Co-operation and water resources protection in Lake Pyhäjärvi

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Surface area 154 km²
Mean depth 5.4 m
Maximum depth 26 m
Coastline 80 km (47.71 mile)
Water residence time 3-5 y

Drainage basin area
Total 615 km²
River Yläneenjoki 234 km²
River Pyhäjoki 77,5 km²
Remaining area (small sub-basins) 149,50 km²
Pyhäjärvi Institute

**PARTNERS of the foundation**

- Municipality of Eura
- Municipality of Säkylä
- Municipality of Eurajoki
- Rauma Town
- Ahlström Kiinteistöt Oy
- Apetit Ruoka Oy
- HKScan Finland Oy
- Mykora Oy
- University of Turku

**Aquatic Environment**
- to improve the water quality and the ecological status,
- to proceed and maintain ecological research of the waters,
- to inform and edify partners and reference groups
- Pyhäjärvi Protection Fund
- River Program Fund

**Bioeconomy, circulation**

**Food Production**

- To ensure the production facilities and competitiveness of the food sector in the region.
- The work is based on the principles of sustainable development.
Pyhäjärvi Restoration Program 1995 -

1. Management of the catchment area
   - basic water protection measures
   - new innovations tested
   - rural area waste water treatment
   - Local people are participating

2. Management of the lake
   - commercial fishery
   - biomanipulation

3. Education and communication

4. Research and monitoring
   - Voluntarily funded by local municipalities and industry since 1995
PYHÄJÄRVI PROTECTION FUND

The aims:

- Stop the eutrophication process of Pyhäjärvi
- Decrease the internal loading
- Maintain and secure the good condition of the lake
- Usability for different purposes is excellent

Terms:

I: 1995-1999
- Stop the eutrophication process of Pyhäjärvi

II: 2000-2006
- Decrease the internal loading

III: 2007-2013
- Maintain and secure the good condition of the lake

IV: 2014-2020:
- Usability for different purposes is excellent
Needs of water legislation

Joint Program for PPP

- Actors
- Terms
- Problem recognition
- Action plan
- Goals

Action

- Background research
- Concrete actions to solve the problems
- Monitoring
- Maintenance

Project 1
- Business

Project 2
- Business

Project 3
- Business

Project...
- Business

- Good status of waterbody
- Benefits for the participants
- Implementation of water legislation

Public actors

Basic long term funding from PPP

Associations, NGO’s

Companies

Public-private-partnership model in Lake and River Restoration

Securing the water quality and ecosystem services of valuable waterbody ja
Benefits for private companies

- Water users: need to guarantee good enough water quality for technical processes
  - savings in water purification processes
- Environmental awareness of customers → public image, green brands and customer behaviour
- Compensation of already caused environmental pollution or harm
- Possibility to make business with clean tech solutions
- Possibility to build networks and co-operate with research institutes
- Access to new challenges, solutions and innovations
Benefits for public authorities

Need to guarantee good water quality and aquatic ecosystem services

• drinking water
• recreational use and tourism

Link between local inhabitants and authorities

Co-operation between actors

*Practical implementation* of WFD plans

• Public authorities don’t have resources
Benefits for all users

- Better water quality!
- Ecosystem services in saved
- Long term basic funding → possibility to utilize national and international project funding
  - Annual budget normally 4-5 x annual basic funding
Management of the catchment area
Sustainable food production

- Southwestern Finland has lots of intensive food production
- Agriculture and forestry are the most important source of external diffuse load
- No significant point source load in Pyhäjärvi catchment
- Key thing is the growth capacity of the soil
  - Water economy
  - Soil structure
  - Farming methods
Hotspot analysis

Source: WFD implementation plan, VEMALA model, local monitoring
Water protection measures taken in the Lake Pyhäjärvi catchment

- Tens of wetlands
- Tens of sedimentation ponds
  - single, small sedimentation ponds
  - chain of small dam ponds
- Large areas of buffer zones
- Sand filters
  - Phosphorus binding amendments and sand
- Combination of ponds, wetlands and filters
- On-site wastewater treatment units
- Cattle yard renovations
- etc.

COST-EFFECTIVENESS, EASY MAINTENANCE, RECYCLIBILITY OF MATERIALS
COMBINATION OF SEDIMENTATION POND-WETLAND-FILTER IN IMPONOJA
In 2000's new filters with new commercial nutrient adsorbing materials
Experimental small-scale filter cartridge

For the treatment of subsurface drainage waters

- CaOH – granules and sand
Wastewater treatment

- Most of the catchment area connected to municipal plants
- Sugar and vegetable refinery conducted waste waters to lake Pyhäjärvi in the beginning of 1950’s
  - After that treated wastewaters have been conducted downstream to river Eurajoki
- No wastewaters from municipal plants
- The experiments with wastewater treatment of single houses in rural areas started in the catchment in the beginning of the 1990s, long before the current legislation
- Advising and consulting services
Management of the lake: fishery
Total commercial catch 1995-2016
15,237,332 kg
26 % of the annual phosphorus load is removed from the lake with the fish catch!

Total commercial catch 1995-2016
15 237 332 kg
→ ~ 100 000 kg removed phosphorus

Nutrient removal

Ventelä et al. 2007, 2011

- 18 % to Eurajoki
+ 10 % from the air
+ 12 % from Pyhäjoki
+ 54 % from Yläneenjoki

remain in the lake 56 %

from ditches in the nearest drainage area + 24 %

the catch of fish – 26 %
Biomanipulation in Pyhäjärvi =

Commercial catch: planktivores vendace *(Coregonus albula)* and white fish *(Coregonus lavaretus)*, roach

**Planktivores:**
Vendace
White fish
Smelt
juveniles (many species)
Effect on phytoplankton

Biomanipulation

Pyhäjärvi

Phytoplankton biomass (g m⁻²)

Year


Biomanipulation

OTHERS
CHLOROPH
EUGLENOPH
DIATOMOPH
CHRYSPHOPH
DINOPH
CRYPTOPH
CYANOBACTERIA
Future

- New funding period 2021-2026
- Funding negotiations and new management plan next year 2020
- Workshop in Finland in spring 2020, Welcome!
Thank you!

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