

Czech Republic: Monitoring of quality and quantity of rivers, development of river pollution over the years

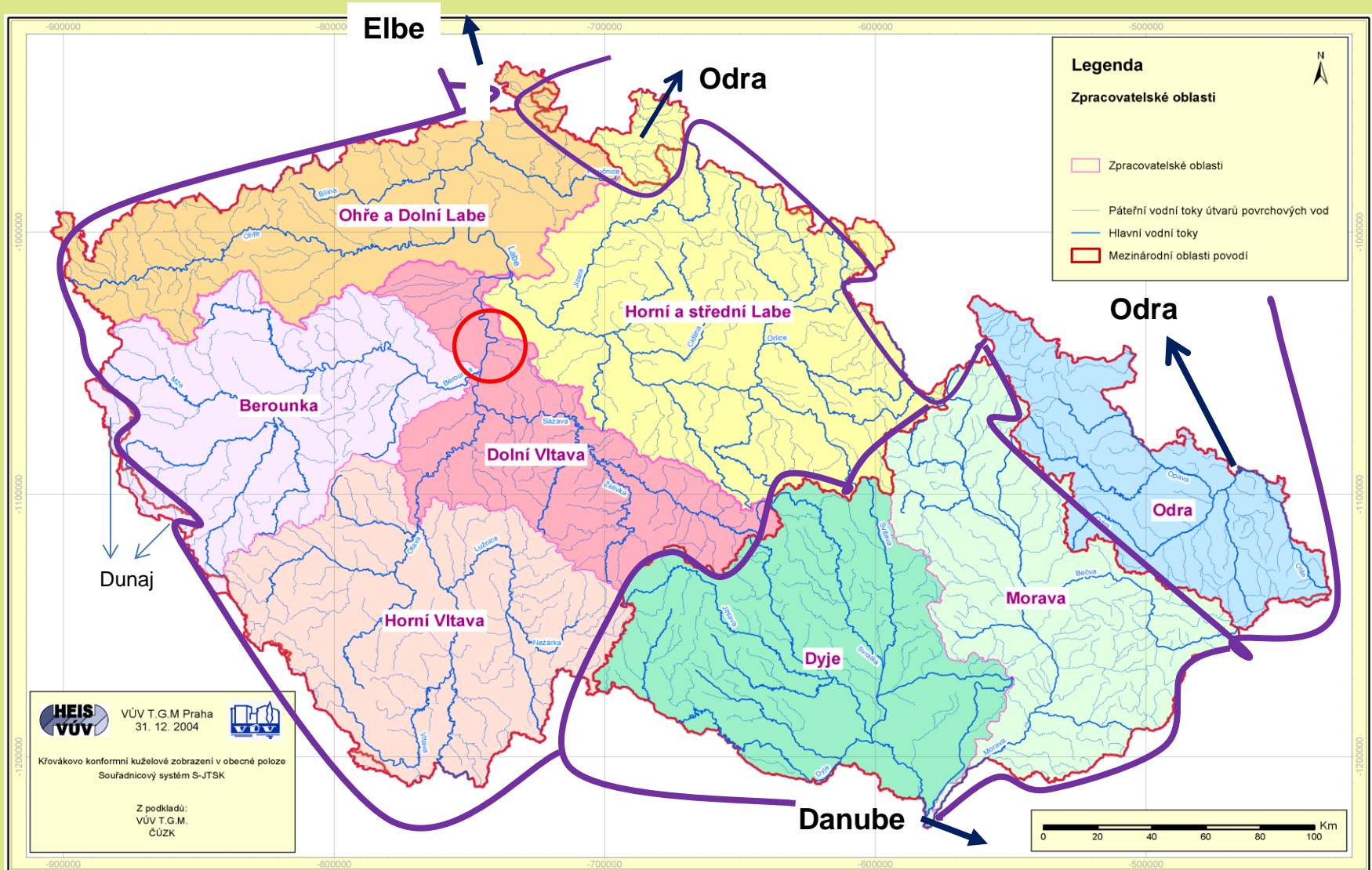
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Arnika: Moldavian Study Tour, webinar 14 DEC 2020.

River basins: Elbe, Odra, Danube = 3 RBDs

Management: 3 River Boards, 8 „subunits“



Czech Republic:

Rivers:

Total length 55 476 km, incl. local streams. (cca 30% „managed“.)
 Specific discharge 6,1 l/s/km² . Three river basins to three seas.

Area:

78 870 km²

31,3 % arable land with crops

32,6 % forests

36,1 % „other“ – „country“ (incl.meadows), roads, rivers, cities etc.

People:

10 578 820 inhabitants (50,9% W, 49,1% M), + maybe 0,5 mil. guests.

94,4% connected to public drinking water systems.

84,7% connected to sewerage with WWTP.

Pollution:

WWTPs: total 2 554 communal, all important (2518) mech./biologic.

719 WWTPs elimination N + P,

569 elimination only N, 67 only P.

History of monitoring:

Austrian/Hungarian Empire:

1851 - Central Institute for Meteorology and Earth Magnetism.

1890 – State Hydrographic Service.

1918 Czechoslovak Republic:

1919 – State Institute for Hydrology (T.G.Masaryk Institute).

- State Institute for Meteorology.

Afterwar Czechoslovak Republic:

1954 – Hydrology shifted from TGM Inst. to „meteorology“;:

- Water Research Institute (TGM name cancelled).

- Czechoslovak Hydrometeorologic Institute (CHMI).

After „Velvet revolution“ and separation of Czech and Slovak Republics.

1991 – Czech Institutions continue, Slovak ones too.

- Water Res. Inst. again the TGM Institute (WRI TGM).

2000 – Water Framework Directive (2000/60/EU).

Present functions - monitoring:

- Meteorology, Hydrology etc. provides the CHMI.
- Groundwaters provides the CHMI.
- Surface waters (quality):

Standard monitoring :

River Boards (= state organizations) – data archived in the CHMI.

Special monitoring, esp. according to WFD:

Specialized institutions - data archived in the CHMI.

CHMI : Czech Hydrometeorological Institute.

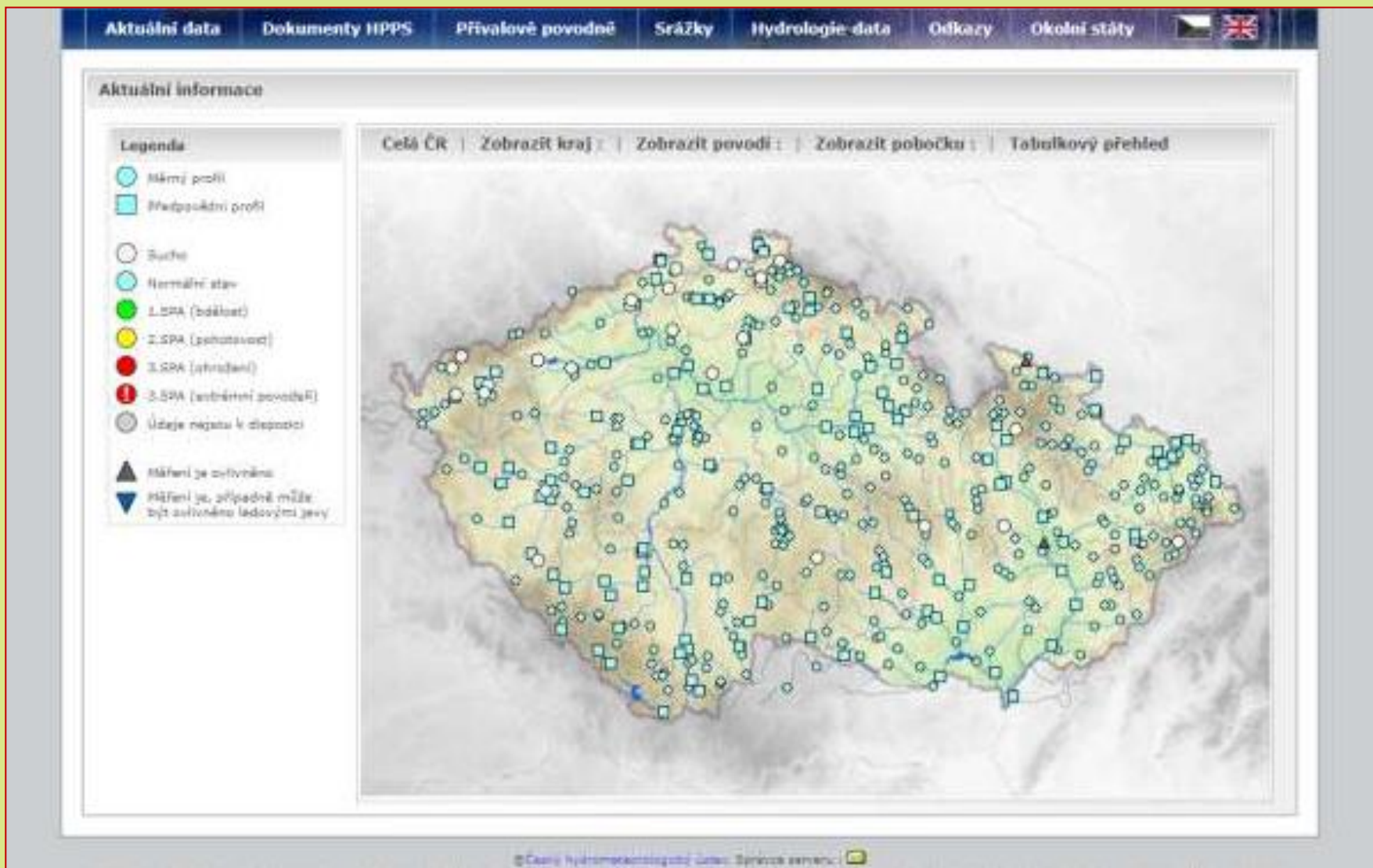
WRI TGM : Research in water quality, ecology, hydrology (HAMR), technologies, WFD ...

HEIS VUV - HydroEcological Information System:

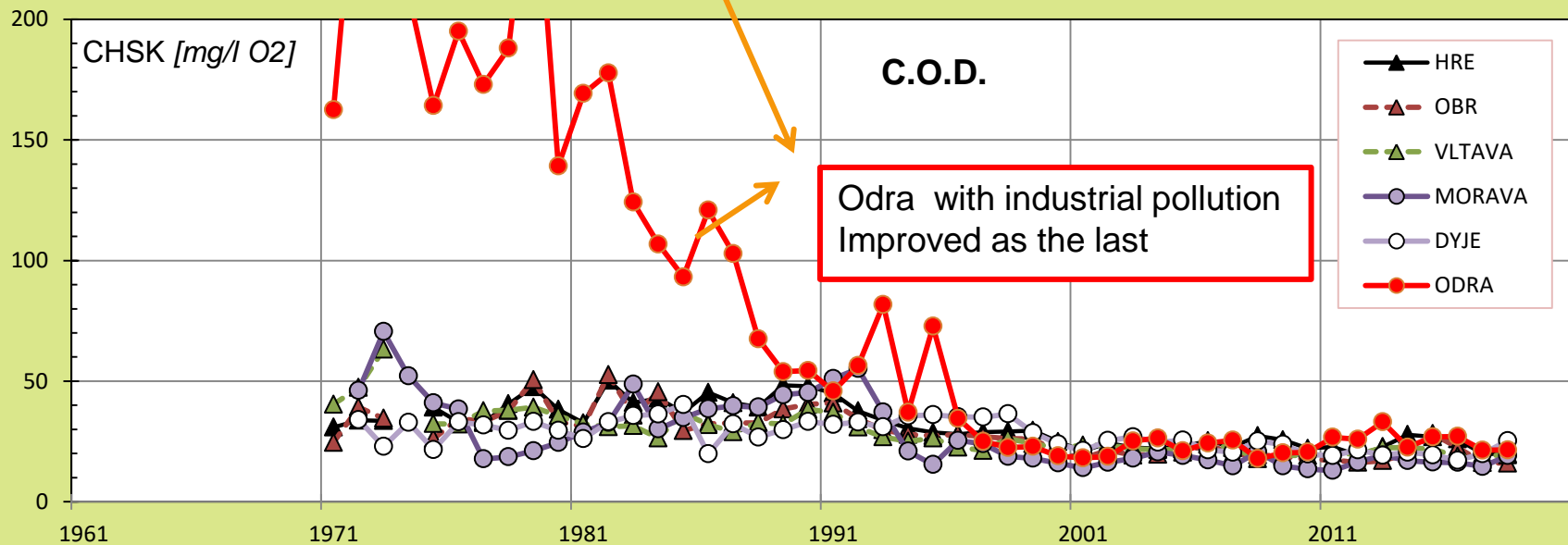
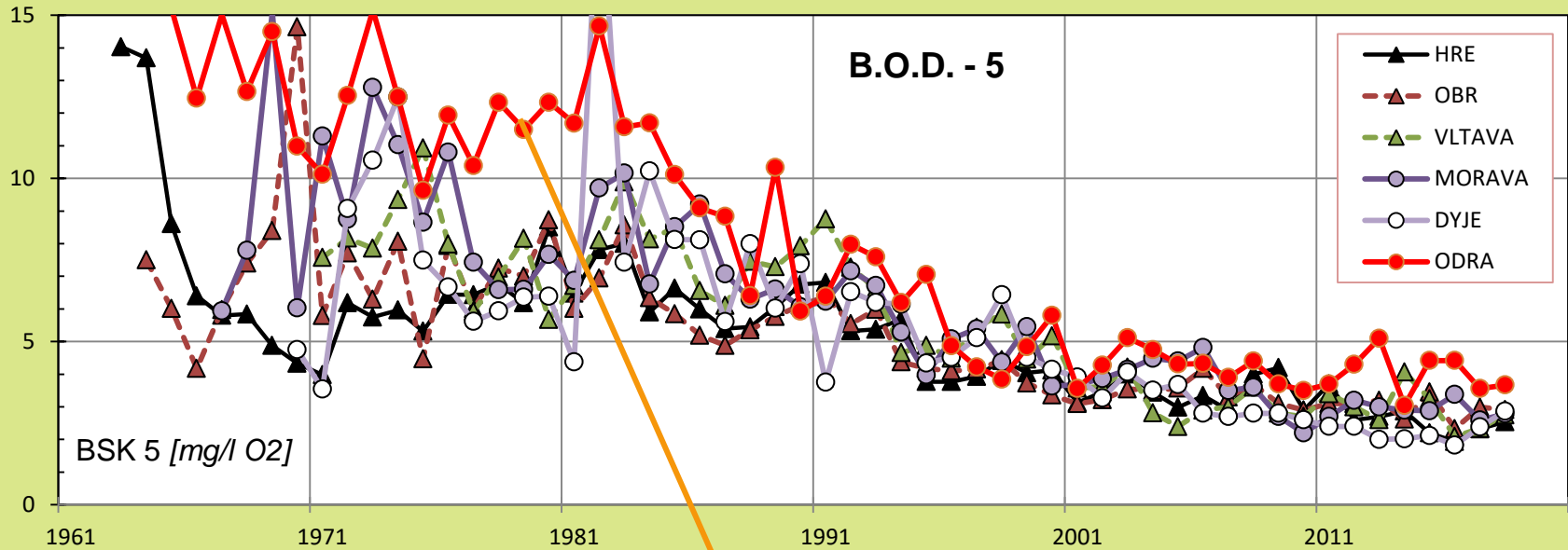
All info, incl. monitoring, population, industry, agriculture, pressures etc.

Access to data: Discharges (Qd) : Public, online (data since 1985).
Water quality : On request (data since 1970).

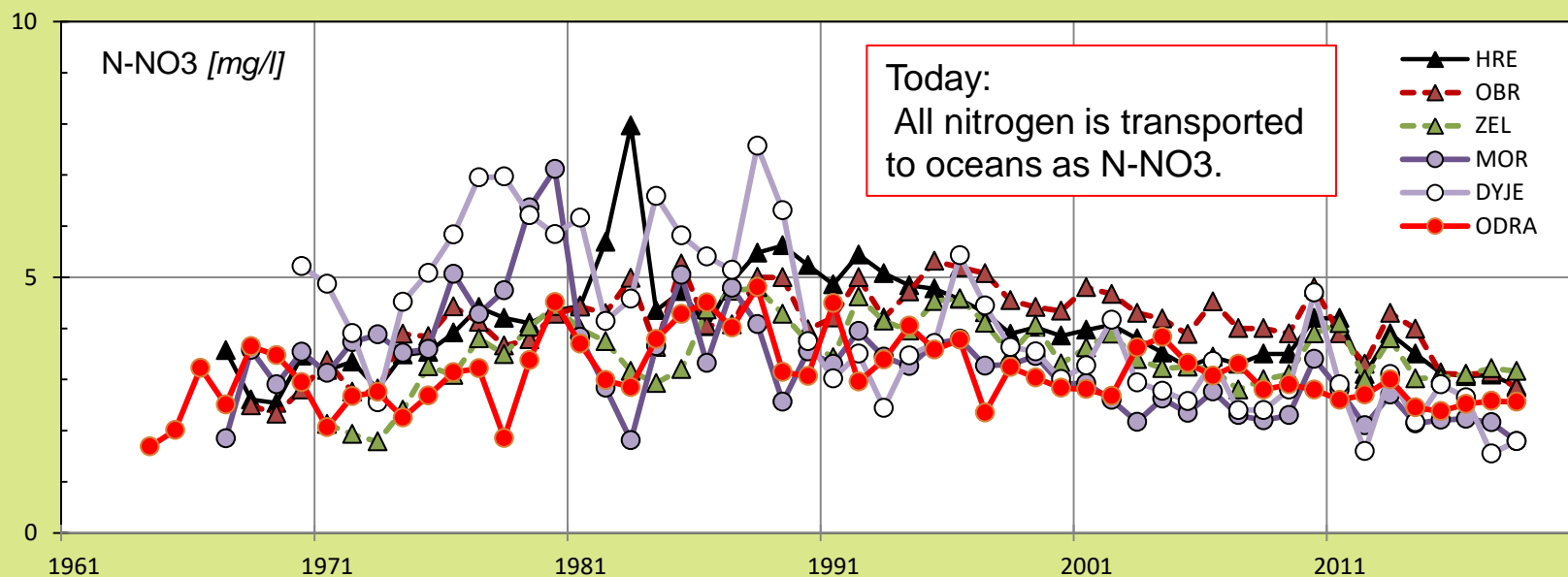
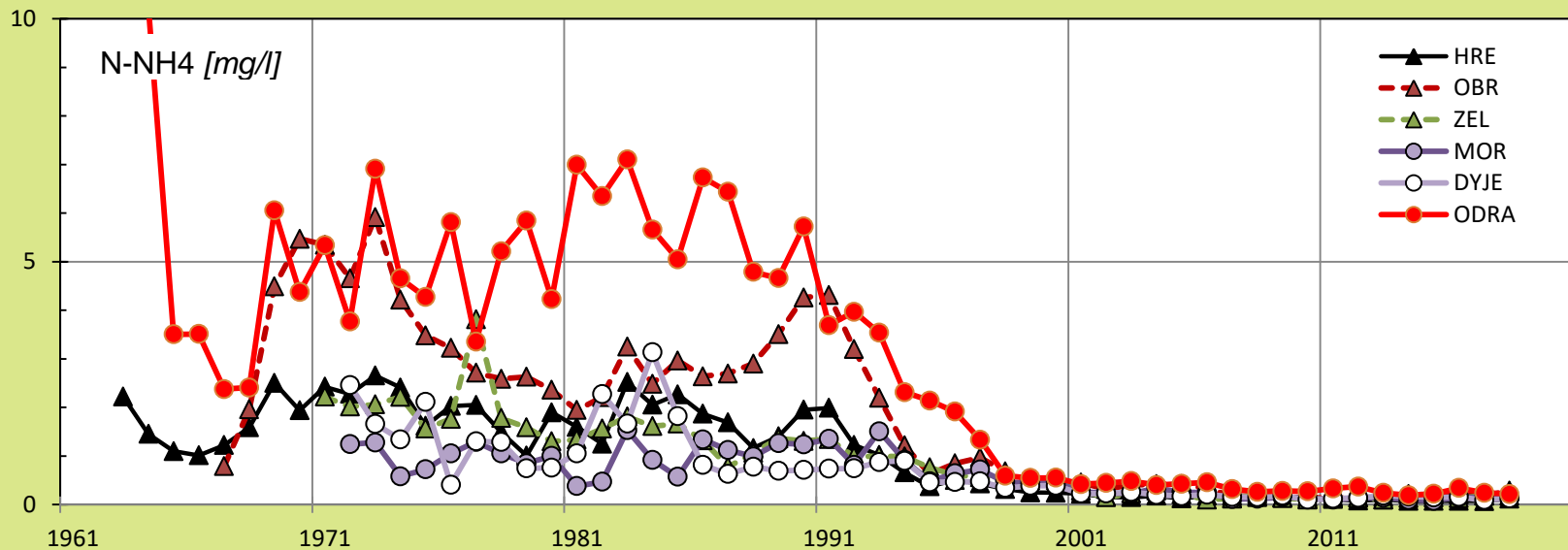
Czech Hydrometeorological Institute :
Map of discharge measurement profiles.
Access to actual data – public, online.



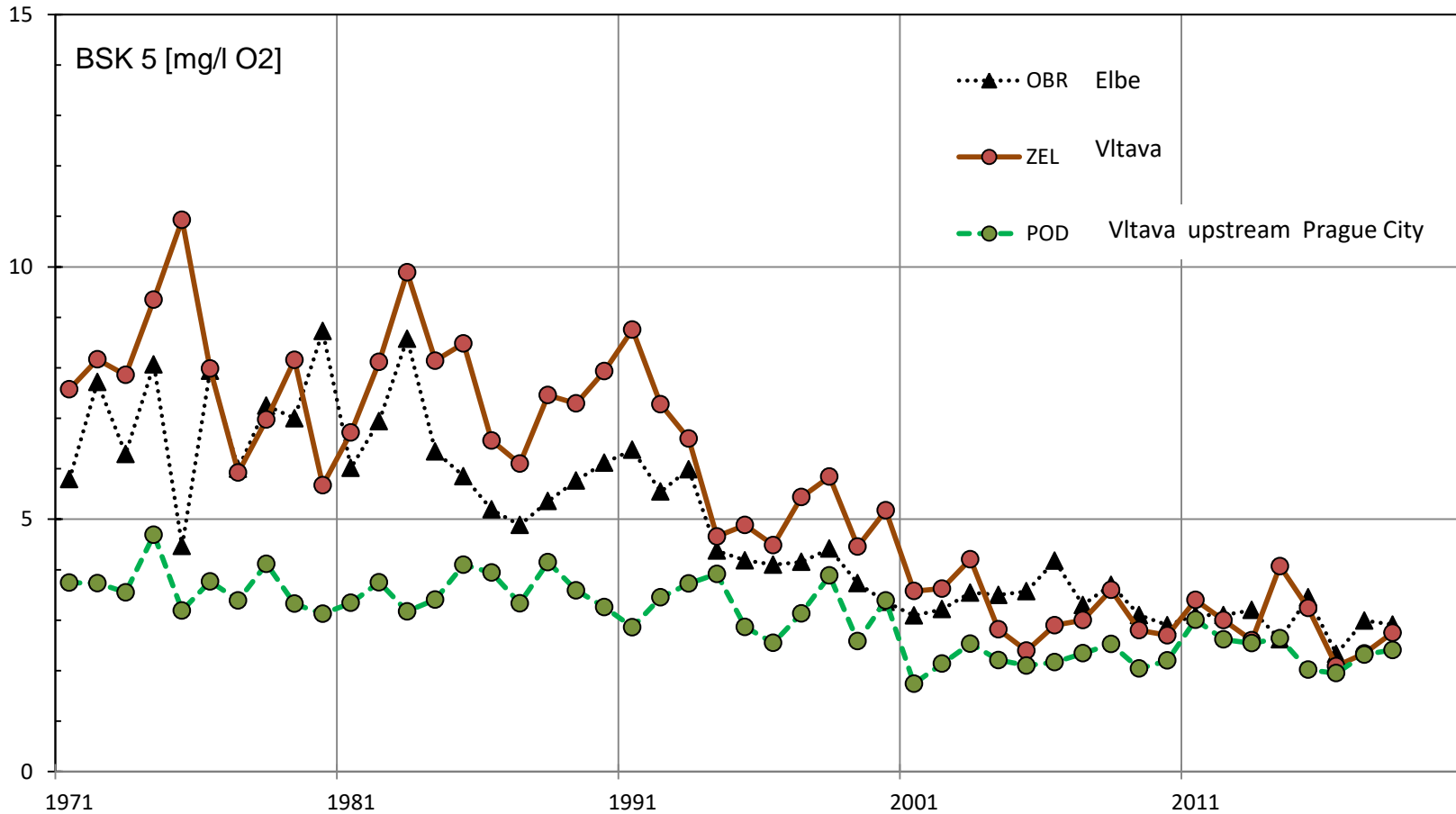
Trends of water quality : Yearly means of BOD 5 a COD



Trends of water quality : Yearly means of N-NH4 a N-NO3.

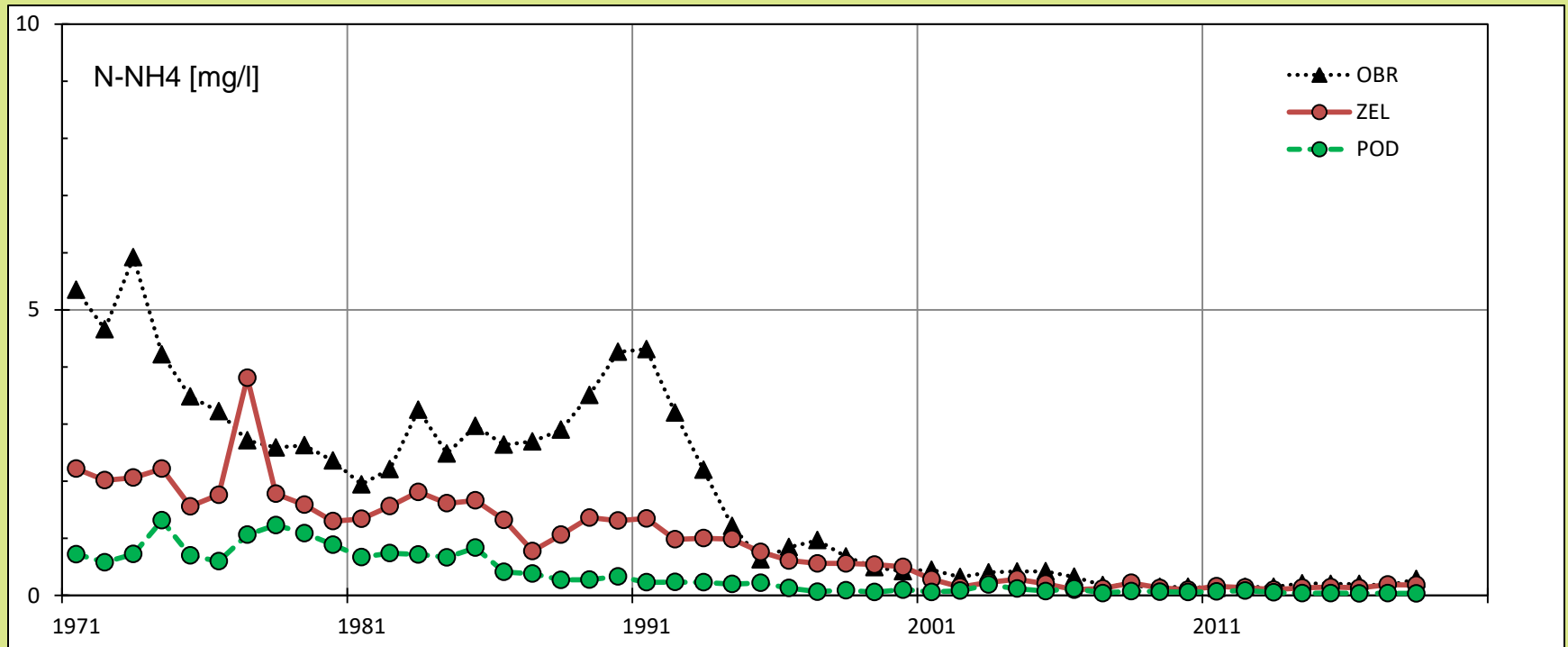


Elbe and Vltava confluence: B.O.D. 5



Situation downstream: Concentrations are comparable all the way to the sea, so the state of pollution is the same as in Germany.

Elbe and Vltava confluence: N-NH₄

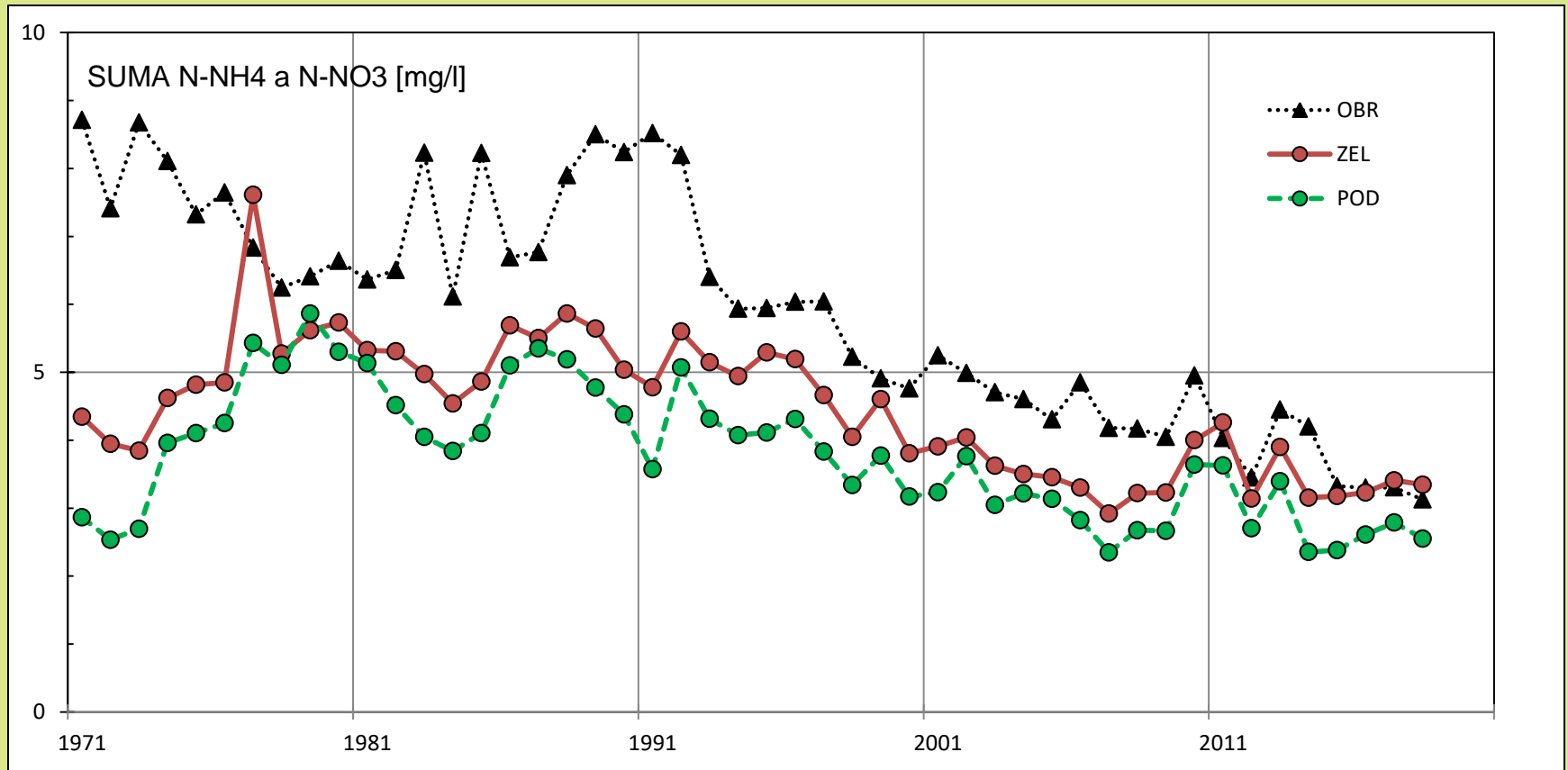


N-NH₄ disappeared.

Local discharges under WWTPs are quickly nitrified to N-NO₃.

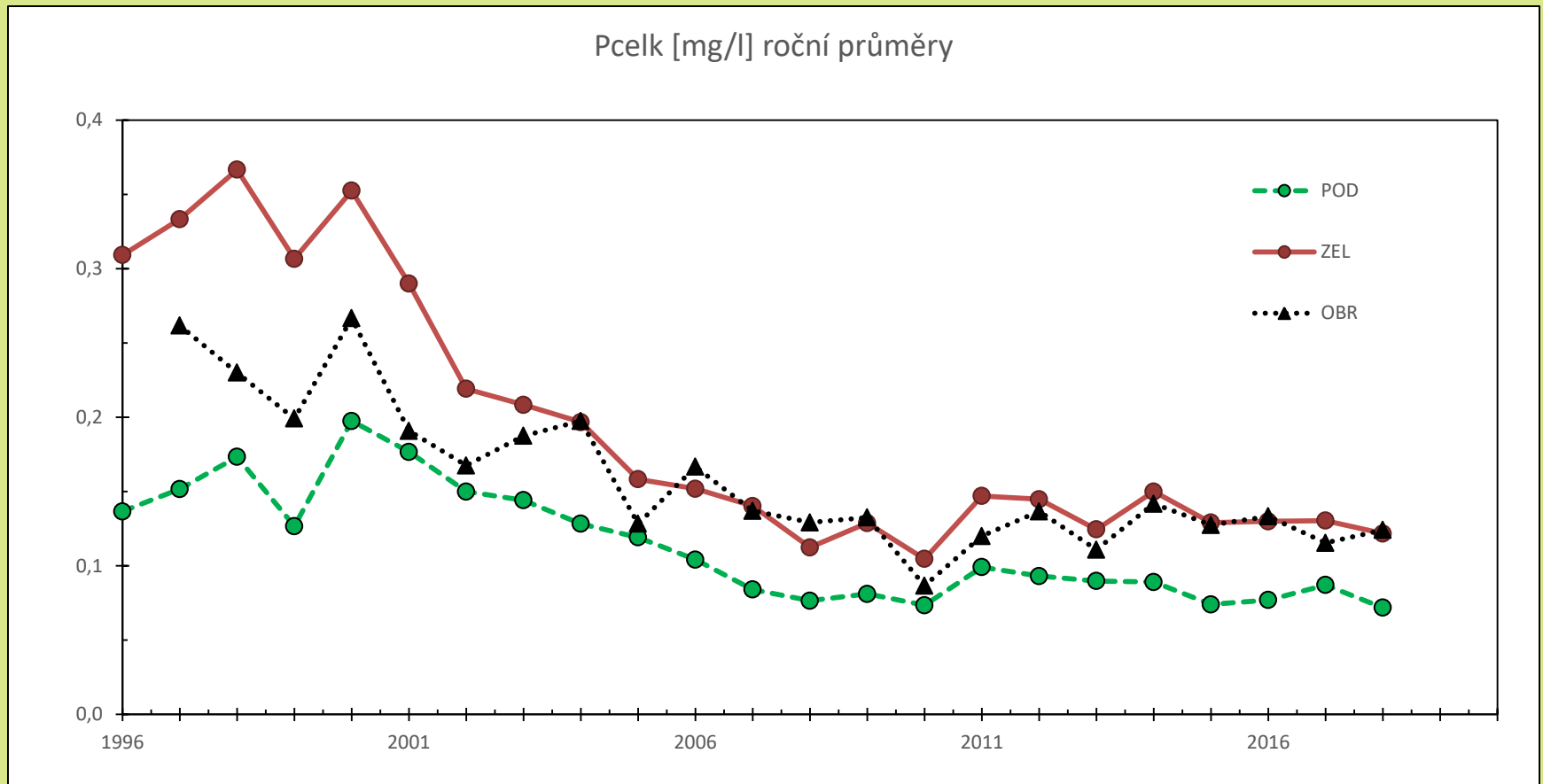
Attention: In winter discharges of N-NH₄ are more frequent.

Elbe and Vltava confluence: Sum N-NH4+N-NO3



Origin of nitrate: 70-80% „from the country“.

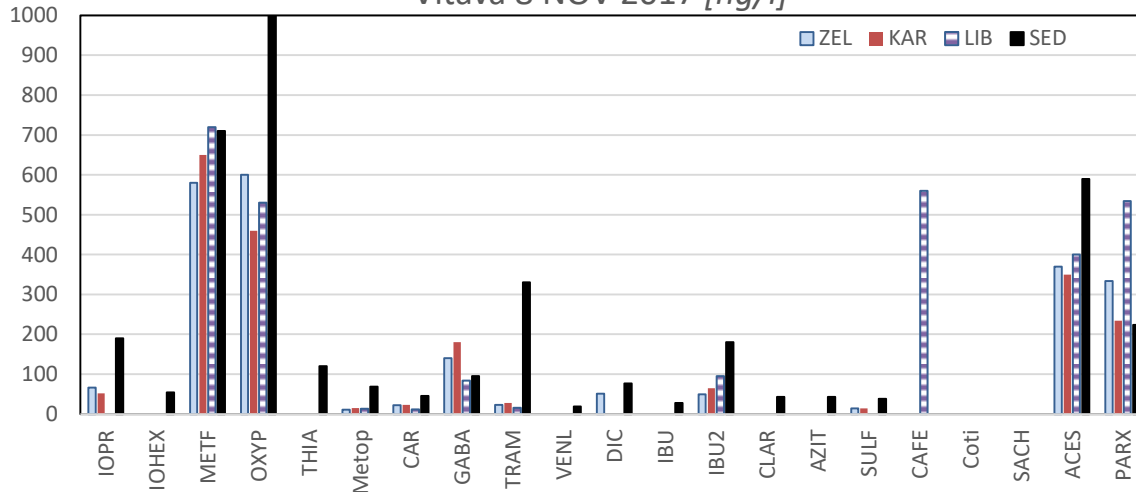
Elbe and Vltava confluence: Total phosphorus



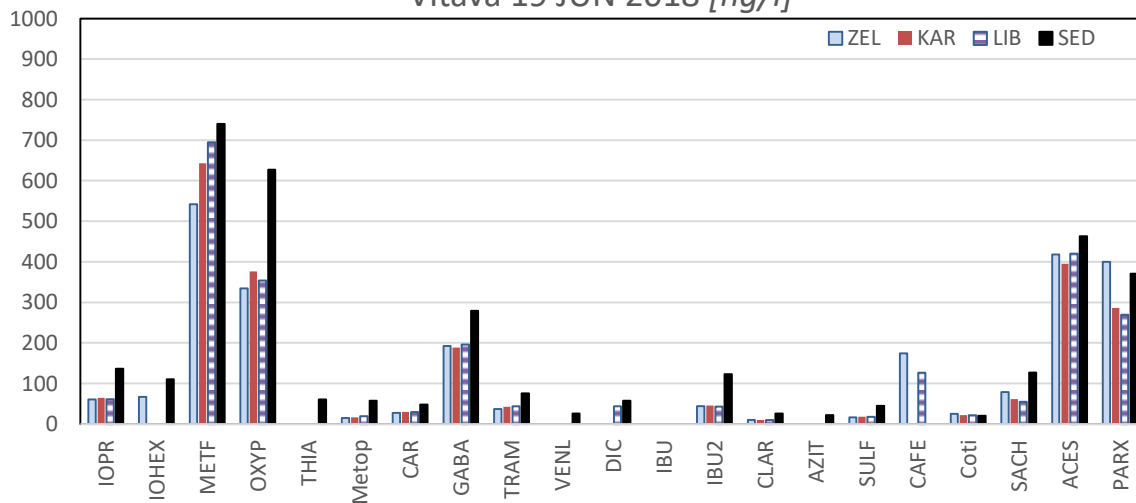
Origin: Cca 90% from WWTPs discharges.

Pharmaceuticals & co., City of Prague as example: Resistant ones are supplied from upstream

Vltava 8 NOV 2017 [ng/l]



Vltava 19 JUN 2018 [ng/l]



Iopromide	IOPR
Iohexol	IOHEX
Metformin	METF
Oxypurinol	OXYP
Hydrochlorothiazide	THIA
Metoprolol	Metop
Karbamazepin	CAR
Gabapentin	GABA
Tramadol	TRAM
Venlafaxine	VENL
Diclofenac	DIC
Ibuprofen	IBU
Ibuprofen-2-hydroxy	IBU2
Clarithromycin	CLAR
Azithromycin	AZIT
Sulfamethoxazol	SULF
Caffein	CAFE
Cotinine	Coti
Saccharin	SACH
Acesulfam	ACES
Paraxanthine	PARX

Longitudinal profile of Vltava River during the passage through Prague: Left/blue column (ZEL) – upstream. Right/black(SED) - downstream the Prague WWTP.

General improvement seems obvious, but problems continue :

- Classic indicators of river water quality show an acceptable level: Very nice comparing with the history.
- Eutrophication continues, phosphorus disposal is still unsatisfactory: B.O.D. show seasonal changes due to primary production etc.
- High and stable transport of nitrate to oceans.
- New pollutants – industrial ones and PPCP (Pharmaceuticals and Personal Care Products). PPCP are discharged from households!!
- Trends to convert rivers to channels: Loss of self-purification capacity.
- Drought: Long periods of low discharges with stable supply of pollution from WWTPs.

A wide river flows through a landscape with bare trees and a cloudy sky. The river is the central focus, with a grassy bank in the foreground and a line of trees in the background. The sky is overcast with soft, grey clouds.

Good Luck in improving Moldavian water management!

And thanks for your attention.

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Datasources :

Monitoring network – CHMI

Water quality graphs – original JKF/WRI T.G.M.