Opening of fish migration routes. Estonian experience

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Migration obstackles in Estonian streams

Dams	~ 1500
Dams in streams suitable for fish life	~ 1000
Dams in streams important for fish life	~ 500
Dams where actions are needed for fish passage	**~ 300**
Beaver dams	4000 … 7000
Beaver dams in streams important for fish life	1000 … 1500
Beaver dams which removing is needed for fish life	**500 … 700**
Natural waterfalls	~ 20

Activity of man and beaver suplement each ohter …

… man dams up all large and average rivers

… beaver dams up all small streams

… together they dam up all rivers and streams

… and fish cannot migrate between spwaning, feeding and wintering areas

To achieve good status of fish fauna we have to open fish migration routes

The best solution is allways dam removal

It is the only method which 100% guarantees free fish passage both up- and downstream

In most of cases it is also most cost-effective method for fish passage

Other methods can be considered only in case, if dam removing is not possible due to social, economical, political or legal reasons

Other methods to open fish migration way

Opening migration way during spawning periods

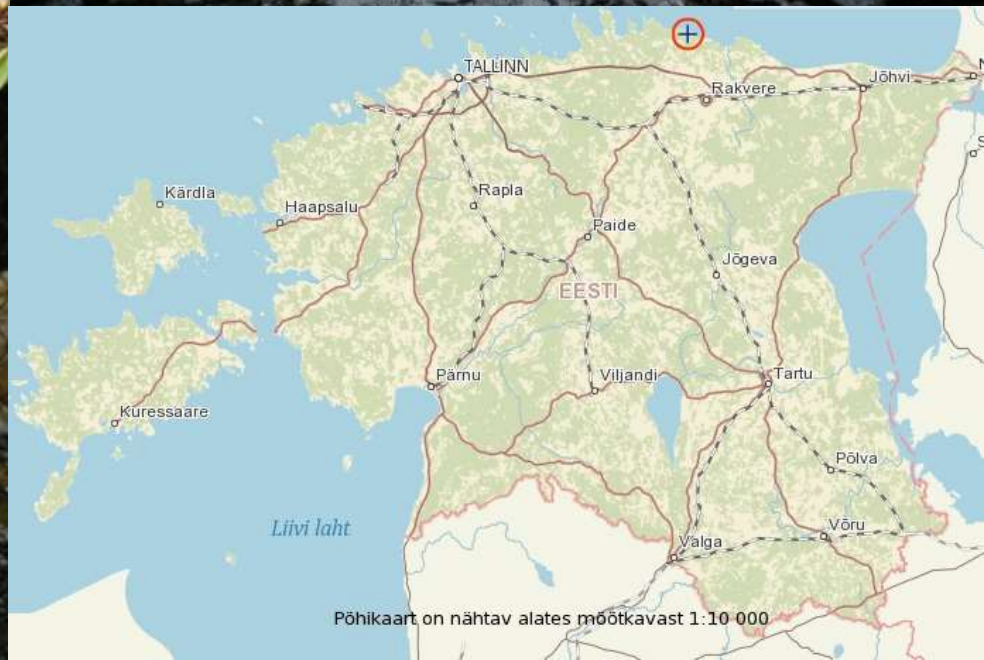
- often technically not possible due to dam construction and hight, size of water reservoir
- there must be a person responsible for water level regulations during several weeks every year
- environmental risks are high
- water use is not possible when dam is down

Building of a fish pass

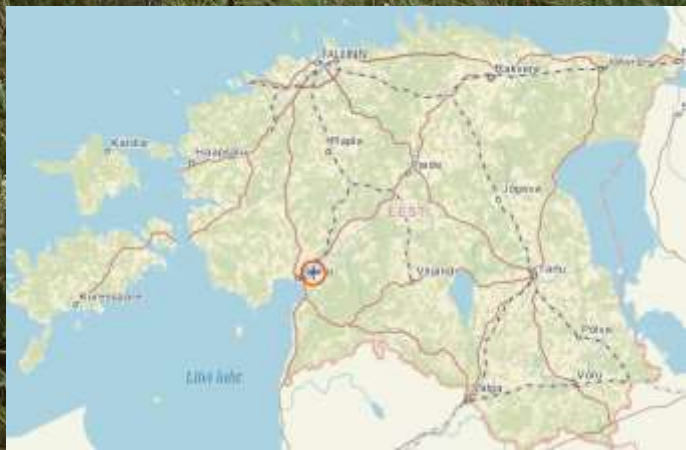
History of fish passes in Estonia

Jägala River, Linnamäe dam, 1924 (h 11 m)

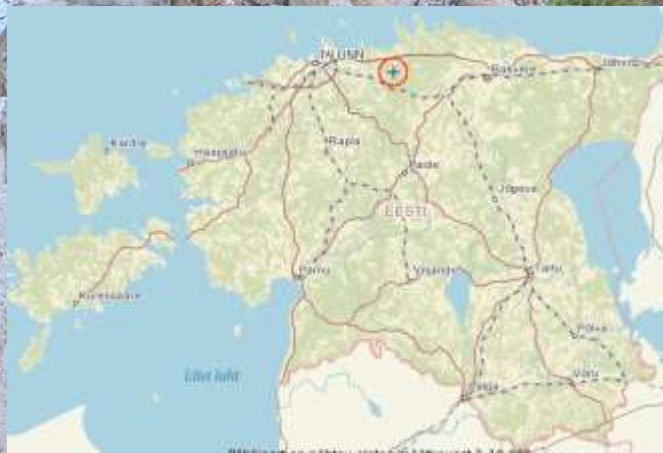
Vainupea River, Pajuveski fish ladder, 1970 (h 2,6 m)



Pärnu River, Sindi dam and fish pass, (1834) 1977…2018 (h 3 m)



Soodla River, Soodla dam and fish pass, 1975-80 (h 12 m)



Intermediate summary:

During 20th ccentury very few fish passes were constructed in Estonia

All solutions were very technical, slope and steps were too high, water discharge too small, positioning of fish passes bad.

None of these fish passes did work

2004 Estonia enters to EU  → 

EU Habitats Directive is enforced

Estonia begins to think about implementation of EU Water Framework Directive

Angry and emotional discussions arise:

- Why dams and hydropower stations are not good for fish?
- Do fish really have to migrate?
- At first decision makers doubt …
- … between 2006 and 2008 decision is made to start with activities

2007 – 2010 some new fish passes are built

… some of them are already close to nature-like ones and almost may work …

Pärlijõgi River, Sänna Alaveski kalapääs, 2009

Rannametsa River, Laiksaare pool cascade fish pass, 2009

Ura River, Rae pool cascade fish pass~2009

Vidva River, Kalvre dam, 2010 ?

2010 – Real activities begin

EU Cohasional Fund allocates 20,5 milj EUR to solve fish migration problems in Estonia.

Cofinancing comes from Estonian Environmental Investment Center.

2011-2013	Estonian dam inventory (~1000 dams covered)
2010-2016	totally 77 projects were financed to open fish migration routes
2016-2019	~ 20 projects have been financed to open fish migration routes

Fish passes have to solve two problems

1) Up stream migration
2) Down stream migration

(problem in case of HPP-s)

Effectiveness of different types of fish passes

Natural-like fish passes

1)	Nature-like rapids in the river bed with low slope (≤2%)	+++
2)	Nature-like rapid or rithral bypass channels with low slope (≤2%)	++(+)
3)	Nature-like pool cascade bypass channels with low slope (≤3.5%)	++
4)	Nature-like rapids and pool cascades with higher slope (≤5%)	+(+)

Technical fish passes

5)	Vertical slot fish passes	++
6)	Pool type fish ladders with surface and bottom openings	+
7)	Pool type fish ladders with bottom openings	(+)
8)	Screw fish elevators	?
9)	Pool type fish ladders with surface openings	~0
10)	Denil fish passes (baffle fish ways)	~0
11)	Pool type fish ladders without openings	~0
12)	Fish locks and lifts	~0

Desires of HPP and dam owner …

Technical fish passes

1) Fish lift
2) Denil fish pass
3) Pool type fish ladder
4) Screw fish elevators
5) Vertical slot fish passes

Natural-like fish passes

6) Nature-like pool cascade with high slope
7) Nature-like pool cascade with low slope
8) Natural-like rapid or rithral bypass channel
9) Natural-like rapid in river bed

…

Dam demolishing

Solutions for first 71 projects:

29 dams redesigned to nature-like rapids in river bed
6 dams redesigned to nature-like pool cascades in river bed
4 dams demolished

36 dams got different types of fish passes, incl.
21 nature-like rapid bypasses
5 pool type fish ladders
2 nature-like pool cascade bypasses
2 bypasses - combination of rapid and nature-like pool cascade
1 bypass – combination of pool cascade and vertical slot fish pass
1 fish lift

Summary:

90% of solutions are natural-like solutions …
… but only 10% of all solutions is demolishing the dam

Only 10% of solutions were technical fish passes

Dam removal

Ahja River, Kiidjärve dam, h 1,9 m, 2016

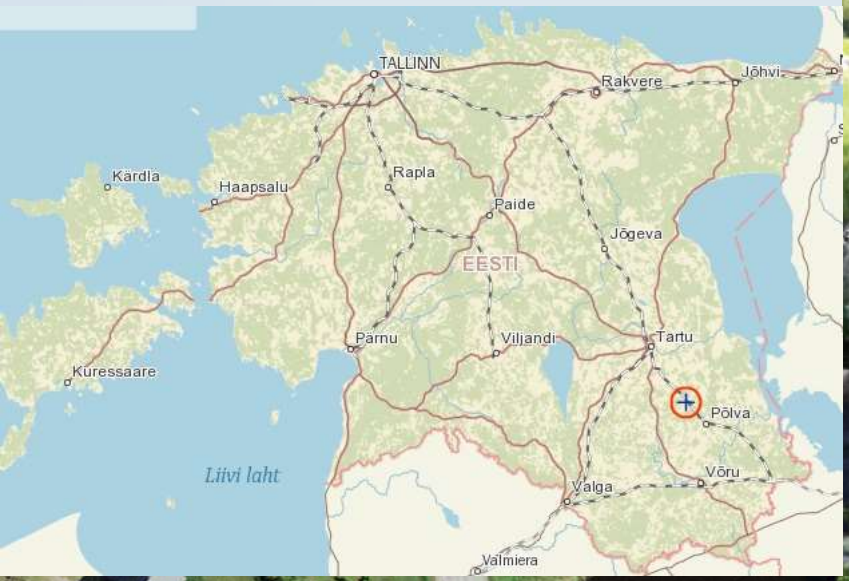
Dam redesigned to nature-like rapid in river bed

Ahja River, Aarna dam, h 1,8 m, 2014

Old dam removed, new dam built with nature-like rapid bypass

Leevi River, Veskijärve dam, h 2 m, 2013

Mon: 5984 fish migrated upstream 2015 apr-may



Combined fish pass:natuure-like pool cascade + vertical slot fish pass

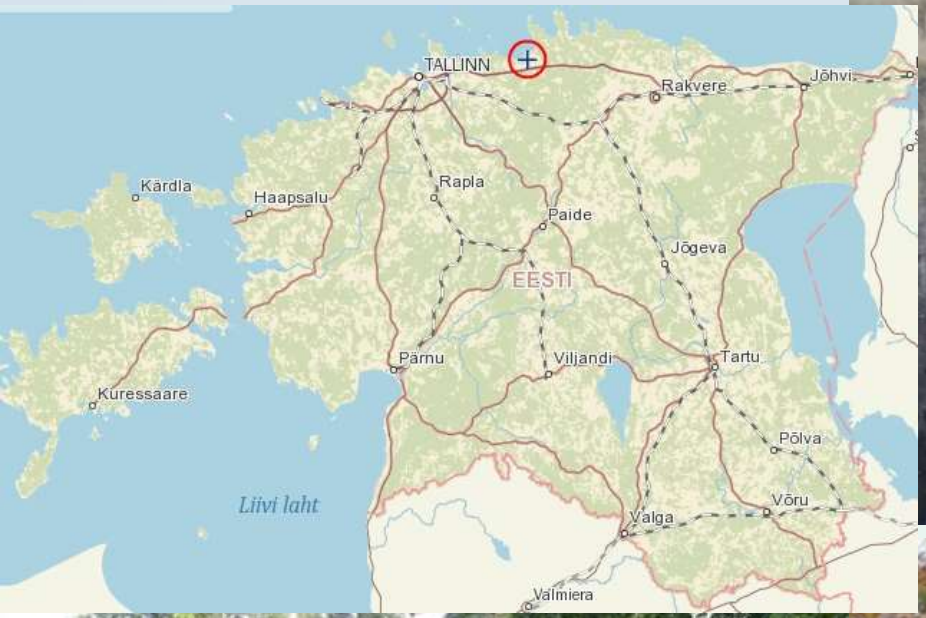
Kääpa River, Koseveski dam + HPP, h 3,4 m, 2014

Mon: >2462 fish migrated upstream 2015 apr-may

Pool type fish ladder

Loo River, Loo dam, h 2,7 m, 2014

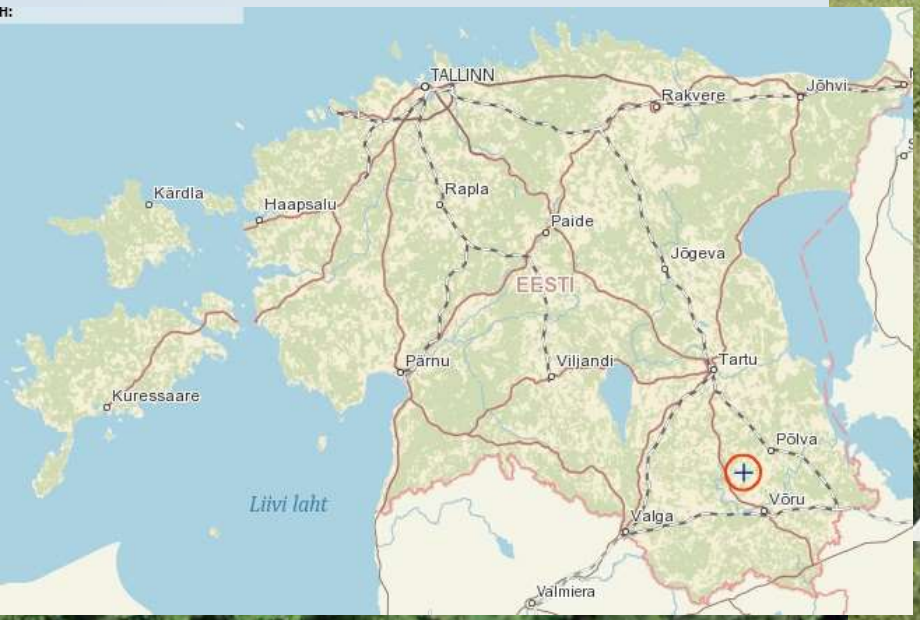
Mon: 0 fish migrated upstream 2015



Pool type fish ladder

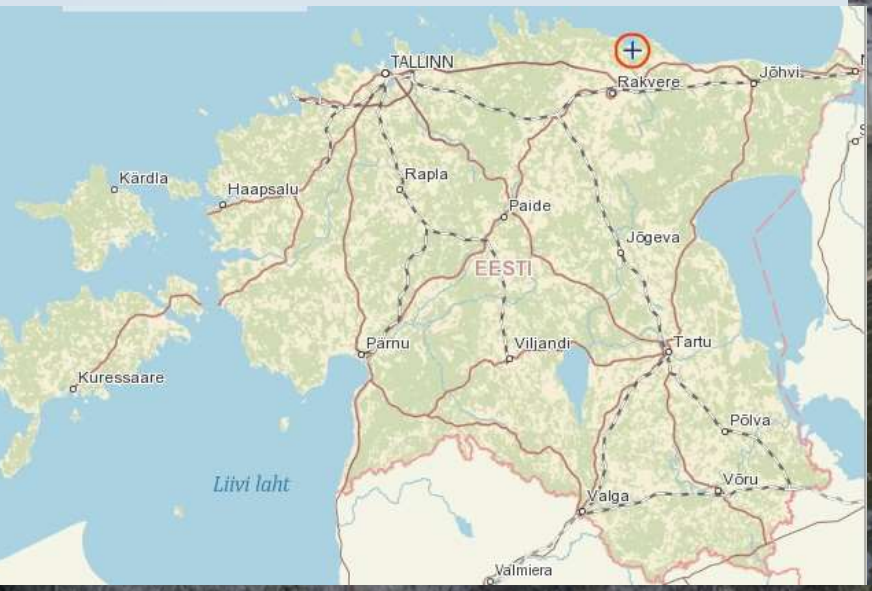
Ahja River, Roti dam, h 2,8 m, 2013

Mon: (21) fish migrated upstream 2015



Fish lift

Kunda River, Kunda dam + HPP, h 2,8 m, 2014



Some frequent mistakes in case of nature-like bypasses

Some key notes and recommendations:

Do not forget, what is the best solution (dam removal).

Take time for negotiations with dam owner. If good solution is not feasible, do not do anything. Wait.

Technical designe must be made by competent hydroengineer. Experienced ichthyologist must participate in the process.

Building company must have experience of hydraulic engineering. Experienced ichthyologist must take part in the building process.

Slope of nature-like rapid fish passes can be 1,5…2%, not more.

Drop between pools can be 5…10 cm, not more (in technical designe).

Good nature-like fish pass is not only migration route, it must be also valuable habitat and spawning ground for rithral fish.


Thank you