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Session D6: Management and Research-Integrated Swedish Work on Best Available Techniques

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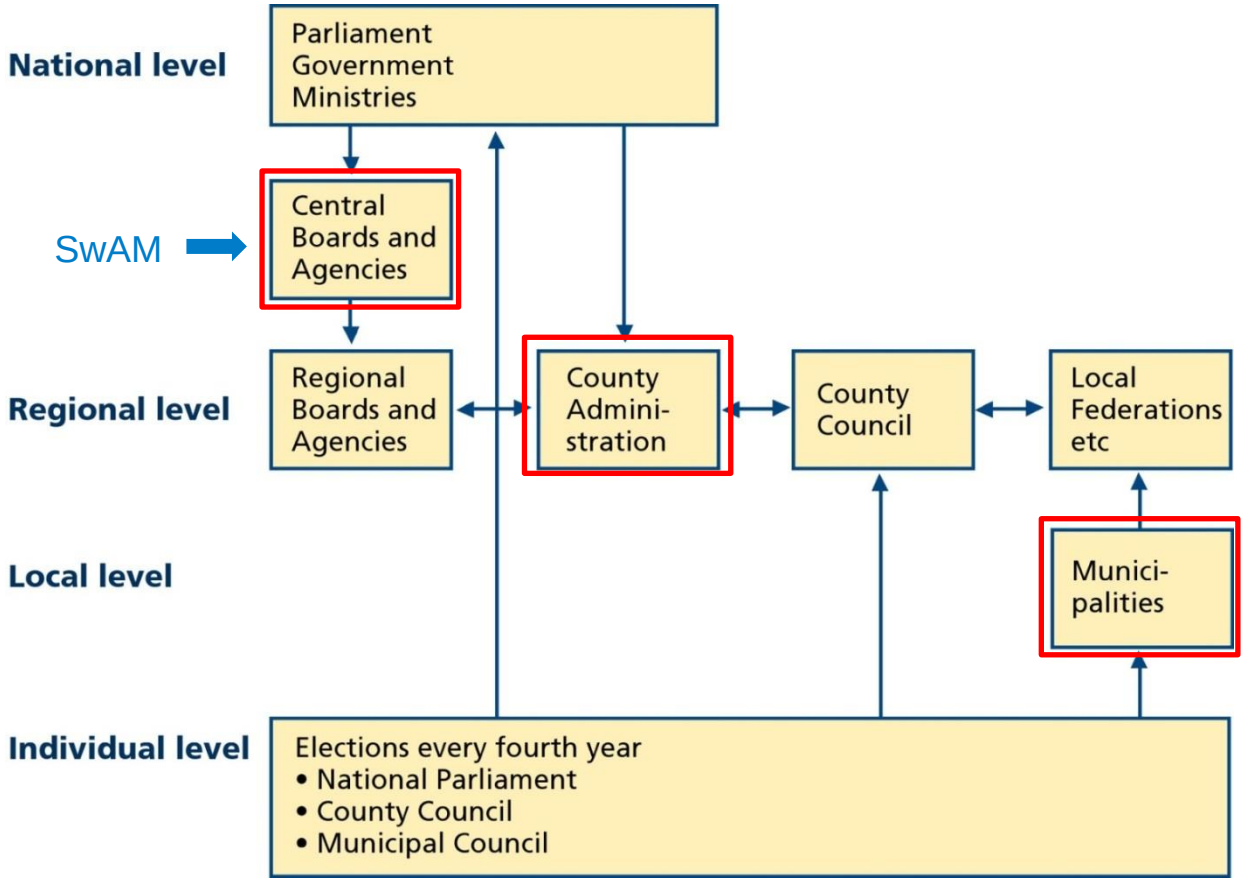

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Instructions from the Government

The Swedish Agency for Marine and Water Management is the administrative authority for issues dealing with the preservation, restoration and sustainable use of lakes, streams and seas.

The Agency shall, within its areas of responsibility, be proactive, supportive and unifying in its implementation of environmental policies and shall promote the sustainable management of fishing resources.

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Swedish dialogue on hydropower

- Balancing the demands of the EU Renewable Energy Directive and the Water Framework Directive
- Ongoing process (3 year now)
- 30 organizations involved
- Consensus due to producing:

a) Swedish strategy for measures

b) Guideline on best available technique due to fish passages and ecoflows

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Sustainable use - Environmental code

- Permission from environmental court necessary for hydropower plants
- Environmental impact assessment
- Best available technique shall be used

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What is best available technique?

- Many different opinions, some knowledge-based, some not.
- SwAM found that there were no suitable knowledge-based literature reviews in Sweden.
- There was a need of close co-operation with researchers and the industry.
- A project was started

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Project organisation

Broad and deep reference group

- Authorities dealing with environmental technique, dam safety, energy and legislation
- Universities and institutes dealing with environmental technique, dam safety, geotechnical assessments, fish migration, hydrology, energy.
- Environmental experts from some well-known hydropower companies and organizations. Even safety experts involved.
- Approximately 10 persons in the project group and 15 persons in the reference group.

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International screening of science

- University of Umeå (Ecoflows)
- University of Karlstad (Fish migration, passages)
- Swedish University of Agricultural Sciences (Fish migration, passages)
- Royal Institute of Technology (Safety)
- Scientific databases, articles, reports and also some management reports (partly scientific-based) was screened. Most important information implemented in four new Swedish scientific reports/reviews (SwAM reports).

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Guideline - Best available technique - Hydropower

Scientific reports/reviews as support to the coming guideline:

- Fishways and Fish guidance
- Ecoflows - ecostructures
- Fish migration
- Effects of constructed lentic waters on fish biodiversity

Results from the reports – examples, fish migration and passages

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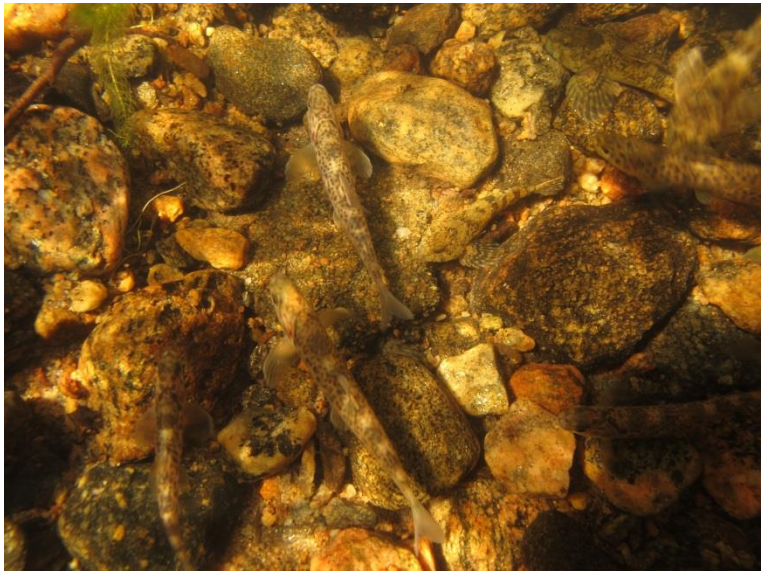
- More species than before known, migrate up- and downstream to fulfill lifecycle.
- Fish migration essential for the resilience.
- Fish passage necessary for both up- and downstream migration.
- Total passage efficiency of 90 % (attraction and passage, both up- and downstream) and maximum migration delay of three days for salmonids recommended.



Results from the reports – examples upstream migration

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- Nature-like passages recommended
- Avoid fish locks and elevators (if not necessary)
- The percentage of the flow in the passage compared to the total flow is important to attract the migrating fish well (often too small amount of water to get the important attraction)
- Placement close to the area where most of the fish stays (often close to the turbine outlet)

Results from the reports – examples downstream migration

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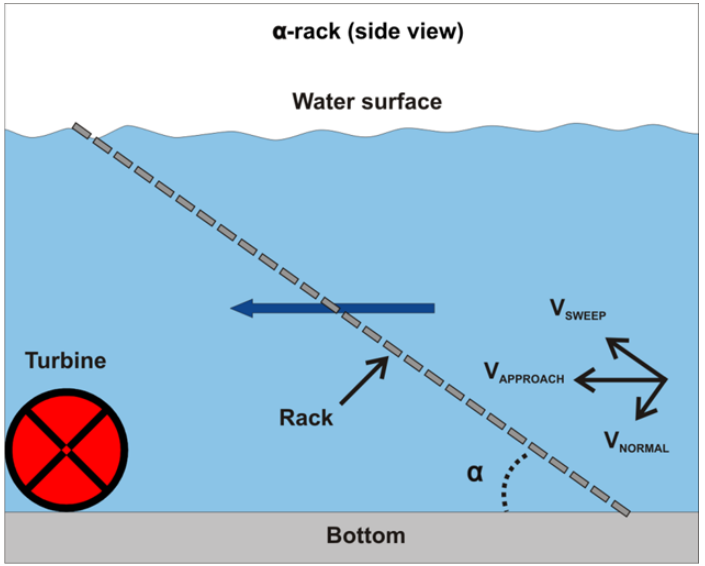
- Physical barriers -Fish-guiding grids with fish-friendly outlets recommended
- Light, audio, electricity, bubbles, chains or similar solutions to affect the behavior of the fish are often unsuitable and should be avoided, if not as a complement to physical barriers.
- The angle (α) of the grid should be maximum 35° and the distance between the bars somewhere between 10-18 mm depending on the situation.



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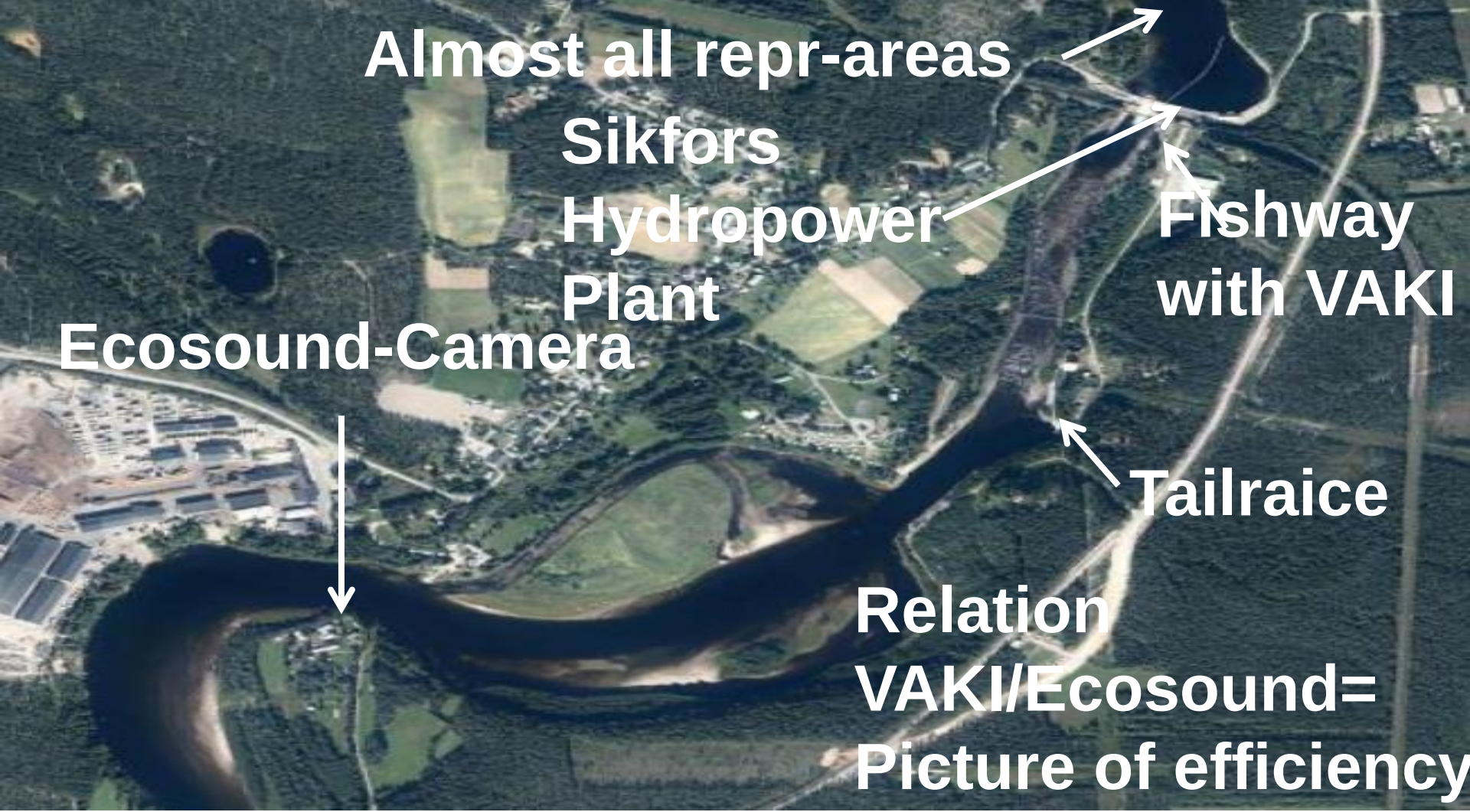
Challenges

- Different species, different migration behaviors. Most studies made on salmonids. How to take that into consideration when producing the guideline, due to eventual targets of passage efficiency and delay?
- How to measure the efficiency?
- Technical and functional uncertainties when scaling up the fish-guiding grids to the largest power-plants (turbines taking hundreds of m3/s).
- Aim to complete the guideline in 2016


Almost all repr-areas
Sikfors
Hydropower
Plant
Fishway
with VAKI
Ecosound-Camera
Tailraice
Relation
VAKI/Ecosound=
Picture of efficiency

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THANK YOU!

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