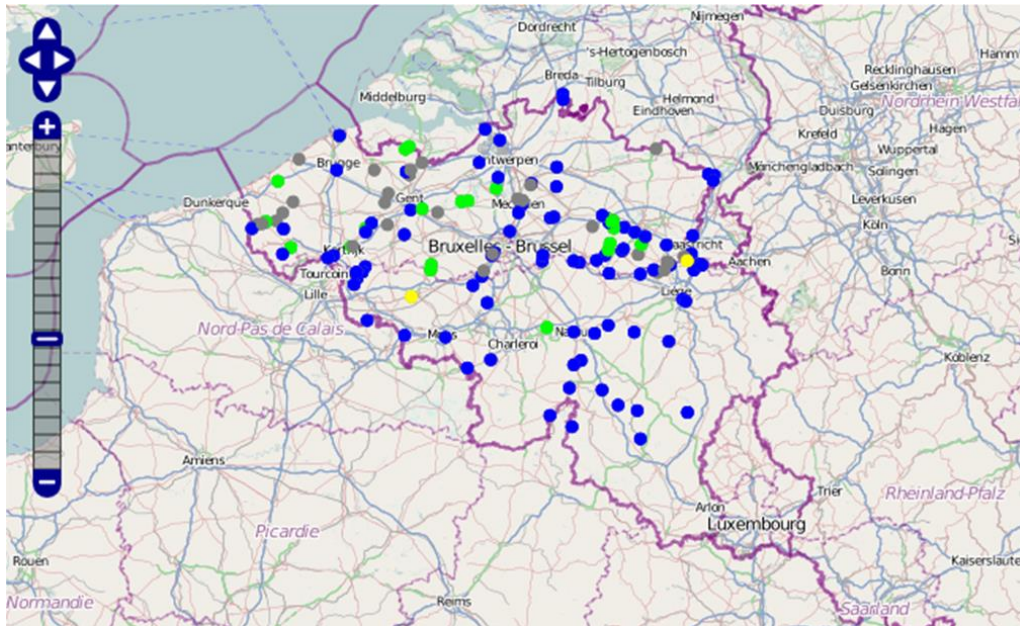


Inspiration ? WaterProtect BE !

- **WaterProtect BE** – A webtool for geospatial analysis of pesticides in groundwater and surface water in Belgium
- **WaterProtect 1.0 (2013):** reporting to federal administration
 - Visualization of (regional) pesticide monitoring data
 - On map
 - In graphs
 - Statistics
 - Reports
 - Overview for a region
 - Details for a selected monitoring location
 - User management with protected access
 - Uniform database



- Reporting tool for surface water and groundwater monitoring data
- Facilitates the use and interpretation of the available monitoring data
- Converts a pile of data into an easily and online accessible source of information

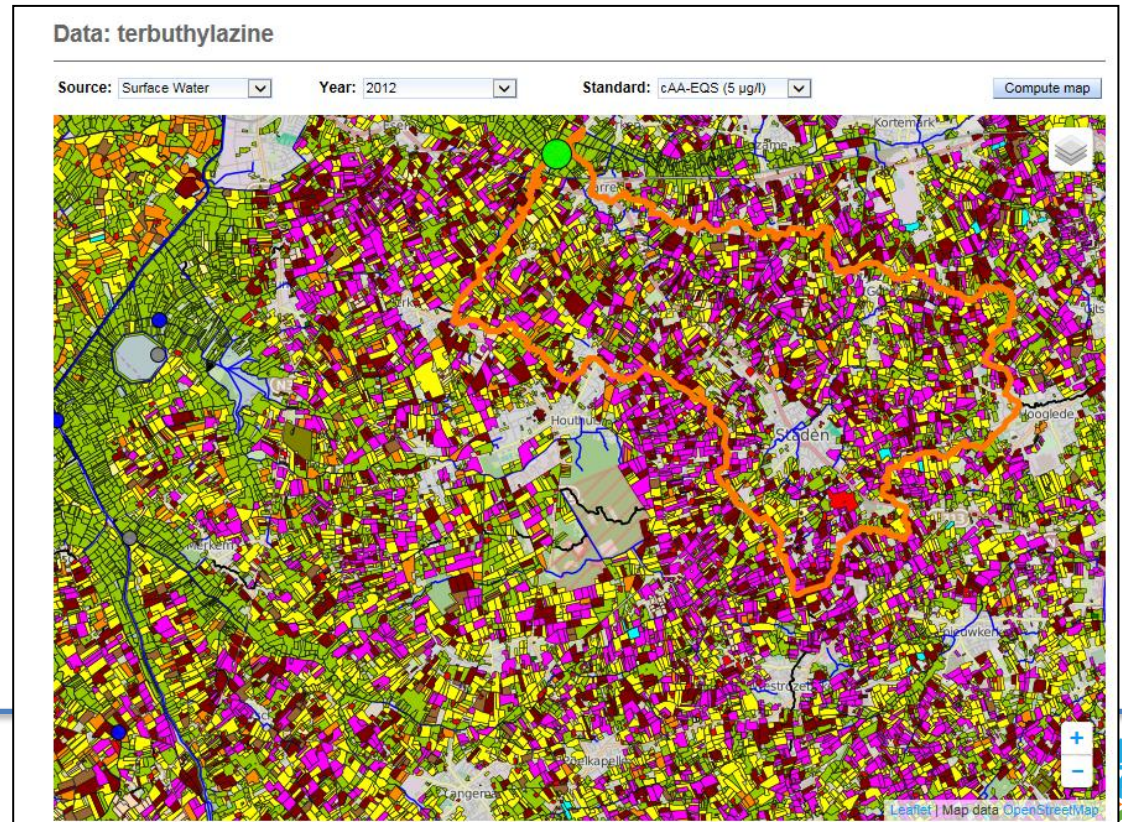


<http://demo.water-protect.be/>
username: demoSUB1
password: demo

- Extension of database with more monitoring data and new substances
- Addition of more maps to allow interpretation of the monitoring data
 - Improved water courses map
 - Subcatchment associated with monitoring location
 - Land-use: crop type at the field scale (maps & statistics)

Land use

	Sugar beets
	Maize
	Cereals, seeds and legume
	Woody crops
	Potatoes
	Grassland
	Fodder
	Vegetables, spices and ornamentals
	Fruit and nuts
	Flax and hemp
	Other crops
	Water
	Agricultural infrastructure



Time series

Home | **Data** | Configuration | Help | Administration | Logout

Data: terbuthylazine

Source: Surface Water | Year: 2012 | Standard: cAA-EQS (5 µg/l) | Compute map

Legend | **Time Series** | Calculations | Reports | Search | Links

923000

Station code	923000
Station name	ZARRENBEEK - LUIKBEEK
Water body code	VLxx_180
Water body name	ZARRENBEEK
Water body type	kunstmatig - grote beek
Sub-basin	Ijzerebekken
Basin	Schelde/Escaut



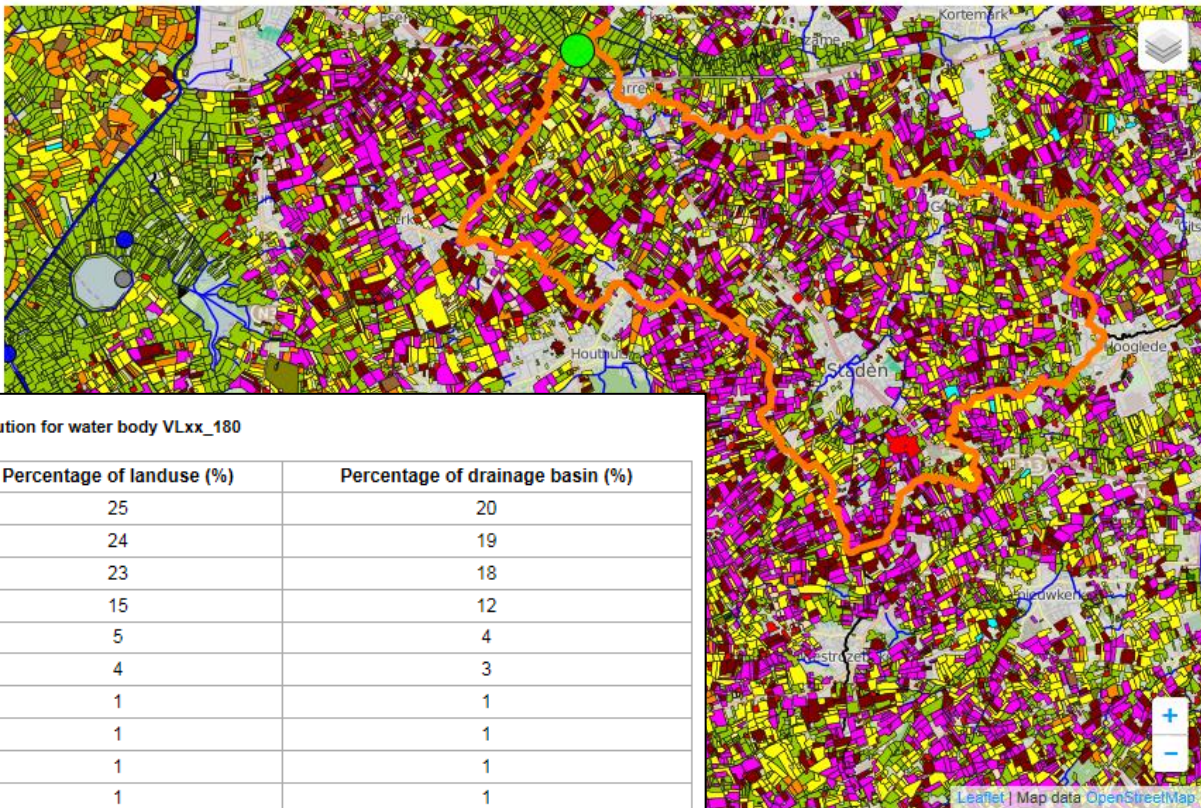
Land use

- Sugar beets
- Maize
- Cereals, seeds and legume
- Woody crops
- Potatoes
- Grassland
- Fodder
- Vegetables, spices and ornamentals
- Fruit and nuts
- Flax and hemp
- Other crops
- Water
- Agricultural infrastructure

Home
Data
Configuration
Help
Administration
Logout

Data: terbuthylazine

Source:
Year:
Standard:
[Compute map](#)



Land use distribution for water body VLxx_180

Land use description	Area (ha)	Percentage of landuse (%)	Percentage of drainage basin (%)
Maize	823.07	25	20
Vegetables, spices and ornamentals	776.51	24	19
Grassland	747.91	23	18
Potatoes	499.76	15	12
Agricultural infrastructure	148.95	5	4
Cereals, seeds and legume	129.79	4	3
Sugar beets	47.74	1	1
Fodder	24.12	1	1
Other crops	23.69	1	1
Fruit and nuts	22.23	1	1
Flax and hemp	4.03	0	0
Water	1.55	0	0
Woody crops	0.78	0	0
Total land use	3250.15	100	78
Total drainage basin	4144.54	-	100

Legend Time Series Calculations **Reports** Search Links

Preferences

As default report period the last five years are taken.
Report period: 2009 - 2013

Reports for a region

- [Country report for TBA in surface water \(Belgium\)](#)
- [Country report for TBA in groundwater \(Belgium\)](#)
- [Region report for TBA in surface water \(Flanders\)](#)
- [Region report for TBA in groundwater \(Flanders\)](#)
- [Region report for TBA in surface water \(Wallonia\)](#)
- [Region report for TBA in groundwater \(Wallonia\)](#)
- [Exceedance report for TBA in surface water \(Belgium\)](#)
- [Exceedance report for TBA in groundwater \(Belgium\)](#)
- [Exceedance report for TBA in surface water \(Flanders\)](#)
- [Exceedance report for TBA in groundwater \(Flanders\)](#)
- [Exceedance report for TBA in surface water \(Wallonia\)](#)
- [Exceedance report for TBA in groundwater \(Wallonia\)](#)

Reports for all stations

- [All location reports for TBA in surface water](#)
- [All location reports for TBA in groundwater](#)

Reports for selected station 923000

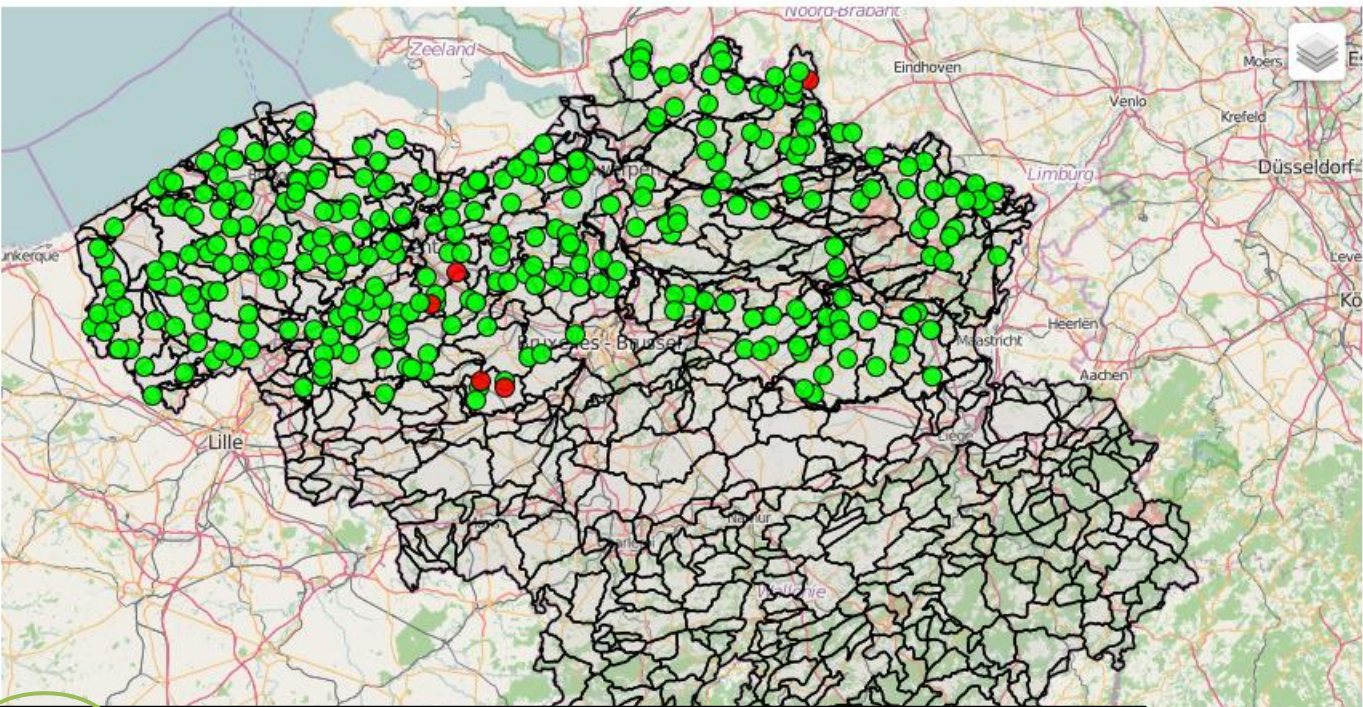
- [Location report for TBA in surface water](#)



Groundwater wells

Data: metazachlor

Source: Year:



Legend Time Series **Calculations** Reports Search Links

2012: GW Limit	Number of Locations	% of Locations
Total (at least one measurement)	310	100
No assessment possible	0	0
≤ 0.1 µg/l	305	98
> 0.1 µg/l	5	2

Groundwater and landuse

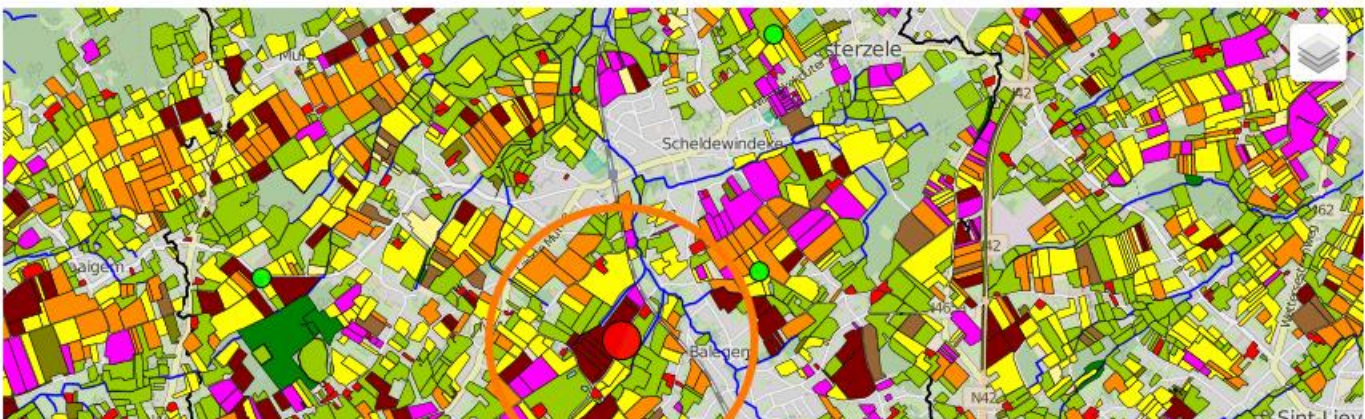
Land use

- Sugar beets
- Maize
- Cereals, seeds and legume
- Woody crops
- Potatoes
- Grassland
- Fodder
- Vegetables, spices and ornamentals
- Fruit and nuts
- Flax and hemp
- Other crops
- Water
- Agricultural infrastructure

Home Data Configuration Help Administration Logout

Data: metazachlor

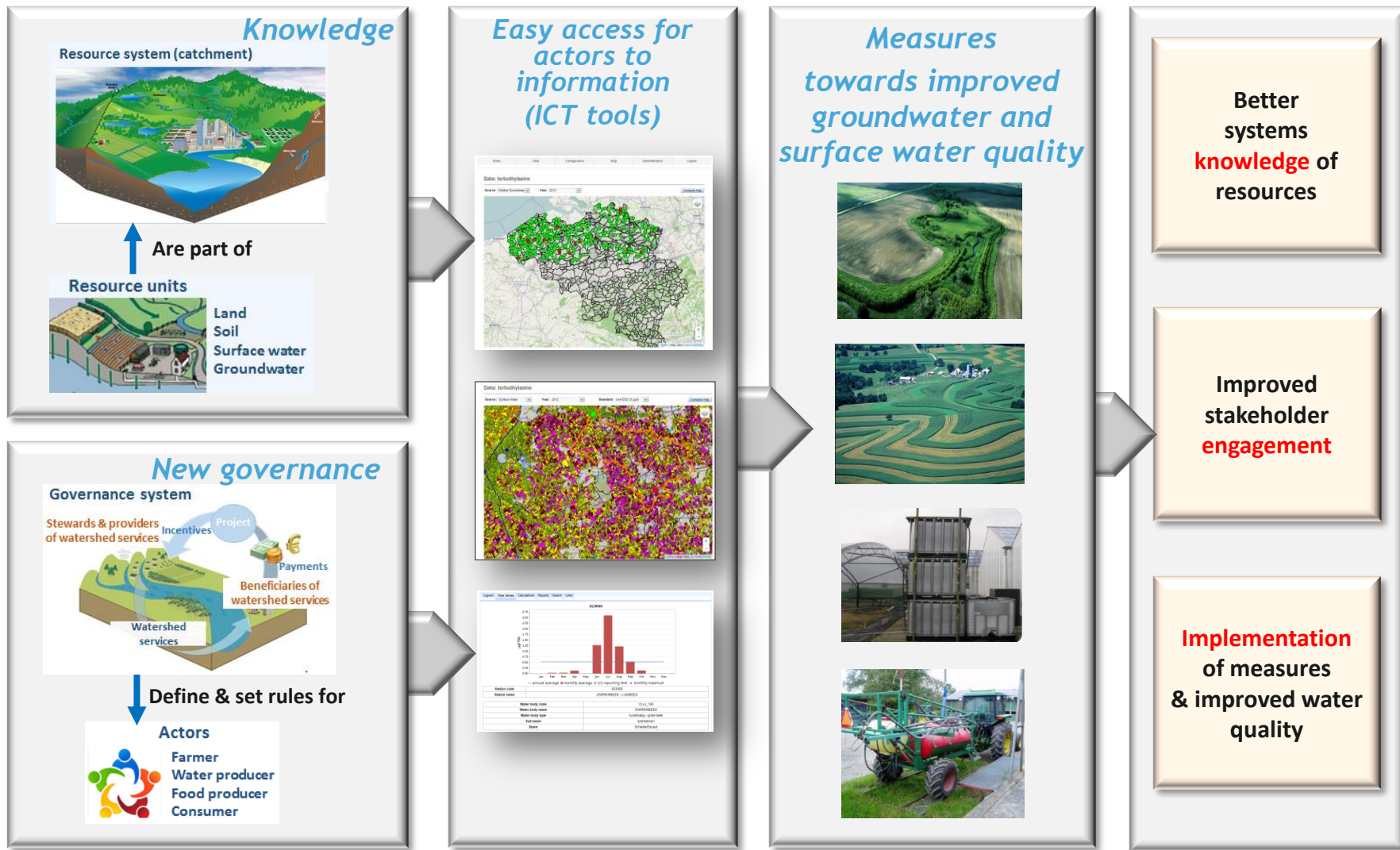
Source: Year:



Land use distribution for station 474/74/1 (1 km circle)

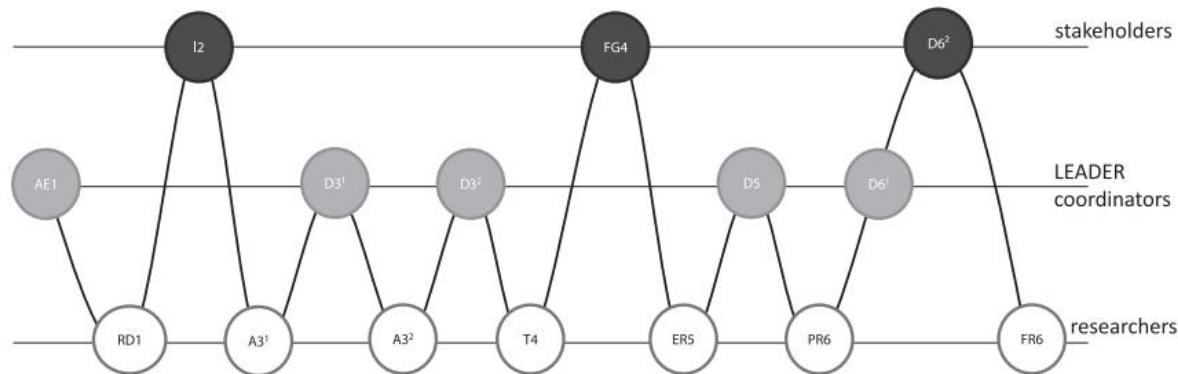
Land use description	Area (ha)	Percentage of landuse (%)	Percentage of 1 km circle (%)
Grassland	64.77	31	21
Maize	57.33	27	18
Cereals, seeds and legume	38.64	18	12
Potatoes	26.22	13	8
Vegetables, spices and ornamentals	12.19	6	4
Agricultural infrastructure	5.07	2	2
Sugar beets	2.02	1	1
Fodder	1.28	1	0
Other crops	1	0	0
Water	0.33	0	0
Fruit and nuts	0	0	0
Woody crops	0	0	0
Flax and hemp	0	0	0
Total land use	208.85	100	66
Total 1 km circle	314.16	-	100

ACTION LAB MULTI-ACTOR MANAGEMENT



The social perspective: multi actor approach

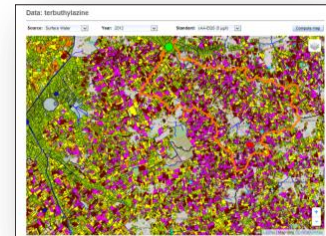
- A transparent and fair process
- Visualization of the process for better understanding
- An equal involvement of all actors
- A neutral start for the process by sharing common objectives and a common language
- Social and emotional dynamics to encourage overall group functioning



Key: the colors indicate specific meeting constellations (white: scientists; grey: project meetings; black: stakeholder meetings). Each circle mirrors a specific activity. The number in the circle refers to the specific stage of the process. The capital characters indicate a specific activity:

AE: assignment and exploration	T: translation
RD: research design	FG: focus group
I: interviews	ER: extensive report
A: analysis	PR: provisional report
D: discussion	FR: final report

Impacts	Targets
multi-actor approach for a close cooperation and sharing of information and knowledge	40 training events 500 interactions webtools
sustainable impact on diffuse pollution and point sources at action lab level	13 mitigation systems installed or demonstrated
reduction of costs of water treatment	trend to improvement of water quality
harmonised datasets on water quality	7 harmonised datasets in 7 countries available through web
co-created participatory monitoring approaches	350 farmers + consumers participating 175 users of the webtool
water governance models that lead to higher adoption rates of best management practices	14 BMPs implemented through the governance process
strong multiplier effect to extend best practices across Europe and to translate the lessons into policy reforms and actions	6 EU workshops initiate EIP Water Governance in Agriculture



WATERPROTECT CORE PARTNERS



Project management



www.vito.be

Multi-actor management



www.ilvo.be

Upscaling to EU



www.ewp.eu

Romanian action lab



www.ecologic.org.ro

Belgian action lab



www.inagro.be

Danish action lab



www.geus.dk

Polish action lab



www.pgi.gov.pl

Irish action lab



www.teagasc.ie

Italian action lab



www.unicatt.it

Spanish action lab



www.csic.es

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement No. 727450



- **Action lab actors (17 local project partners)**
 - Environment Agencies
 - Drinking water producers
 - Consumer organisations
 - Local communities
 - Farmers advisory
- **Action lab stakeholders (30 local organisations signed letters of Support)**
 - Local rural networks
 - Farmers unions
 - Fertilizer and plant protection products industry
 - NGO's and nature conservation
 - Ministeries: environment, agriculture
- **EU level stakeholders (WaterProtect Advisory Board)**
 - COPA-COGECA (Farmers)
 - ECPA (Plant protection industry)
 - CEEP (Water producers)
 - BelFertil (Fertilizer industry)
 - EFBW (Mineral Water Bottlers)
 - EU expert = Jenny 😊
- **EU policy (DG RTD and DG AGRI)**
 - EIP Agri

Questions ?

- I have !