

Joint 34th ICP Waters and 26th ICP IM Task Force
Meeting, Warsaw, Poland, 7-9 May 2018

Regional assessment of freshwater acidification in Poland

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Acidification of surface waters in Poland

- National scale assessments

- In Poland, the **acidification of surface waters** caused by the atmospheric deposition is **not considered as a significant pressure** on a national scale. Such status is reflected in both: the assessment of acid sensitivity and in the scope of state monitoring system.
- **National scale assessments** regarding the sensitivity to acid deposition in Poland were focused mainly on the Critical Load to **soils** calculated with the simple mass balance method (SMB)
- Lack of national scale assessment of acid sensitivity of surface waters



Acid sensitivity in Poland

- Map of sensitive regions

Steps of the initial assessment of sensitivity of waters:

- preparation of **map of parent material** – bedrock (European Soil Database, geological data from national resources)
- **assignation of the sensitivity** based on 4-point scale
1) sensitive, 2) moderately sensitive, 3) low sensitive and 4) insensitive
- Identification of sensitive **surface water bodies** based on the **typology** (in accordance to the WFD)
- Preparation of the **final sensitivity map** basing on the combination of bedrock data and the typology of surface waters

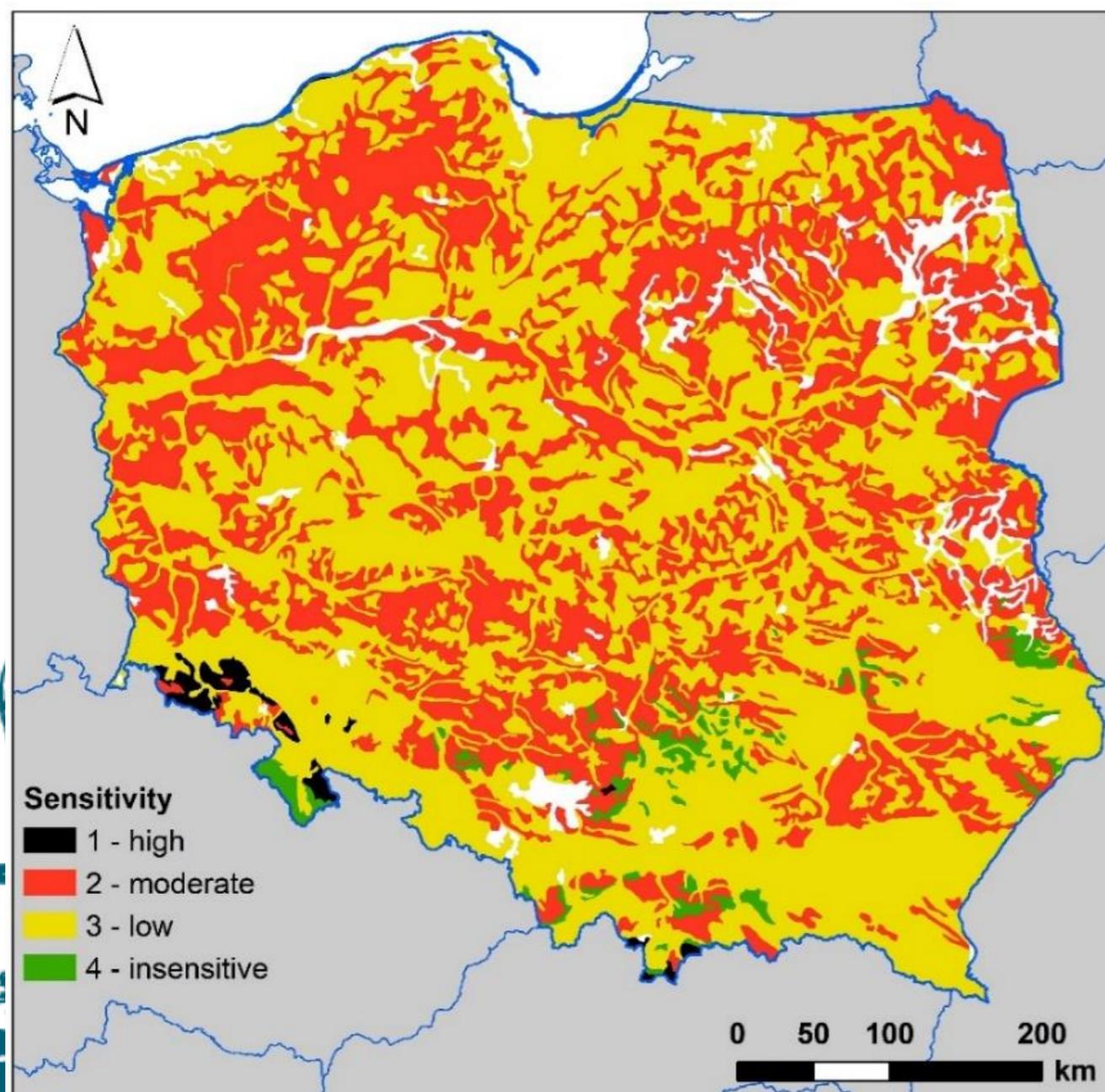


Acid sensitivity in Poland - bedrock

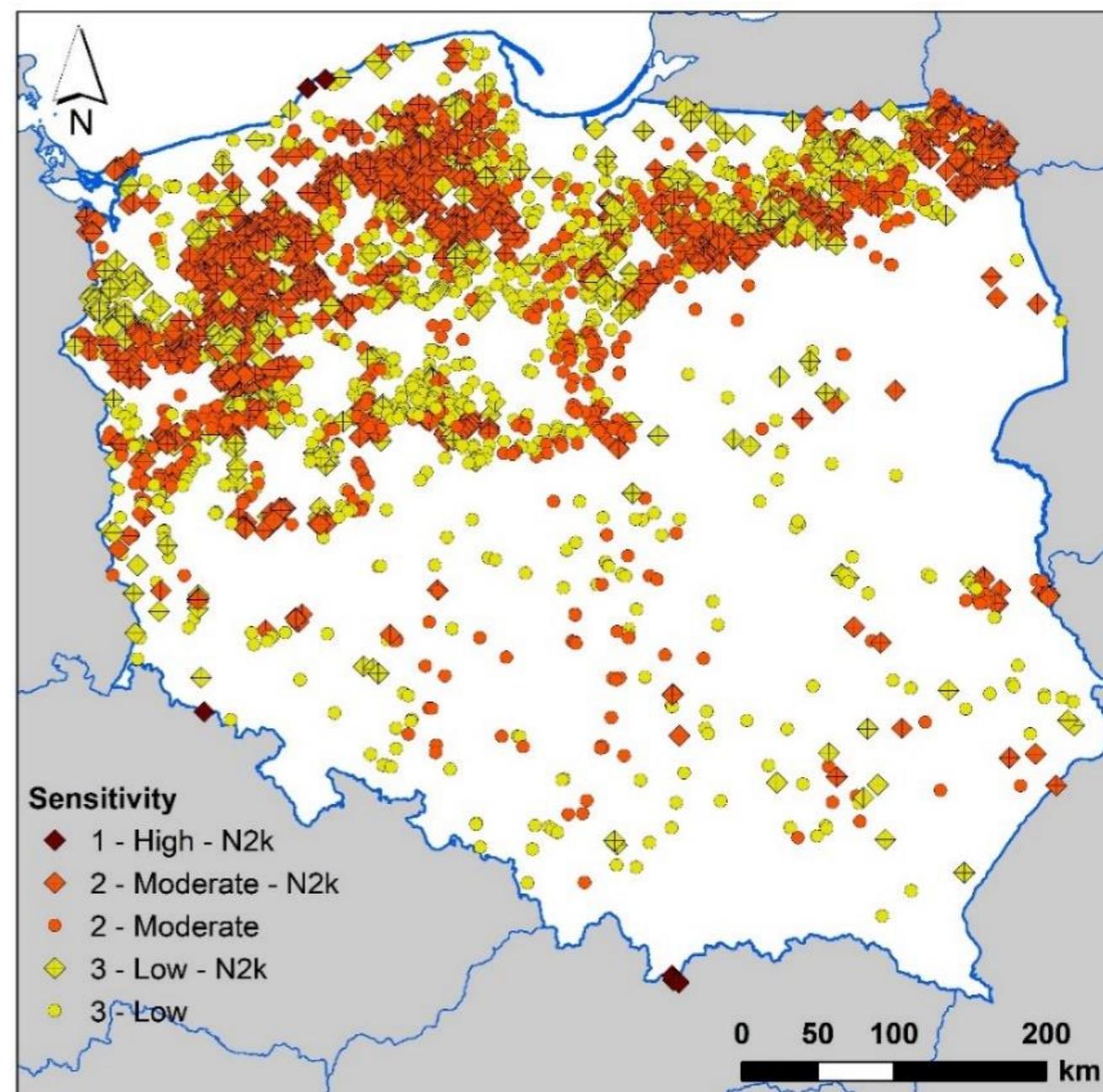


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Acid sensitivity of the bedrock in Poland



Acid sensitivity of lakes based on the bedrock characteristics (assessment includes 3324 lakes out of over 9000 in Poland)

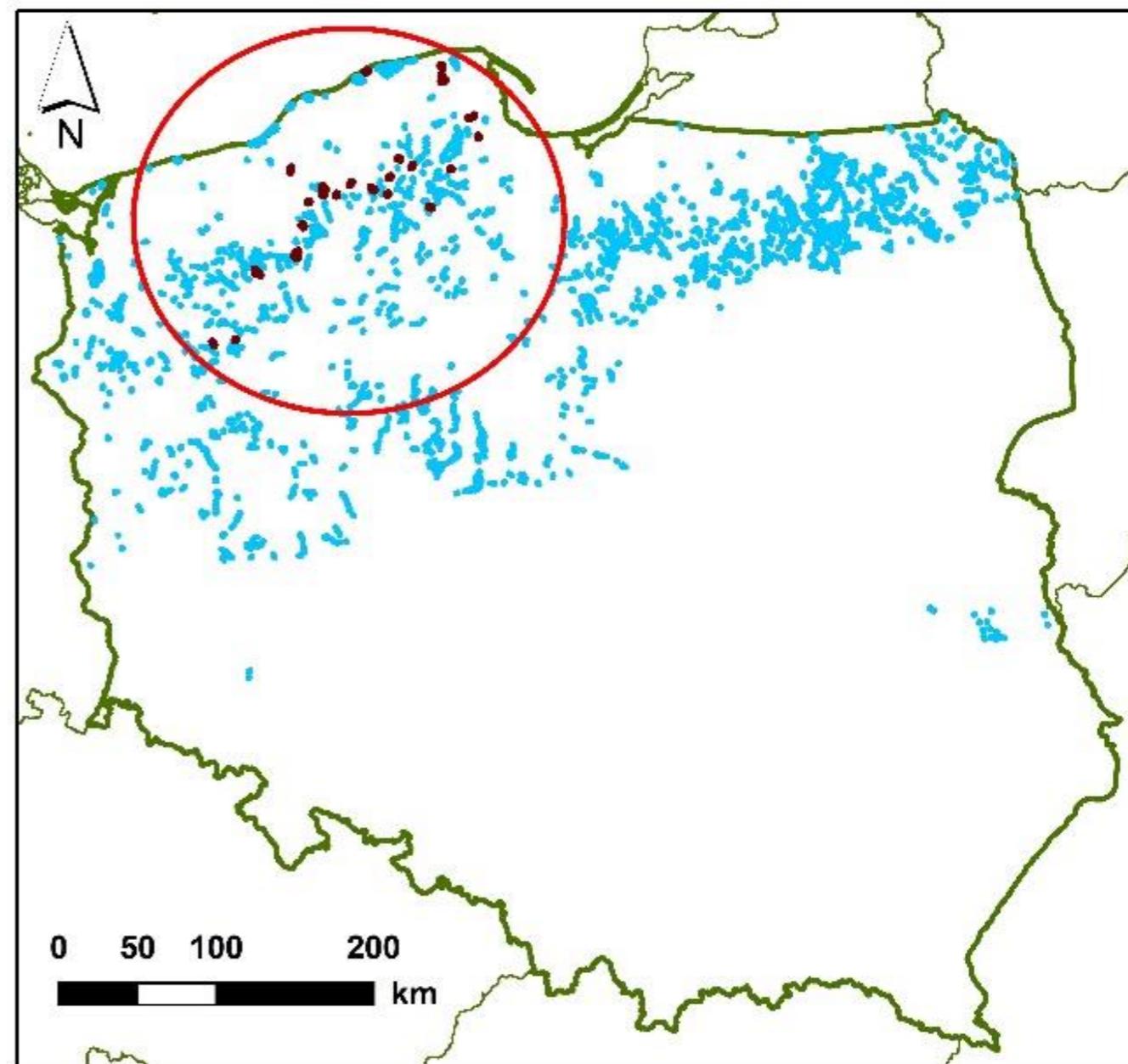


Acid sensitivity in Poland - Water Framework Directive

typology of water bodies in accordance to the WFD

Lakes (> 50 ha):

- geology was substituted by water quality parameters including concentration of calcium with 25 mg Ca/l as a threshold value
- only 27 lakes (out of 1402 monitored) have the concentration of Ca less than 25 mg/l and they are characterized by relatively low alkalinity – less than 1,3 meq/l



Types basing on the concentration of Ca:

■ < 25 mg/l

■ ≥ 25 mg/l

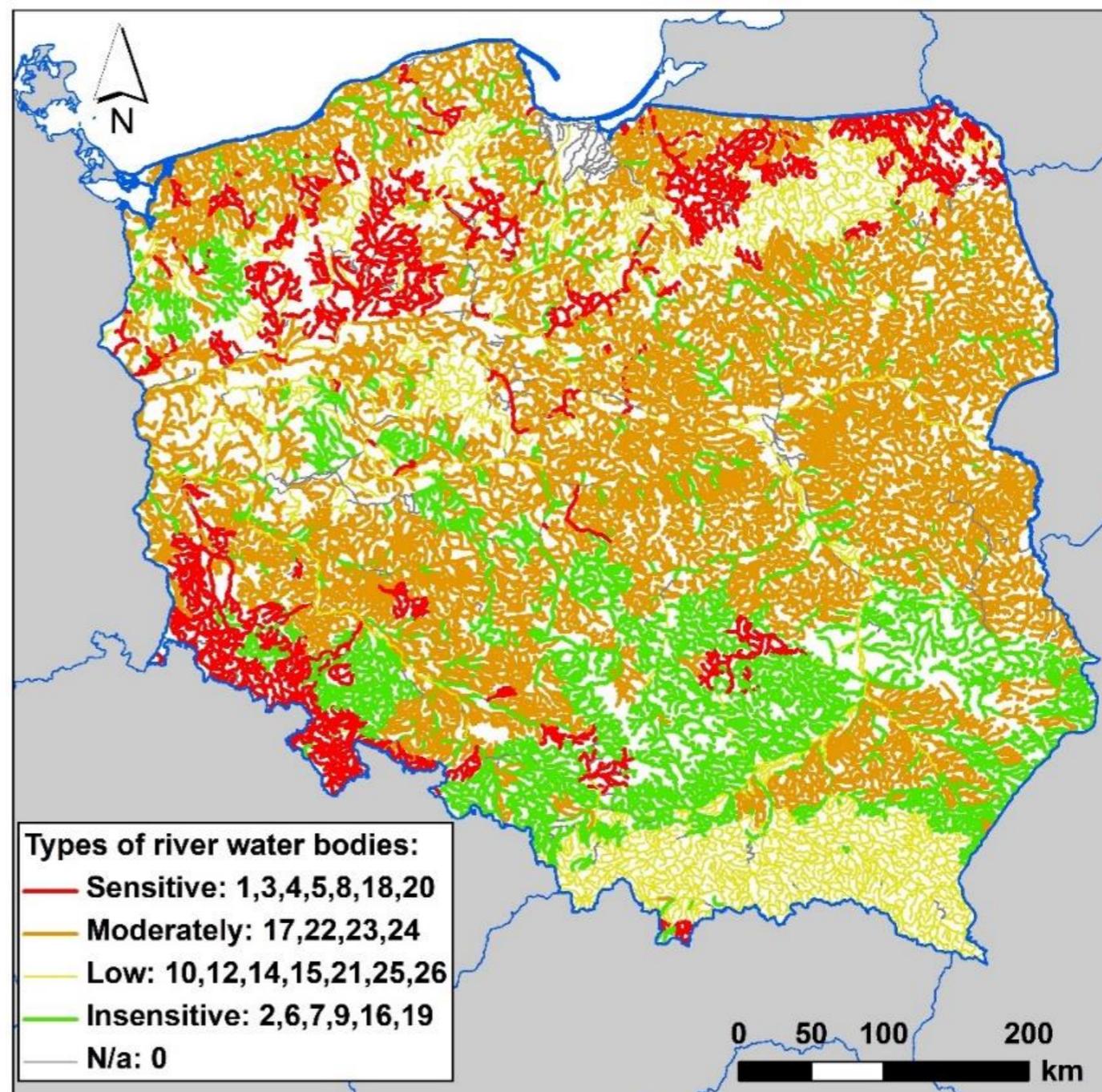
Acid sensitivity in Poland - Water Framework Directive

typology of water bodies in accordance to the WFD

Rivers (catchment area > 10 km²):

- typology includes a riverbed material which was divided into three groups according to the WFD's "system A"
- typology includes also local characteristics (e.g. peat or alluvial soils)

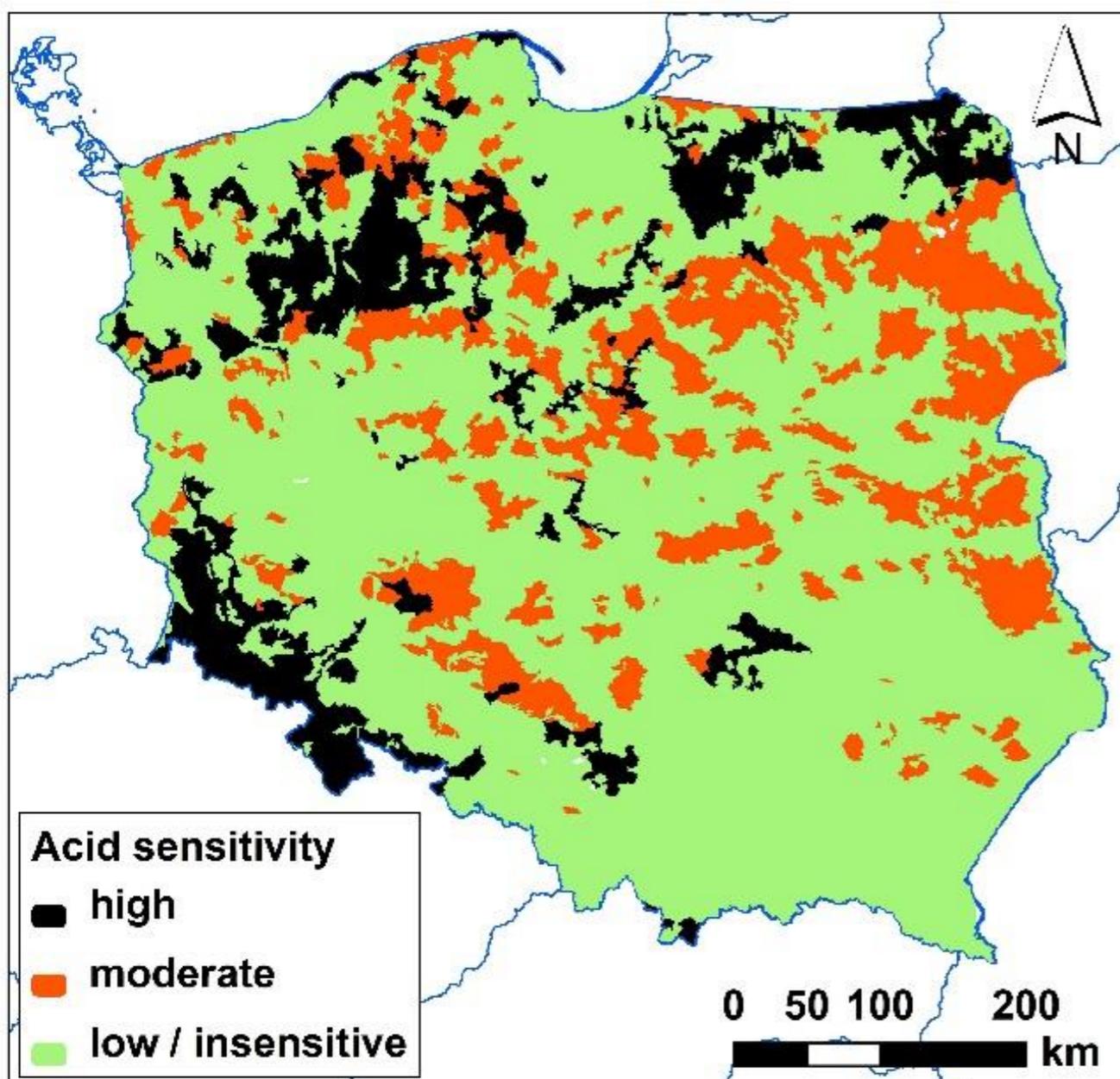
- Sensitive:** types clearly indicated as of siliceous riverbed;
- Moderate sensitivity:** domination of sand and gravel or organic material, occasionally clay and rocks;
- Low sensitivity:** various material; dominating gravel, marlstone, slate; sometimes sand or clay in sections of low slope;
- Insensitive:** Riverbed clearly described as calcareous;
- N/a: not applicable** due to the lack of information about the riverbed material.



Acid sensitivity in Poland

- The final map of acid sensitivity

Includes **three classes** of acid sensitivity following the earlier assessments done by the ICP Waters for Europe



Class	Condition	Percent of total area
High	1. Sensitive bedrock OR 2. Sensitive surface water body OR 3. Type of water body is „0” (unspecified) AND its basin is adjacent to the high sensitive region	12.5
Moderate	body of surface water AND the bedrock of its catchment are moderately sensitive	17.3
Low / insensitive	All other cases	70.2

Acidification of surface waters in Poland

- Monitoring

State monitoring system

- Monitoring of surface water bodies (according to the WFD).
Monitoring campaigns are conducted in 6-year cycles
 - once (surveillance monitoring and monitoring of protected areas),
 - twice if the water body is at risk of failure to achieve environmental objectives (operational monitoring)
 - every year if the body is a reference monitoring point or intensive monitoring point.
- Monitoring of air quality - monitoring of chemical composition of precipitation at 22 stations (e.g. SO₄, NO_x, Cl, Na, Ca, Mg, K, TN, pH) and the estimation of monthly deposition to soils
- Integrated monitoring – 11 stations include monitoring of deposition and most of them monitoring of surface waters with the scope consistent with the ICP Integrated Monitoring

Acidification of surface waters in Poland

- Monitoring

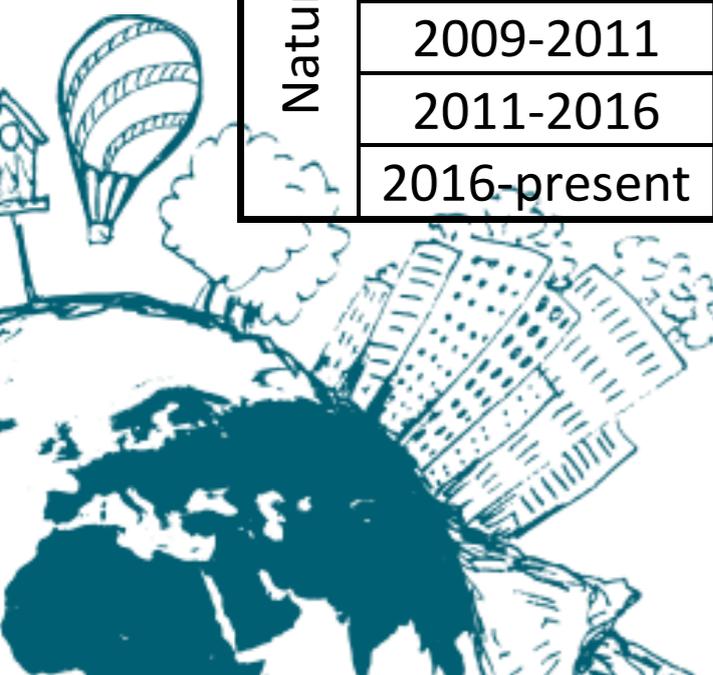
Monitoring of surface water bodies (according to the WFD)

		TOC	Cl	SO ₄	NO ₃	Mg	Ca	NH ₄	pH	Alkalinity
Natural rivers	1962-1970		X***		X				X	
	1970-1991			X				X		
	1991-1994					X				
	2004-2009					X				
	2009-2016				6 (12*)					6
	2016-present				6 (12**)					6
Natural lakes	1962-1970		X***		X				X	
	1970-1991			X				X		
	1991-1994					X				
	2004-2009					X				
	2009-2011				3 (6**)		2		3 (6**)	
	2011-2016				4 (6**)				4 (6**)	
	2016-present			4 (6**)				4 (6**)		

* for river types: 19, 20, 21, 24 and 25

** for reference monitoring points

*** if water was used as a source of potable water prior to the treatment or for the agriculture



Acidification of surface waters in Poland

- Monitoring

Long-Term Ecosystem Research in Europe (22 sites, ten of which include monitoring of surface water chemistry but at least half of sites includes water bodies not suitable for the ICP Waters).

ICP Waters monitoring sites:

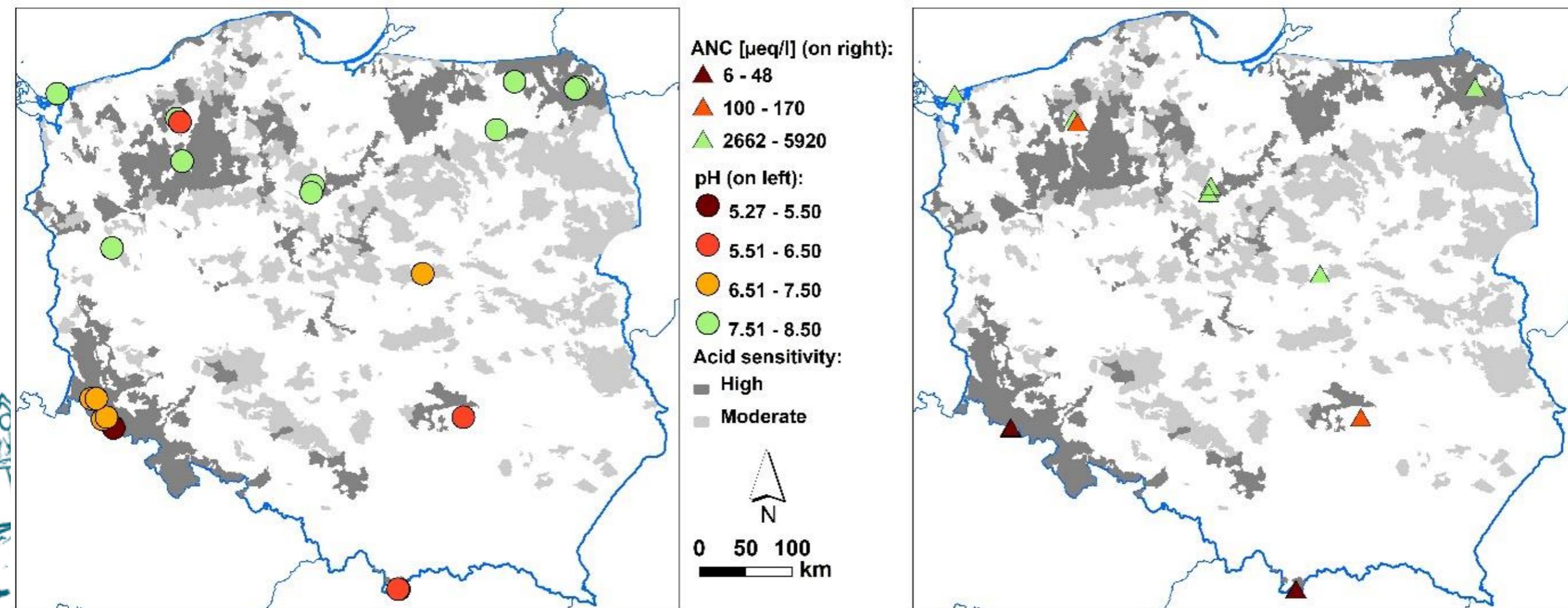
- Two lakes in the Tatra Mountains (1992-2013)
- Two lakes in the Karkonosze Mountains (2004-2013)
- Five new sites proposed in 2016 (lakes: Jegocin, Długie Wigierskie, Krąpsko Długie, Głębokie and Łękuk Wielki) with data available since 1990's. Only part is located in acid sensitive regions and none has the ANC monitored.



Acidification of surface waters in Poland - Initial assessment

Based on 22 points:

- Current data
- In or less than 1 km from the acid sensitive regions
- Different types of water bodies, locations, land use of catchment areas



Results / Conclusions:

- Initial acid sensitivity map has been prepared basing on the bedrock material and typology of surface waters
- State monitoring system is not representative (large lakes and river basins, scope of monitored parameters, reference and integrated monitoring points only partially located in acid sensitive regions)
- Only 4 of 4586 points monitored in accordance to the WFD had the pH below target (all four in the Sudety Mountains)
- The most acidified waters are in small lakes in high mountains and in highly polluted areas, e.g. Święty Krzyż IM station (based on research and integrated monitoring)
- Streams in mountains have relatively low pH only in case of small catchment area and acid sensitive bedrock (based on research monitoring).
- In northern Poland (main lake districts) only small lakes with small catchment areas are prone to the acidification (based on the pH and ANC analyses)
- A recovery from acidification was reported for mountain areas based on research monitoring of water chemical status and on biological studies with diatoms as indicators



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Thank You

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