XX TECHNICAL DAM CONTROL INTERNATIONAL CONFERENCE

TKZ2023

Functioning of the Regional Water Management Authority in Poznan retention reservoirs in the context of climate change and water needs - challenges and operational problems on the example of selected objects

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POLITECHNIKA WARSZAWSKA

GÓRNOŚLĄSKIE PRZEDSIĘBIORSTWO WODOCIĄGÓW SPÓŁKA AKCYJNA

Instytut Badań Stosowanych
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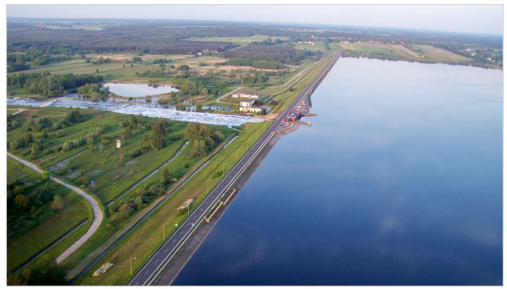
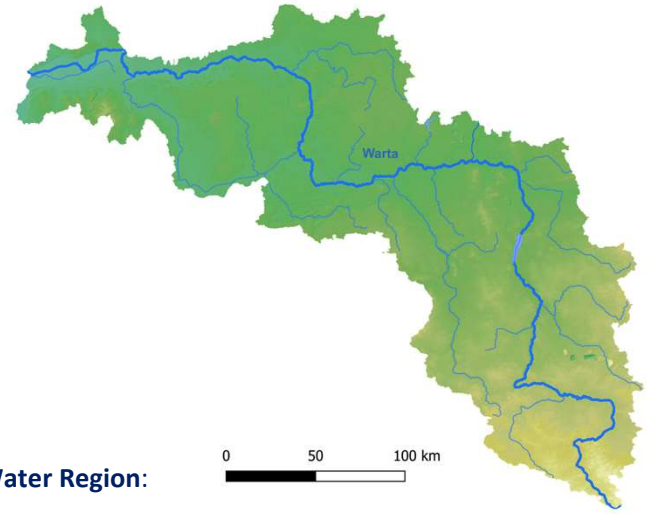
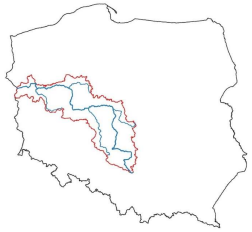
Presentation plan

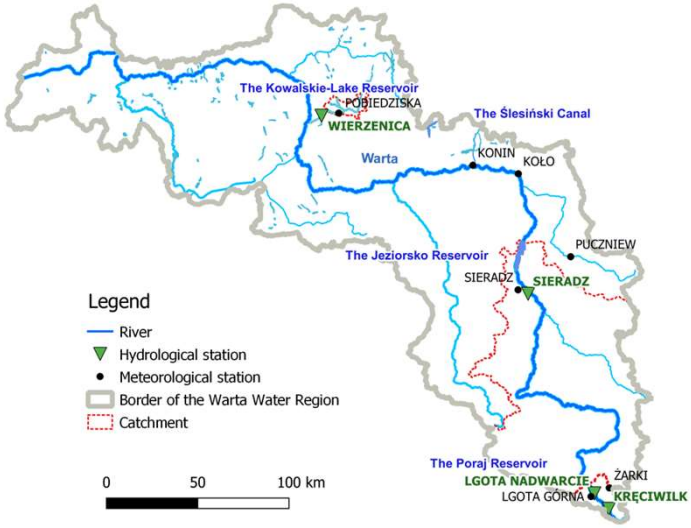


1. **The Warta-river Water Region & selected objects – short characteristic**
2. **Research methodology**
3. **Analysis & results:**
   - **The Poraj Reservoir**
   - **The Jeziorsko Reservoir**
   - **The Kowalskie Lake reservoir**
   - **The Ślesiński Canal**
4. **Conclusions**

The Warta-river Water Region & selected objects – short characteristic







The Warta-river Water Region:

- Area = 37 221,3 km^2
- Total rivers lenght = 14 631,9 km
- Main rivers:
  Warta (808 km),
  Liswarta (93 km),
  Widawka (100 km),
  Ner (125 km),
  Prosna (233 km),
  Wełna (113 km),
  Obra (175 km).

Reservoir	PORAJ	JEZIORSKO	KOWALSKIE	THE ŚLESIŃSKI CANAL (upper section)
River	Warta	Warta	Główna	
Year of construction	1979	1986	1985	
Capacity (norm.) [mln m^3]	13,4	142,8	5,9	47,2
Capacity (max.) [mln m^3]	24,9	222,5	6,6	48,7
Area (norm.) [km^2]	3,8	35,5	1,9	7,3
Area (max.) [km^2]	5,4	37,7	2,0	

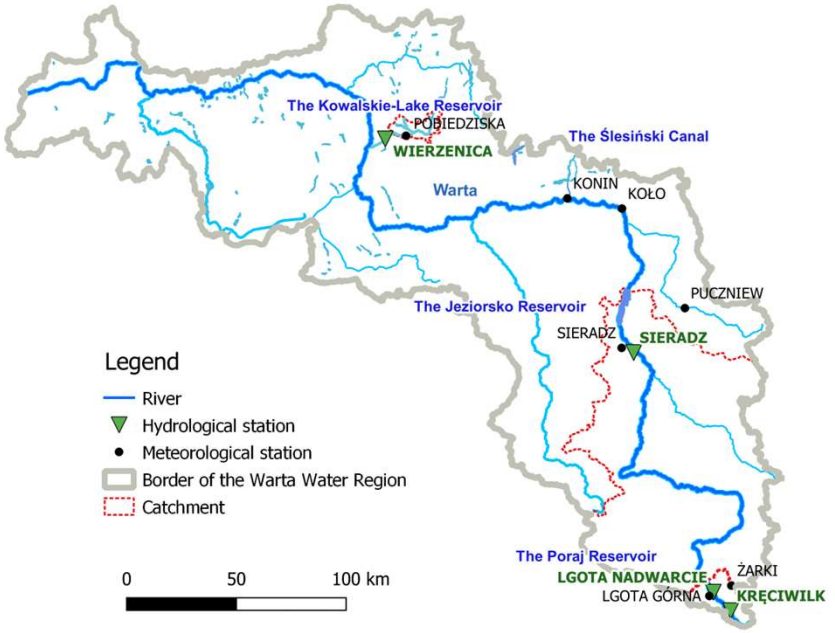
Research methodology

1. Three water reservoirs + lakes on the catchment division (The Ślesiński Canal)

2. Meteorologic data (IMGW PIB) – 1993-2022:
   - annual average temperature [T],
   - annual & monthly precipitation: snow [Ps], rain [Pd], total [Pc].

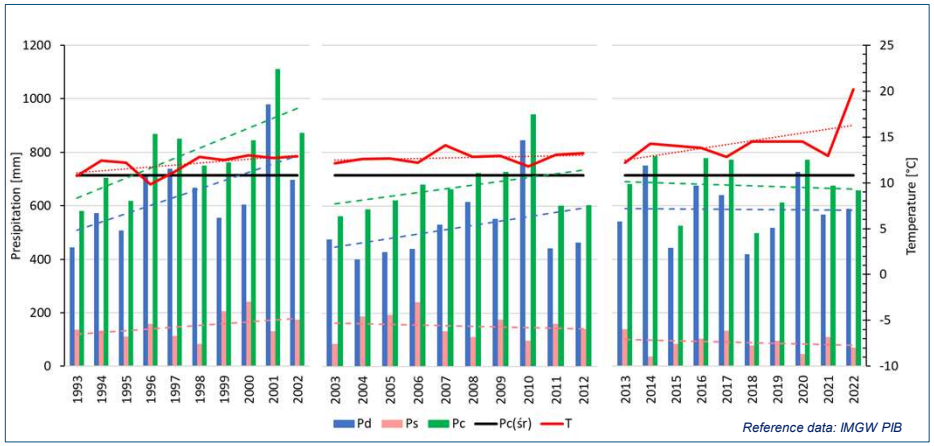
3. Hydrologic data (IMGW PIB, RZGW Poznań) – 1993-2022:
   - annual & monthly water discharge,
   - reservoirs inflow & outfolw,
   - reservoirs & the canal water levels.

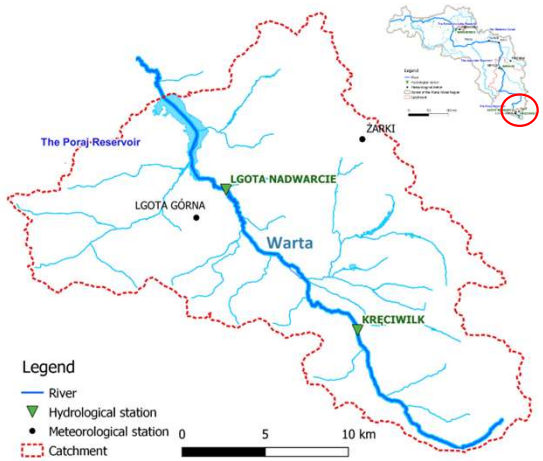
4. Statistical analisies (corelation and significance analisies).



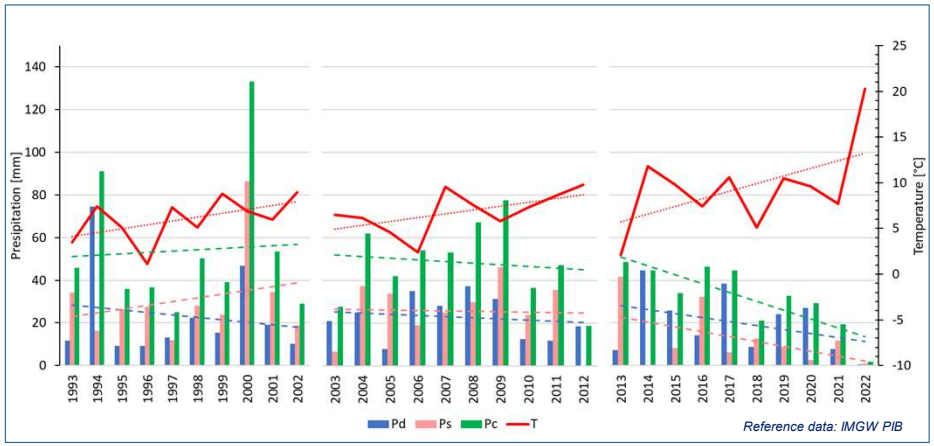
The Poraj reservoir – presipitation & temperature varability

Annual variation over the years →





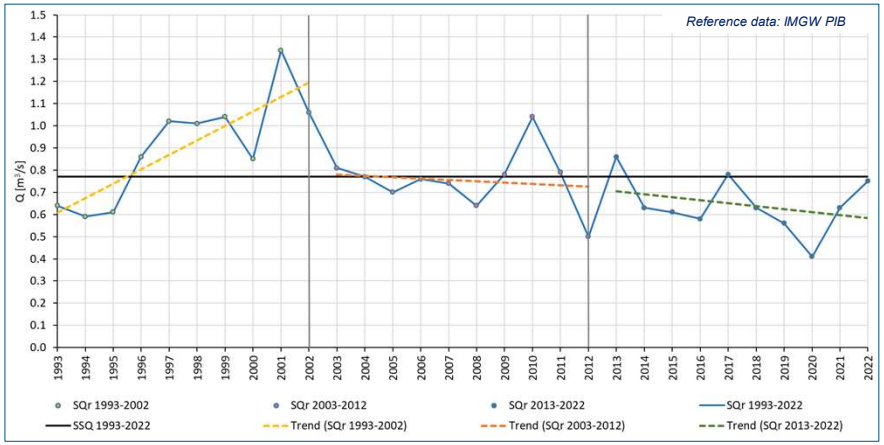
March's variation over the years →



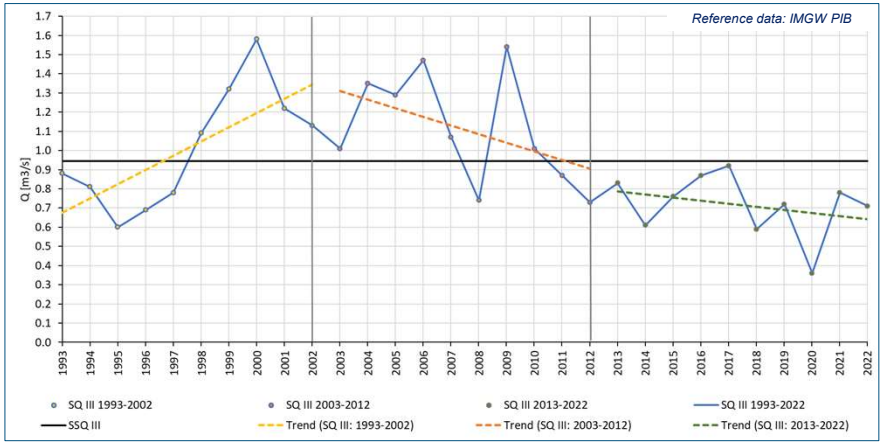
[T] - temperature,
[Ps] - snow,
[Pd] - rain,
[Pc] - total presipitation,
[Pc(śr)] - average total presipitation.

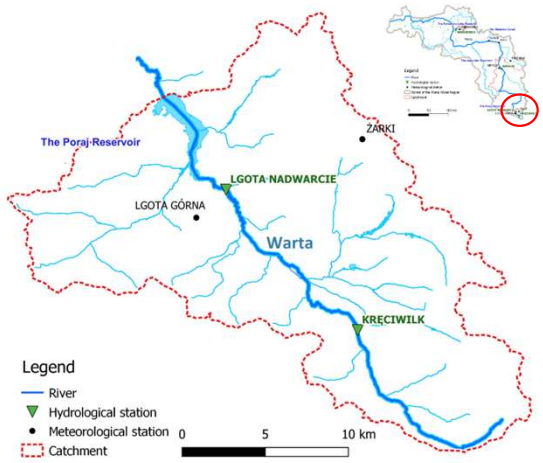
The Poraj reservoir – hydrology (the Warta-river discharge) varability

Annual variation over the years →



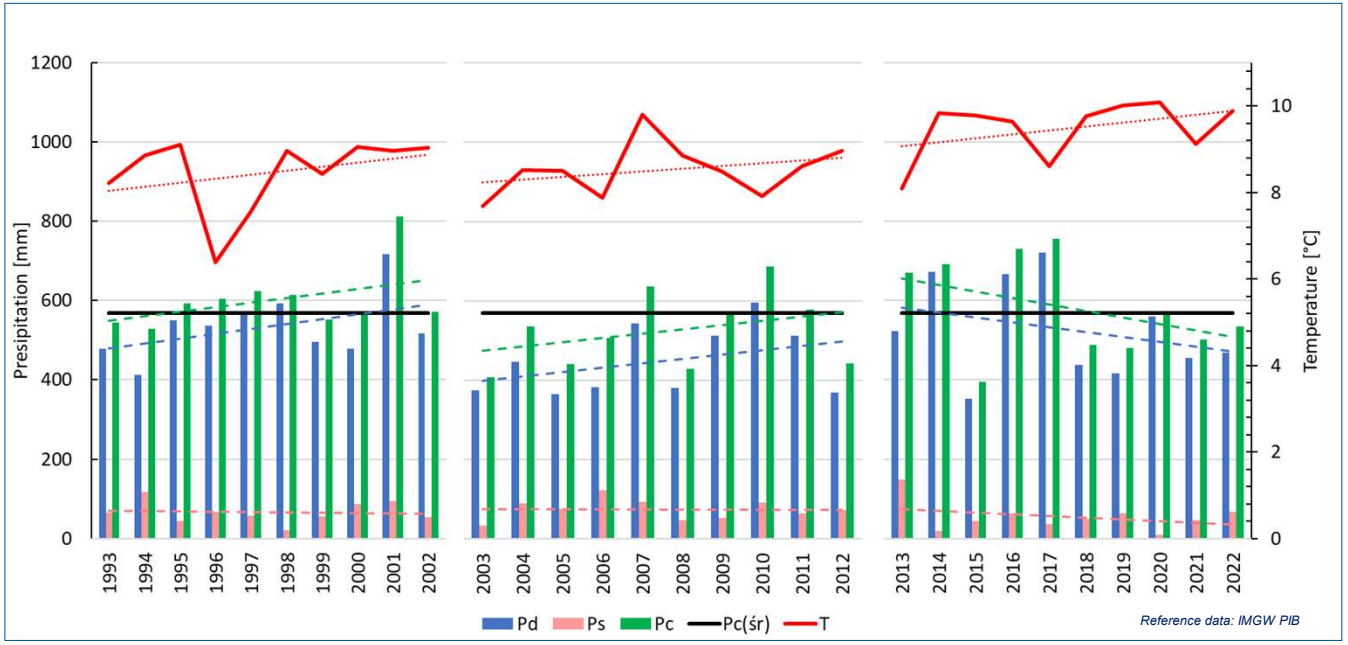
March's variation over the years →

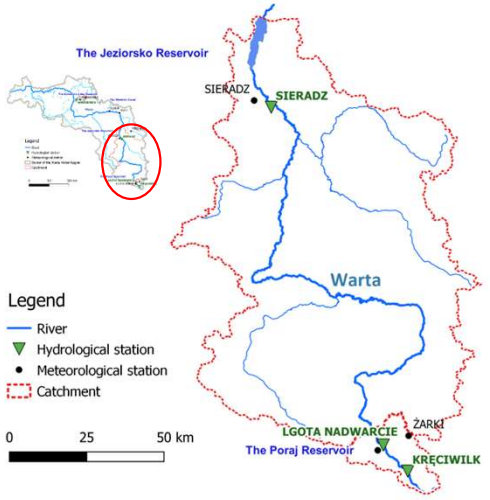




[SSQ] - multi-year average discharge,
[SQr] - average annual discharge,
[SQ III] - average march discharge.

The Jeziorsko reservoir – annual presipitation & temperature varability





[T] - temperature,
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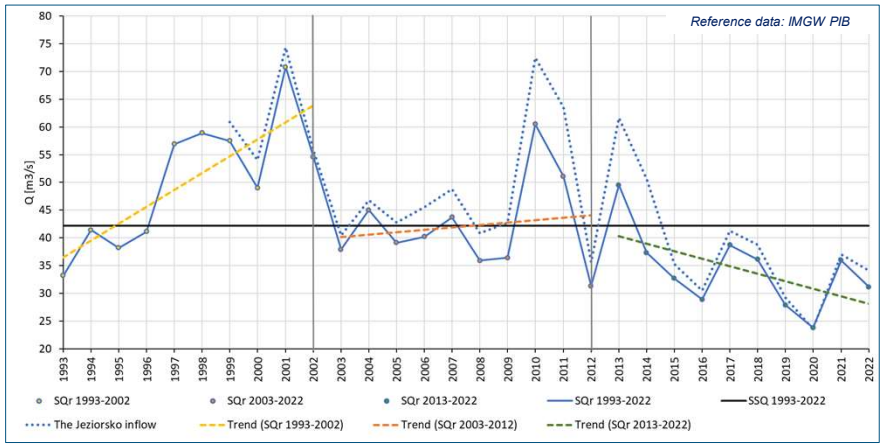
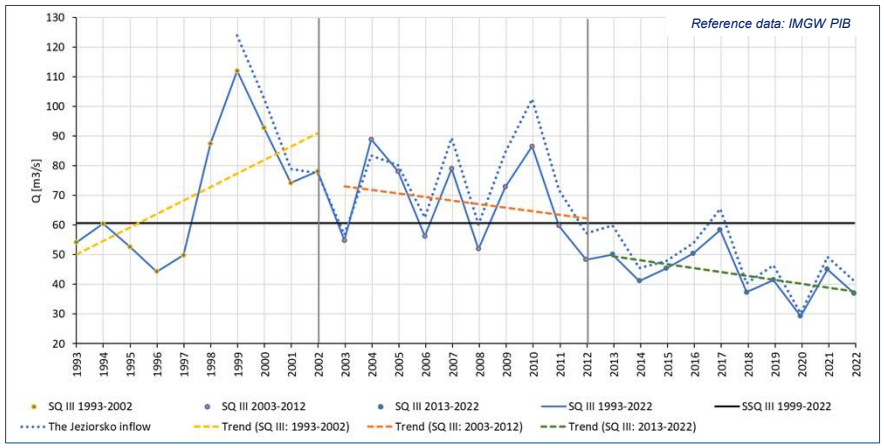
[Pd] - rain,
[Pc] - total presipitation,
[Pc(śr)] - average total presipitation.

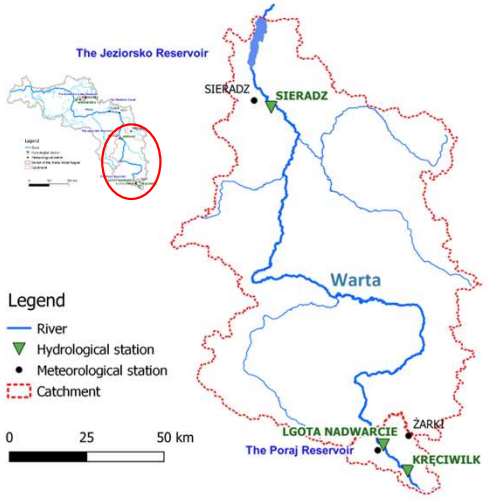
The Jeziorsko reservoir – hydrology (the Warta-river discharge) varability

Annual variation over the years →



March's variation over the years →

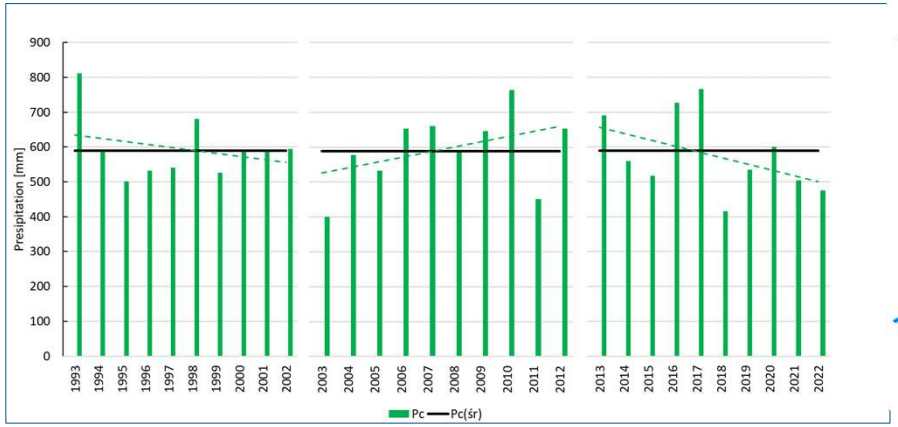


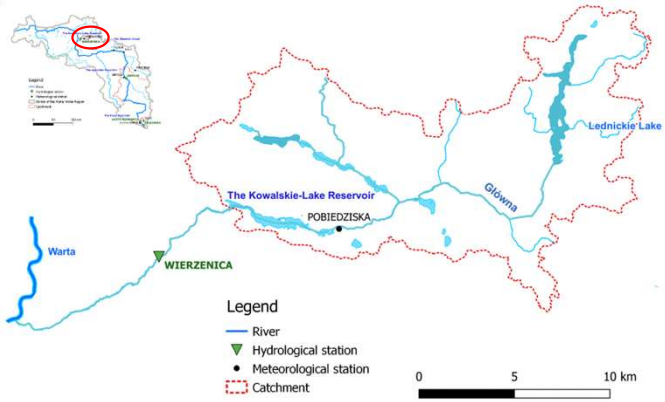


[SSQ] - multi-year average discharge,
[SQr] - average annual discharge,
[SQIII] - average march discharge.

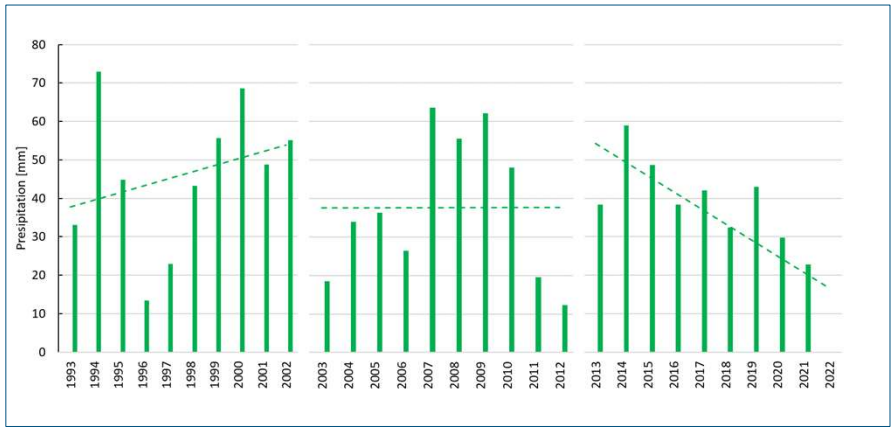
The Kowalskie Lake reservoir – presipitation varability

Annual variation over the years →





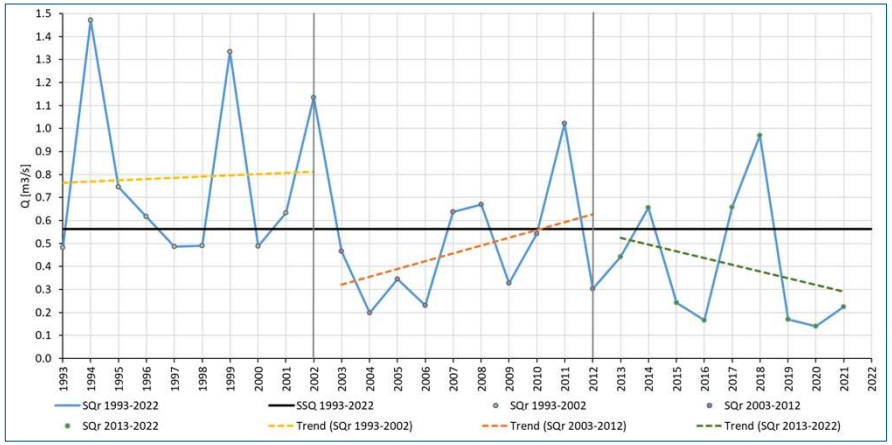
March's variation over the years →

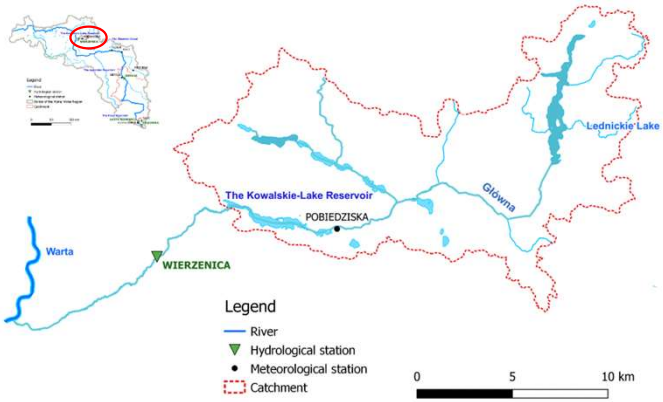


[Pc] - annual total presipitation,
[Pc(śr)] - average total presipitation.

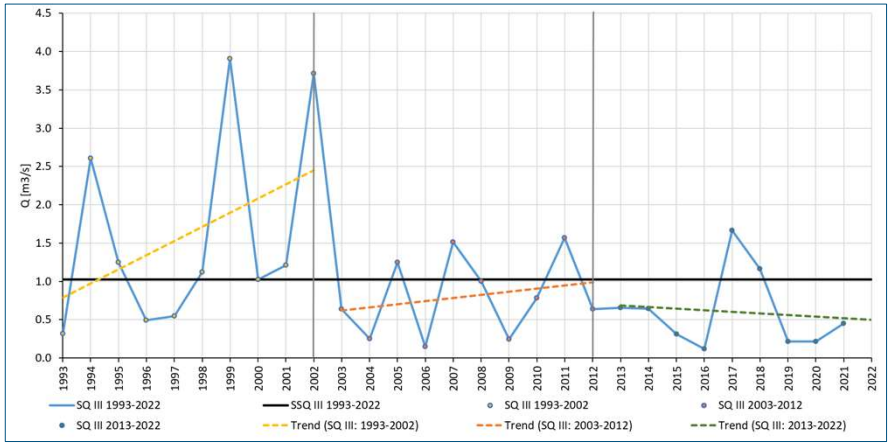
The Kowalskie reservoir – hydrology (the Główna-river discharge) varability

Annual variation over the years →



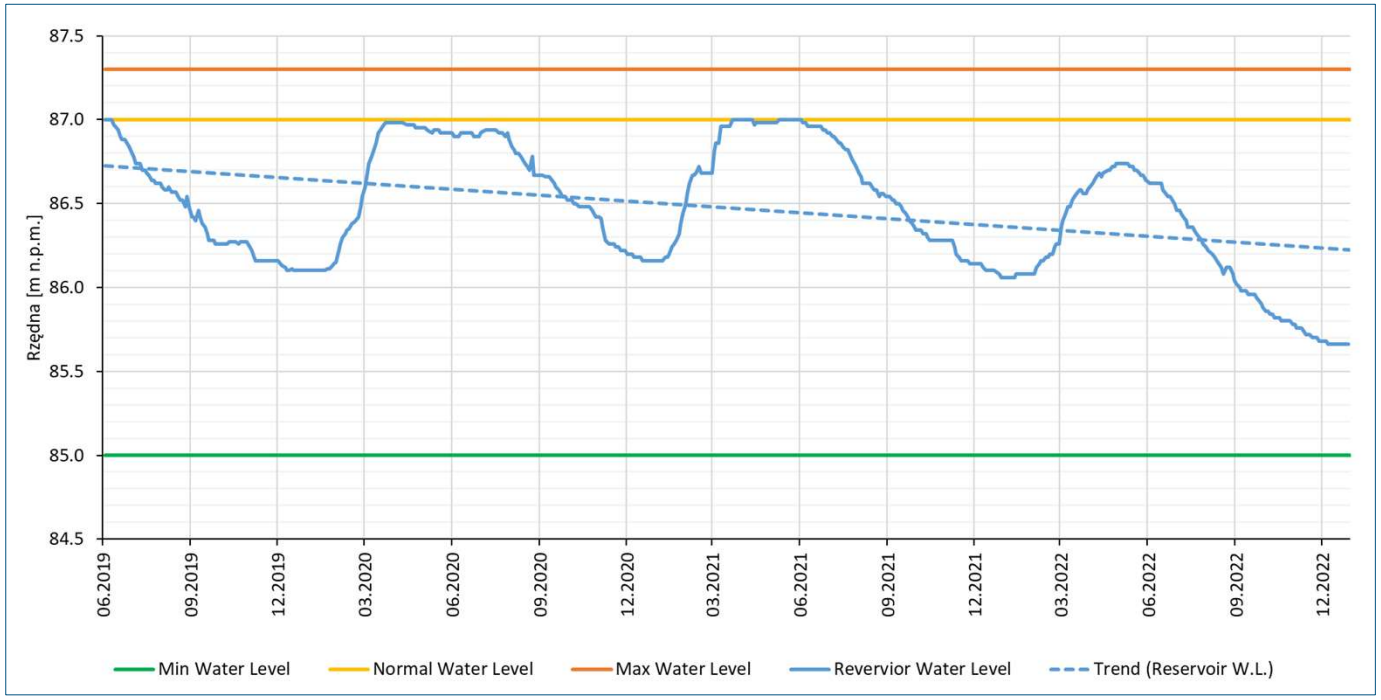


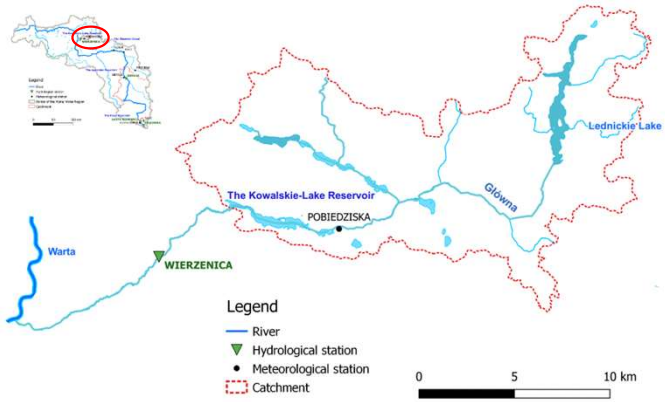
March's variation over the years →



[SSQ] - multi-year average discharge,
[SQr] - average annual discharge,
[SQIII] - average march discharge.

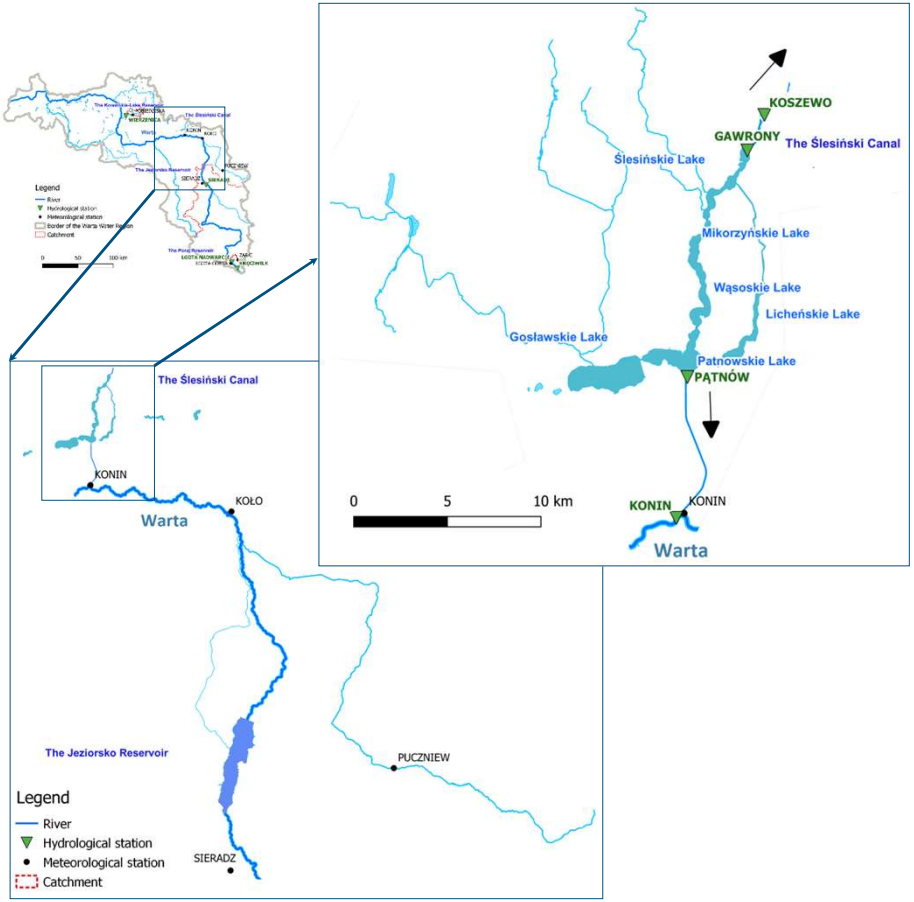
The Kowalskie reservoir – water levels/capacity varability



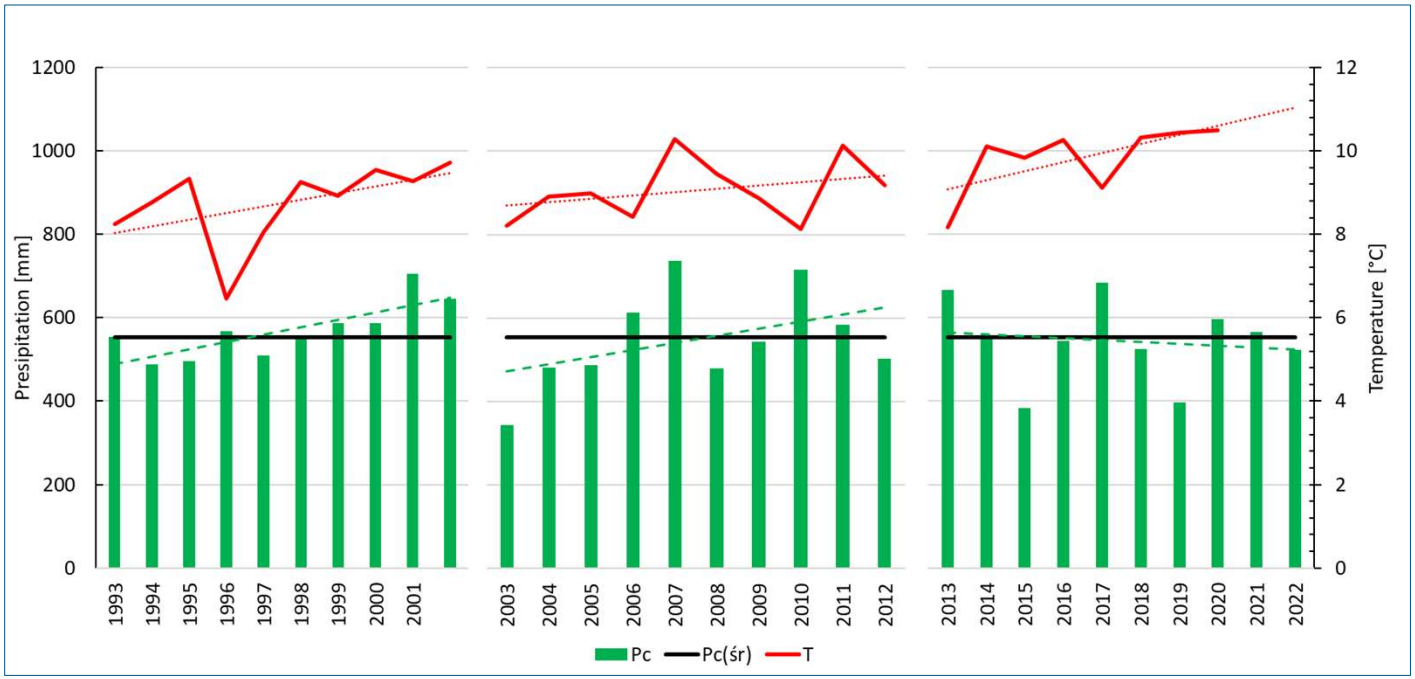


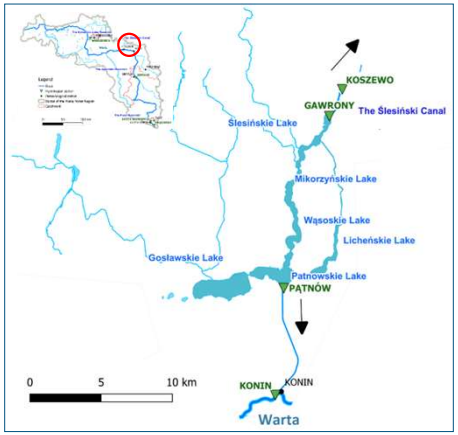
The Ślesiński Canal – short characteristic

Lake	Area [km^2]	Capacity [mln m^3]
Pątnowskie	2,9	7,3
Wąsowo-Mikorzyńskie	2,5	29,1
Ślesińskie	1,5	11,6
Czarne	0,1	0,4
Other	0,2	0,4
Total	**7,2**	**48,8**



The Ślesiński Canal – presipitation & temperature varability

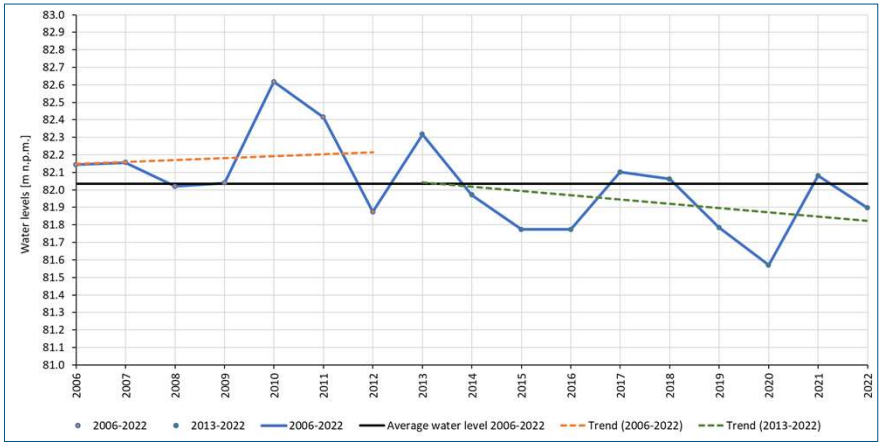


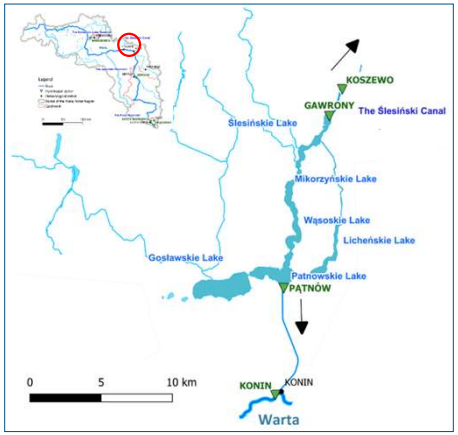


[T] - temperature,
[Pc] - total presipitation,
[Pc(śr)] - average total presipitation.

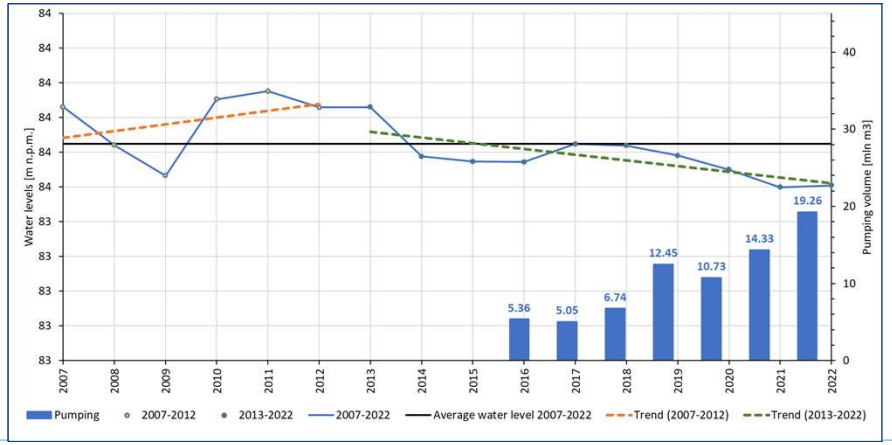
The Ślesiński Canal – water levels & pumping volume varability

The Morzysław Lock's tailwater levels →
(pumping boundary condition)





The Pątnów Lock's headwater levels
(= upper section water levels)
&
Pumped water volume →



Summary / conclusion *(1)*

1. **Precipitation decreasing trends - especially in the last decade.**

2. **Change in the precipitation characteristic :**
   - **practically snowless winters,**
   - **little spring precipitation,**
   - **rainfall with high intensity but fleeting with small spatial range precipitation.**

3. **Average air temperature increase.**

4. **Discharge and supply of water reservoirs decreasing trends with long-term volume below average value.**

Summary/conclusion *(2)*

5. **Hydrometeorological conditions affect problems with reservoirs' water management.**
6. **The unfavorable conditions affect water management facilities under increasing pressure**
7. **Mutual dependencies in the functioning of objects and multi-tasking nature of large reservoirs**
8. **New challenges for water management, redefining the goals and tasks, adjusting operation rules ...**

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Thank you for your attention

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