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Sponsors:



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**Comparison of nitrogen and phosphorus
concentrations in surface waters of small urban and
agricultural catchments in Northern Poland**



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Introduction

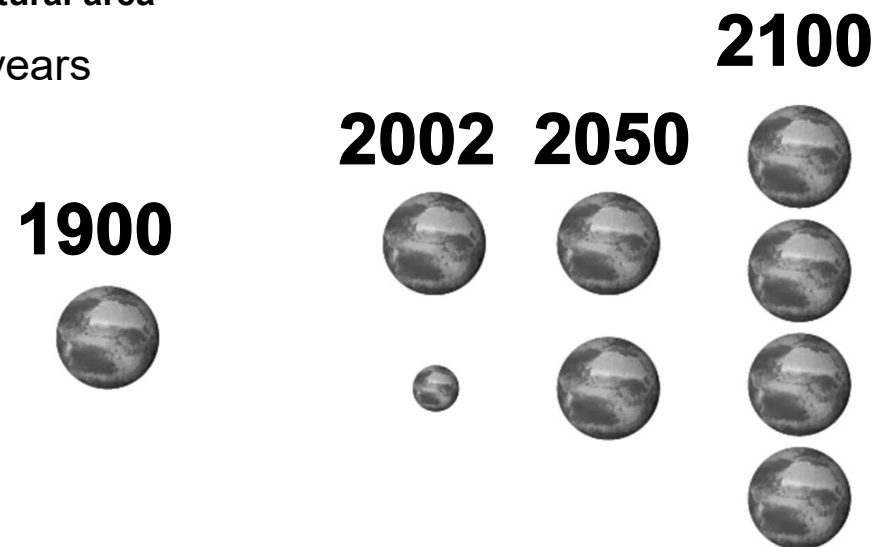
1) Population growth

2) Antropopressure:

1) We need for additional homes and flats – **urban spaces**

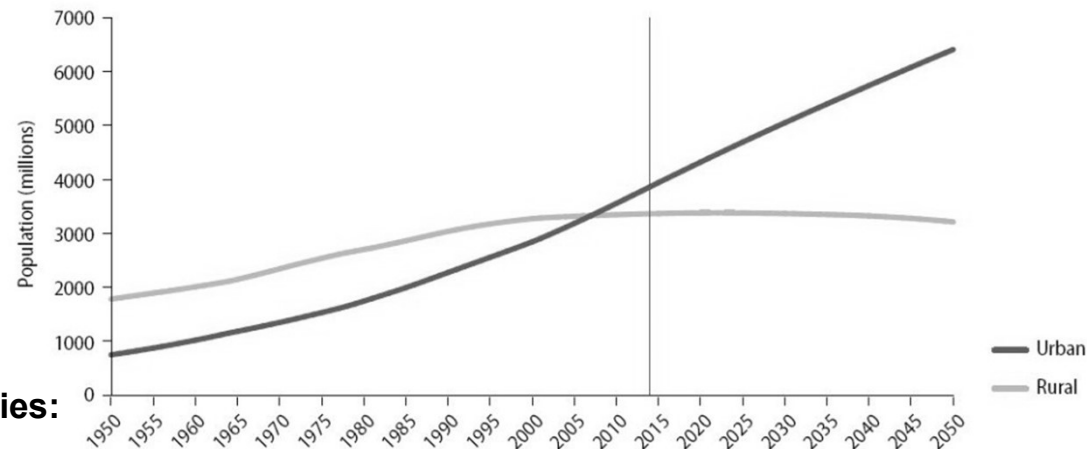
2) We need more food – **agricultural area**

3) Predictions for the coming years



Introduction

Predictions for the coming years



Population lives in cities:

- Belgium 98%
- Japan – 93%
- Argentina – 92%
- Holland – 90%



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Sampling points



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Sampling points - 2

Błazikowski Stream



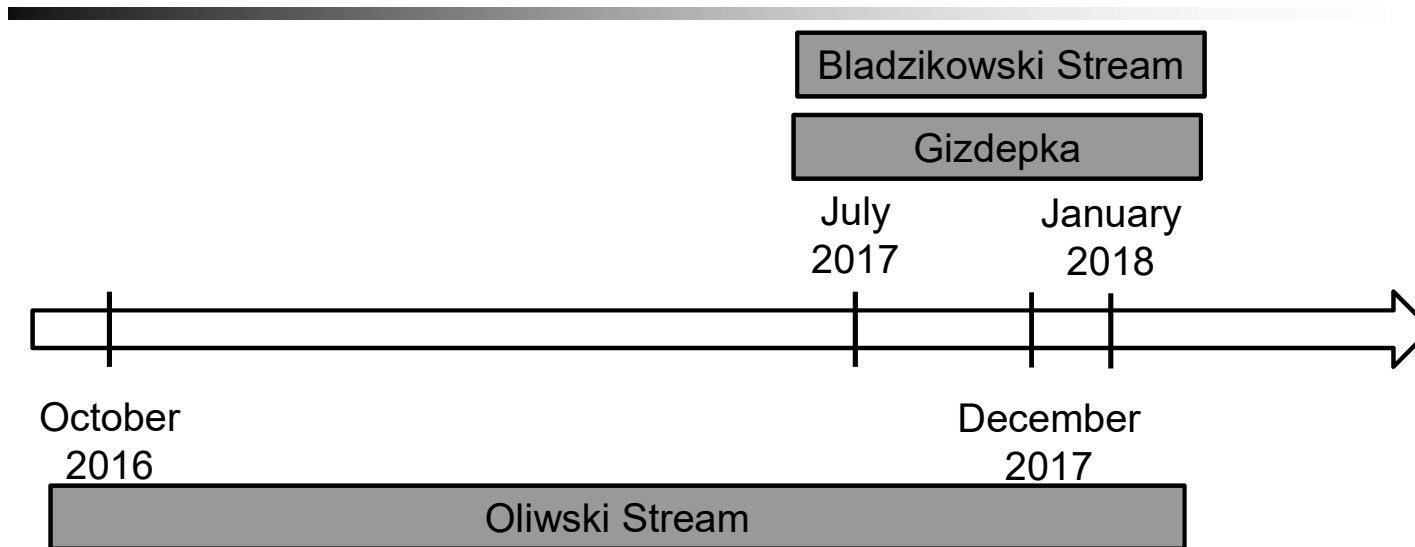
Gizdeпка



Oliwski Stream



Sampling

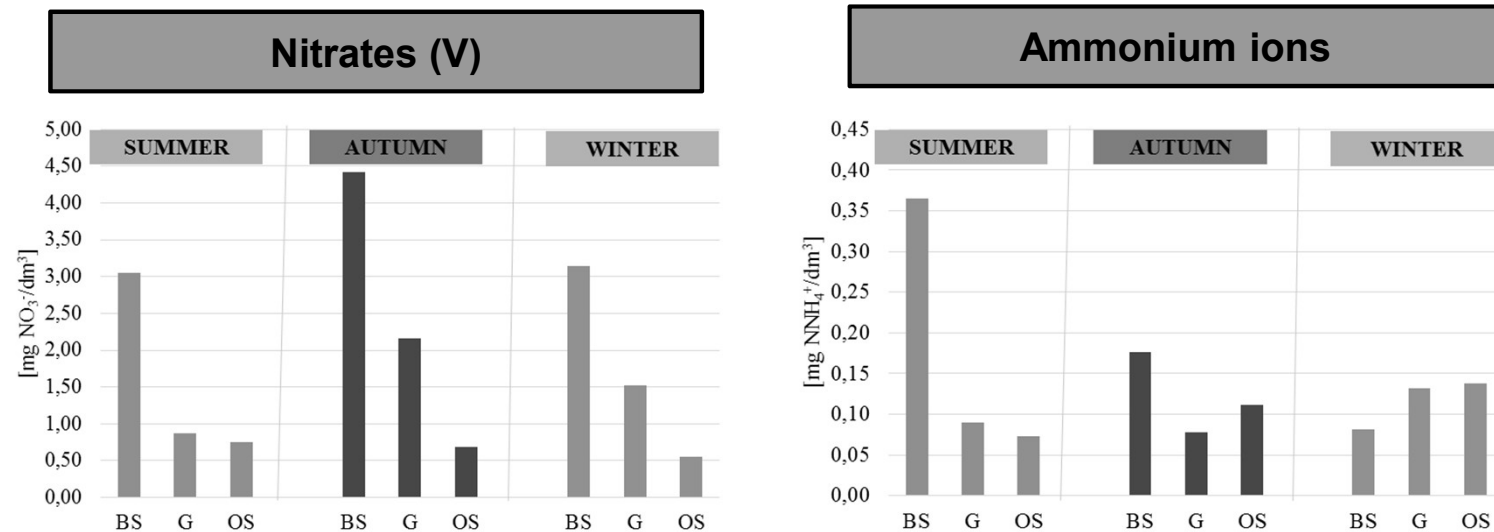


NO_3 NH_4^+ PO_4 P_{tot}

Streams

Watercourse	Bladzickowski Stream	Gizdeпка	Oliwski Stream
Catchment area [km ²]	23,00	37,20	28,92
Length [km]	11,00	13,60	9,57
Bottom slope [‰]	4,0	7,8	14,6
Mean flow rate [m ³ /s]	0,035	0,173	0,206
Kind of catchment	agricultural	agricultural	urban
Estuary to the sea	Puck Bay	Puck Bay	Gulf of Gdansk

Concentration of two nitrogen forms



In the Bladzikowski Stream nitrates (V) concentrations are 4-6 times higher than for the Oliwski Stream and 2 – 4 times higher than for Gizdepka.

The biggest differences between the streams inflowing to Bay of Puck were recorded in summer. In case of Oliwski Stream the autumn concentrations showed the highest difference in comparison to other analyzed streams.

The surface load of nitrogen forms

The surface load of **nitrates (V)** for:

- the **urban** catchment $0.019 \div 0.026 \text{ mg/dm}^3 \cdot \text{km}^2$,
- watercourses in **agricultural** areas $0.023 \div 0.058 \text{ mg/dm}^3 \cdot \text{km}^2$.

The surface load of **ammonium ions** for:

- the **urban** catchment $0.003 \div 0.005 \text{ mg/dm}^3 \cdot \text{km}^2$ (the highest values in winter),
- the **agricultural** catchment $0.002 \div 0.005 \text{ mg/dm}^3 \cdot \text{km}^2$ (the highest values in summer).



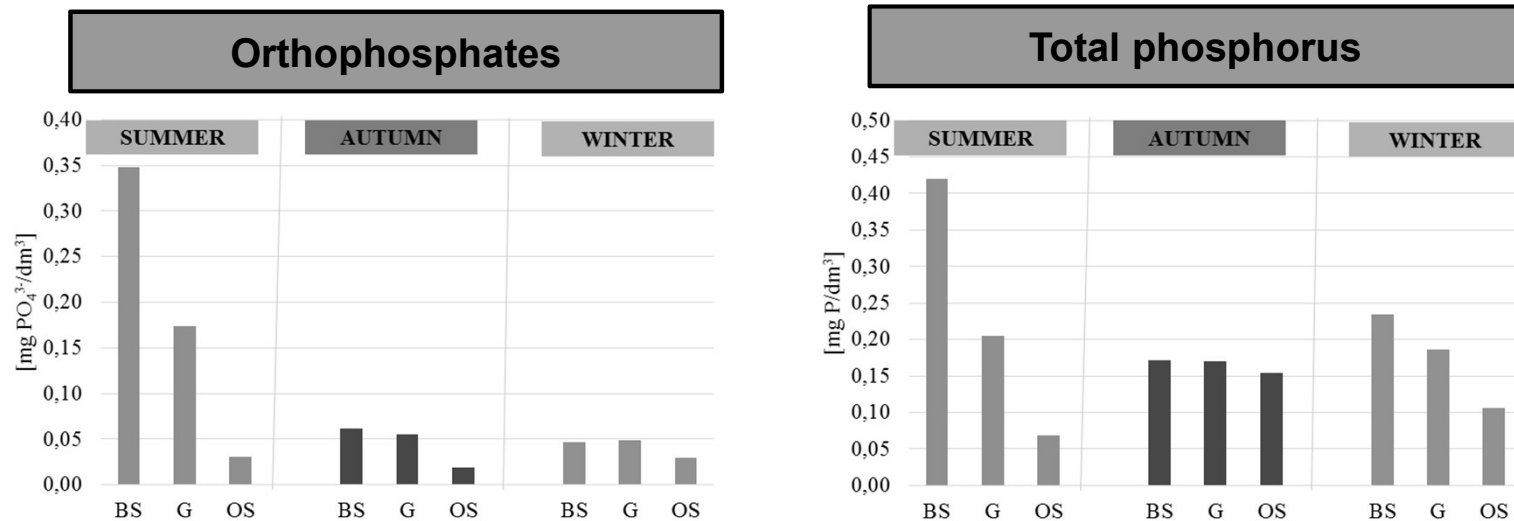
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Concentration of phosphorus forms



The highest concentrations of orthophosphates were also recorded during the summer. Similarly to nitrogen, the largest fluctuations in concentrations occurred in the Bladzikowski Stream, where concentrations in the winter were 7.5 times lower than in the summer. For the agricultural catchment the orthophosphates account for 83-84% of total phosphorus while in case of the urbanized area only 45%.

The surface load of phosphorus forms

The surface load of **total phosphorus** for:

- the **urban** catchment **0.002÷0.005 kg/d· km²**,
- watercourses in **agricultural** areas **0.005÷0.006 kg/d· km²**.



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Conslusions

- **The widely accepted assumption that agricultural catchments are the main emitters of nutrients into the Baltic Sea may lead to overlooking the threat coming from the constantly developing cities.**
- The comparison of nutrient concentrations in the waters of the catchments with agricultural area and the urbanized catchment area indicated a higher concentration of pollutants in agricultural areas.
- The highest concentration of nutrients occurred in Bladzikowski Stream – usually in summer – which probably resulted from the lowest flow rate in this period in relation to the annual cycle and the highest flows after thaw in winter.