More than 1 million barriers block European rivers

We have all seen them; barriers in streams and rivers to control water. They come in all shapes and sizes; from 30 cm weirs to large 50 meter high dams for hydropower production. Although barriers in rivers are a common sight, they are special. People have been building barriers to control water for a long time. Earliest known records date back almost 5000 years. Examples of large scale barriers can be found in both Ancient Mesopotamia and Egypt. Impressive examples can also be found a bit closer to home. In Italy, close to Rome, Roman engineers constructed a 50 meters high dam, which remained the highest dam in the world for well over a thousand years.

Dalälven River in the Färnebofjärden national park, Sweden.

In recent times the construction of barriers to control rivers and streams has increased, due to increased demand for water and energy. Currently there are estimated to be over 1 million barriers in European rivers and streams. They provide essential services like irrigation, drinking water, energy production and protection against flooding and droughts. Operation of these barriers and the construction of new ones are carefully planned processes carried out by professional practitioners in the field of water management.

Although barriers can be very useful, they can also change rivers and streams profoundly. Barriers control the flow of water in a river and thereby change the flow regime from its natural state to an artificial one. This unnatural flow regime can lead in turn to changes in discharge, water velocity, oxygen saturation and water temperature. The altered flow regime also changes the sediment dynamics of a river, disturbing sedimentation both up- and downstream of the barrier. This in turn modifies the habitat of many riverine species; including fish.

Furthermore by constructing barriers, rivers and streams become fragmented, and they no longer run uninterrupted from their source to sea. Stream fragmentation can have profund effects on river ecosystem. A barrier divides the river into separate segments up- and downstream, with limited possibilities of exchange. As a result movement of of species is impaired and full connectivity is lost.

Small weir in the Netherlands

Barriers can have a huge negative impact on fish migrations. Some migratory fish species swim over large distances in order to reproduce; think of salmon or eel. Barriers represent obstructions for fish trying to migrate to and from their spawning grounds. As a result less fish are able to reproduce. This impacts on fish populations and causes a decrease on fish stocks. Over time it can also lead to a losslof genetic diversity and may eventually lead to local extinctions, as it has already happened in some European rivers.

Given the impacts of some barriers on the environment and the predicted increase in the construction of dams for hydro-power production and water supply, it is clear that fish and other aquatic species face hard times; there is a clear need for change. However, one cannot simply remove all barriers. After all, we cannot do without the benefits that many barriers provide.

A solution would be smarter and more adaptive ways to manage and plan barriers. By adjusting the operation of existing barriers, renovating and improving outdated barriers, and removing barriers which are no longer beneficial, the impact on the environment can be greatly reduced. Also by carefully planning the construction of new barriers in such a way that they minimize impacts on the environment, the situation for fish and other species can be improved without compromising water supply, flood protection and energy production.

Achieving this on a European level is no small challenge. However this is exactly what the new AMBER-project aims to do. AMBER stands for “Adaptive Management of Barriers in European Rivers”. It is a 4 year research project of 20 organisations throughout Europe, funded by the European Commission.

The first step of this project is to create an inventory of all barriers in Europe . This in itself is challenging enough, since for many regions there is only limited information of existing barriers. Complicating the situation is the fact that barriers are managed by many different organizations. This lack of information is the first obstacle to make well informed decisions. To overcome this, AMBER is developing a Smartphone application to give everyone the opportunity to help mapping and researching stream barriers across Europe. This application will allow iusers to locate and upload photos of stream barriers all over Europe, and enter information on their size and use.

The second step of the AMBER project is the development of four decision support tools. These will help dam managers and planners to adjust the operation, improve existing barriers or carefully plan new ones.

Due the growing demand for water and energy, the number of barriers in European rivers will likely increase, leading to increased fragmentation. By restoring stream connectivity throughout Europe we aim to make it a nicer place; well connected streams will become more natural and will provide good habitat for many species, whilst still providing us with all the benefits we need. A dream for both fish and (fisher)man!

Project Updates

The new AMBER website is launched and will be updated weekly with news, updates and downloads. You can also subscribe for the newsletter or read about the project.

Read more

Members of the International Centre for Ecohydraulics Research (ICER) at the University of Southampton started the first trials for the barrier assessment methodologies in Monk's Brook near Southampton, United Kingdom.

Read more

On the 5th, 6th and 7th of July 2016 the AMBER partners met up in Warsaw, Poland for the first project meeting. The meeting started on the evening of the 5th of July with a General Assembly.

Read more

Read more news

AMBER launch events

AMBER is being launched today! With events in many European countries. See below for a selection of these events.

Belgium
Screening of DamNation Documentary in Brussels.

Italy
AMBER launch in Milan, Italy.

Switzerland
Field trip to fish passage facility.

View all events

What does an AMBER partner do?

Curious to know what an AMBER partner does as part the project? Read the text below and take a look at the video produced by the International Centre for Ecohydraulics research at the University of Southampton.

Humans have been altering rivers for centuries for many reasons like navigation, irrigation and energy production. As a result many of the waterways now fail to meet good ecological status under the Water Framework Directive. Adaptive management of barriers is needed to strike a balance between the various needs. However we often don't have a good understanding of socio-economic conditions at barrier locations. This is an important aspect to include in order to successfully mitigate the effects of barriers.

The International Centre for Ecohydraulics research at the University of Southampton will use their experimental infrastructure like flume facilities to develop technologies to mitigate environmental impact of barriers. The work will focus on improving understanding of poor performance of existing barrier mitigation schemes, developing decision support tools to guide management of barriers and researching the socio-economic impediments such as stakeholder conflicts.

Why is a power-company initiating a removal of a hydropower plant?

Guest article by Johan Tielman - Uniper

Sweden is a country where more than half of the electricity generation is renewable. This is mainly due to hydropower but wind power is growing fast. In order to further increase the share of renewable energy, hydropower plays a major role, both as an energy-supply but just as important, as a regulator when more and more intermittent supplies of energy, such as wind, are being harnessed.

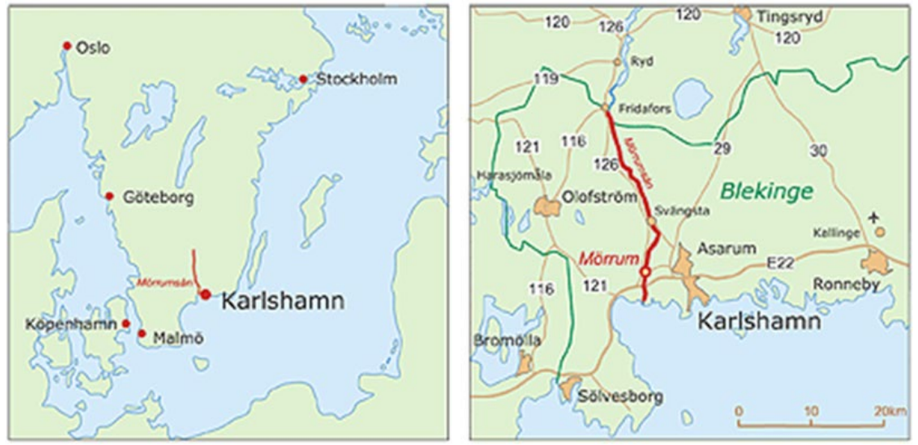
At the same time, the issue of protecting and increasing ecological values in our water-bodies is very much in focus, mainly driven by the European Water Framework Directive (WFD). In many cases this means a conflict between contradicting targets as water that could have been used for producing renewable energy may be needed for ecological enhancement measures or the other way around.

One of the objectives in the AMBER-project is to better understand the drivers of river fragmentation in European watersheds. With better knowledge it is possible to consider what can be done to reduce river-fragmentation, but also to consider the services provided by dams and weirs, of which hydropower production is one of many.

During the last four years, an intense dialogue has been going on in Sweden, involving national authorities, power-companies and NGO´s. The challenge was to create a strategy for where, and how much, a reduction of hydropower generation can be acceptable, without a severe impact on the energy-system. The outcome is the National Strategy for Hydropower, which sets a limiting target of 2,3 % or 1,5 TWh, for how much the contribution from hydropower can be reduced for ecological purposes. It also emphasizes that the regulating capacity cannot be reduced.

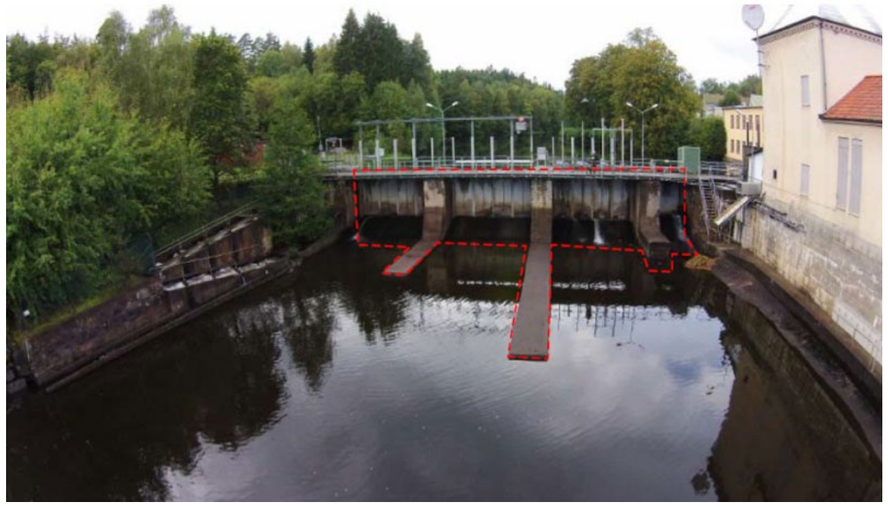
To put it simply, the strategy contains six river-categories based on each rivers value for the energy system and ecology. Big rivers with much water, high head and large scale hydropower-plants belong to categories one and two while small rivers with only small scale hydropower but relatively high ecological values belong to categories five and six. For categories three and four both values may be important or equal.

Uniper* supports the National Strategy and believes that - in combination with an open dialogue between all stakeholders - it is the right way forward as some kind of prioritizing will be necessary. Even though the Strategy has no legal or binding status, Uniper has chosen to act in accordance to it. One example is the removal of Marieberg hydropower plant in river Mörrum, in the southeast of Sweden .



The River Mörrum is a world-famous angler-destination, mainly because of its trophy-sized Atlantic salmon and sea-trout.

However, the river is also home to many endangered species and is today a Natura-2000 area. Solutions for increasing river-connectivity are already in place at Uniper's four hydro-plants but the dam close to the river-mouth is still a bottle-neck. In cooperation with the local county board and local stakeholders, Uniper has decided to remove the dam and the power-plant. In addition to improved connectivity, not only at Marieberg, but also further upstream, some of the former streams and rapids can be restored as the impoundment disappears.



The Marieberg Hydropower dam, dotted line shows which parts will be removed.

The Marieberg power-plant is the smallest one in the river so the loss of renewable energy can be accepted as the ecological benefits are big. This quota looks different in other hydropower-locations, which means that other measures may be better or simply that there are no reasonable measures possible. Also, in some cases present plants may be upgraded and made more efficient without further negative impact on the environment.

Illustration of river Mörrum upstream Marieberg Hydropower plant before and after removal.

The situation in Sweden is a good example adaptive barrier management and prioritisation based on striking a balance between energy production and conservation of river ecosystems. The AMBER project will also implement adaptive management and consider the need for achieving a balance between energy production and other ecosystem services. This will lead to widely supported measures. Follow the AMBER project to learn more about this.

**Uniper is an international energy company with about 13,000 employees, activities in more than 40 countries and with approximately 40 gigawatts of installed generating capacity.*

Would you like to stay up to date about the AMBER project and read about river connectivity, barrier management, events, project updates and guest articles?

Sign up for the newsletter

Follow @AMBERtools on social media:

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 689682.

Copyright © 2016 World Fish Migration Foundation, All rights reserved.