

# Designation of heavily modified water bodies in Finland

Antton Keto

# Outline of presentation

- Designation process of heavily modified water bodies
- Heavily modified water bodies in Finland (1st planning period 2010-2015)
- Did we manage to identify heavily modified water bodies?

# Introduction - defining hydromorphological status

- Hydromorphological status is evaluated with so called HyMo-criteria
- In this method water bodies are given points according to the level of anthropogenic changes in their hydrological and morphological pattern
- Water bodies can be classified as heavily modified **either according to the direct criteria** or with the **more specific evaluation** with the HyMo-criteria

# Direct criteria for classification as heavily modified water bodys

## ■ Regulated lakes

- Water-level draw down during winter
  - is over 3 m, or at least half of the average depth or
  - decreases the water covered area to at least half of the regular size

## ■ Rivers

- River has been changed by damming, cleaning, embanking or moving for at least half of its length or at least half of its natural head loss is dammed

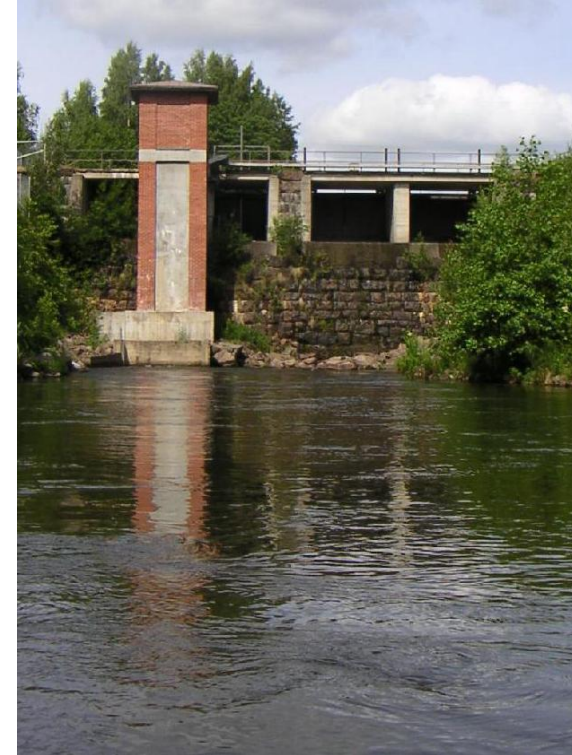
## ■ Dammed coastal bays

- No natural connection to the sea exists

# Defining hydromorphological status in rivers with HyMo-criteria

Criteria for hydro-morphological changes:

- Upstream migration barriers (% of river length)
- Constructed head loss (%)
- Constructed part (%) of the river length (cleaning, embankments, new channels, dry stretches)
- The daily discharge variation compared with mean discharge (HQwk- NQwk)/MQ under normal water conditions
- Change (%) in the spring HQ compared with the natural discharge or the occurrence of the critical low flows



# Criteria for evaluation of hydromorphological changes in rivers (HyMo)

	1. Upstream migration barriers	2. Constructed head loss (%)	3. Constructed part (%) of river length (cleaning, embanking, new channels, dry stretches) and its effects	4. The magnitude of short-time regulation <sup>(1)</sup> (HQwk- NQwk)/MQ under normal water conditions or frequency of 0-discharge	5. Change (%) in the spring HQ compared with the natural discharge
Very high (4 points)	Completely closed <sup>(3)</sup> (90-100 %)	Over 50	over 50, This has caused destruction/significant negative changes in natural underwater habitats (e.g. rapids)	Case-specific evaluation <sup>(2)</sup>	Over 75
High (3 points)	50-90 % closed	>30-50	30-50 Natural underwater habitats largely destroyed / significantly changed	Case-specific evaluation <sup>(2)</sup>	> 50-75
Moderate (2 points)	25-50 % closed	>15-30	15-30 At maximum third of natural habitats destroyed/ significantly changed	Case-specific evaluation <sup>(2)</sup>	>25-50
Slight (1 point)	10-25 % closed	5-15	5-15 Minor negative changes in natural habitats	Case-specific evaluation <sup>(2)</sup>	10-25
No change (0 points)	Less than 10 %	Less than 5	Less than 5 Natural habitats	Case-specific evaluation <sup>(2)</sup>	Less than 10

<sup>1)</sup> Short-time regulation contains weekly and annual regulation. HQ-NQ can be calculated from a weeks period.

<sup>2)</sup> The effects on the water levels on down stream water courses shall be taken into account.

<sup>3)</sup> Excluding the short period possibilities to upstream migration. Can be evaluated in several discharge situations if necessary.

# Defining hydromorphological status in lakes with HyMo-criteria

- Average winter draw down (m) or average winter draw down compared with the average depth (%) or change in water covered area (%)
- Raising or decreasing the mean water level (m)
- The proportion of constructed shore line of the lakes shore line (%)
- The effects of bridges and embankments
- Migration barriers



# Criteria for evaluation of hydromorphological changes in lakes (HyMo)

	1. Average winter draw down <sup>1)</sup> (m)	2. Average winter draw down compared with the average depth (%) or change in water covered area (%) <sup>2)</sup>	3. Raising or decreasing meanf water level (m) Average depth		4. The proportion of constructed shore line of the lakes shore line(%)	5. The effects of bridges and embankments	6. Migration barriers <sup>3)</sup>
			<1,2 m	>1,2 m			
Very high (4 points)	> 3,0	>50	>1	>1,5	>50	Case-specific evaluation	Migration of fish completely prevented
High (3 points)	>1,5-3	>30-50	>0,5-1	>1-1,5	>20-50	Case-specific evaluation	Migration of fish almost completely prevented
Moderate (2 points)	>1,0-1,5	>10-30	0,1– 0,5	0,5-1	10-20	Case-specific evaluation	Migration of fish partly prevented or only some species are able to migrate
Slight (1 point)	0,5- 1,0	1- 10	< 0,1	< 0,5	<10	Case-specific evaluation	Only migration of some species is prevented
No change (0 points)	< 0,5	<1	0	0	<5	Case-specific evaluation	All fish and the rest of aquatic fauna can migrate

<sup>1)</sup> The water depth at the time of the ice cover formation - the lowest water level during the period of ice cover. Calculate average e.g. from years 1995-2005.

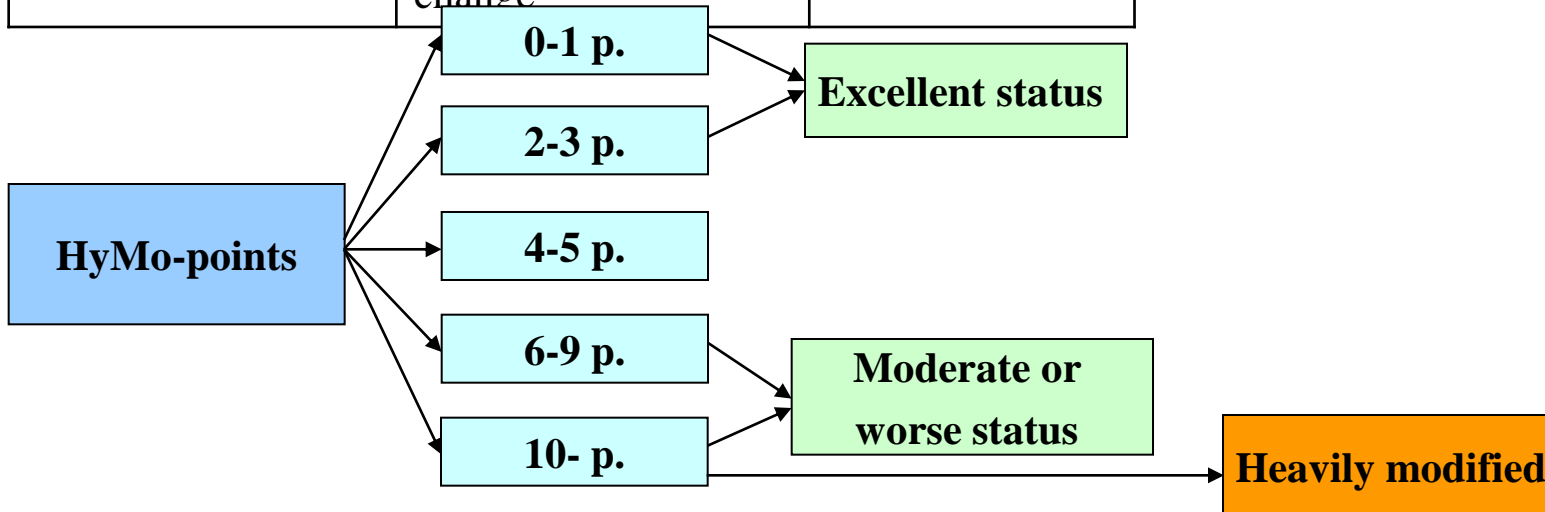
<sup>2)</sup> Both factors shall be estimated. Points shall however be given for only one of the factors.

<sup>3)</sup> Can be evaluated in several discharge situations if necessary. Also the impacts of the migration barrier on the fish stocks can be taken into account.

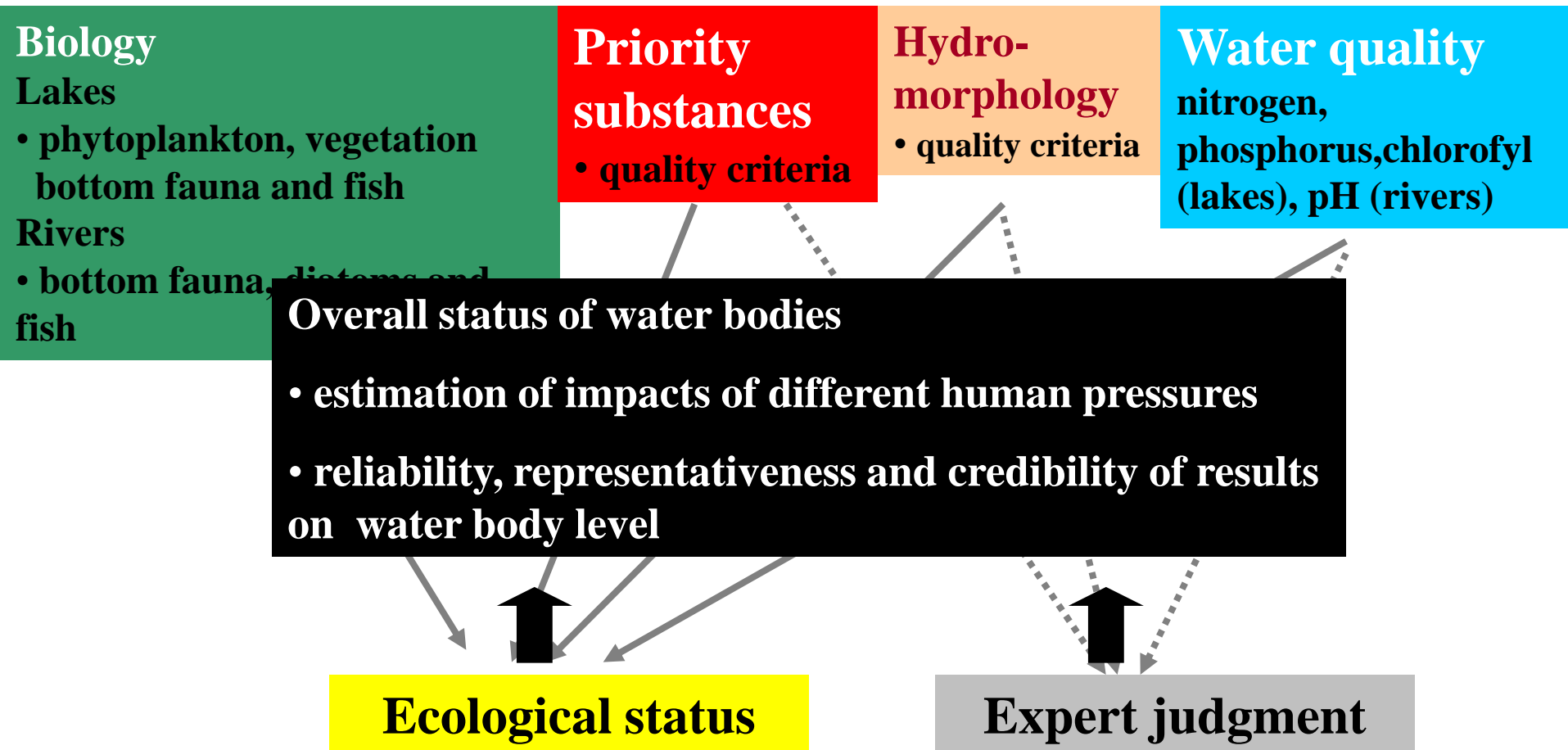


# Evaluation of hydromorphological status – total score

Level of hydro-morphological change	Changes in the hydro-morphological status	HyMo-points
0	No change	0 – 1
1	Slight change	2 – 3
2	Quite significant change	4 – 5
3	Significant change	6 – 9
4	Very significant change	10 -



# Principles of ecological classification system



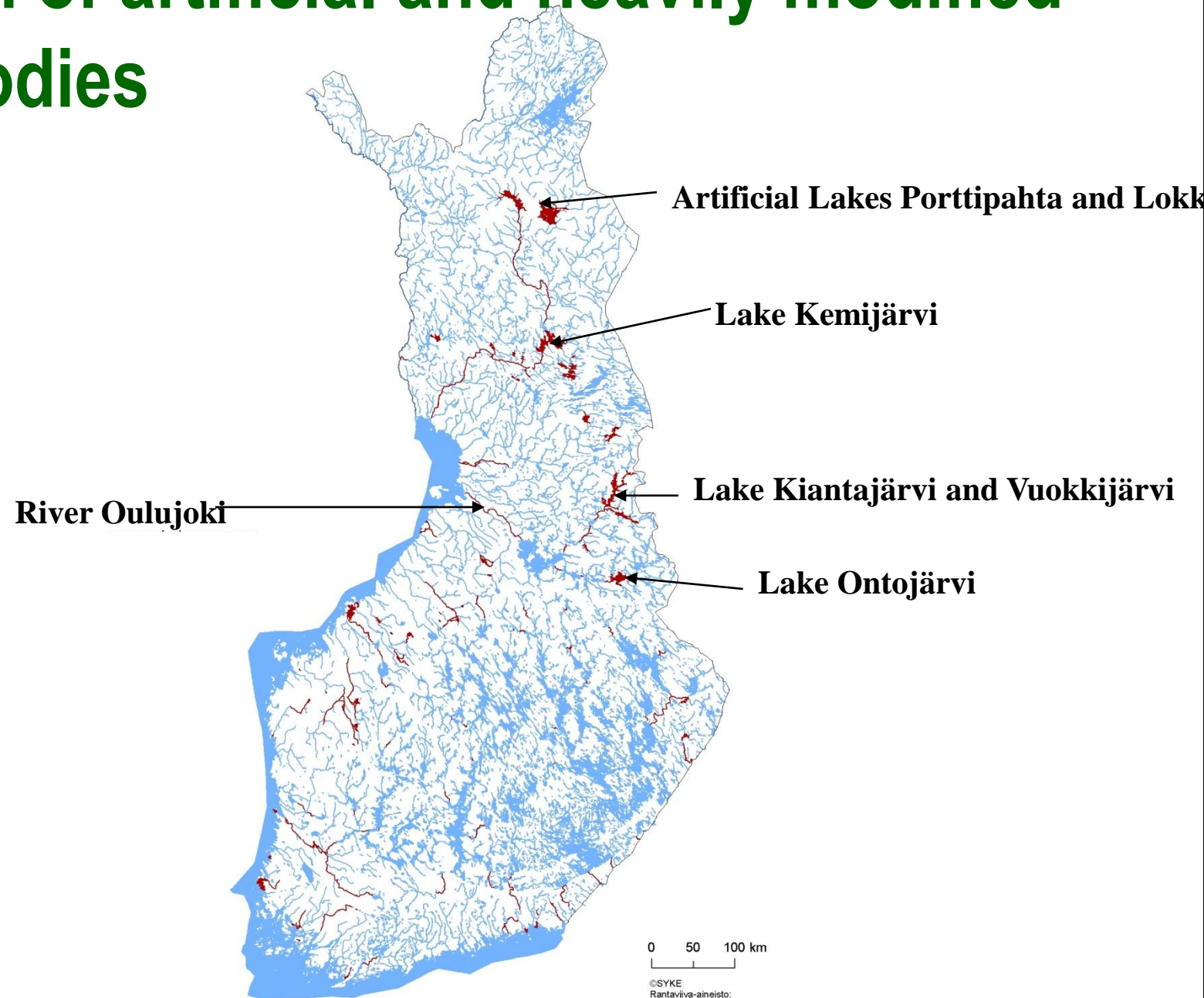
# Comparison of HyMo- criteria - FIN / SWE

- In general, Swedish criteria (preliminary designation of heavily modified water bodies) resembles Finnish direct designation criteria
- In Finland values of criteria are based on current situation, in Sweden permit conditions
- Hydrological criteria are not as important in Sweden
- In Finland, threshold values of criteria is often 50 %, in Sweden 70 %
- Hydrological criteria for lakes are quite similar
  - SWE: regulation amplitude 3 meters
  - FIN: water-level draw down in winter more than 3 meters
  - SWE: Constructed head loss 80 %
  - FIN: Constructed head loss more than 50 %

# Heavily Modified Water Bodies in Finland

- Until now, we have 6165 water bodies of which ecological status was possible to classify in 2600 water bodies
  - Rivers 1604, Lakes 4286 and Coastal waters 275
- There are altogether 126 heavily modified water bodies
  - Lakes 32
  - Rivers 79
  - Coastal waters 13
- There are altogether 29 artificial water bodies
  - Lakes 25
  - Rivers 4
- The number of heavily modified and artificial water bodies is 5 % of the total number of classified water bodies and 2 % of total number of all water bodies

# Location of artificial and heavily modified water bodies



# How we achieve to identify those water bodies which really are HMWB's

- Water body doesn't achieve good ecological status and the reason for that is physical alteration/changes by human activity
  - We designated those water bodies as HMWB's where HyMo-changes are high, but we don't know ecological response exactly
- Water body can be designated, if it is not possible to meet good ecological status without significant adverse effects on environment or specific use like,
  - Assessments have been done partly. In those places where large hydropower dam exist, answer is often easy. Those places where many small physical pressures exist, assessments are missing.
- The beneficial objectives of the water body cannot for the reason of technical feasibility or disproportionate costs, reasonable achieved in other way, which are a significantly better environment option
  - Hydropower – Windpower (technical feasibility)?
  - Flood protection – more flood damages (disproportionate costs)?