

# Reducing the presence of pharmaceuticals at the catchment scale - Interreg project noPILLS

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*Summary of the presentation at Science-Policy Event (21.11.2013, Brussels, Belgium) by Sven Lyko, Emschergerossenschaft/Lippeverband, Essen, Germany*

Emschergerossenschaft and Lippeverband (EGLV) are two public water boards located in the federal state of North-Rhine Westfalia, the most populated state in Germany. As public corporations they are managing the natural catchment of the rivers Emscher and Lippe with different services around the water cycle. With almost 1 billion m<sup>3</sup> sewage they are the largest German operator of wastewater treatment plant (in total 60 WWTPs).

In the past seven years EGLV initiated and participated in several research and communication projects dealing with micropollutants in the aquatic environment. Part of these R&D projects was the implementation and operation of several full-scale applications for micropollutant removal from wastewater (membrane bioreactors, ozonation, activated carbon adsorption, hospital wastewater treatment) and several monitoring campaigns. Without legal requirements according to the current Water Framework Directive (WFD) all these activities were conducted on own effort.

Based on results of above mentioned activities EGLV suggests a more balanced evaluation. On the one hand advanced techniques for full-scale applications sometimes allow for an improvement of the aquatic environment and for reduced risks. On the other hand the end-of-pipe solution doesn't lead to zero discharges. Furthermore, the increased energy demand and costs are not in every case reflected by an ecological benefit.

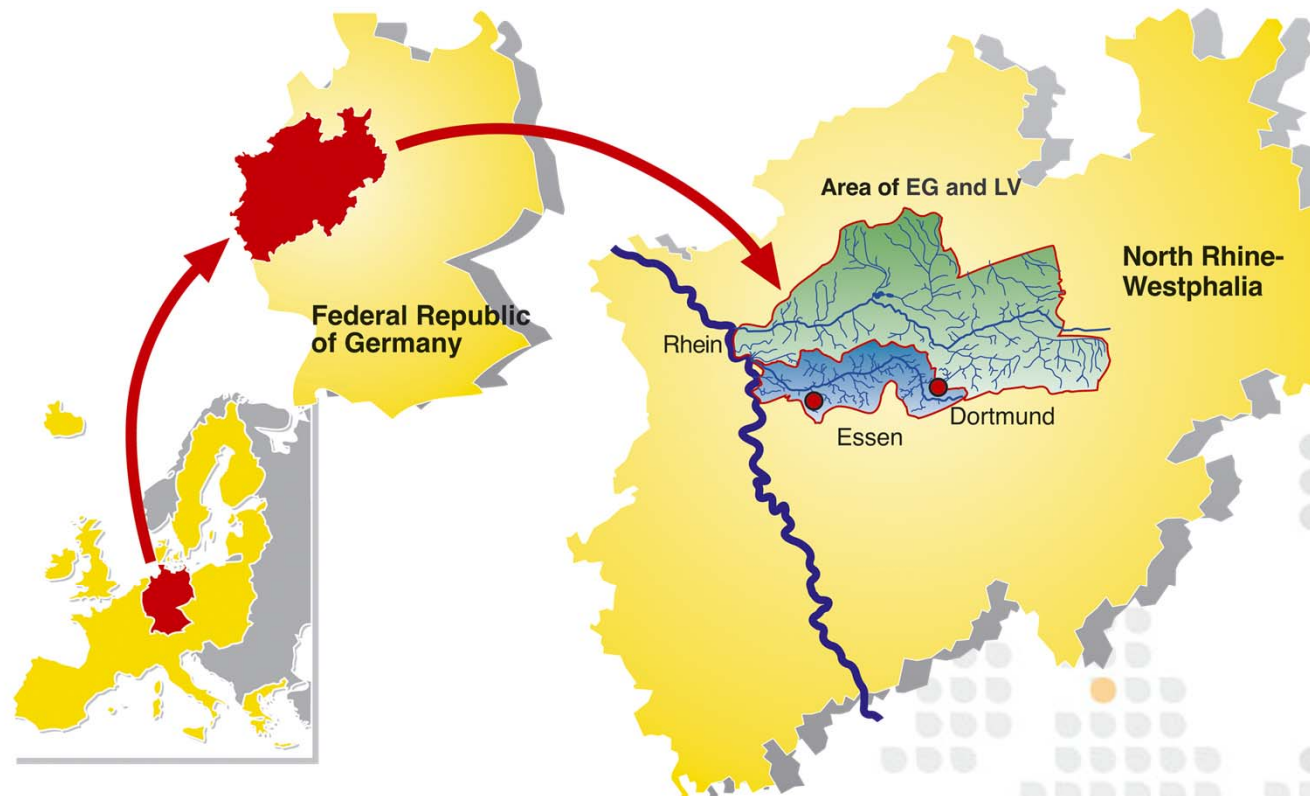
The existing lack of data and the lack of scientific knowledge on the fate and effect of micropollutants in the aquatic environment ask for ongoing research. Up to now it is well-known that avoidance and source control are more sustainable than end-of-pipe solutions.



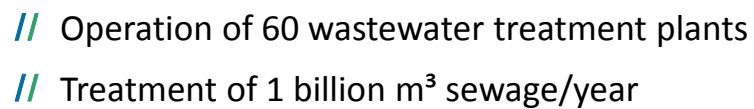
# Reducing the presence of pharmaceuticals at the catchment scale

## Interreg project noPILLS

Sven Lyko and Issa Nafo  
Emschergenossenschaft/ Lippeverband



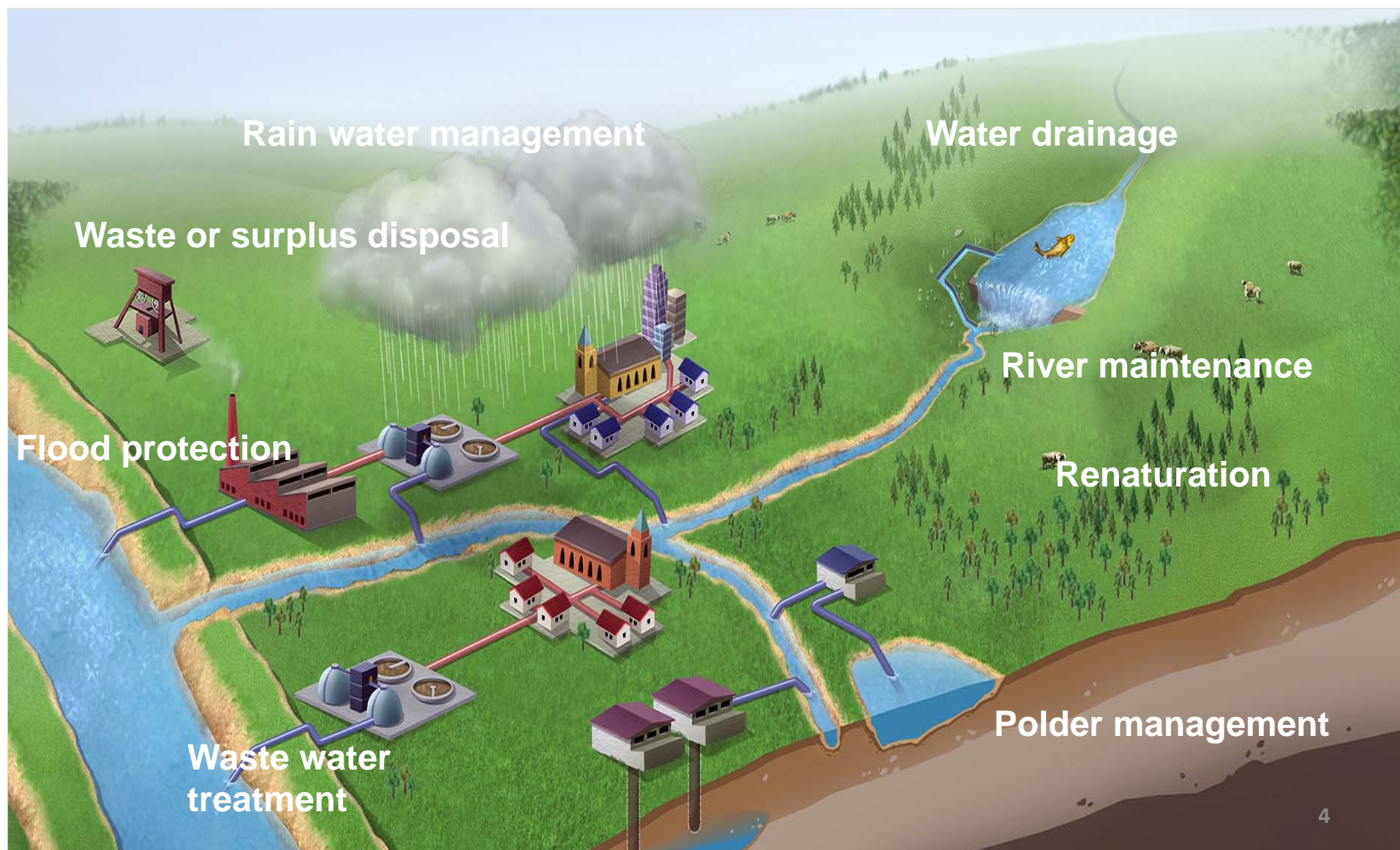
- // 2 public water boards working as a joint company since approx. 100 years
- // Non profit public corporations
- // Different services around the water cycle



	Area (km²)	Population (Mio)	Population/km²
Lippeverband	3,280	1.4	427
Emschergenossenschaft	865	2.4	2,775

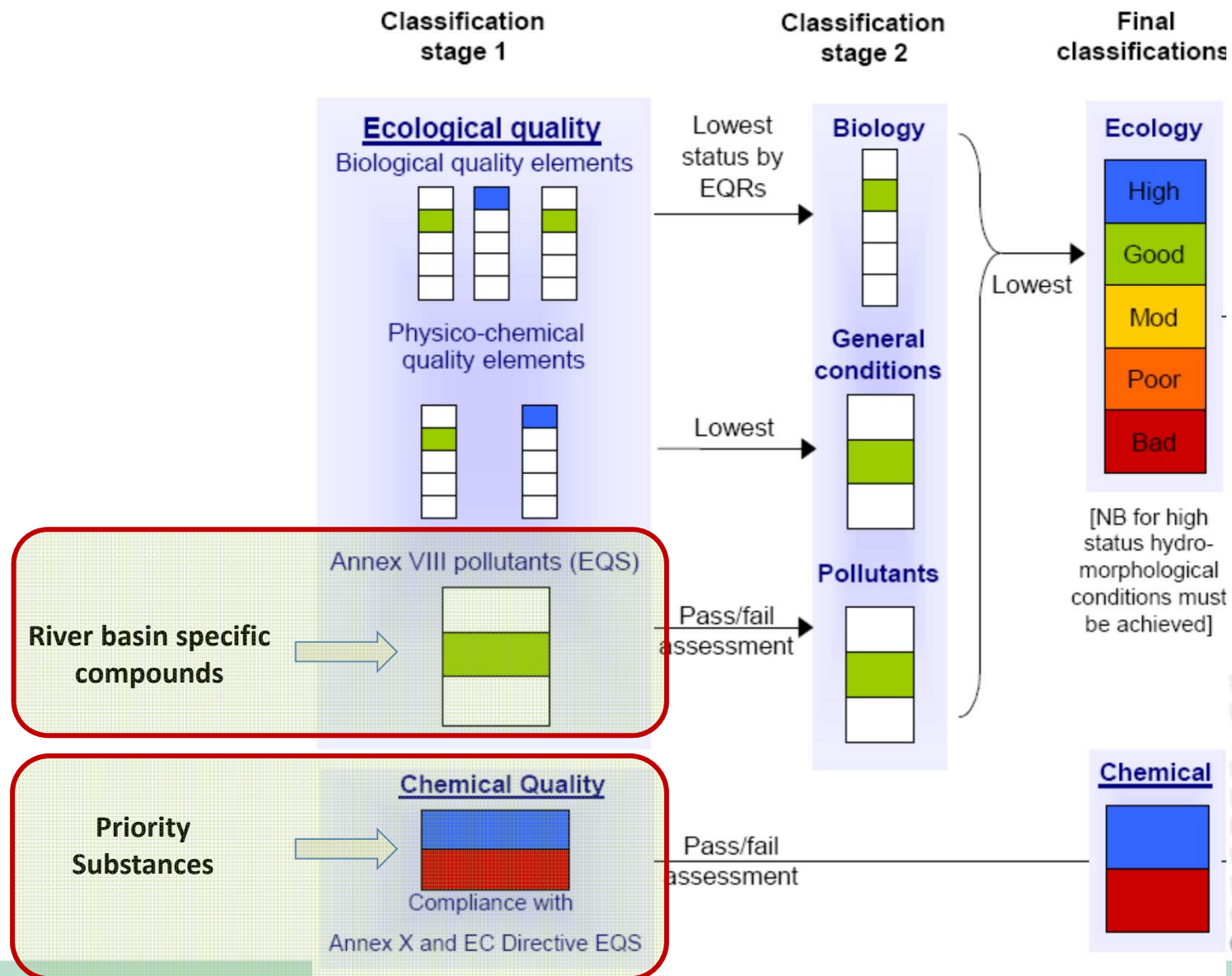


## Integrated water management





Link to WFD – Pharmaceuticals in the assessment of the „good status“







Link to WFD – Schedule and implementation planning (pharmaceuticals)



- Update of the „List of priority substances“ (recently)
- National implementation until autumn 2014 (OGewV)

#### For more stringent regulated priority substances

- From 2015 New EQS
- From 2014 Integration in management plan (2015-21)
- From 2021 Achievement of classification „good chemical status“

#### For „new“ added substances

- 2018 UQN für neue Stoffe gültig
- From 2018 Integration in national monitoring
- From 2021 Integration in management plan
- From 2027 Achievement of classification „good chemical status“

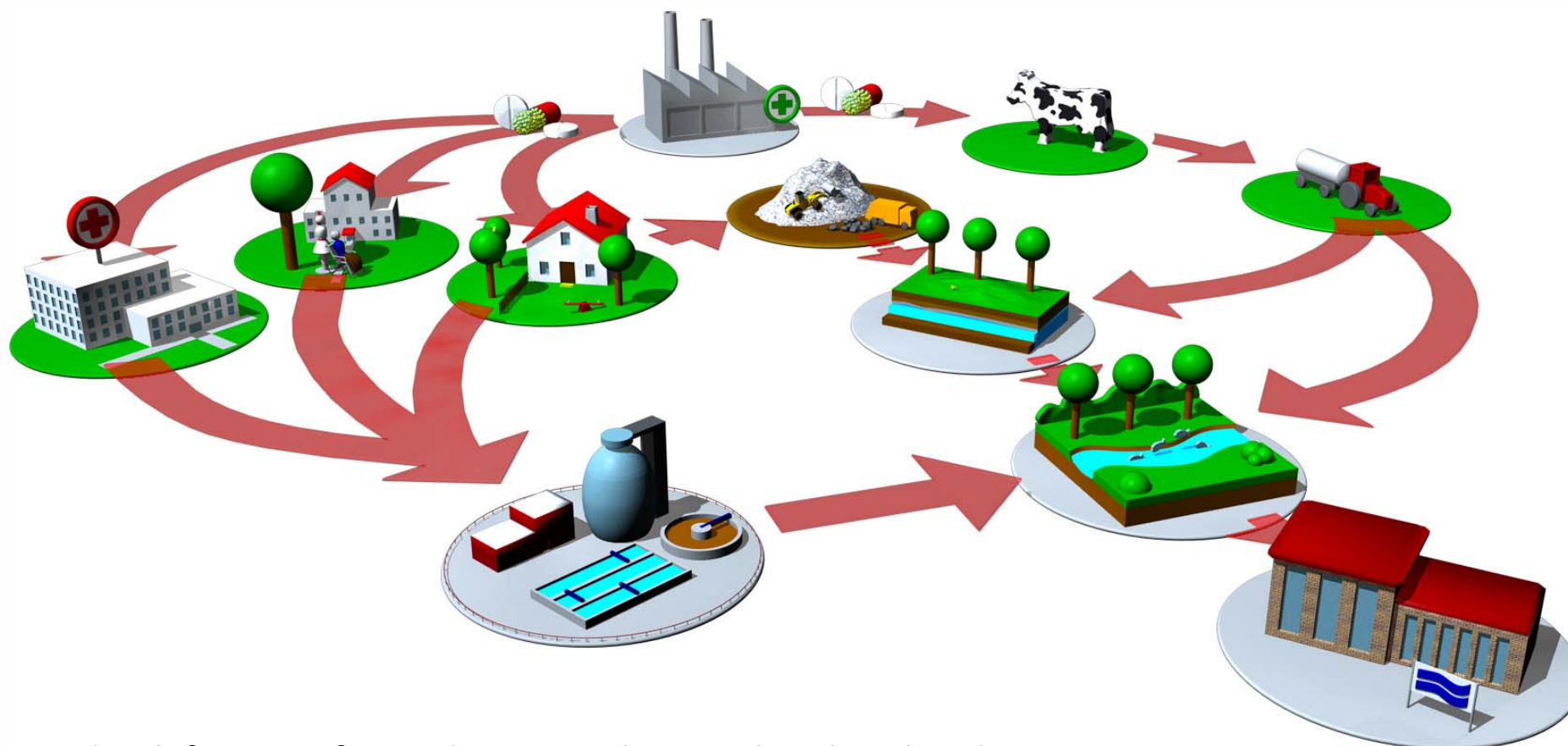
#### „Watch list“

- First publication within 1 year
- Updating every 2 years (limited to 10 (14) compounds)
- Definition of EQS probably within 4 years

#### Watch list (for now):

17 $\alpha$ -Ethinylestradiol  
17 $\beta$ -Estradiol  
Diclofenac

## Context – The pathways of pharmaceuticals in relation to the water cycle



The definition of a catchment is always related to the objective.





## Investigated WWTPs (Micropollutants)

**MBR**



KA Hünxe  
(15 000 PE)

KA Dülmen  
(55 000 PE)



**PAC**



KA Bad Sassendorf  
(13 000 PE)



Marienhospital Gelsenkirchen  
(1 000 PE)

**MBR + O<sub>3</sub> + PAC**

- Technical measures
- Monitoring
- Information/ communication

**O<sub>3</sub>**

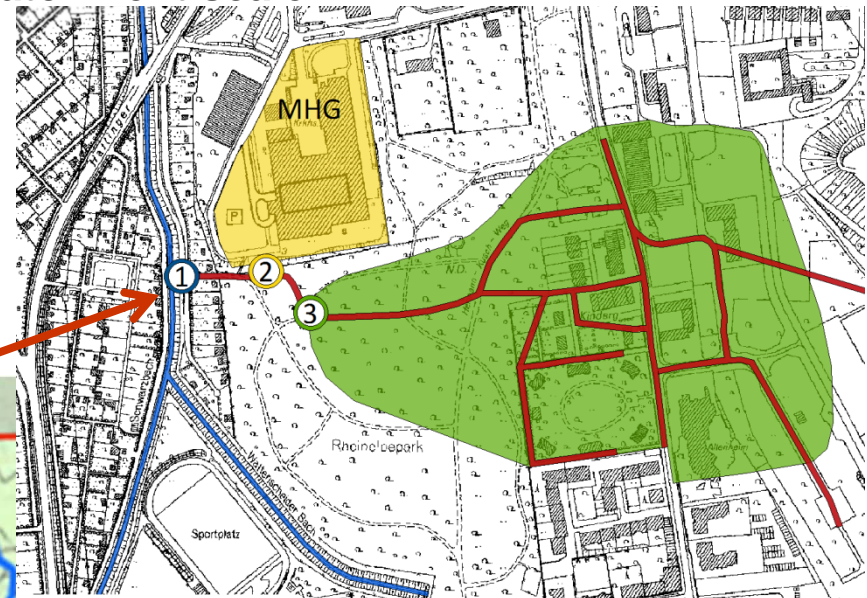




## Point source emission of pharmaceuticals at catchment scale

### 2 Effluent of Marienhospital

Wastewater flow 2.5 L/s



1

### Schwarzbach

Catchment area: 15 km<sup>2</sup>  
No. of Inhabitants: 76,500  
Wastewater flow: 334 L/s



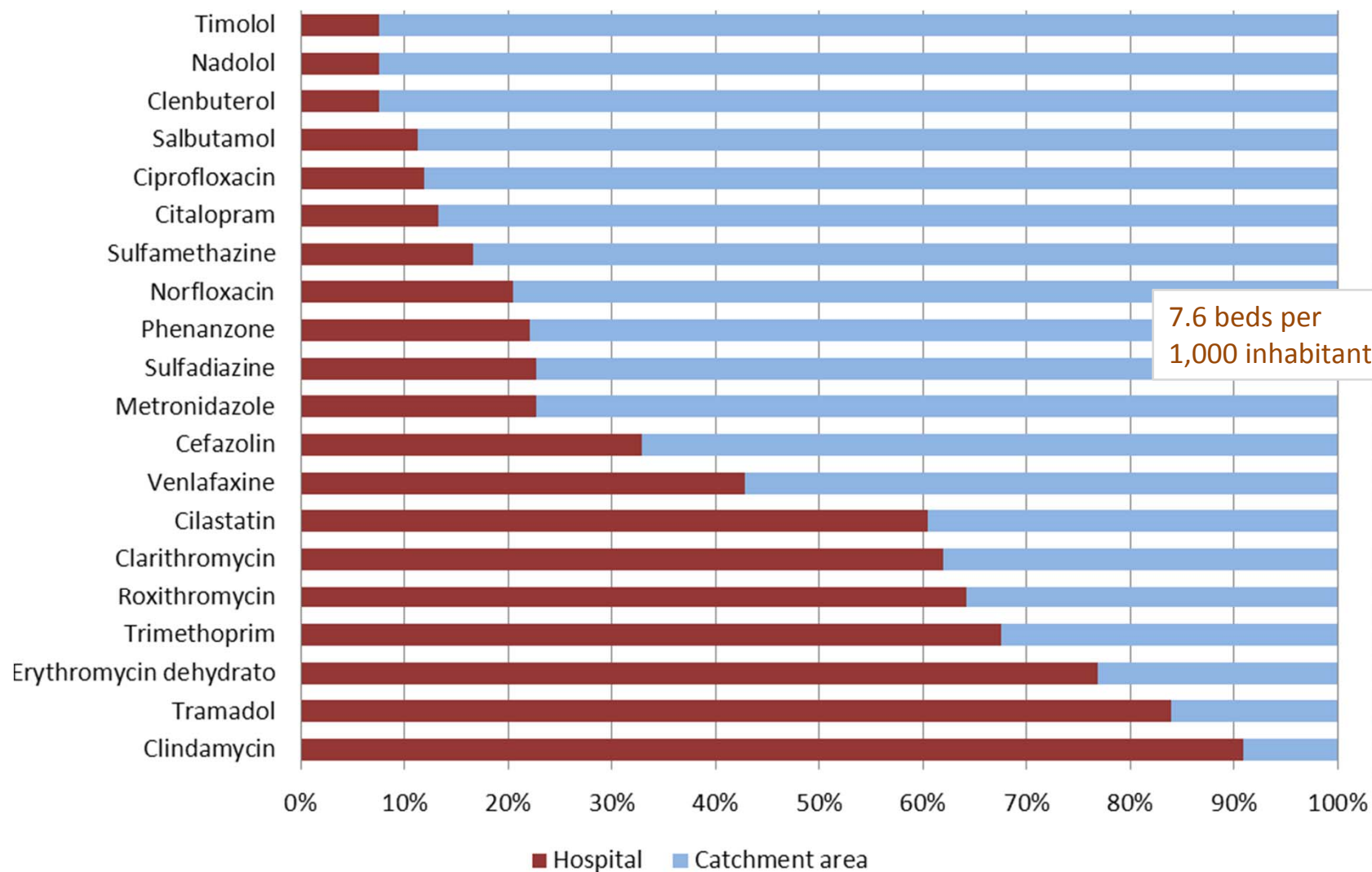
3

### Connecting sewer

Catchment area: 5,9 ha  
No. of Inhabitants: 735  
Wastewater flow: 0.8 L/s



## Compound-specific consideration is needed







## EOP case study: WWTP Bad Sassendorf (13,000 PE)

- Efficiency regarding micropollutant removal:
  - Conventional activated sludge system (CAS)
  - CAS with tertiary treatment (low dose ozonation)
  - CAS with tertiary treatment (high dose ozonation)
- Internal results (non-published)
- 24h-composite samples (n=10 to 40)
- 29 PPCPs (pharmaceuticals, PCPs, contrast media, disinfectants)
- Presentation as sum parameter of 29 PPCPs

## Overview of the selected 29 PPCPs

Carbamazepin	Antiepileptics
Carprofen	Analgesics / Anti-Inflammatories
Cashmeran	Musk compounds
Celestolide	Musk compounds
Clofibrinsäure	Lipid Regulators
<b>Diclofenac</b>	Analgesics / Anti-Inflammatories
Fenoprofen	Analgesics / Anti-Inflammatories
Flurbiprofen	Analgesics / Anti-Inflammatories
Galaxolide	Musk compounds
Gemfibrocil	Lipid Regulators
Ibuprofen	Analgesics / Anti-Inflammatories
Indometacin	Analgesics / Anti-Inflammatories
Indoprofen	Analgesics / Anti-Inflammatories
Iohexol	X-ray contrast media

Up to now:

Compounds being discussed in the context of advanced (municipal) wastewater treatment techniques are only partially covered by the existing WFD.

## Micropollutant removal at WWTPs?

- 2 technologies applicable at full-scale
- Precautionary principle
- Sometimes improvement for aquatic environment
- Reduction of risks for humans possible
- ...



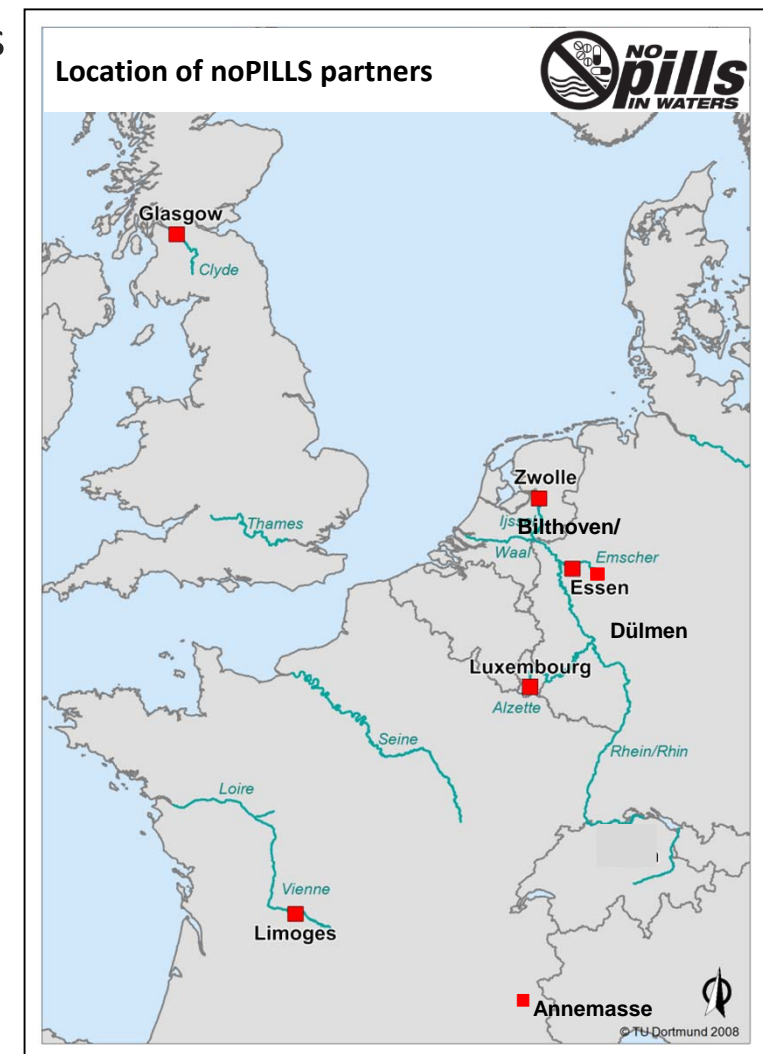
- Only „end-of-pipe“
- Increase of energy demand
- Increase of costs
- No zero discharge
- Ecological benefit vague
- ...





Six partners from five European Member States

- Emscher-genossenschaft (DE),  
Lead Partner
- RIVM (NL)
- CRP Henri Tudor (LU)
- Lippeverband (DE)
- Glasgow Caledonian University (UK)
- Université de Limoges (FR)
- Budget: 8.8 Mio. €
- ERDF funding: 50 %





## Objectives of the project

1. **awareness raising**  $\Rightarrow$  all partners
2. **reduction** of pharmaceutical consumption **by changing behavior** of prescription and consumption (avoid or reduce consumption, application of biodegradable substances)  $\Rightarrow$  D, UK, NL
3. **Improve waste water treatment** and resource efficiency  $\Rightarrow$  D, L, F, (NL)
4. **Impact assessment** for measures accompanying awareness raising
  - road bag study  $\Rightarrow$  L
  - comprehensive regional public campaigns  $\Rightarrow$  D
5. All: **Recommendations** “messages to Europe” on strategic and technical measures (Water Framework Directive? Threshold value? Ban of substances?)



noPILLS @ LV = DSADS in Dülmen



1

**Information & Awareness raising  
for the reduction of  
pharmaceuticals at the source**



What can be done by the health care sector?



What can be done by the citizen?



2

**Construction of tertiary treatment  
at the municipal WWTP Dülmen  
(powdered activated carbon)**



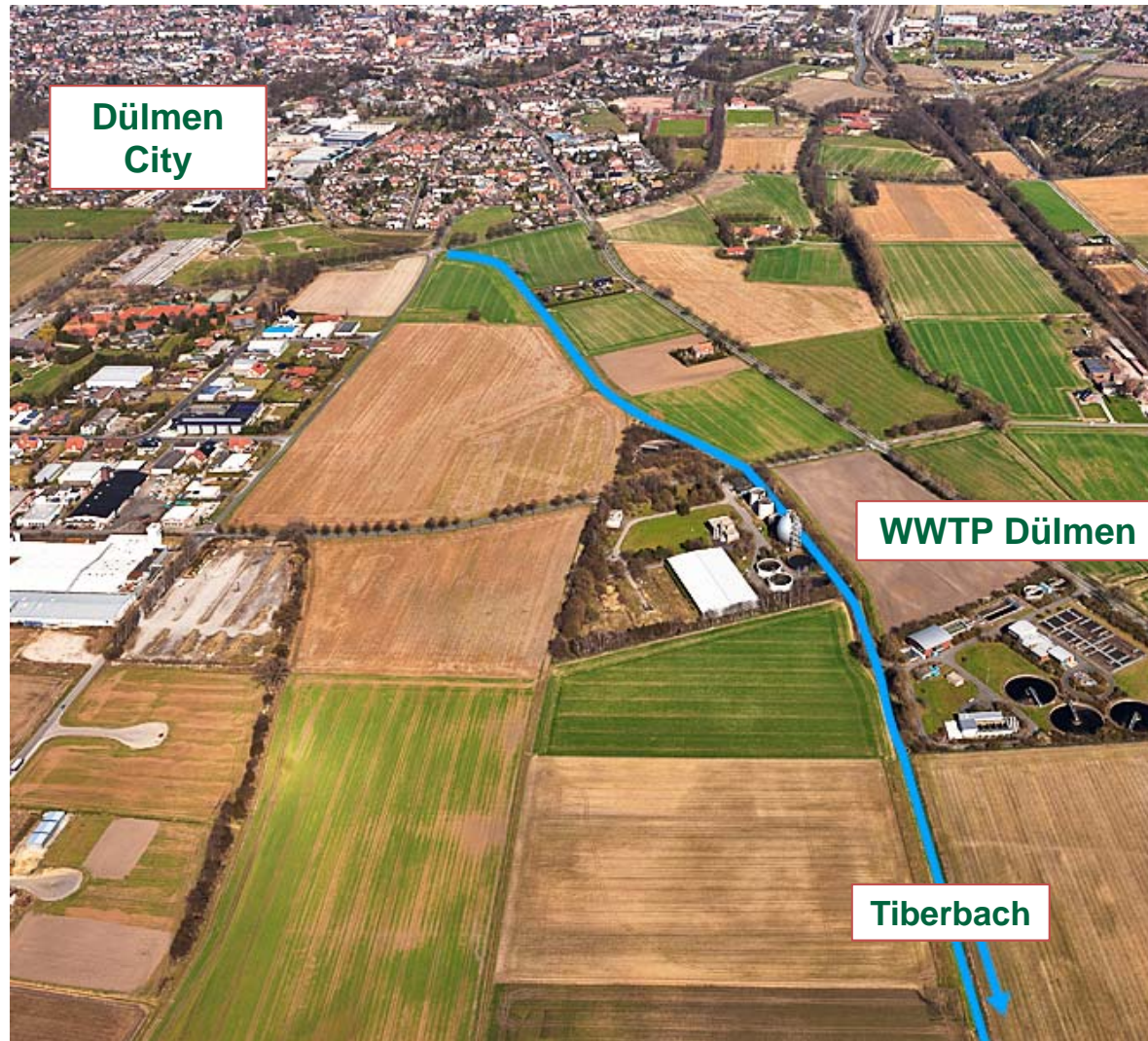




## Good status after micropollutant removal?



Sampling campaigns in the small river upstream and downstream the WWTP



- Sampling campaigns before the installation of tertiary treatment (reference)
- Sampling campaigns in the small river
- Monitoring of WFD relevant parameters
- Analysis of stress markers in aquatic organisms (sediment analysis)



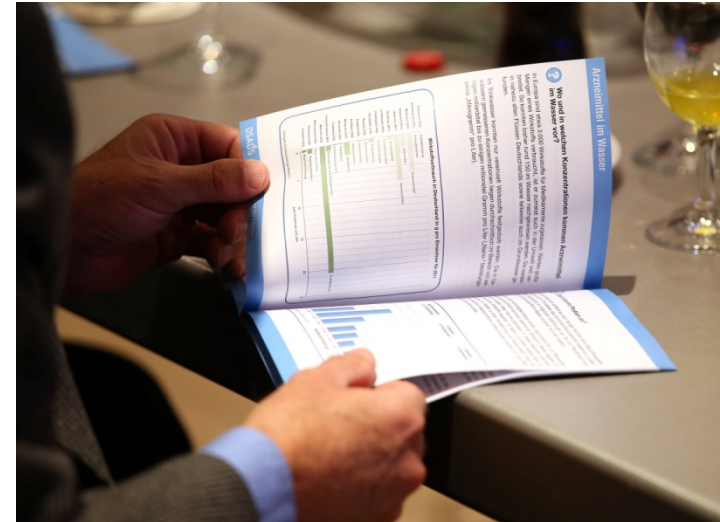


Getting into contact with the people at local events (Dülmener Bürgertreff )



First Special conference  
with local pharmacists and  
doctors (2.10.2013) on

„What can be done by  
pharmacists and doctors?“





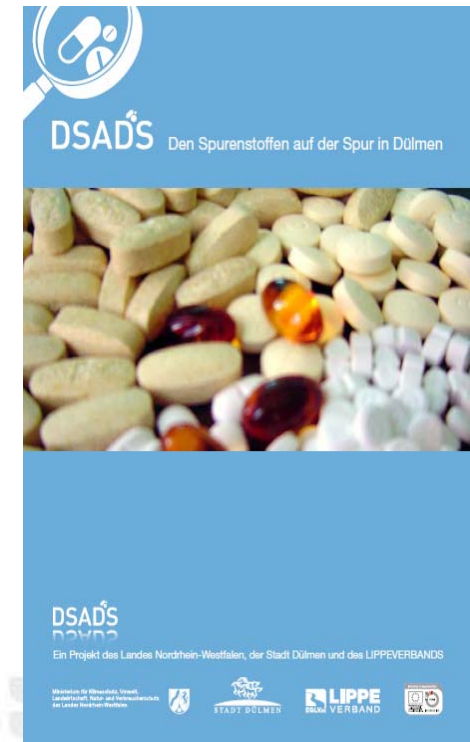


Avoidance and source control are more sustainable than end-of-pipe solutions

[www.dsads.de](http://www.dsads.de)

[www.no-pills.eu](http://www.no-pills.eu)

[www.pills-project.eu](http://www.pills-project.eu)



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