Basic environmental monitoring

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Finnish Environment Institute SYKE
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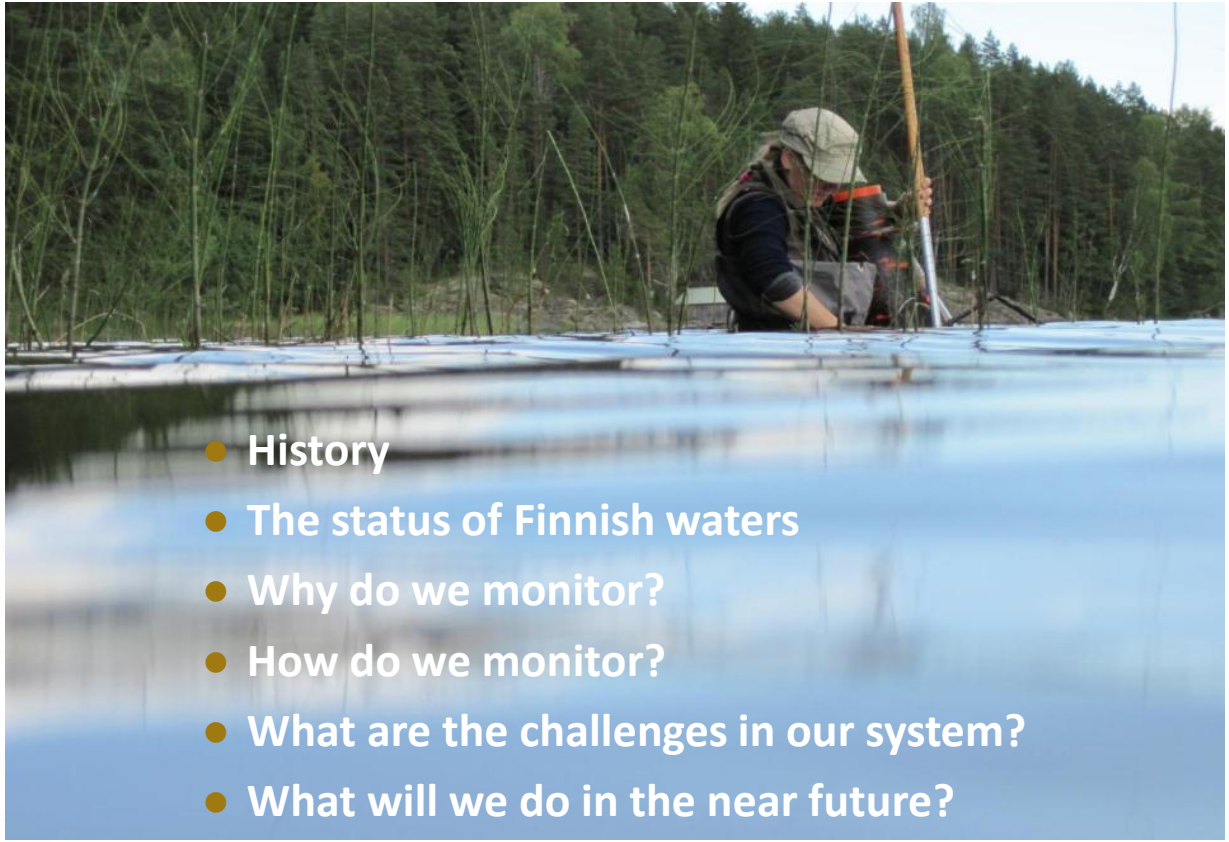
OUTLINE



- History
- The status of Finnish waters
- Why do we monitor?
- How do we monitor?
- What are the challenges in our system?
- What will we do in the near future?

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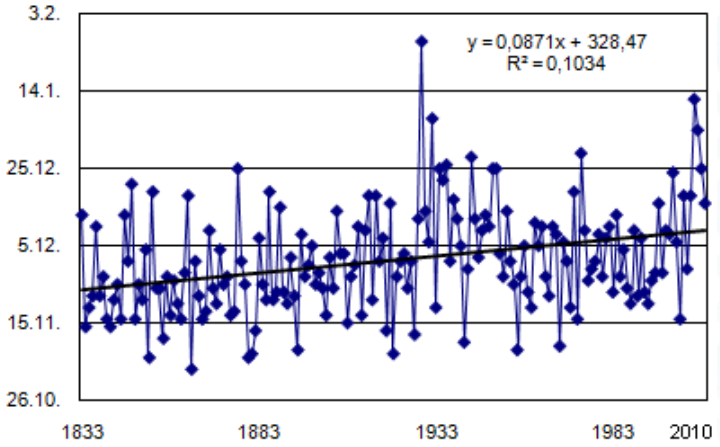
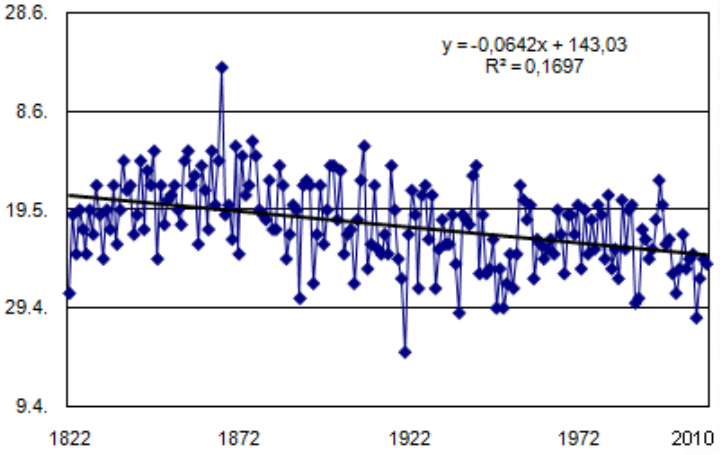
Hydrological monitoring

- Hydrological monitoring of water flows and levels is a basis and oldest part of monitoring
- Great benefits for flood protection, water borne traffic and irrigation
- Hydropower production needs exact information of water flows and levels
- Important data for national and international use
- => essential for climate change scenarios

Freezing date of Lake Kallavesi 1833-2009



Break-up date of lake Kallavesi 1822-2010



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National hydrological monitoring programme 2018

Observation network	Number of stations/sites		
	SYKE/ELY	Others	Total
Hydrometeorology			
precipitation	-	240	240
snow water equivalent	142	-	142
evaporation (Class A)	5	-	5
Surface waters			
water level	376	290	666
river discharge	189	205	394
ice thickness	51	-	51
water temperature	34	-	34
runoff/small basins	35	-	35
Geohydrology			
groundwater level	90	-	90
groundfrost depth	38	-	38

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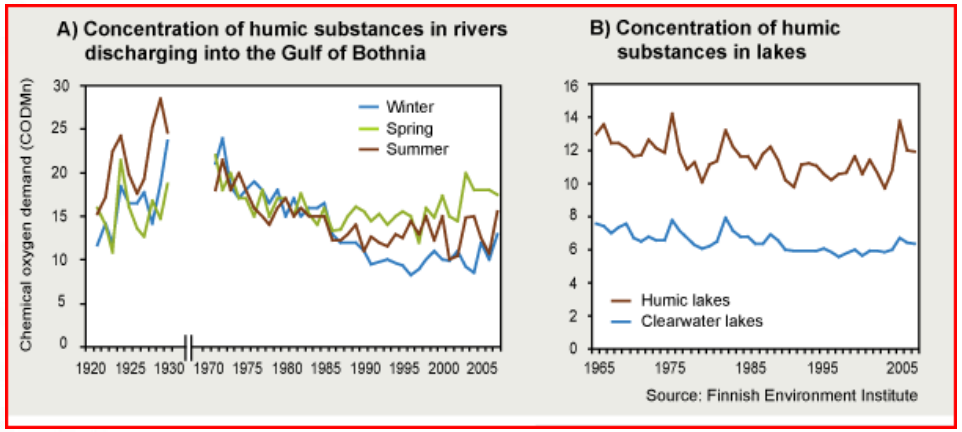
Water (physico-chemical) quality monitoring -long time series

- **Standardized field and laboratory procedures**
  - Comparability
- **Regular system since early 70's**
  - Quick and easy to establish



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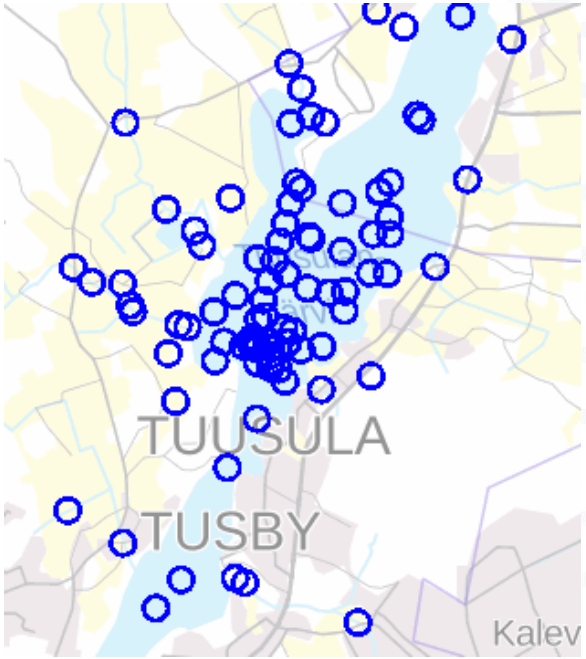
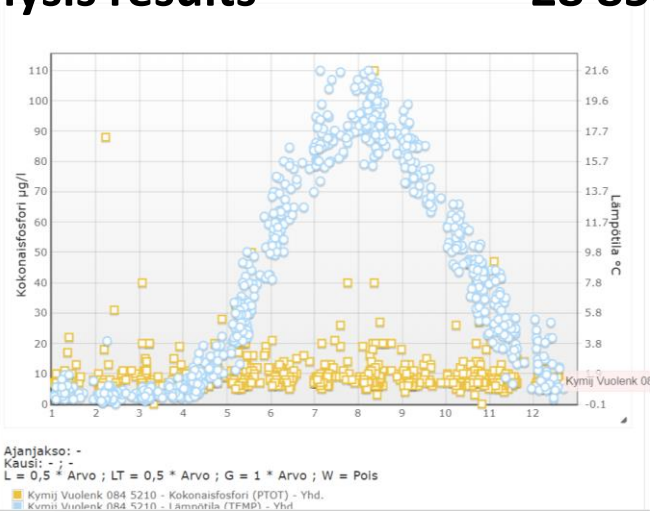
Water quality data system (VESLA)

- **Monitoring sites** **tot. 70 085**
  - Lakes 37 117
  - Rivers 27 308
  - Sea areas 5 660

- **Analysis results** **28 850 228**





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Measured water quality parameters

General parameters

- temperature
- oxygen (mg/l, %)
- conductivity (mS/m)
- turbidity (FTU)
- color (mg/l Pt)
- COD_{Mn} (mg/l)

Eutrophy

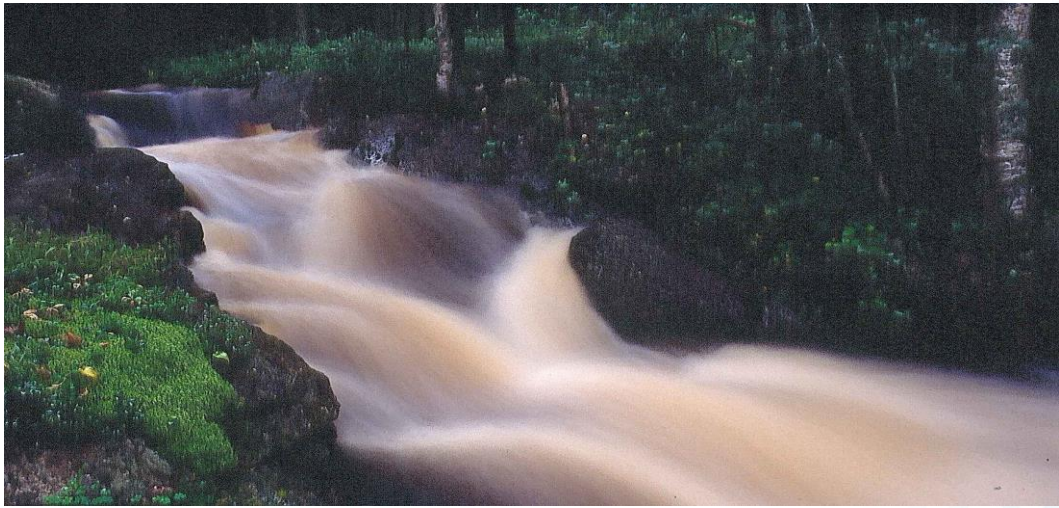
- total P, total N,
- NO_2+NO_3-N, NH_4-N, PO_4-P
- chlorophyll *a*

Acidity

- pH, alkalinity

Metals

- Fe, Mn, K, Ca, Mg, Na



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Why do we monitor?

- **Environmental monitoring**
  - Systematic studies that observe the state of the environment.
- **Systems based on**
  - Environmental objectives and legislation
- **The purpose**
  - To assess the progress in environmental objectives
  - To detect new environmental issues.

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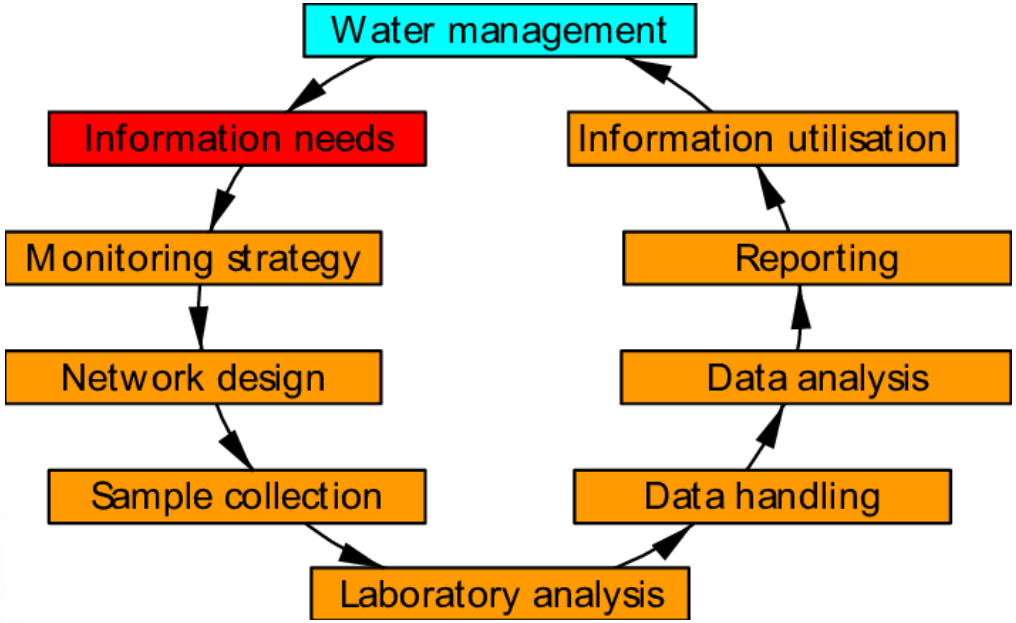
Water monitoring and management –joint continuous circle



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Types of the surface water monitoring

- **Surveillance** monitoring
  - To provide information of long term changes
  - To supplement and validate the impact assessment
- **Operational** monitoring
  - In waterbodies under environmental pressure
  - At risk of failing to meet the environmental objectives.
- **Investigative** monitoring
  - Cause and effect relationships

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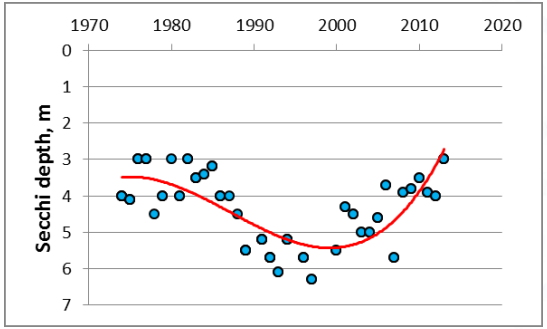
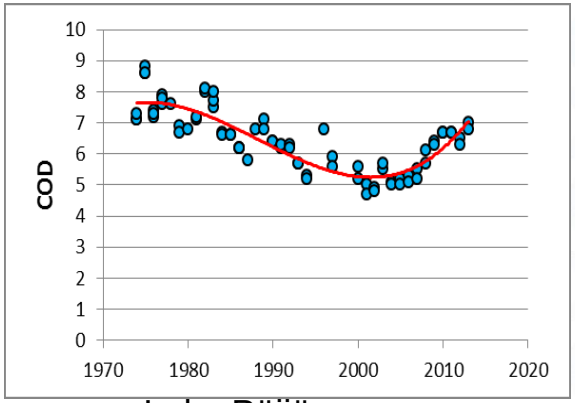
Surveillance (basic) monitoring

- **Information on long term changes**
  - Hydrological trends
  - Water quality in lakes, rivers & coastal areas
- **Impact assessment**
  - Reference conditions





Lake Päijänne

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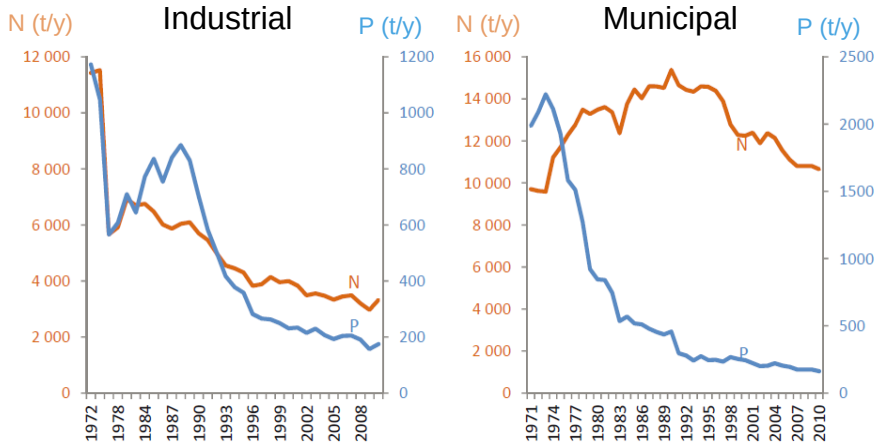
Operational monitoring – Largely obligations to polluters

- **Waterbodies under human pressure**
  - Industrial wastewaters
  - Municipal wastewaters
  - Diffuse loading from agriculture / forestry
- **Obligations in environmental permits**
  - Environmental monitoring and reporting
  - Collaborative measures
  - 80% of all surface water monitoring



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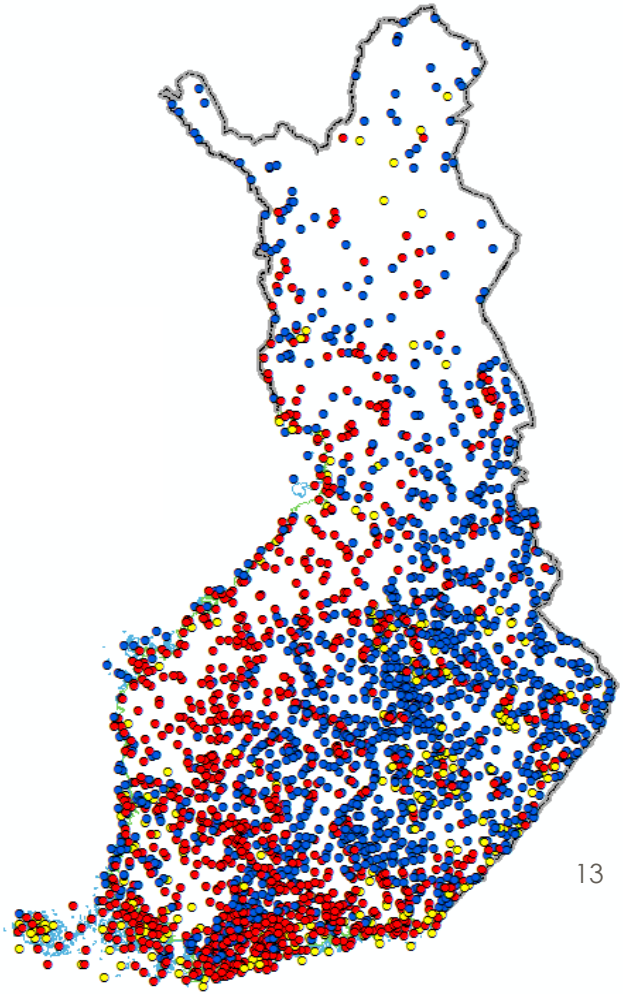
Number of water bodies and monitoring stations

Surface water category	WFD reporting 2016	
	sites	water bodies
Lakes	1637	4714
Rivers	962	2028
Coastal	259	276
Total	2858	7018

	Surveillance monitoring
	Operational monitoring
	Both



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Monitoring Frequency

- The monitoring frequency is either annual (4 – 12 times a year for water quality) or every three, six or 12 years (biological quality elements)
- Monitoring programs and monitoring network are guided by MoE and prepared by local ELY centers with help from SYKE
- Sampling and analysis is outsourced to private companies and laboratories. Data is transfered to SYKE databases online with transfer files.

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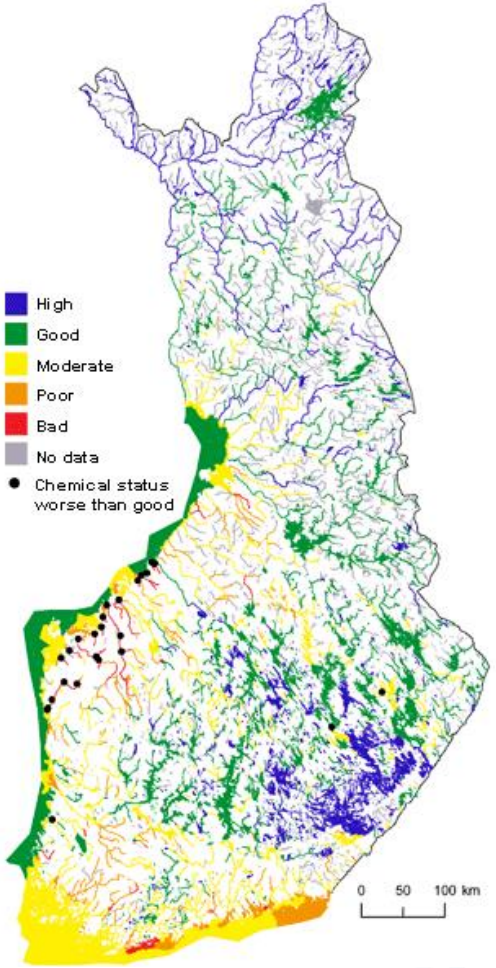
Ecological status of the Finnish surface waters

Ecological status	Rivers	Lakes	Coastal waters
High or Good	52%	87%	36%
Moderate, Poor or Bad	48%	13%	64%



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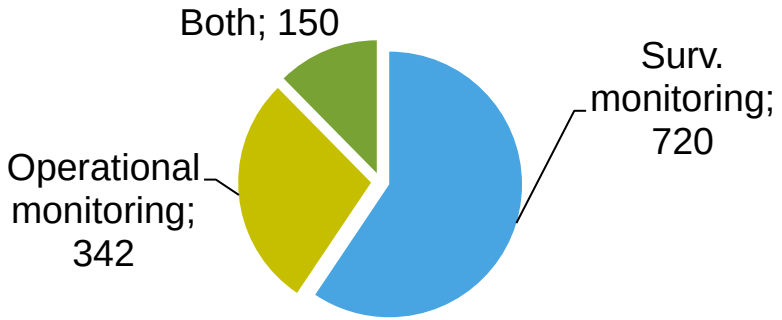
- **Monitoring now**
  - Rivers 437
  - Lakes 775
- **Contradiction**
  - Ministry of finance => monitoring too expensive
  - EU => too few sites
- **Result by now**
  - monitoring reduced over 20%



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Water monitoring –what will hapen -new methods and innovations

- Traditional sampling has been and is decreasing
- There will be more new monitoring technologies available
- Crowdsourcing (for example using phone technologies coupled with water quality testing) fits to some specific interesting aims

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Remote Sensing (satellites), smart buoys, drones, automatic sensor stations passenger/cargo ships with measuring sensors

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Thank You!

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