



Fakulta rybnářství  
a ochrany vod  
Faculty of Fisheries  
and Protection  
of Waters

Jihočeská univerzita  
v Českých Budějovicích  
University of South Bohemia  
in České Budějovice

**CENAKVA**

South Bohemian Research Center  
of Aquaculture and Biodiversity  
of Hydrocenoses

# The potential of biological ponds in the removal of micropollutants from municipal wastewater



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- ***General aspects***
- ***Biological pond as a tertiary treatment step***
- ***An example of wastewater reuse: a system of ponds in Vodňany, Czech Republic***
- ***Ecological risk assessment of micropollutants***
- ***Conclusions and discussion***



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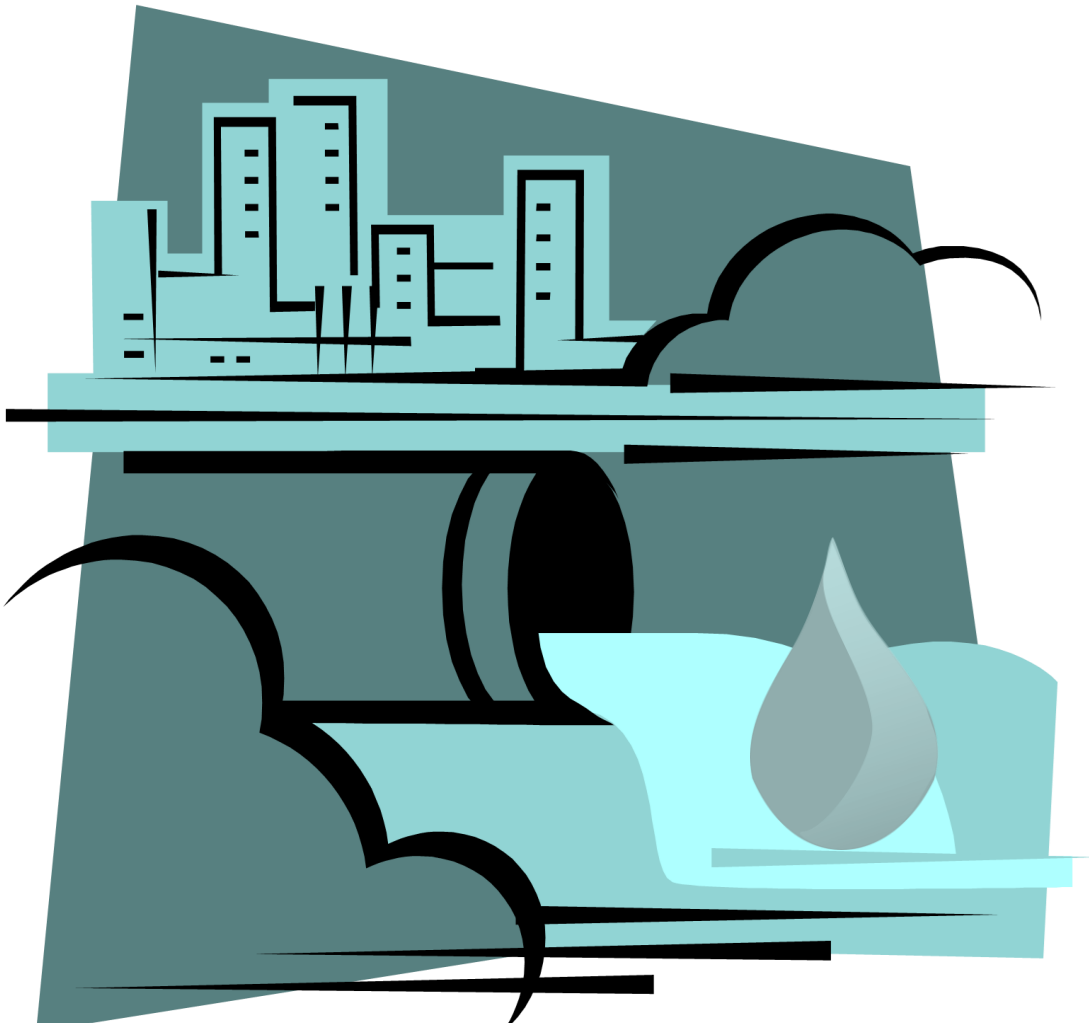
**Pollution**

**Wastewater  
treatment**

**Water scarcity**

**Wastewater  
reuse**



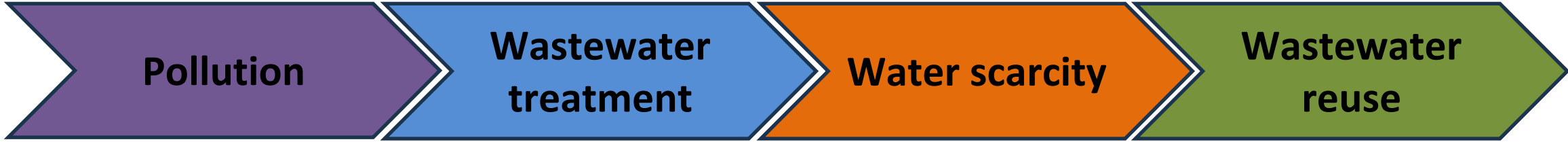


➤ **Nutrients**

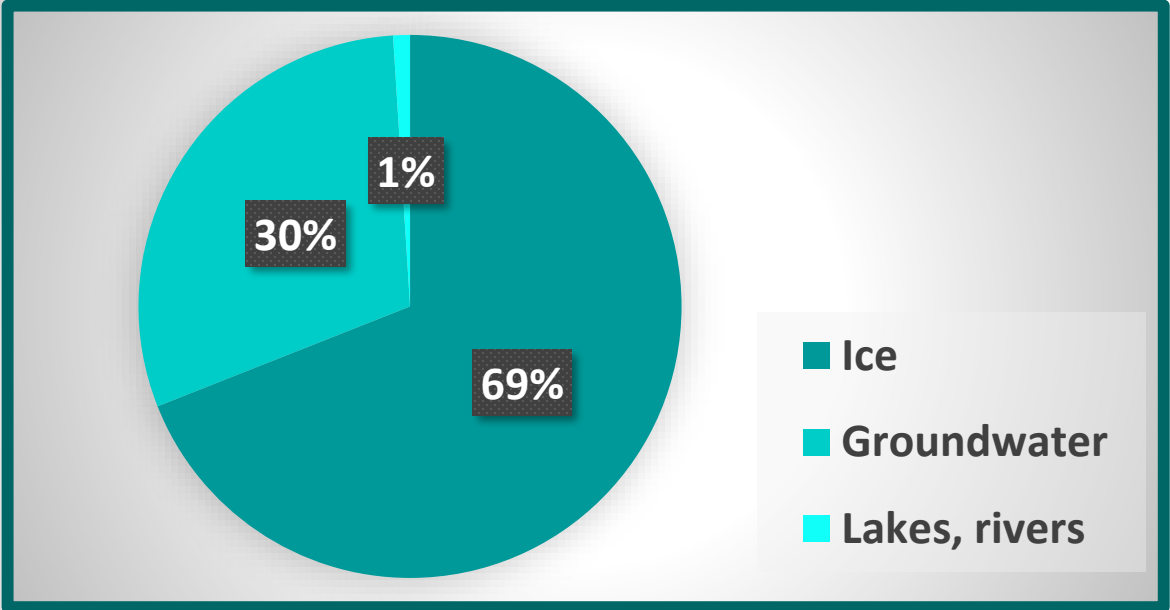
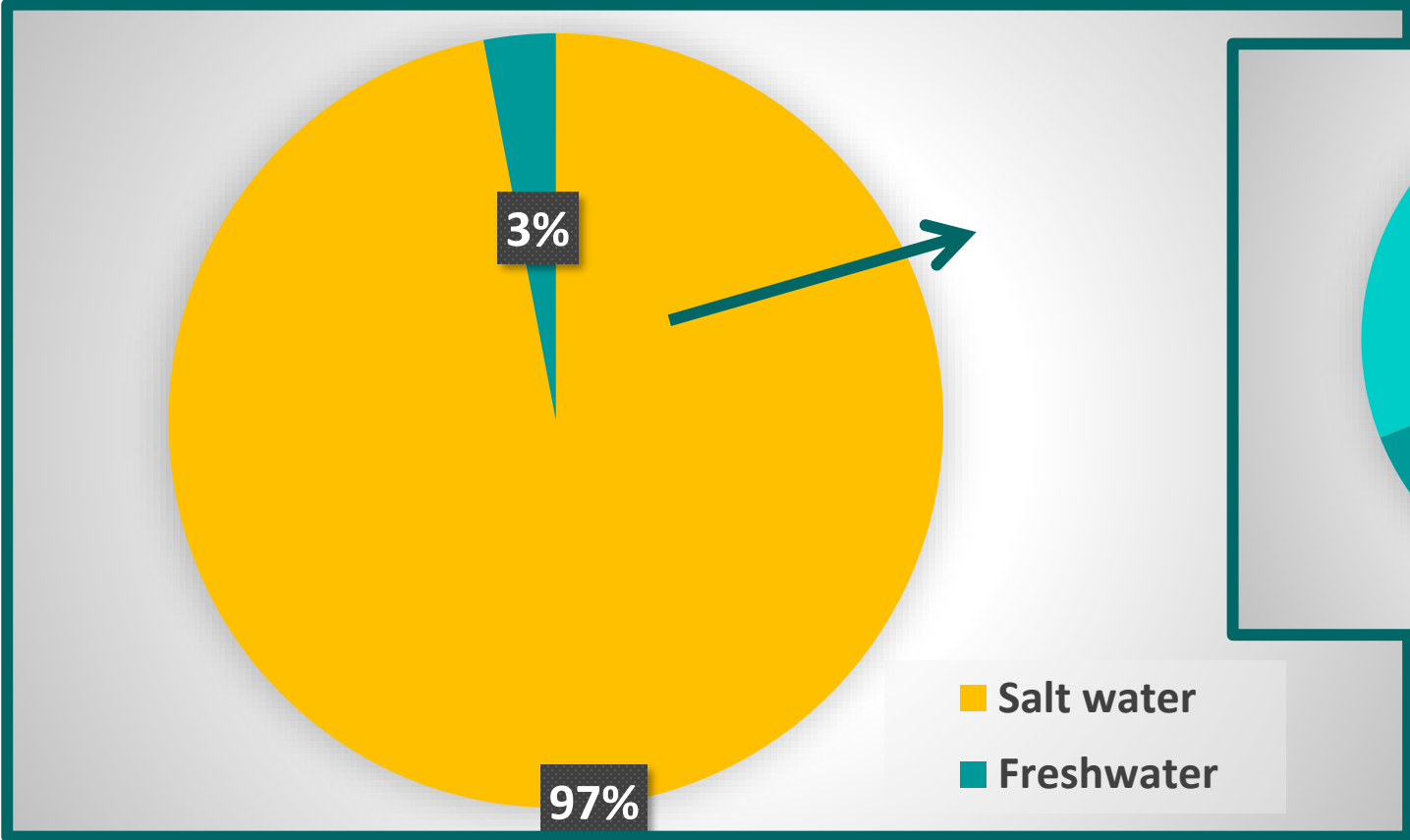
➤ **Viruses, bacteria**

➤ **Pollutants**

- Heavy metals
- Pesticides/herbicides
- Hormones
- CECs – pharmaceuticals, personal care products, food additives



1.36 billion cubic kilometers of water on Earth

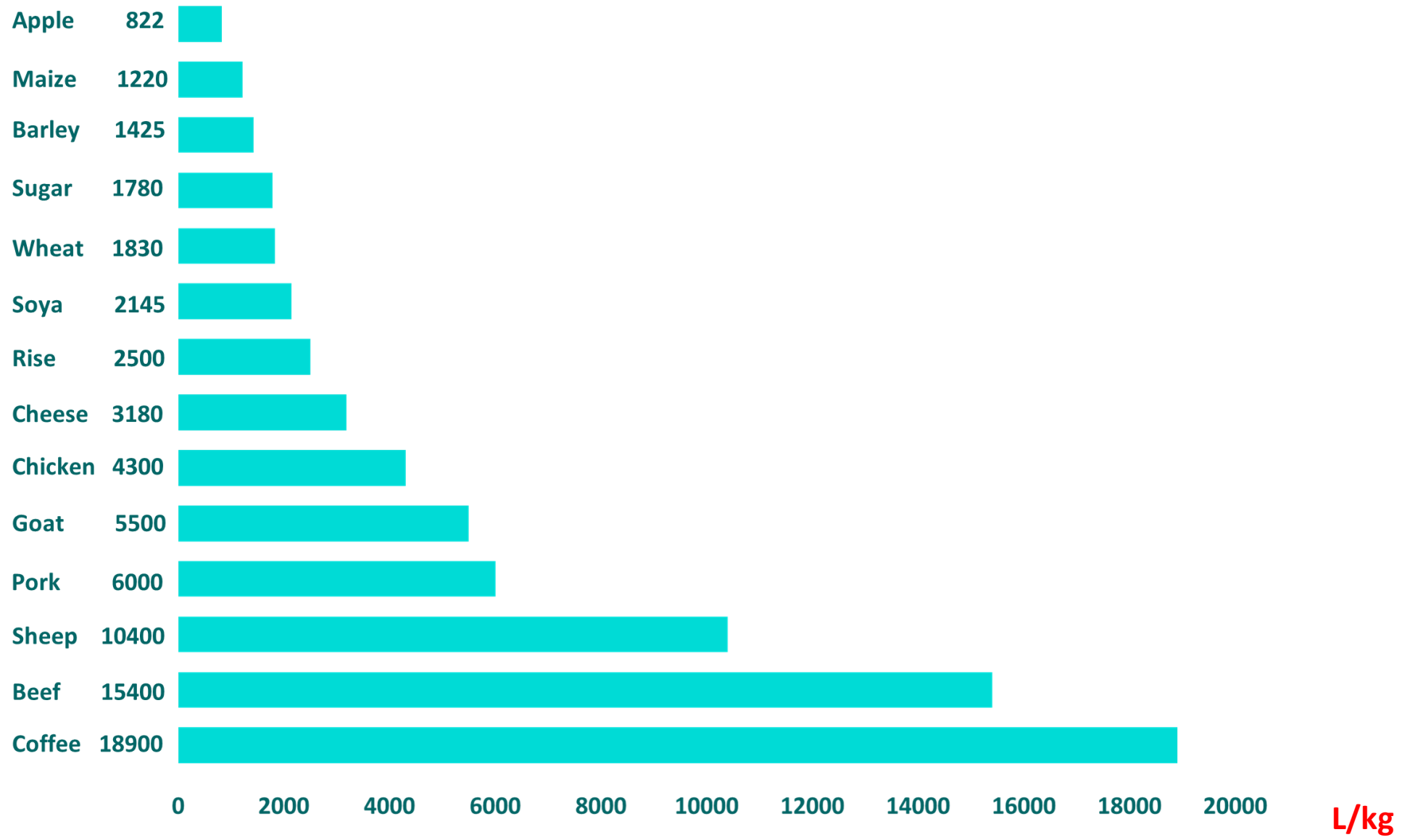
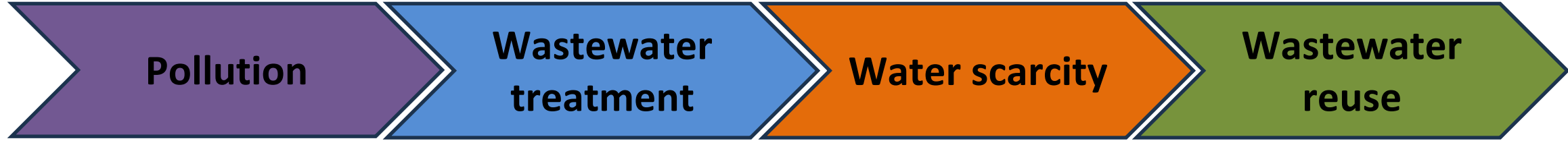




*How many liters of water do we use every day?*

**3496**

<http://thewaterweeat.com>



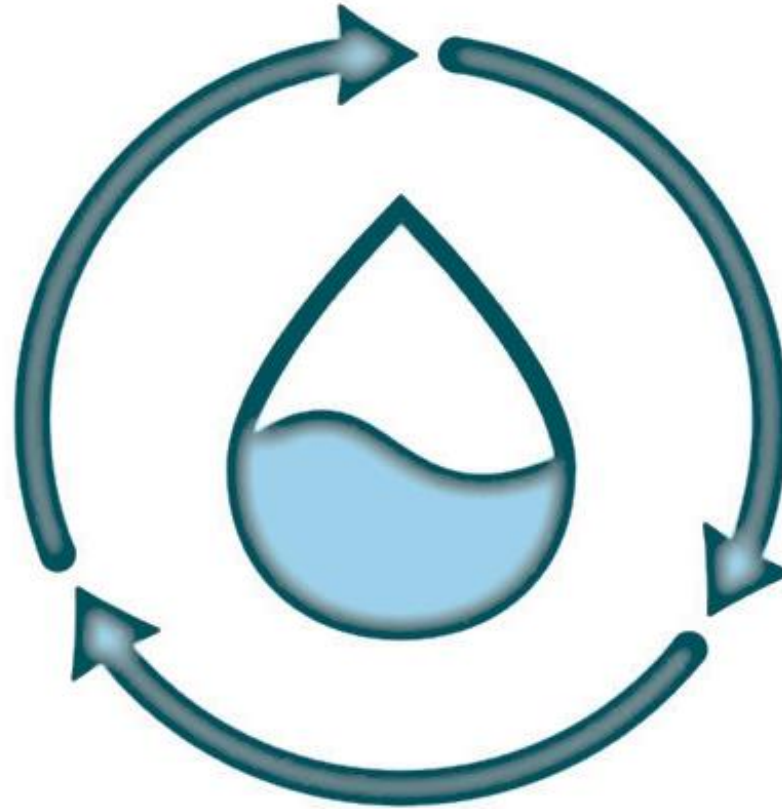


**Pollution**

**Wastewater  
treatment**

**Water scarcity**

**Wastewater  
reuse**



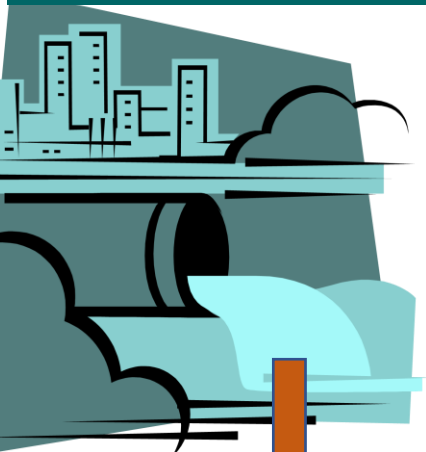
~~**WASTEWATER**~~





## Wastewater treatment plant

- Average discharge 2151 m<sup>3</sup>/day
- 7000 inhabitants
- Mechanical filtration
- Sedimentation
- Activated sludge treatment



Influent

Treated wastewater  
pond

2.6 ha

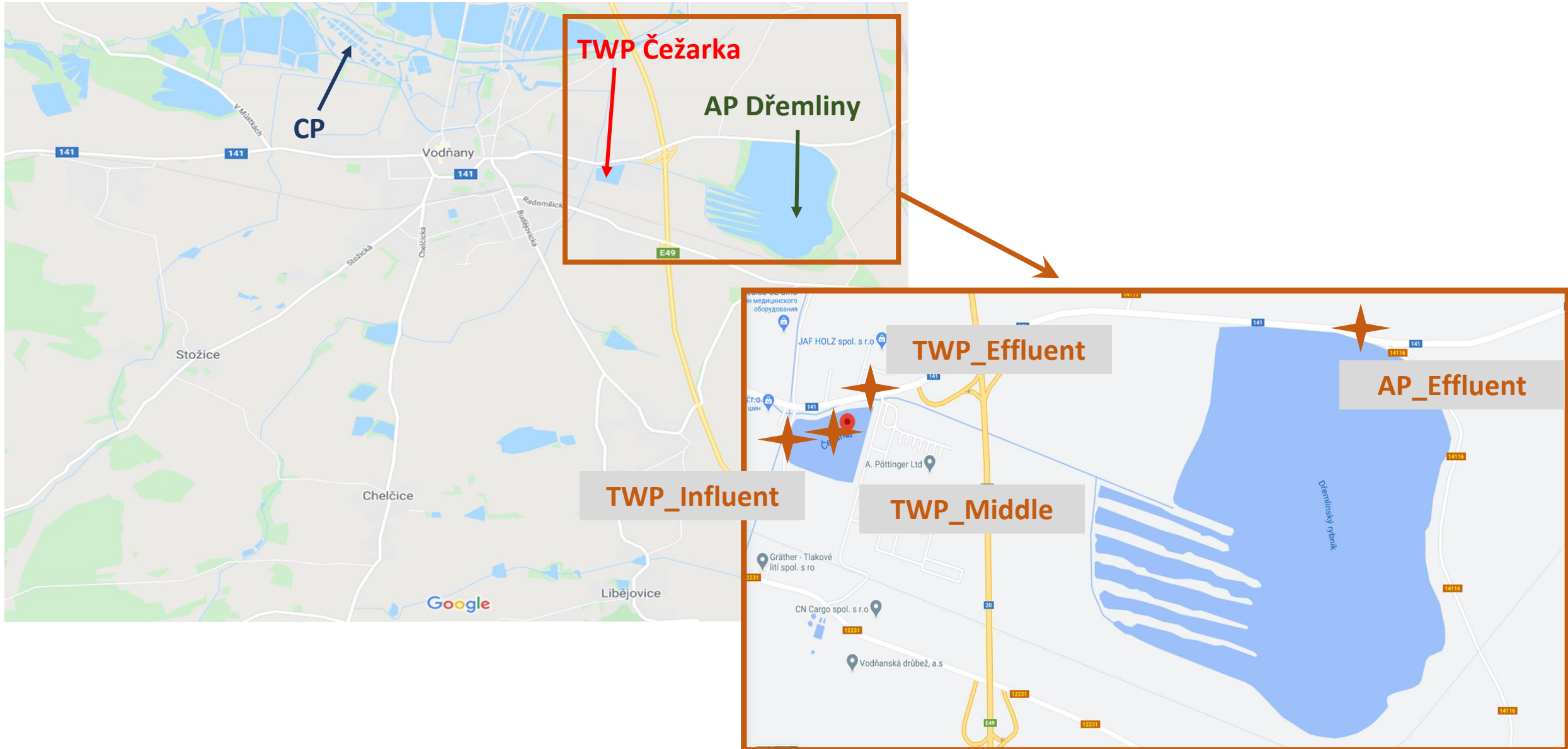
Effluent

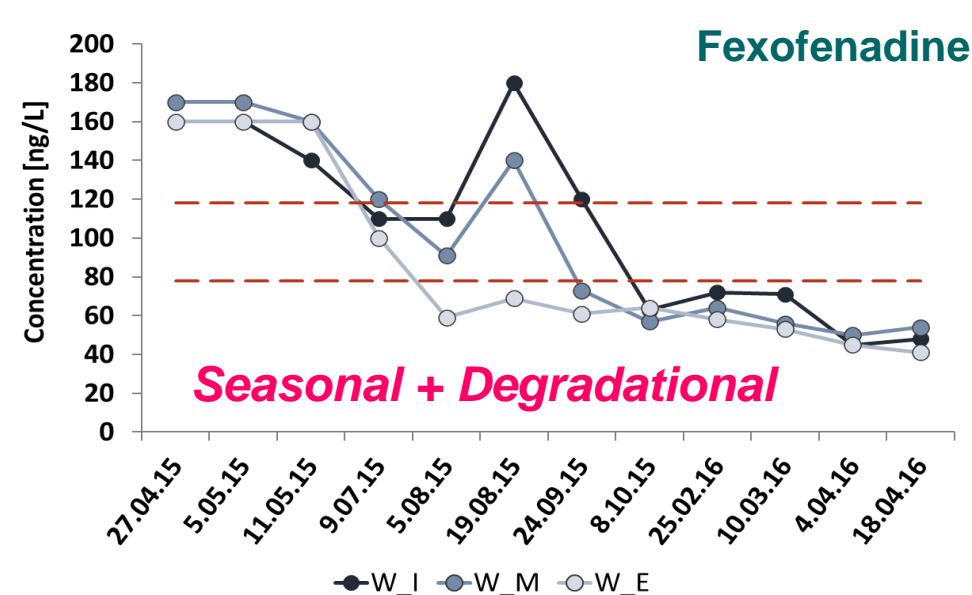
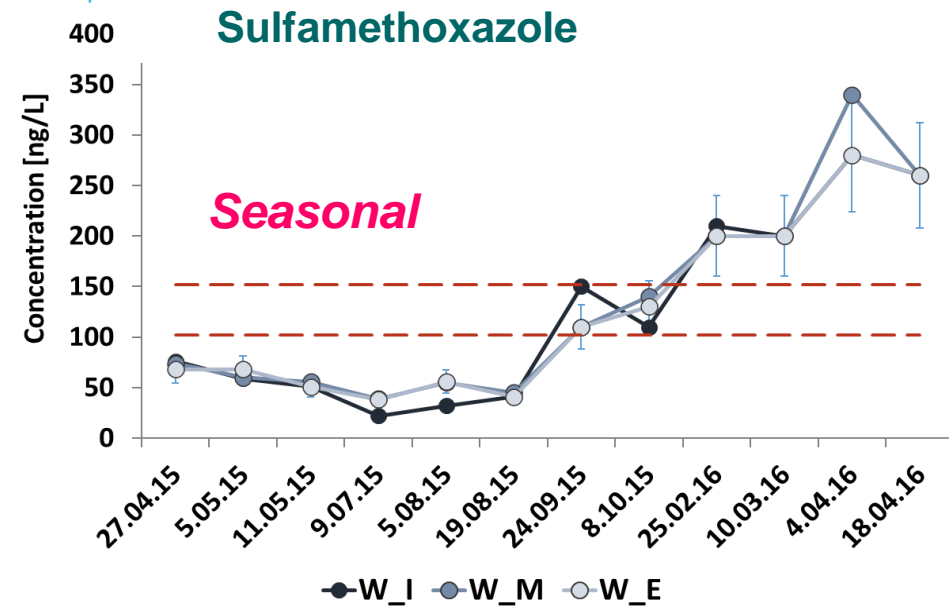
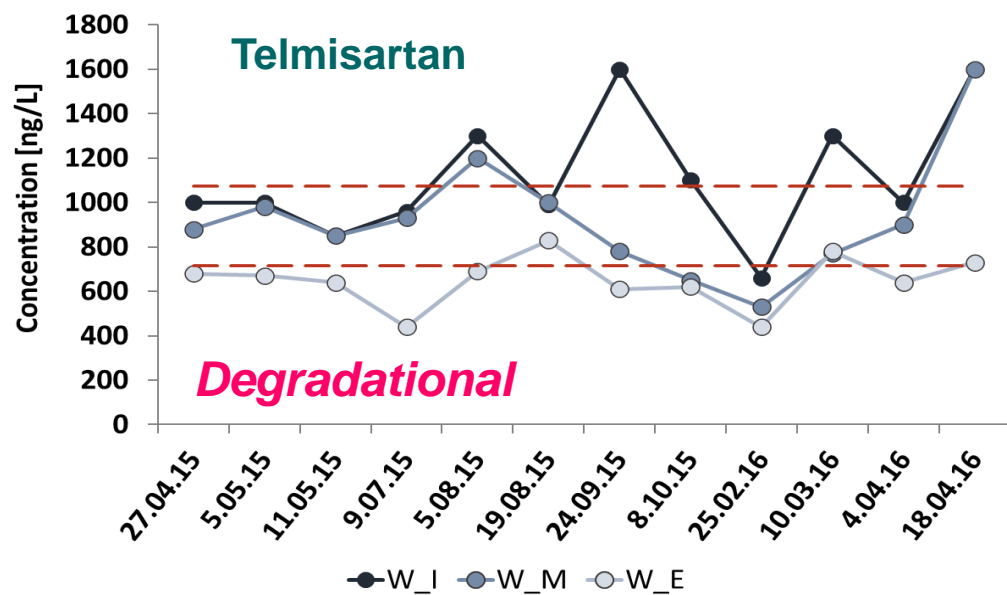
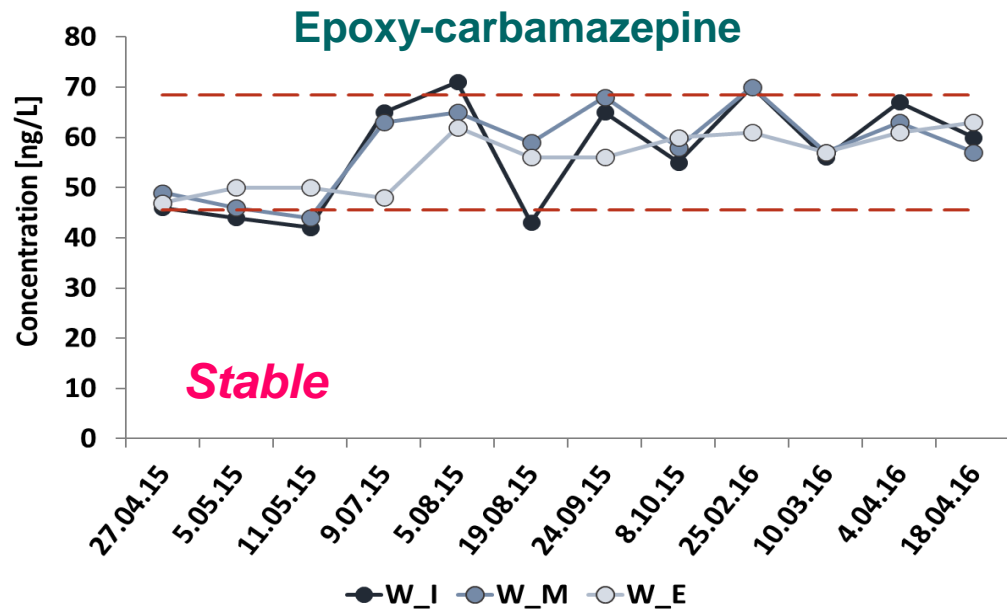
Aquaculture pond

75 ha



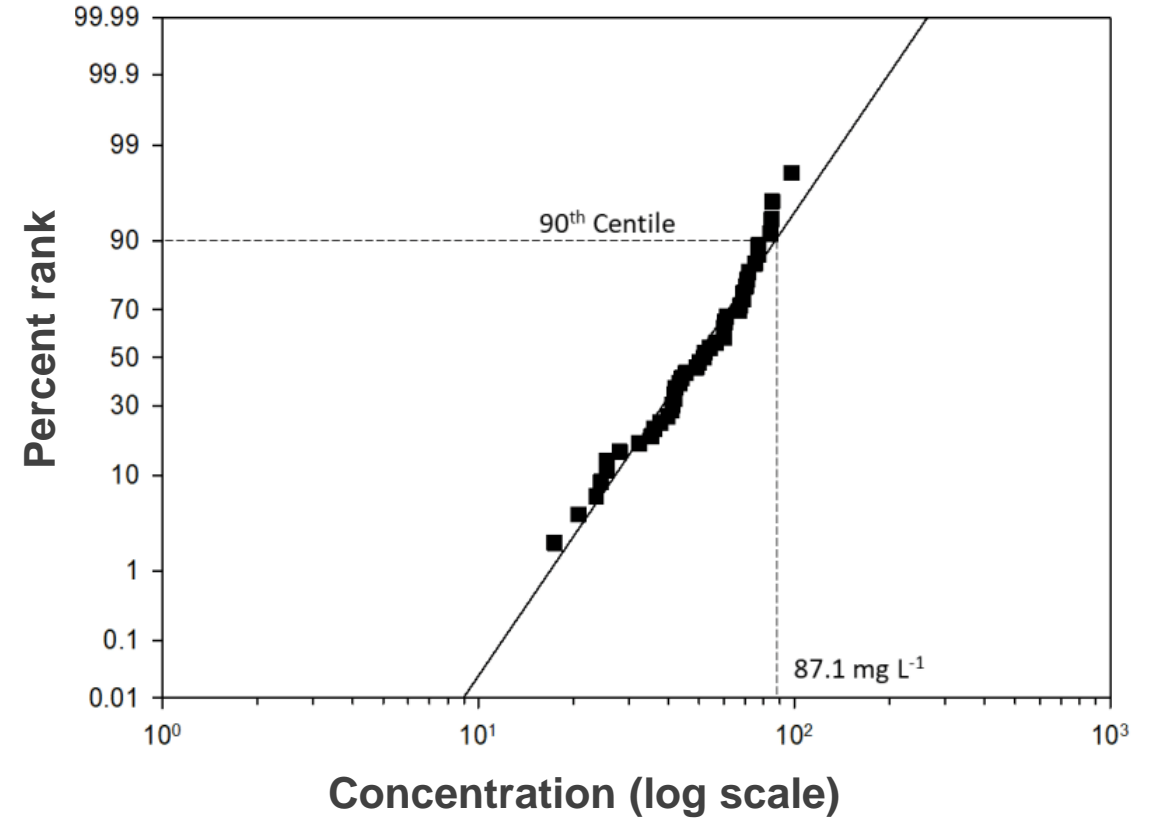
- Fate of a wide range of pharmaceuticals
- Risk assessment using probabilistic approach
- Bioaccumulation of pharmaceuticals by fish





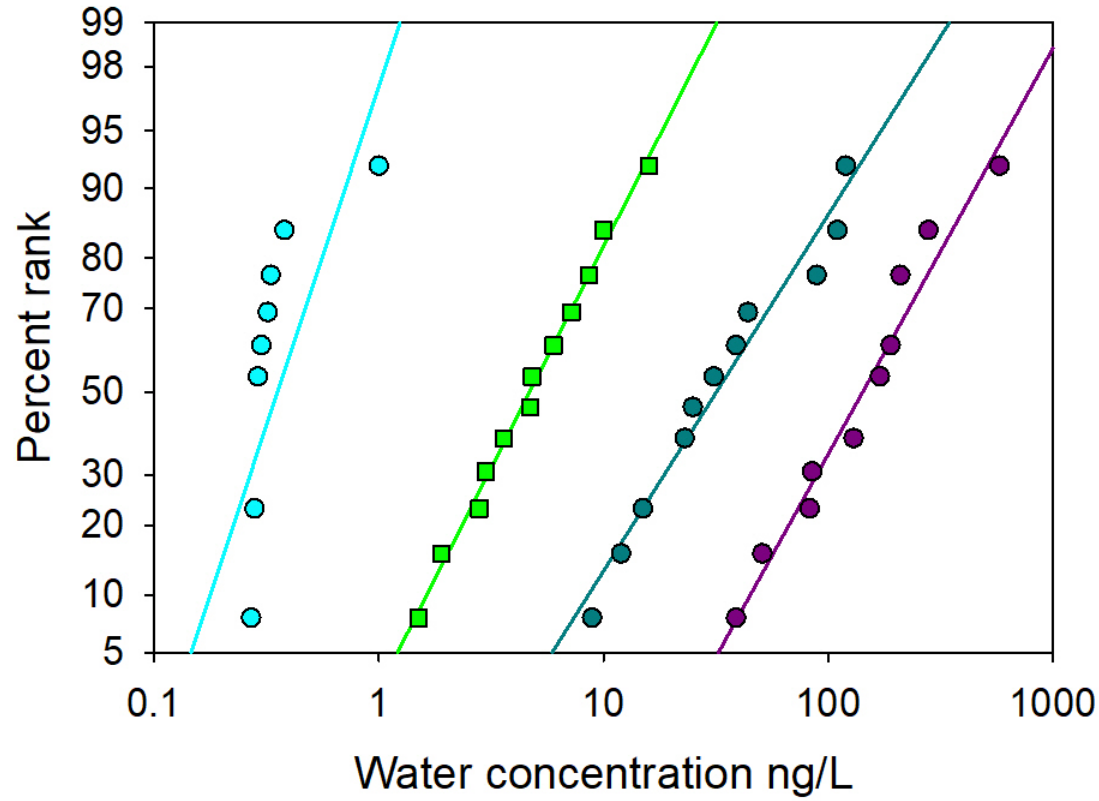


$$RQ = PEC/PNEC$$



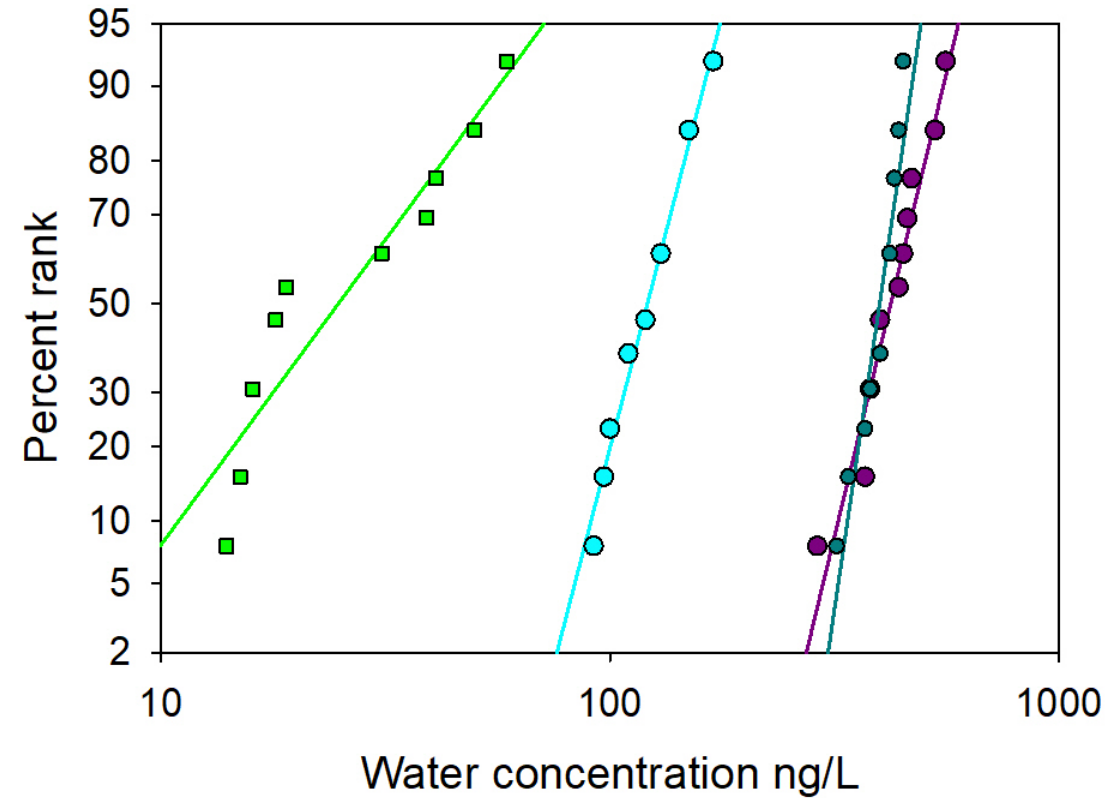


### Venlafaxine



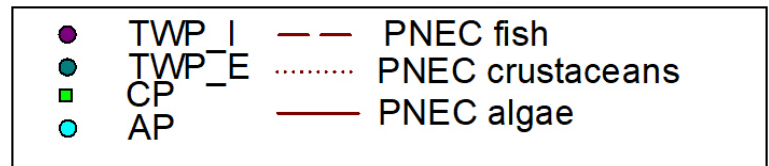
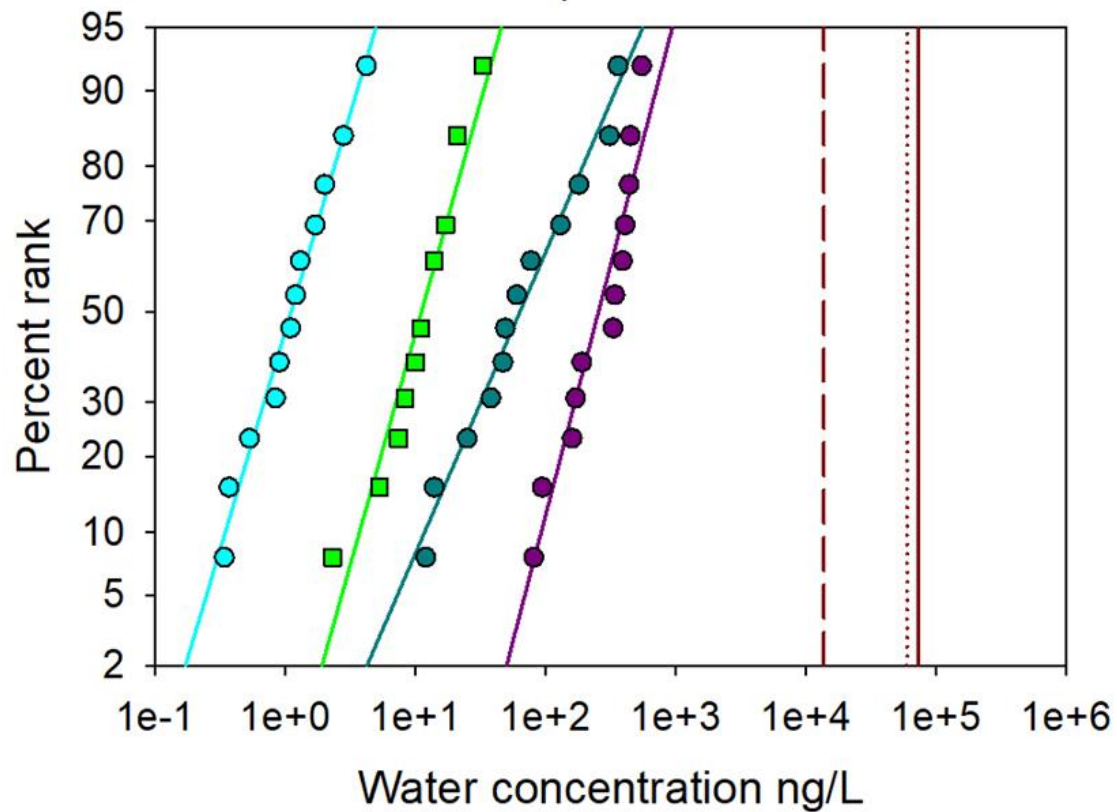
- TWP\_I
- TWP\_E
- CP
- AP

### Carbamazepine

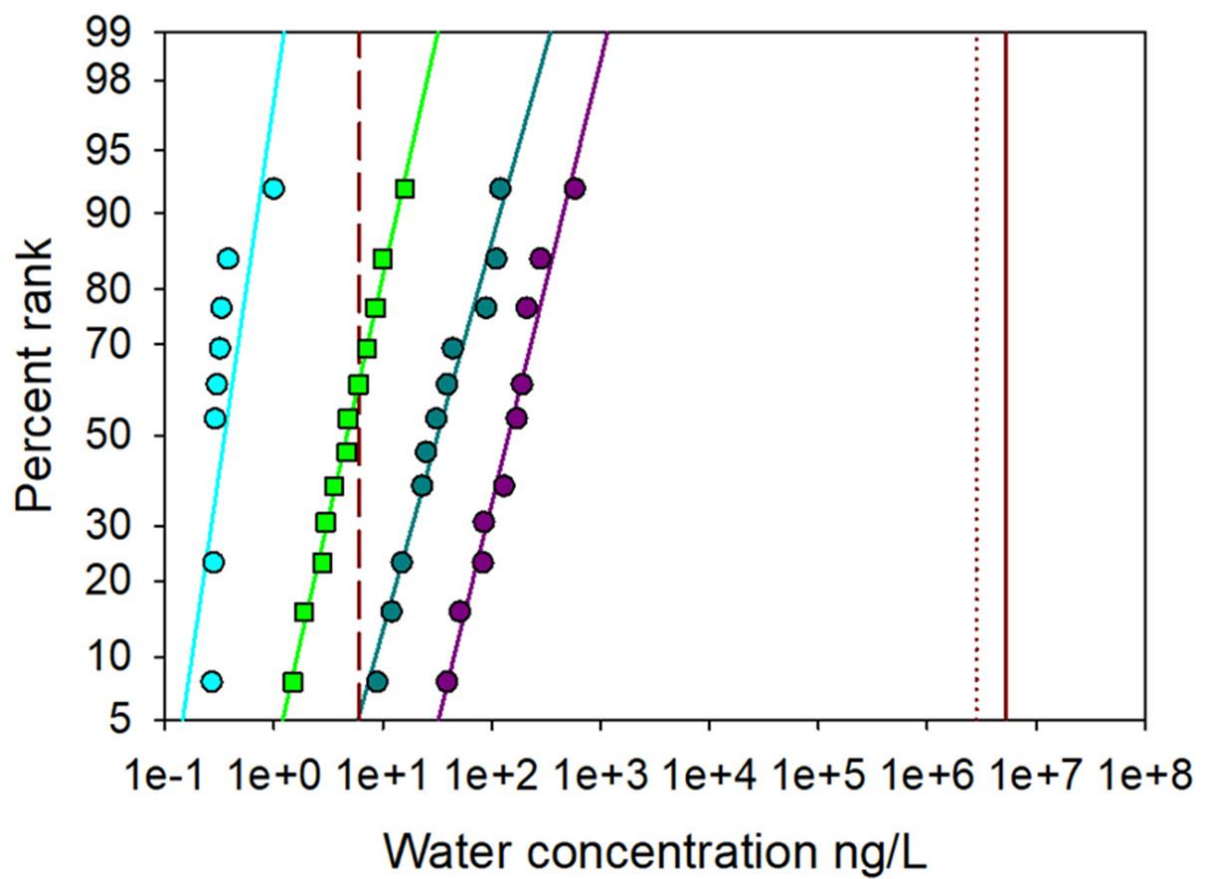




### Metoprolol

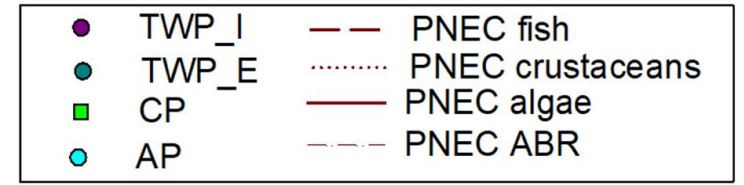
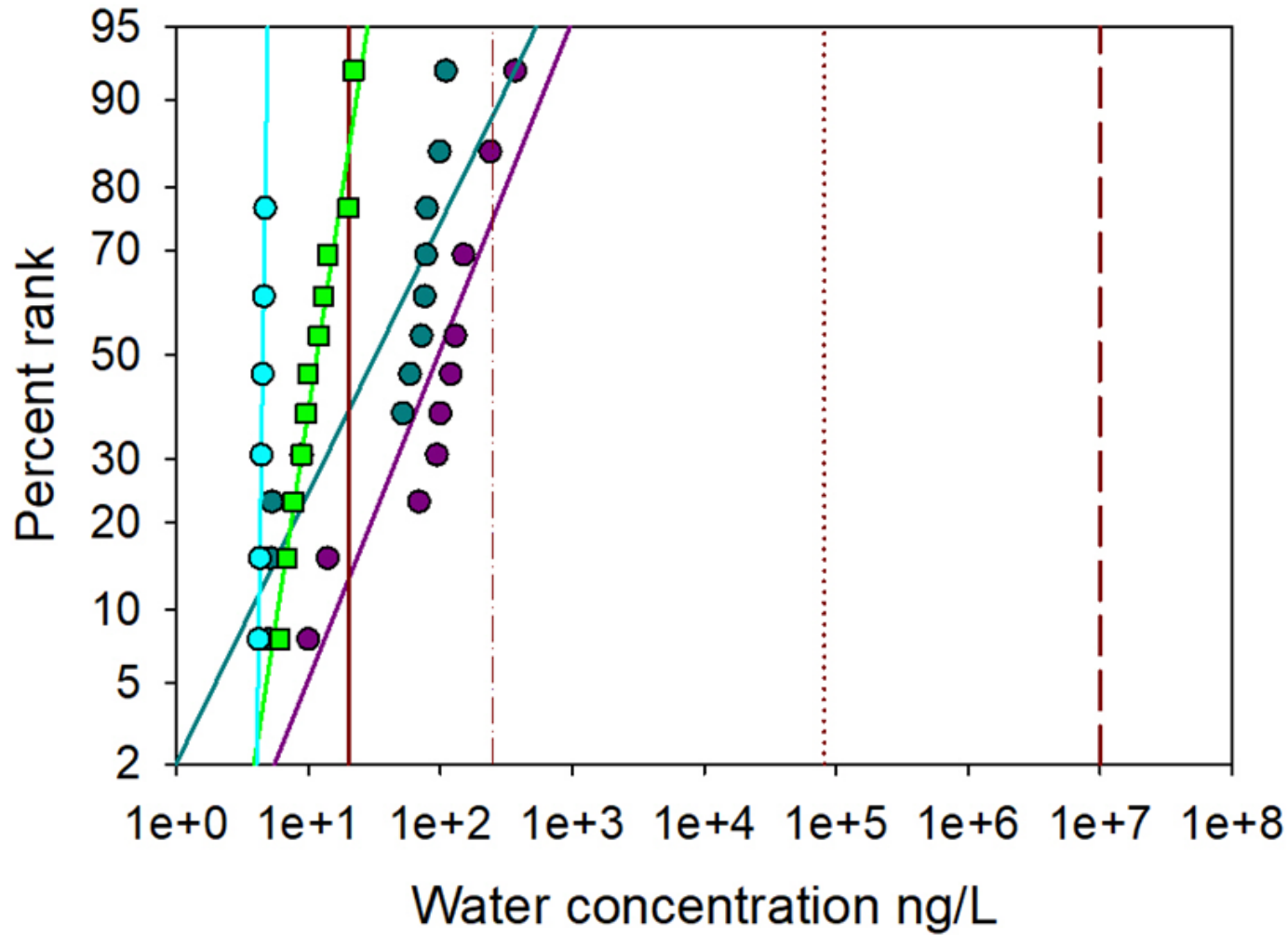


### Venlafaxine





### Clarithromycin



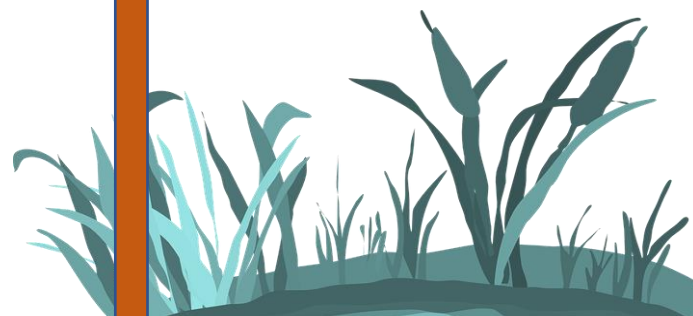




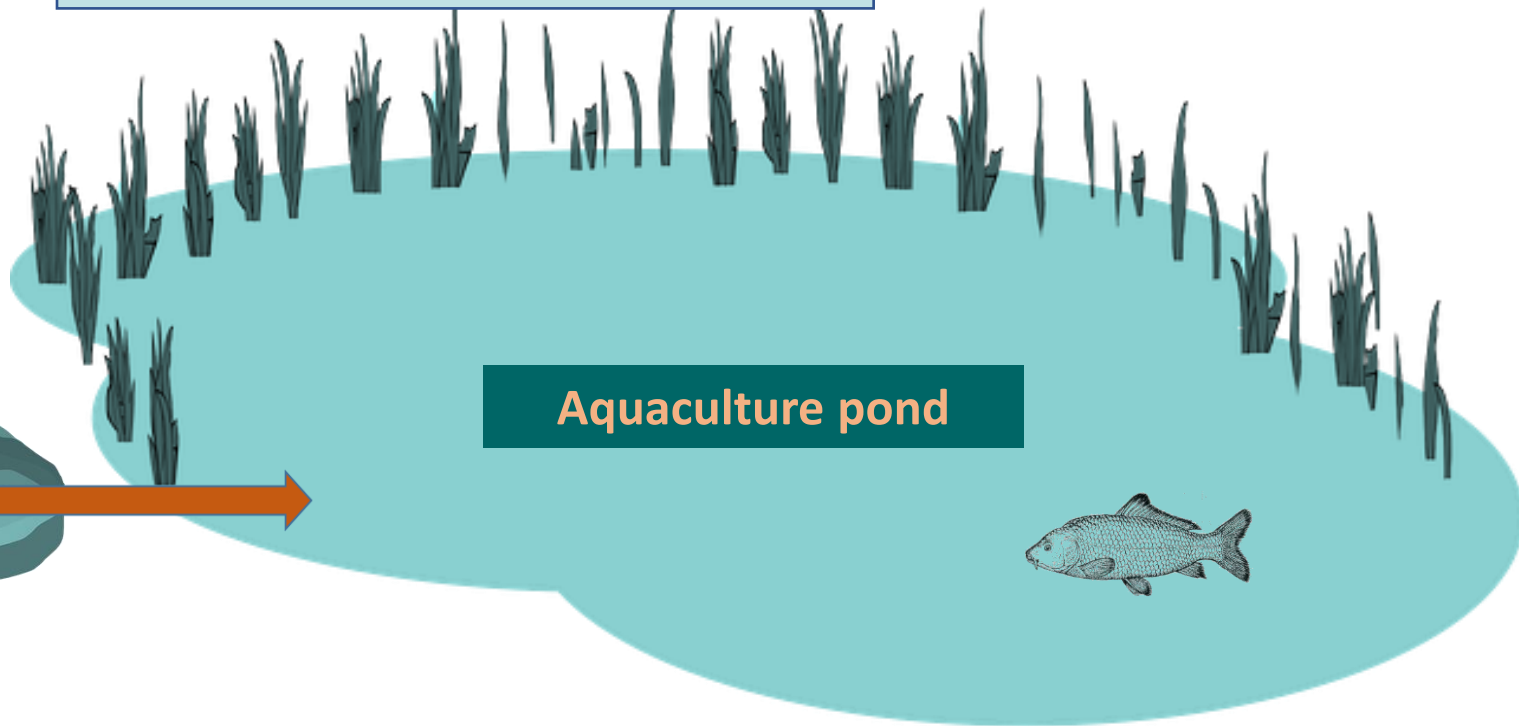
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Czech Republic

## Wastewater treatment plant



Treated wastewater  
pond



Aquaculture pond

## Ecotoxicological risk



TWP influent

TWP effluent

AP

Conclusions



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Results



**KEEP  
CALM  
AND  
REDUCE, REUSE  
RECYCLE**



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Prague



Vodňany

