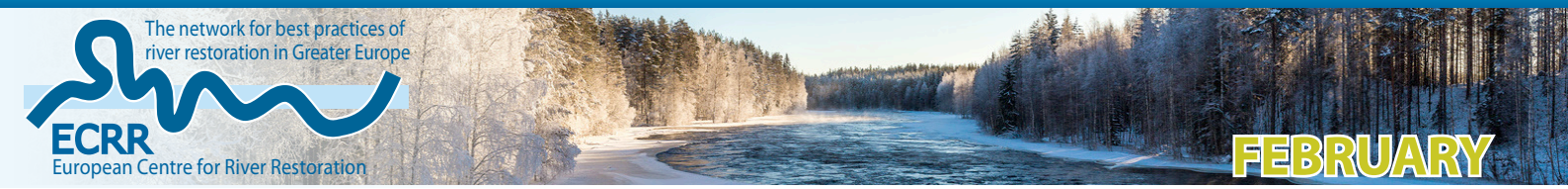
The network for best practices of river restoration in Greater Europe
ECRR
European Centre for River Restoration



In this newsletter

Braided river in UK © the RRC

RRC Conference 2006 site visit River Tummel © the RRC

Editorial

Entering a new decade, does not mean that river management in the coming decade will also be completely new. River restoration is even more needed than it was in the past decade. Evidence gathered by the ECRR highlights the extensive work done in recent decades towards developing best practice approaches to restore the natural processes of rivers and their ecology. With water quality having been significantly improved in many river basins, the focus is now on addressing hydromorphological pressures and re-establishing lateral and longitudinal connectivity. The ambitions of the EU WFD are high, for governance as well as for ecology. To achieve these ambitions in the iterative process over several implementation cycles requires in all countries, needs more time than was initially expected.

Fortunately, the outcome of the EC Fitness Check assessment concerning whether the Water Directives are fit for purpose was very positive. Their performance was set out against 5 criteria in the Commission's Better Regulation agenda: effectiveness, efficiency, coherence, relevance and EU added value. ECRR is very happy with the following conclusion made: The fact that the WFD's objectives have not been fully reached yet is largely due to insufficient funding, slow implementation and insufficient integration of environmental objectives in sectoral policies, and not due to a deficiency in the legislation. The same conclusion was also drawn in ECRR's review submission in March 2019.

Therefore, In the recently held ECRR's member meeting an important decision was made that ECRR should prioritize and focus on a few thematic activities. For the coming year(s) this is first of all river continuity restoration, including dam removal. Other themes are climate change and river restoration in relation to floods and droughts. Furthermore, the RiverWiki for river restoration projects must be upgraded and made more user friendly, being able to maintain it as an important tool for sharing best practices knowledge and information concerning river restoration.

The articles in this issue of the ECRR technical newsletter prove and showcase that these themes and type of projects and knowledge is on one hand more and more needed and on the other hand more and more developing. And not just by the 'traditional' river restoration institutions, organisations and people, but they are increasingly used and developed by the river authorities and river management practitioners. This means that supported river restoration is now getting mainstreamed by the general river management supported by the WFD implementation. And this how it should be, the WFD is just a tool and river restoration is the target and not the other way around.

The articles are very varied, from Riverine ecosystem management, to sustainable hydropower, from river care to braided, wild, rivers, from dam removal to ecological compensation of dams and of course about involving the public, by citizen science activities and demonstrative festivities on fish migration. And finally, the forthcoming events, more extensive than ever, concerning the integrated river basin management. We wish you a very good read at the start of this very promising, new decade.

Best wishes,
Bart Fokkens, ECRR and Wetlands International,
Francisco Martinez Capel, CIREF,
Timur Pavlyuk, RosNIIVH.

Challenges and solutions in Riverine Ecosystem Management with a focus on hydropower

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University of Natural Resources and Life Sciences Vienna

The following article represents an excerpt from the presentation held in June 2019 at the Workshop "Sustainable Hydropower – strategic planning, measures and governance" in Sweden.

1. Brief review

When discussing sustainable hydropower development in Austria, two major historic events of direct democracy which still influence today's decision-making have to be mentioned. Shortly after the construction works for Austria's first nuclear power plant Zwentendorf started in 1972, they were followed by massive protests. Assuming that most people would approve the exploitation of nuclear energy, former chancellor Kreisky decided to consult the population in a referendum. Unexpectedly, 51.47% voted against the plant whereupon a law prohibiting the use of nuclear power was adopted in Austria. This decision was lately reassured after the reactor catastrophe in Chernobyl in 1986.

As nuclear power was not an option for Austria, hydropower exploitation experienced a significant increase in installed capacity in the second half of the 20th century. In search of attractive locations, plans for a hydropower plant in the Danube floodplains near Hainburg (downstream of Vienna) emerged in the early 80's. Since the plant was considered to be of general public interest, it was quickly commissioned and construction started in 1983. But campaigns initiated by NGOs and the associated reporting awakened the public interest, leading to a mass occupation of the floodplain in winter 1984 and more than 40,000 people demonstrating against the government's actions. With more than 350,000 people signing a referendum against the hydropower plant, the plant was abandoned and the respective site is now protected by a national park including one of the last two remaining free-flowing sections in the Austrian Danube.

Based on those cases, civil disobedience was officially acknowledged as a valid component of direct democracy in Austria which lead to a new environmental consciousness and paved the way towards a more sustainable energy generation. Even though hydropower construction decelerated, many more hydropower plants were constructed so that Austria nowadays exploits 70% of its hydropower potential to cover 60% of its electricity demand. At the same time, almost 60% of Austria's waterbodies are at risk of failing the goals of the EU Water Framework Directive (WFD). While many rivers are impacted by morphological alterations and fragmentation, around one third of them are significantly impacted by hydropower-related pressures such as impoundments, water abstraction and hydropeaking.

European countries face an ambitious EU legislation. While the EU Renewable Energy Directive (RED) strives for a further increase in renewable energy sources such as hydropower, the WFD aims at improving the ecological status of rivers. Under these circumstances, and especially since river sections with unexploited hydropower potential often coincide with predominantly natural river sections of high ecological value, there is a clear need for inter-sectoral cooperation, regulatory frameworks and strategic planning tools.

2. Avoidance > Minimisation > Compensation

To be recognized as sustainable, the hydropower sector needs to apply the full mitigation hierarchy starting with avoidance, minimisation and eventually compensation. The following paragraphs present three best-practice examples of riverine ecosystem management in Austria.

2.1 Strategic planning (Avoidance)

In Austria, the first steps towards a strategic planning process for sustainable hydropower development have been set with the Austrian Water Catalogue (AWC) which was published by the Austrian Ministry of Life in 2012. In order to develop an instrument for the identification of hydropower projects with high energy efficiency and least conservation concern, the AWC suggests criteria related to energy and water management, ecology and other water-related issues. Within the WWF-funded project "Ecomasterplan III" the catalogue of criteria was adopted, complemented and combined into an overall assessment approach which was then applied to about 100 planned hydropower plants. Overall, six scenarios ranging from maximal to minimal conservation were compared. The results showed that the abandonment of projects with low economic rating (lower half of the graph in Figure 1) would reduce the number of projects by 47%, while the installed capacity and annual production would only decrease by 2.3% and 12% respectively. This illustrates that especially small hydropower plants marginally contribute to the achievement of the RED while jeopardizing the goals of the WFD.

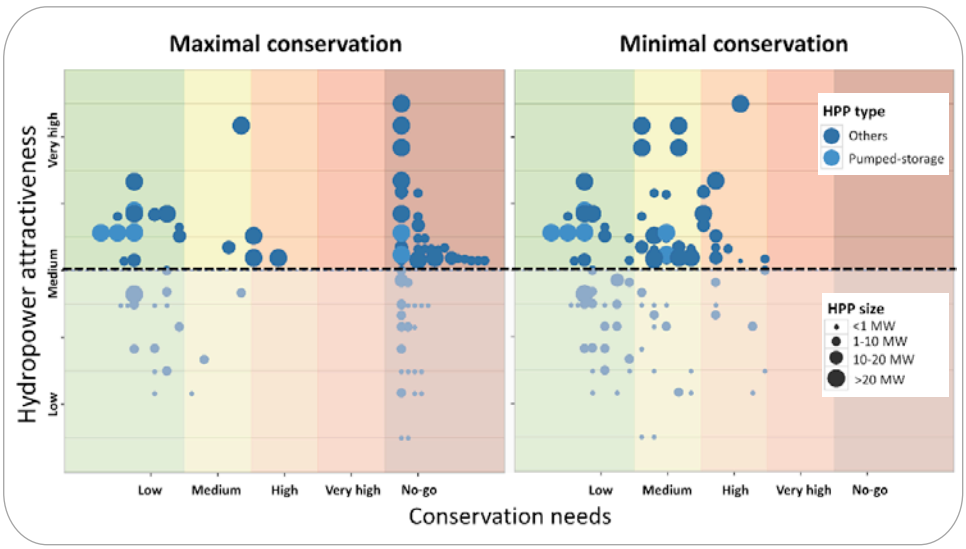

Figure 1: Two scenarios of the WWF-funded project Ecomasterplan III (Seliger et al. 2016)

Since the protection of rivers is cheaper than their restoration the designation of no-go areas is highly recommended and especially important for sensible river sections. Based on the WFD, Federal States in Austria were encouraged to release the so-called "regional plans for river protection". While some plans define no-go areas, others prohibit exceptions from the no-deterioration principle due to overriding public interest. In cases where the construction of new hydropower plants is still possible, a clear set of environmental mitigation measures is defined. This approach does not only protect sensible river sections but also reduces the risks of stranded investments.

2.2 Hydropeaking mitigation (Minimisation)

In the age of climate crisis, the acceleration of CO_2-neutral energy sources creates an increased need for balancing and storing energy which brings hydropower into the centre of attention. Storage hydropower plants are characterized by their ability to produce energy when it is needed, but their flexibility comes at a price. The discontinuous release of turbined water, called hydropeaking, is associated with significant environmental impacts on aquatic organisms. Due to the obligation to improve the ecological status, Austrian energy companies as well as provincial and national governments funded several research projects to investigate potential mitigation measures. The first project "Hydropeaking in Austria" (2010-2013) assessed hydrologic hydropeaking characteristics and cause-effect relationships. To assess the effect of hydropeaking on aquatic organisms under controlled conditions, the HyTec channels were constructed (see Figure 2). The two parallel channels allow the comparison of stranding and drifting rates at different intensities of hydropeaking in relation to unimpacted conditions.

Based on the pioneering results two more projects were funded. SuREmMa (2014-2017 https://oesterreichsenergie.at/ueber-uns/oesterreichs-energie-forschung-innovation/studien.html) and SuREmMa+ (2017-2019 https://www.ieahydro.org/media/255e2ab2/5%20-%20Greimel_etal_Bru%CC%88ssel_final.pdf) aimed for defining and comparing potential mitigation measures. Besides ecological effects also the implications for energy and climate policy (e.g. security of supply) were investigated and discussed with stakeholders. The success of these projects could not have been achieved without the good cooperation between ministries, energy companies and research institutes. First mitigation measures (compensation reservoirs for temporary storage to flatten the peaks) are planned or under construction and more detailed evaluation will follow within the next years.

2.3 River restoration – a common pathway (Compensation)

In September 2015 the Austrian Water and Waste Management Association (ÖWAV) organized the workshop "River restoration – a common pathway". More than 50 participants from different disciplines as well as local, regional and national governments followed the invitation and engaged in an integrative discussion on how to restore rivers in Austria. In a first step, the workshop tried to elaborate whether participants from different sectors with highly diverse and partially conflicting interests can agree on a joint vision for Austrian river systems. Then, specific problems were discussed in small groups on the basis of a

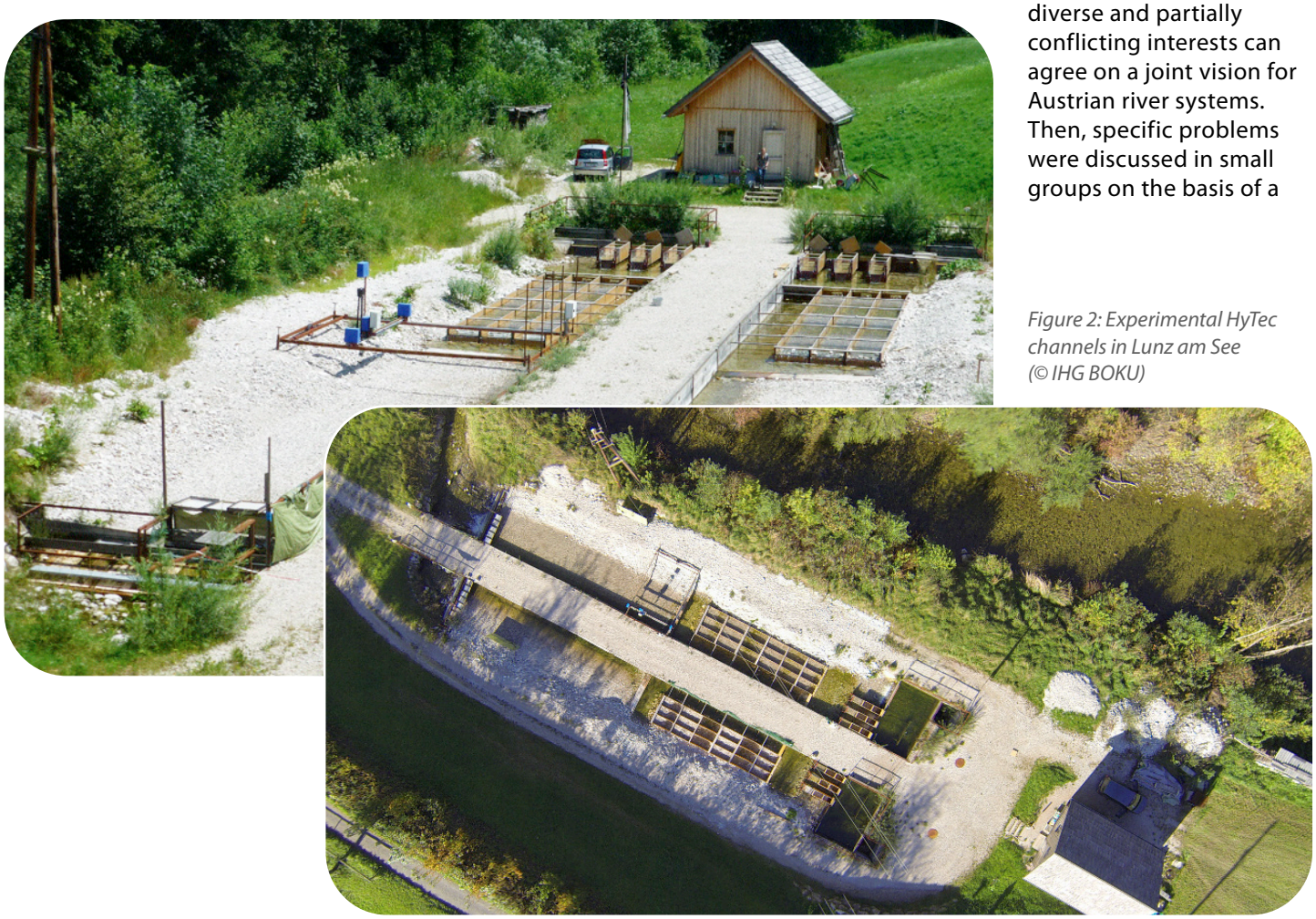

Figure 2: Experimental HyTec channels in Lunz am See (© IHG BOKU)

graphically illustrated catchment with multiple impacts (see Figure 3). The participants were encouraged to participate in role games to promote mutual understanding of different sectors. With the aim of finding integrative solutions for protecting the environment while safeguarding user interests, potential obstacles and win-win situations could be identified.

Despite their different interests all sectors agreed on the common goal to improve environmental conditions, however under consideration of user interests. Most rivers are impacted by multiple pressures and the underlying cause-and-effect relationship are not always well investigated. As this contradicts the application of the polluter-pays principle, a holistic planning process on catchment scale has to be aimed at to allow balanced decision making. Due to the complexity of the topic, the coordination of restoration measures and the exploitation of synergies requires a clear definition of responsibilities.

Besides the willingness to combine forces for a common goal, the success of restoration depends to a large degree on funding opportunities. This topic was elaborated in the second workshop in 2018, where participants agreed on the necessity of subsidies. While the restoration of hydropower-induced impacts was to a large degree financed by energy companies, morphological improvements have to be covered by public authorities. But to use the available funds in the best possible way, prioritisation strategies should be elaborated based on scientific investigations.

To convince decision makers to allocate funds for river restoration requires pressure from strong stakeholder groups or the broad public. Therefore, the third workshop in 2019 focused on how to increase awareness about the necessity and importance of river restoration amongst people. The workshop included presentations by media experts which gave recommendations for successful public relationsactivities.

Three workshops organized by the Austrian Water and Waste Management Association represent major building blocks towards the elaboration of river restoration strategies. Further workshops will follow to foster a joint dialogue and mutual understanding.

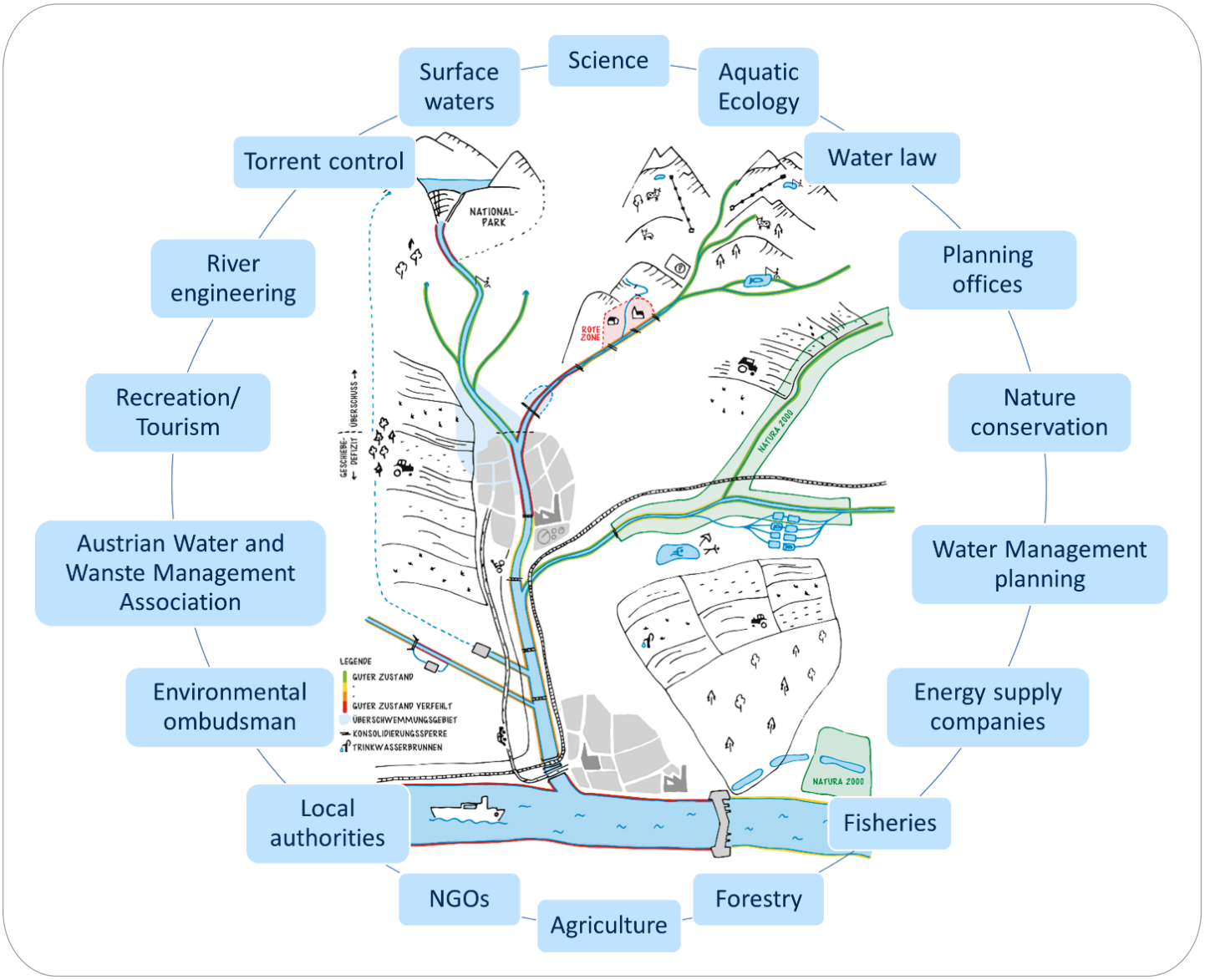

Figure 3: Conflicting sectors aiming for a common pathway in river restoration (© manuschmidt.com 2016)

Towards sustainable hydropower in Sweden

Johan Kling and Erik Årnsfelt
Swedish Agency for Marine and Water Management.

Introduction

The history of hydropower in Sweden is very old and dates back to medieval times. One of the first environmental laws can be traced back to the year 1228. The law for mills, which stated that one-third of the river must be free-flowing and the fish connectivity must be ensured.

The first electrical hydroelectric plant was built in 1882 to provide light in a dusty textile mill. The initial hydropower development was however slow, but in 1918, new legislation was decided by the Parliament to improve the rate of development. The environmental concern in this new legislation was mainly focused on compensating the loss of commercial fishing. The outcome of the legislation was few hydropower plants in Sweden with fish passages, and minimum flow was usually limited to 5 % of the average flow. Sweden has today approximately 1800 hydropower plants and 600 regulating dams, from which 199 plants above 10 MW provide with 94 % of the 65 TWh hydropower and almost all the regulated power. The demand for regulated power is increasing by the rapid increase of wind power and -more moderately- solar power.

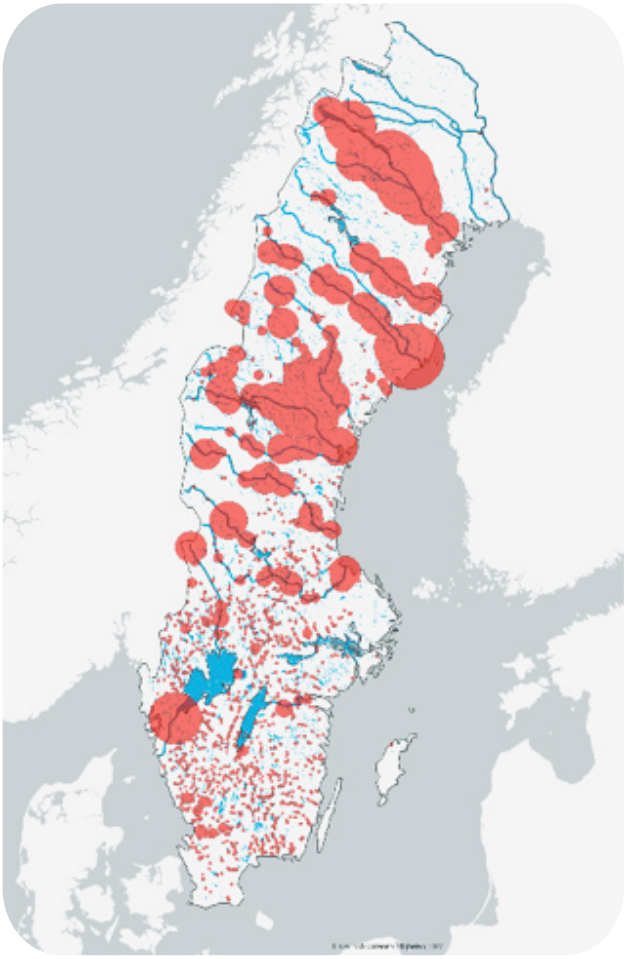

Figure 1. Southern Sweden has a large number but generally relatively small hydropower plants. In the North, the large scale hydropower plants dominate, usually operated in a regulation scheme with many plants.

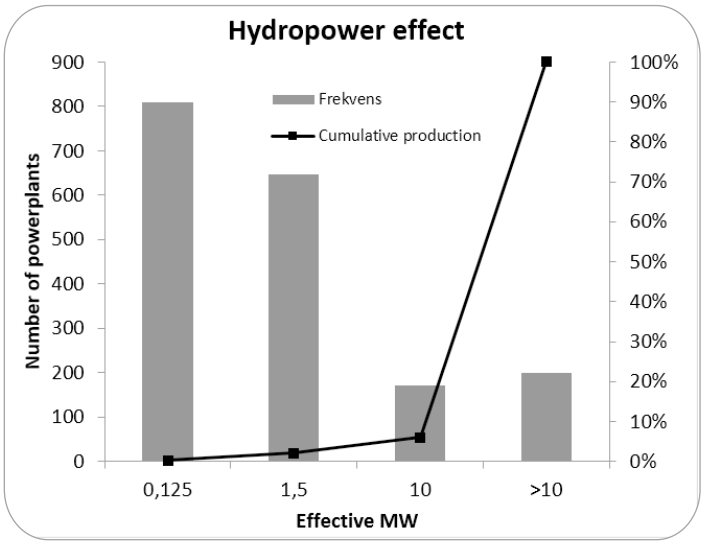

Figure 2. Number of hydropower plants classified by installed power and cumulative production in 2014. If data on production is missing, an approximation has been used.

Based on the classification within the Water Framework Directive, hydropower is one of the most extensive pressure on lake and river water bodies in Sweden. More than 11 000 water bodies[1], that is 50%, have significant pressures on hydromorphology; a significant part but not all of them are affected by dams and hydropower. These data suggest there is a need for revision of the licenses of the hydropower plants to decrease their environmental impacts.

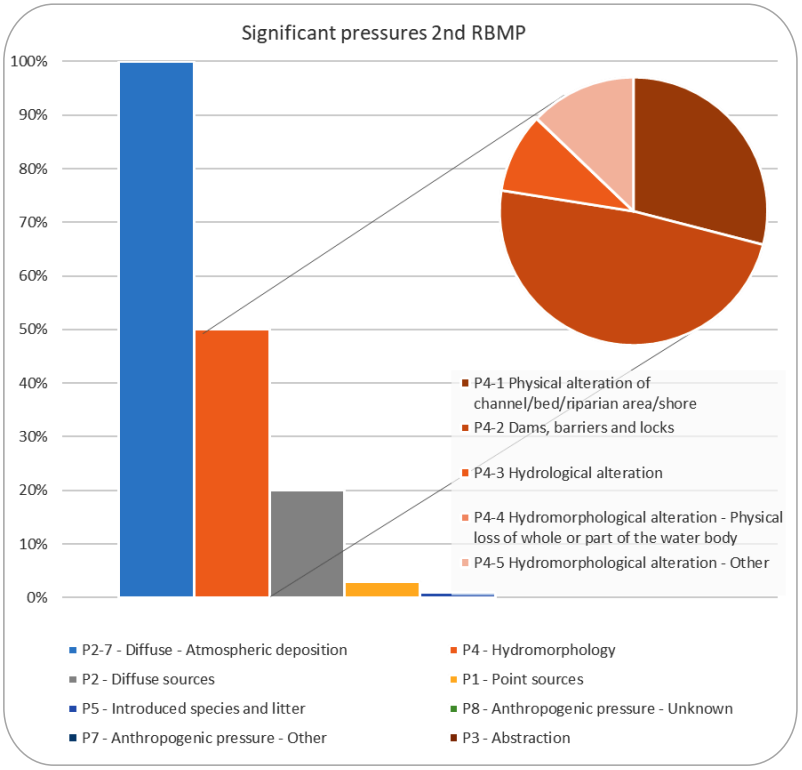

Figure 3. Significant pressures as assessed in the second cycle of RBMPs for lakes and rivers. Approximately 50% of the water bodies have significant pressures concerning hydromorphology. Dams, barriers and locks account for nearly half of these pressures.

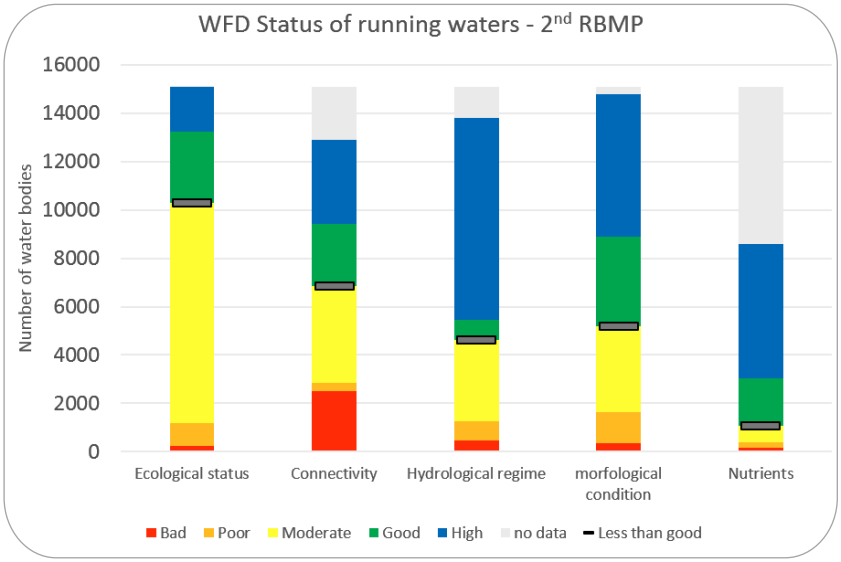

Figure 4. Status of the river water bodies and classification for some parameters in the 2nd RBMP. The Status comes from the EEA Ecological status of surface water bodies and the classification of individual parameters from the VISS (Water Information System Sweden).

Sustainable hydropower

In 2014, the Swedish Agency for Marine and Water Management and National Energy Agency suggested a national strategy to balance the need for improved ecological status and the need of hydropower. The strategy suggested different goals in seven groups of catchments, based on a considerable number of environmental parameters, parameters describing energy values and multicriteria analysis. The strategy also stated that 1.5 TWh/year is a benchmark for a significant impact on hydropower when applying heavily modified water bodies. If the strategy were fully applied, it would mean the implementation of environmental flows and fish passages in many hydropower plants in Sweden except the large-scale regulatory plants.

Based on the results from the national strategy, the work continued within a high-level discussion in 2015 among the power sector, the NGOs and the two authorities. A proposal was submitted to the government suggesting changes in legislation and an environmental fund is proposed, provided by the main hydropower companies in Sweden. The Hydroelectric Environmental Fund was set to almost 1 billion euro with an additional 0.3 billion euro supplied by all plant owner. In return, the hydropower sector suggested to the Government a lowering of the property tax for the hydropower sector, not adding additional environmental requirements on the hydropower, and keeping the yearly production loss to 1,5 TWh. The Parliament decreased the property tax in 2017 and the Environmental fund is now in operation by the hydropower sector.

Legislation

On the 1st of January 2019, new legislation was completed. The Government along with the new legislation gave SWAM, The Swedish Energy Agency and the Svenska Kraftnät (the grid operator), the assignment to provide a national plan for the revision of the hydropower plant licenses. The national plan is to be carried out over an operational period of 20 years. A new aspect of the legislation is time-limited environmental requirements with a maximum period of 40 years. The plant owner is responsible to update the license when a requirement is outdated. The main part of the plan is composed of geographical areas, mostly a catchment, in which the hydropower plants have environmental connections, together with a time plan when the plant owner should apply for a revision of his/her license.

Integrated policy and planning

The new national plan was submitted to the government on the 1st of October 2019, with additional suggestions by the authorities. One of the most important suggestions was a collaboration process within each catchment before the application process. The goal is a plan with overall environmental targets in each catchment, with environmental functions that should be ensured in each water body. Parallel with the implementation of the national plan for hydropower, there is a need for a general restoration strategy at the national and catchment scales. Sweden has more than 10 000 dams excluding hydropower dams, which in most cases are barriers for continuity. The impact of timber floatation, drainage, and land reclamation is extensive. Restoration programs in each catchment have to start parallel to the revision of hydropower licenses to reach the full potential of the national plan. There are also other programs to be coordinated with the national plan, such as management plans for protected species like eel, salmon, sea trout, and freshwater pearl mussels.

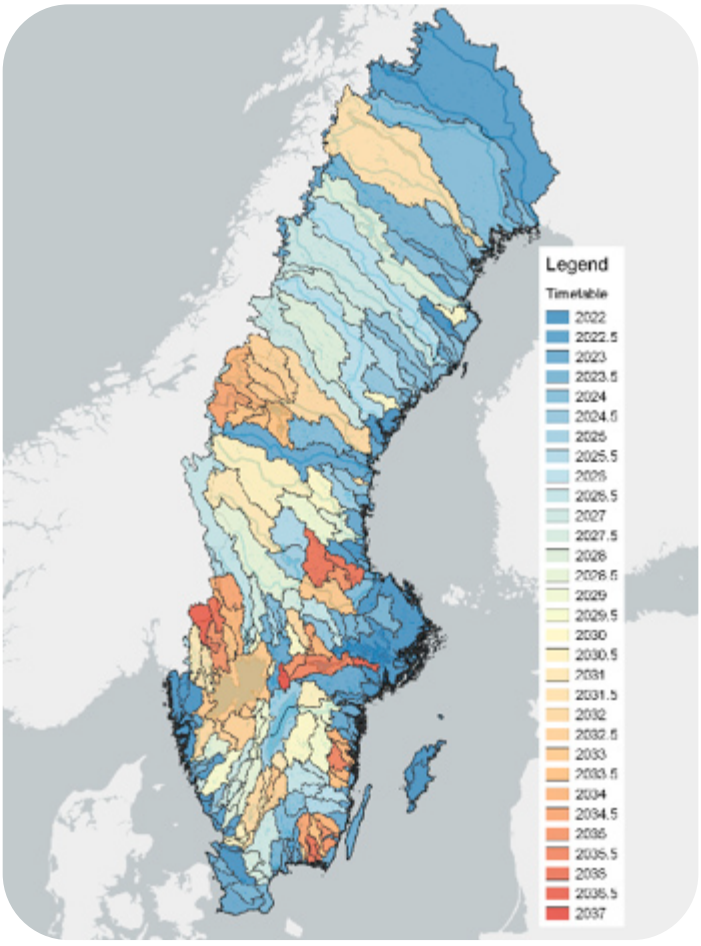

Figure 5. The areas for licence revision are geographical areas, mostly a catchment, in which the hydropower plants have environmental connections. They are managed according to a time plan when the plant owner should apply for a revision of the license.

Research, innovation and knowledge exchange

The monitoring of biological and hydromorphological quality elements needs to be upgraded and extended, especially in regulated streams where monitoring is scarce. Gathering information about the river habitats will be a major task due to the large number of river water bodies. This work will be important to set the right measure in the right location. The use of modern IT, like geo-intelligence and remote sensing will be essential. The evaluation of restoration measures and mitigation measures in hydropower plants must be improved to have a continuous learning process. An upgrade of the national measures database has already been initiated.

There is a need for rapid progress in research and development, but also education in river ecology, hydromorphology, and river restoration to avoid bottlenecks. Skilled persons in river restoration will have a very good future in Sweden. In order not to reinvent the wheel, it is important to collaborate and make networking with other countries in Europe where hydropower is relevant and elsewhere, but also with organizations like the European Centre for River restoration (ECRR).

Hopefully, there will be a decision by the government in due time regarding the plan. The environmental plan for the hydropower will be a significant game-changer and a major boost for the rivers restoration in Sweden.

Photo 1. Sustainable Hydropower Conference Participants, June 2019, Storforsen, Sweden. © Johan Kling.

Photo 2. Fish ladder made of composite, 2019, Sweden © Johan Kling.

Photo 3. Fish ladder made of concrete, 2019, Sweden © Johan Kling.

[1] EEA ……https://www.eea.europa.eu/themes/water/european-waters/water-quality-and-water-assessment/water-assessments/pressures-and-impacts-of-water-bodies

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Dutch Research Programme River Care

Ralph Schielen
Rijkswaterstaat-Water, Traffic and Environment and TU-Delft

RiverCare is a research programme with 21 research positions at various universities in The Netherlands (Delft, Utrecht, Nijmegen, Twente and Wageningen). Research institutes like Deltares, and a considerable number of consultancy companies (on the technical field, as well as on the ICT-field) are connected to the RiverCare consortium. RiverCare has been funded in 2013 by the Dutch Organisation for Scientific Research (NWO) in the so called Perspective Programma and has a duration of 6 years. That means that the programme ends in December 2019. Within RiverCare, universities, knowledge institutes and consultancy firms work together with the national authorities to get more knowledge and insights about the consequences of interventions in a river system. That knowledge leads to a better understanding of the behavior of lowland rivers and can be used to improve and optimize operations and maintenance of the Dutch rivers. The latter is the main task of Rijkswaterstaat, the executive organization of the Ministry of Infrastructure and Water Management, and therefore Rijkswaterstaat contributed significantly to RiverCare. STOWA also contributed to RiverCare and cooperated in the projects with a focus on the regional water system. More information is available on https://ncr-web.org/projects/rivercare/

RiverCare found its inspiration in the Room for the River programme. Since 2007, 39 different measures have been constructed in the Dutch Rhine branches Waal, Neder Rijn-Lek and IJssel). On many locations, the landscape changed dramatically. The 'Spiegelwaal'-project near Nijmegen is a spectacular example of such a change, but also near Munnikenland along the Waal river, near the city of Zwolle along the IJssel river and near Vianen along the Lek rivier, the consequences of Room for the River are noticeable.

RiverCare
Towards self-sustaining multifunctional rivers

Rivers2Morrow
Working on the Future of our Rivers

One of the questions that the researchers within RiverCare answered is related to the morphological development of side channels. Constructing side channels has been a popular measure in Room for the River, as well as in the Water Framework Directive. The side channels have in general a bed level that is higher than the main channel, and are provide with a weir at the upstream entrance to the floodplain to regulate the discharge. It was well known that side channels aggrade over the years, and hence need regular maintenance to maintain their function. The exact mechanisms with respect to the sedimentation, and also the related time scales were largely unknown. At the University of Twente, this has been studied by Pepijn van Denderen. By carefully studying the system of side channels near Gameren along the Waal river, where a lot of data was available, we now know that in many side channels, the fine sediment that is transported as suspended bed material load in the main channel, is transported towards the side channel. We also found out that the aggradation depends on the discharge-regime. A few high discharges in a relatively short period can flush the side channel, but a few low discharges after each can cause so much aggradation that vegetation starts to grow and the side channel becomes part of the floodplain. Using model calculations, we can also predict how long in average it takes before such side channels close if there is no regular maintenance. This is a period of about 15-20 years.

Munnikenland, Vianen and Nijmegen. (https://beeldbank.rws.nl, Rijkswaterstaat , Ruimte voor de Rivier, https://www.ruimtevoorderivier.nl/press_release/meer-ruimte-lek-vergroot-waterveiligheid/ en https://beeldbank.rws.nl, Rijkswaterstaat , Ruimte voor de Rivier / Ruimte voor de Rivier)

This knowledge will be used in estimating the maintenance costs for future side channels.

The West-channel at Gameren, Waal River. Photo: Ralph Schielen

Another research project is connected to the longitudinal dams. Longitudinal dams have been constructed as an alternative measure for lowering the groynes. Over a stretch of 10 kilometers of the Waal river, the original groynes have been removed and the navigational channel has been narrowed. The result is that in periods of low discharge, the water level is higher, and in periods of high discharge, the water level is lower (because the longitudinal dams create less friction than the original groynes). Besides, a small channel alongside the main channel is created and this gives a number of opportunities for ecology. The main advantage is that ship waves and also the noise of ships penetrates less into this channel, which creates a more tranquil environment. The conditions are ideal for fish and macro invertebrates. Research at the Radboud University Nijmegen (Frank Collas) showed that the biodiversity increased due to the dams. The dams also influence the morphology of the river, which might affect commercial navigation. This has been studied at Wageningen University Research (Timo de Ruijscher). Because there are adjustable gaps in the longitudinal dams, there is a possibility to control (to a certain extent) the patterns of sedimentation and erosion. Therefore, an intensive monitoring programme is connected to the longitudinal dams, monitoring changes in the main channel as well as in the side channel.

On the left the longitudinal dam, on the right the traditional cribs. Foto: https://beeldbank.rws.nl, Rijkswaterstaat, Ruimte voor de Rivier / Jasja Vliegt

Apart from studying the consequences of the Room for the River programme, RiverCare also studied the secondary system of small streams. Here, STOWA is closely involved. At Wageningen University Research, Jaspar Candal looked at the Overijsselse Vecht. He was able to describe a relation between the historical changes in the planform of the river and the discharge. He found stable, and less stable periods over the past several of thousands of years, and he was able to connect the periods with large changes in planform to substantially higher discharges occurring in the late Holocene. Those discharges might have a relation with the climate change that occurred in that period.

Also, with respect to stakeholder interaction and the consequences thereof, progress has been made within RiverCare. At the Radboud University in Nijmegen, the complex network of stakeholders that is active in river management has been visualized and analyzed, looking for improvements in cooperation. This has been done by Jan Fliervoet. The University of Twente has develop a so called Serious Game, which can be played by policy makers and stakeholders. Aim is to disentangle the different interests and get an understanding for each other stakes. This might then lead to improved cooperation. This game is special in the sense that it is a combination of a classical board game and a computer simulation model. Players move pieces to simulate e.g. the removal of forest in a floodplain and the hydraulic consequences are rapidly calculated and projected on the playing board such that the consequences can be discussed.

The 'Virtual River'. Photo: Ralph Schielen

And more things happened within RiverCare. Research has been carried out towards the use of biomass available from the floodplains, new tools for monitoring vegetation and monitoring temperature of water in the river have been tested. A complete overview of the results can be found at the site of RiverCare: www.rivercare.nl. The scientific output (e.g. the journal papers) is also available from https://kbase.ncr-web.org/rivercare/outputs-overview/. There, also the story-lines are available, an accessible method to communicate complex scientific stories to a more laymen-public. Furthermore, RiverCare has made a number of short informative movies, in which on a fast yet attractive way the various studies of RiverCare are introduced. On June 19th, 2019, an event was organized at the Wijnfort in Lent (an appropriate place along the Waal river, very near to the Nijmegen Room for the River project) where all the results have been shown to a large and mixed public of policy makers, users and scientists. Meanwhile, the successor of RiverCare has already started by means of the program Rivers2Morrow. This research programme (which is unlike RiverCare, completely funded by Rijkswaterstaat and the Ministry of Infrastructure and Water Management) studies specifically the long term behavior of Rhine and Meuse, taking into account the process of climate change. Because also in 2100 and even beyond that date (so with increased sea level rise and increased river discharges), we would like to remain in this country to work and have fun!

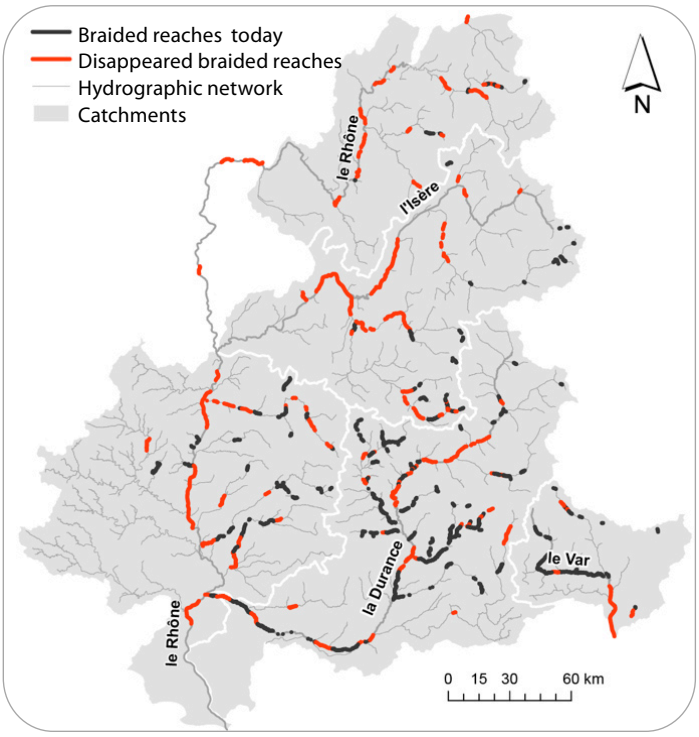
Braided rivers, an endangered ecosystem?

Typical landscape of a braided river, in this case the river Bléone, in the French Southern Alps (© M. Colin)

Benoît TERRIER, *project leader in hydromorphology at the Rhône Mediterranean river basin agency* benoit.terrier@eaurmc.fr

Braided rivers are truly outstanding ecosystems with a great dynamic and yet they are little known from the general public. They are characterized by multiple channels which diverge and converge, separated by more or less vegetated islands.

Braided rivers represent one of the most endangered ecosystems in Europe. A census of the French Alpine braided river showed that only half of the cumulative lengths of braided rivers observed in the 18th and 19th centuries still exists in the region, with around 700 km of braided rivers remaining today in the Rhône-Mediterranée river basin. Such a regional extent of braided rivers is unique in France and even, it seems, in Western Europe.



Braided rivers, endangered ecosystems? In black: location of braided reaches today. In red: location of braided reaches that have disappeared since the 18th to mid- 19th century. Adapted from Piégay et al. 2009

In order to better understand those rivers and improve their management, a 4 year multidisciplinary research project was set up with several research teams of the Zone atelier bassin du Rhône (ZABR). The project was financed by the Agence de l'eau Rhône Méditerranée et Corse. A technical guide was published in May 2019 (in French) to summarize and disseminate the findings. (See links below).

The scientists studied over 50 braided reaches. They identified several types of braided rivers. They also provided typical geomorphological trajectories for braided rivers in South East France and gave explanations for the observed evolutions. Several factors can explain the decrease in the number of braided rivers, such as climatic factors, flow regulation, torrential correction work, afforestation, sediment mining, spontaneous establishment of forest etc. The fundamental role of vegetation in braided rivers has also been studied.

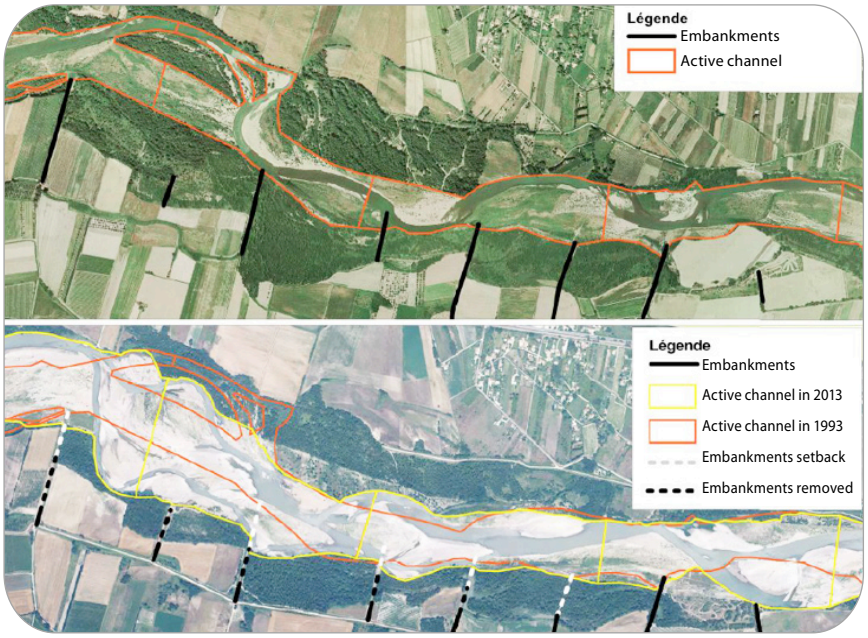
Hydrobiologists also studied life in those dynamic environments. They found that braided bars can contain macroinvertebrate fauna that is rare at the European scale. Sediment dynamics has a major effect on habitat diversity as it shapes geomorphological features. It was also found that braided reaches with strong vertical water exchanges are usually characterized by great biodiversity.

In Rhône Méditerranée basin, around 40% of braided rivers are under pressure due to channelization or gravel mining. Over 40% of them have also been identified as priorities in order to restore their ecological continuity. Braided rivers are also particularly sensitive to hydrological pressures and many of them have their hydrological regime disrupted by dams or excessive water abstractions.

The scientists have developed several tools to help river managers to diagnose the state of health of braided rivers, both from a geomorphological and an ecological point of view. Recommendations on their management and on the restoration of braided rivers are provided in the technical guide with illustrated examples. Typical restoration measures include restoring space for river to restore lateral erosion processes, setting back embankments, restoring channel morphology, restoring ecological continuity by removing weirs or managing dams to restore sediment continuity during flood events, reducing water abstraction etc.

Ecological restoration of a braided morphology makes sense and will be sustainable when the geomorphological processes that are at the genesis of the braided pattern are still present. For example, this is usually the case when coarse sediment supply is still abundant and is due to remain abundant in future.

An example of one of the first braided river restorations took place on the river Durance, in 1997. Following the 1994 flood event, it became clear that the flood defenses made of embankments were not efficient. In 1997, the SMAVD (the local organization responsible for river basin management) decided to set back some embankments by 100 to 200m and to remove some of them. As a result, between 1997 and 2013, the active channel width of the restored reach has increased by 40% over 4 km. The restoration project has decreased water levels up to the 1 in 50 year flood event. The project cost 2M€ and it is estimated that it saved 10M€ as opposed to the reconstruction of embankments close to the river. As can be seen on the following photographs, the braided pattern has come back and with it some typical fauna and flora of braided rivers such as *Corispermum gallicum*, a protected species on the red list of IUCN for threatened flora.



Aerial views in 1993 and 2013 of reach restored in 1997 on the Durance river (© SMAVD)

A workshop was organized with Graie (Rhone Alp research group on water and infrastructures) and RRGMA (regional association of river managers of PACA region) on the 11th of October 2019 to disseminate the tools developed by the scientists. The workshop was limited to 60 practitioners. In the morning, the participants were split into groups and they were asked to make initial geomorphological and ecological diagnosis of various braided rivers, using the tools developed by the scientists and the data that they had prepared. In the afternoon, participants visited to 2 river restoration sites on the Büech river. Presentations of the workshop are on line, as well as an introductory video and other materials (http://www.rrgma-paca.org/accueil/seminaire-les-rivieres-en-tresses-des-hydrosystemes-d39exception-en-images~1967.html).

The technical guide on braided rivers (Terrier et al., 2019) can be downloaded in French at the following link: https://www.eaurmc.fr/upload/docs/application/pdf/2019-09/guide_riviere_en_tresses_v27_complet.pdf

For further reading in English :

BELLETTI B., DUFOUR S., PIEGAY H., 2013. Regional variability of aquatic pattern in braided reaches (example of the French Rhône basin). Hydrobiologia, 712, p. 25–41.

LIÉBAULT F., LALLIAS-TACON S., CASSEL M., TALASKA N., 2013. Long profile responses of alpine braided rivers in SE France. River Research and Applications, 29: 1253-1266. DOI: 10.1002/rra.2615

PIÉGAY H., ALBER A., SLATER L., BOURDIN L., 2009. Census and typology of braided rivers in the French Alps. Aquatic Sciences, 71, p. 371–388.

Case study: Restoration of Pärnu river basin, Estonia

Külli Tammur, *Project manager of Environment Agency of Estonia.*

Background and Challenge:

Pärnu river basin is one of the largest river basins in Estonia and covers 20% of Estonias territory. The length ofthe Pärnu river is 144 km,together with the tributaries (270 rivers and streams) it makes up 3,000 km of river course. The Pärnu river is the biggest historical salmon river in the country with a potential twice as big as the other rivers. The removing of the dam will highly improve the salmon populations. There are 32 fish spieces living in the river basin, including salmon (Salmo salar), brown trout (Salmo trutta), whitefish (Coregonus lavaretus), river lamprey (Lampetra fluviatilis), and river mussel (Unio crassus). The Pärnu river is included in the Natura 2000 network.

The free free migration of fish was not ensured in the Pärnu river basin because of the several dams, the biggest one was Sindi dam. This 151 m wide and 4.5m high dam is the first migration barrier within the river (14 km from the sea) so removing it will effectively open up the river basin. And 6-7 smallers dams will be opened aswell; 2 of them were already done.

Approach:

Some discussions about removing the Sindi dam has been in air for decades. But the project really started in March 2015, when the minister of environment decided to buy the dam and land from the private owner. The

Sindi dam before removal 5 October 2018 *© Environment Agency Estonia*

Sindi dam removal 14 December 2018 *© Environment Agency Estonia*

Sindi dam almost completely removed 4 November 2019 *© Environment Agency Estonia*

previous owner had an idea to start producing hydropower in the Sindi, but the law had been changed and it is forbidden now to restore any hydropowerplants on salmon rivers in Estonia; the owner decided to sell the 'useless' dam to the government. One dam on the Pärnu river belongs to the local governemnt, one to the state and 5 smaller ones are still privately owned, all of them will be removed.

At first it was difficult to get everyone on board. The dam offered an artificial lake where local people enjoyed swimming and thus taking away their outdoor pool was a huge obstacle to overcome. The project team came up with multiple visions of how the community and environment could look like once the dam was gone. The final vision winner's plan was including excavating the river a bit so it could be deeper and easier to swim in. And the plans included also to create pathways for walking along the river banks, leave a rapid for recreational kayaking, etc..

The main goal of the project was and is now the protection and restoration of habitats for protected species – first of all salmon! The river basin has a potential of 48,000 smolts per year. Also free movement of sediments and flood prevention were included in the in project.

The project budget is 15.2 M€ and is funded 85% by the Europen Cohesion Fund and 15% by the state budget. The project is managed and executed by central government through the Environment Agency of Estonia.

Results:
The project is still ongoing but in last October the project managed to open the upstram the migratory routes for fish in the Pärnu river to its full lenght. This year it is ensured by the scientists that all the species can migrate hopefully. The numeric results are not yet measured, but we hope to achieve full potential of 48,000 salmon smolts per year in the next few years.

Two videos of the dam removal process can be seen in the internet:
https://www.youtube.com/watch?v=BgKqfNFGfTQ
https://www.youtube.com/watch?v=ylGKC8NRjXo.

Dam Removal Europe is pleased to announce the "Dam Removal goes Alps" seminar, organized by WWF (Germany, Austria and Switzerland), Dam Removal Europe partners, and in cooperation with regional and international partners. It takes place from 14 to 16 May 2020 in the BVS Educational Centre Holzhausen in Utting am Ammersee, Bavaria, Germany. It will be the Global Headquarters for World Fish Migration Day and a public outreach event! Read more……

Our rivers are blocked, dammed and constrained. Recent analyzes show that purely by calculation, European rivers are blocked every kilometer by a transverse structure. Experts like John Waldmann, professor of biology from the United States, are certain: **no other measure brings back the ecological function of rivers as effectively as the dismantling of dams.**

The Dam Removal Movement started in the USA, where the era of dam construction is over. Over the past 30 years, more than 1,000 transversal structures have been dismantled. The most spectacular example of a dam demolition took place in 2011 on the Elwha River at the Olympic National Park, Washington. In Europe, we have dismantled around 5,000 dams particularly in France, Sweden, Finland, Spain, and Great Britain. Of these, the largest demolition of a dam is currently taking place at the Sélune River in France.

RIVER RESTORATION AND ECOLOGICAL COMPENSATION IN FINLAND

Koljonen S. *Finnish Environment Institute, Freshwater Centre, Jyväskylä, Finland*
Jormola J. *Finnish Environment Institute, Freshwater Centre, Helsinki, Finland*

FIG. 1. Bypass channel can serve as compensation habitat for stream ecosystem (Imatra City Brook). © Jukka Jormola

The major causes for river degradation in Finland have been hydropower production and timber floating. Hydropower dams modify long river sections, preventing fish migration. Most of the rivers were dredged by mid-20th century for timber floating (many rivers were straightened and stones were removed); these actions damaged suitable riverine habitats of salmonid fish, especially Atlantic salmon (*Salmo salar* L.) and brown trout (*Salmo trutta* L.) therefore many populations were extinct. Nowadays, after improving waste water treatment (from point sources), forestry and agricultural drainage still impact water quality in many rivers. Ecologically speaking 35% of the rivers in Finland are qualified being in less than good ecological status and measures to improve the status are needed.

Although hydropower is promoted as greenhouse gas friendly, CO_2-neutral and clean energy, damming and regulation can have major ecological impacts on aquatic ecosystems. Requiring ecological flows into dry river sections is a promising measure to be promoted which can also increase the amount of suitable habitat for many species. Several cases of increasing minimum flow in dry river sections have been accomplished, mainly from voluntary basis. In larger rivers, hydropower plants rarely include fishways, blocking these streams to short stretches of more lacustrine than lotic habitats. But even though connectivity of rivers may be restored by the fishways, there is still in many cases a crucial lack of suitable spawning and rearing habitats. Traditionally, technical fishways are constructed for strong swimmers like salmon and trout. Research has been focused on species' abilities to find the entrance, swim upstream, and on the time spent in passing through the fishway. Downstream migration has still a lot of unrevealed challenges. A research project for installing a screen is ongoing at the river Iijoki in northern Finland.

FIG. 2. Brown trout population has increased rapidly in the constructed brook (Imatra City Brook) and ecological state indicates good state for the ecosystem. © Jukka Jormola

Many of the challenges here described may be solved by nature-like bypass channels. This type of fishway combined with compensative habitats, is built to resemble a natural side channel with suitable substrate, water velocities, morphology and slope. The channels generally consist of either a sequence of pools and short riffles or a continuous run/riffle habitat. To make the channels passable for all species and life-stages and to increase the area and quality of habitats, the slope of the channel should be limited. In addition to the fishway function, these bypass channels can serve as compensative habitats. Heavily modified streams (e.g. with several hydropower dams) have almost impassable routes to the headwater natural habitats. Building these bypasses to mitigate habitat loss may be crucial for some species.

Nationally, in Finland, the government now applies the Finnish fish pass strategy which aims to enhance the natural life cycle and reproduction of salmonids. After the timber floating ceased in 1980's there has been a massive emergence of restoration measures to return ecosystems and habitat for migratory fish species. Until now the loss of economically important salmonid populations been mainly mitigated by stocking. The goal of this action has been to enable commercial fisheries in the Baltic Sea area. There is mounting evidence that stocked fish from hatcheries can have unintended genetic and ecological consequences for wild fish populations, leading to low productivity. Thus, natural reproduction is nowadays endorsed instead.

FIG. 3. Invertebrate studies indicate good ecological status of the Imatra City Brook already after two years of construction. © Jukka Jormola

There is also a tendency towards dam removals and the small size hydropower units are not anymore promoted. These units are not producing energy for short term regulation, are often technically old and their national economic importance is notably less than the ecological potential of the free-flowing watercourse. The dam removal projects in Finland have recently been activated as cities (like Vantaa and Jyväskylä) have been prioritizing free flowing watercourses as an important element in the urban environment. Dam removal international projects have developed from small dams now to the rather big dams and ecosystem health has been taken more and more into account. Being so numerous, small dams and road culverts are the major cause for fish migration obstacles to which more effort is nowadays been focused. Dam removals are the best possibility for ecosystem restoration. In many cases removing the obstacle is not realistic and then a natural channel as a bypass (with potential to suitable habitat) is the second-best option.

The potential for habitat compensation in a built channel has been studied in 2014 as the Imatra City Brook was constructed. The Vuoksi watercourse runs from Finland to Russia and this new habitat can further serve the brown trout population migration from the main stream. After a year from the construction, juvenile brown trout densities already have been very high and individuals are in good condition. In an ongoing monitoring study, we have found evidence of rapid colonization of macroinvertebrates in the recently constructed channel, which indicates good ecological status. Inaddition there is basal production and suitable nutrition for juvenile fish. Video monitoring has also revealed that many other fish, until now eleven species are using the stream, also otter and birds use the bypass as their habitat.

Restoring rivers and keeping water quality in favorable state has a strong background in the EU Water Framework Directive. The implementation of the directive is not yet fully coherent, as the needed measures and actions are in many cases not anymore managed by the local or regional authorities but the third sector (citizens, associations, trusts). Especially in small streams and lakes these volunteer-based actions are rapidly increasing rapidly and a lot of different actions can be done with very good results. Guidance and research with longer term monitoring are highly needed to reach our goals and to be able to uniform our actions. We also need a wider understanding in large scale challenges and diverge environmental aspects in which international co-operation is highly important.

Measuring the impact of citizen science activities in environmental projects

MICS
Measuring Impact of Citizen Science

Fig 1. Citizen scientists in the field! Source: River Restoration Centre, UK

Citizen Science

Citizen science activities provide a great opportunity for the public to learn about science and the environment as well as collecting valuable data to support scientific research. The term 'citizen science' is defined by the European Citizen Science Association as an umbrella term capturing a range of citizen activities and different levels of citizen participation for example from long term monitoring, one-off experiments, to citizen led or co-designed projects. Citizen science plays an important role in environmental research, as well as providing benefits for the citizens involved and other stakeholders. Citizen science is used in many river restoration schemes. The multiple benefits of citizen science activities are widely recognised, however, there are no clear methodologies to evaluate the impact of these interactions for the projects, the citizens involved or on our wider society.

Typologies of citizen science and the importance of co-design

Citizens can participate at any stage of a project cycle from project design to delivery. Haklay (2013) defines the common types of citizen participation:

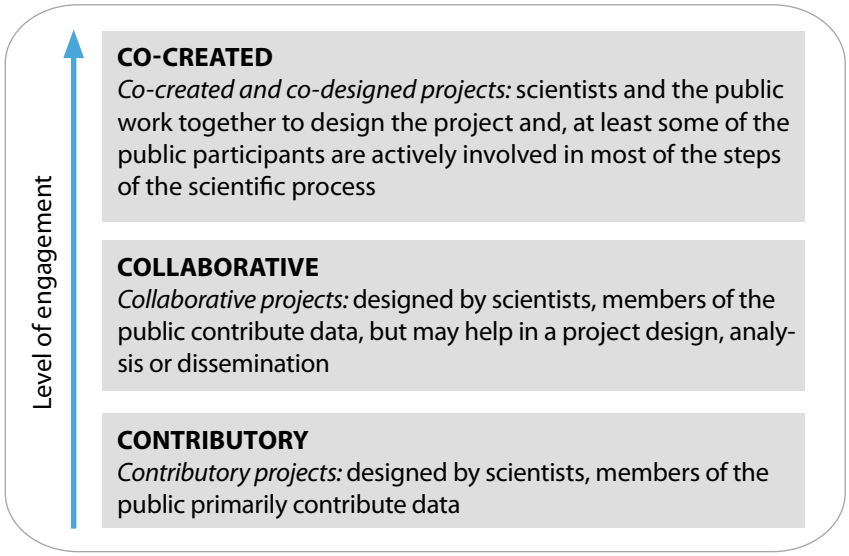


Fig 2. Level of citizen science engagement. Modified from Haklay's (2013) overview and typology of participation

The type of participation results in different levels of citizen engagement and different levels of impact. Co-designed projects aim to empower citizens, other stakeholders and scientists to develop meaningful citizen science activities together from the beginning of a project. An initial co-design meeting involves citizens working with stakeholders to understand a problem and capture the project requirements. Citizens are given the space to lead discussions and share ideas rather than the process being scientist led. As a result, co-design allows the creation of activities within communities with common interests and goals, helping to sustain longer-term citizen science involvement and impact because of the co-operative process.

Measuring the Impacts of Citizen Science

The European Union Horizon 2020 funded Measuring Impacts of Citizen Science (MICS) project aims to develop metrics and tools to evaluate the impact of citizen science activities in the development, implementation and monitoring of nature-based solutions such as river restoration schemes to tackle environmental problems.

The MICS project metrics aim to measure the impacts of citizen science in the domains: society, governance, economy, science, and the citizen scientists involved. A key element to the project involves defining the term 'impact' and developing the metrics applicable for all different levels of citizen participation. The output of MICS will be an integrated platform where the metrics for evaluating citizen science are available for use by anyone involved in understanding citizen science impact, whether at the planning stage or several years after the project's completion.

Citizen science activities in environmental projects: the MICS case studies

The MICS metrics will be validated in four case studies across Europe, in the UK, Romania, Italy, and Hungary. The case studies provide the opportunity to evaluate different approaches to tackling water related problems and have different levels of citizen science engagement.

The UK MICS case study explores the role of citizen scientists in identifying pollution in rivers from surface water outfalls: 'Outfall Safari'. Developed by the Zoological Society of London, Environment Agency, Thames Water and Frog Environmental, Outfall Safari is an innovative citizen science method for locating, assessing the impact of, and reporting on polluted surface water outfalls. Citizens use an app to score outfalls based on the appearance and flow. Polluting surface water outfalls often occur when household appliances are incorrectly plumbed, 'misconnected', into surface water drains, which flow directly into rivers. The polluting outfall scores are reported to local water companies who work to trace misconnected pipes to remedy pollution hotspots. Other forms of remediation involve setting back the outfalls and having a retention pond area so pollution settles out before entering rivers. Since the Outfall Safari began in 2016 over 160 citizen scientists have been involved in the Outfall Safari surveying over 150 km of rivers across Greater London. The project helps raise awareness of the issue, collect valuable data and helps water companies target efforts to reduce pollution and improve our rivers. Citizen science activities through Outfall Safari therefore have both immediate and longer-term impacts for the environment and society.

In the Romanian case study, citizens are involved in the co-design of monitoring activities on the Carasuhat Wetland, Mahmudia on the Danube Delta. The Carashuat Wetland was created by connecting the Danube River to 924 ha of land in 2016 to create new habitats and reduce flood risk. Citizens will be involved in monitoring water quality and habitat biodiversity to assess how the environment evolves following the wetland creation.

Fig.3 MICS project meeting on the Danube Delta, Romania. Source: River Restoration Centre, UK

Fig 4. Carasuhat Wetland on the Danube Delta, Romania.
Source: River Restoration Centre, UK

In Budapest, Hungary, citizens are involved in the co-design of citizen science activities to monitor habitat biodiversity and water quality along Creek Rákos, a tributary of the Danube. The restoration plans along Creek Rákos aim to improve the connectivity of the river, wetlands and groundwater, to increase water retention and biodiversity in the heavily urbanized watershed.

Fig 5. Creek Rákos, Hungary.
Source: Balázs Kozák, Geonardo

Marzenego River, Italy. Source: www.initaly.com

In Italy, citizens are involved in the co-design of activities to monitor water and ecological quality before river restoration takes place along the Marzenego River. The Marzenego River flows through dispersed rural and urban land uses with intensive agricultural activities. Urbanization and agriculture activities have caused the degradation of water quality and river channels have been artificially modified, which in turn has increased the risk of flooding. The river restoration project will involve the creation of water storage areas, improvement of riparian vegetation, floodplain construction and channel enlargement. These activities aim to reduce point and diffuse pollution; improve ecological connectivity; improve hydromorphological processes; and reduce flood risk.

The case studies provide the opportunity to test the MICS metrics for different citizen science activities, different levels of citizen science engagement, and different nature based solutions to environmental problems. More information and project updates can be found on the MICS website: www.mics.tools

JANUARY 2020

WORLD FISH MIGRATION DAY 2020

Blog by Roxanne Diaz, World Fish Migration Foundation Communications Manager

© Jeremy Monroe

Migratory fishes are a strong, remarkable group of species. There are more than 1,100 freshwater species which migrate a distance of more than 100 km; some swim over 11,000 km over the course of their lifetimes. They navigate using the currents, magnetic fields, and with their sense of taste and smell. Migratory fish are a crucial link in the food chain and play an important role in creating healthy and productive river systems.

They support billions of people around the world who depend on them for food, sport, research and intrigue. Because of this, we need to ensure the survival of these species for generations to come. But many times, fishes do not receive the proper attention they deserve.

World Fish Migration Day event in Colombia
© Jeremy Monroe (Freshwater's Illustrated)

To raise the awareness of these overlooked species, the World Fish Migration Foundation coordinates World Fish Migration Day every two years. World Fish Migration Day is a one-day global celebration to improve the public's understanding of the importance of migratory fish and free-flowing rivers and how to reduce our impacts on them. On this day, thousands of organizations, schools, aquariums, zoos and communities organize their local events to educate and excite people about migratory fish species and our collective reliance on healthy free-flowing rivers.

Our campaign this year, *Love Flows*, raises awareness of the commitment, work and care people across the world are doing to ensure the survival and ability to mate of migratory fishes. Love helps us in our goal of connecting fish, rivers and people. We encourage you to get involved by hosting an event on May 16th 2020. This can be as simple as screening a documentary like Love Flows, to a more in-depth educational program or a visit to a local river! By working together we create a greater driving force to educate others, share ideas and secure commitments to freshwater fish conservation.

Please register your event and share your photos and celebrations with us! Use #WorldFishMigrationDay on social media and reach out to your local news outlets to harness more attention for your event. We hope to celebrate with as many communities and organizations as possible across the globe and reach millions of people of all ages.

Downloadable resources to support your event can be found on the World Fish Migration Day website, as well as ideas about how you can get involved! To find out more or register your event, please visit www.worldfishmigrationday.com or contact Pao Fernández Garrido at pao@fishmigration.org, World Fish Migration Foundation Events Coordinator.

The network for best practices of river restoration in Greater Europe

ECRR
European Centre for River Restoration

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Working to restore & enhance our rivers

ECRR Events calendar 2020

Date / period	Title / issue	Location	Links
21-22 April 2020	The RRC Annual Conference	Harrogate, England	https://www.therrc.co.uk/conference
28-30 April 2020	6th IWA International Symposium on Water, Wastewater and Environment in Ancient Civilizations: Traditions and Cultures	Istanbul, Turkey	https://iwa-network.org/events/iwa-regional-symposium-on-water-wastewater-and-environment-traditions-and-cultures/
14-16 May 2020	Dam Removal Europe goes Alps	Utting, Bavaria, Germany	www.wwf.de/damremoval-alps2020
16th May 2020	World Fish Migration Day	Global	www.worldfishmigrationday.com
19-24 May 2020	28th International Symposium "Delta and Wetlands" & Jubilee Symposium of 50th Danube Delta National Institute	Tulcea, Romania	http://ddni.ro/wps/ddni-jubilee-symposium/
20-23 May 2020	12th Eastern European Young Water Professionals Conference: Water Research and Innovations in a Digital Era	Riga, Latvia	https://iwa-network.org/events/12th-eastern-european-young-water-professionals-conference-water-for-all-water-for-nature-reliable-water-supply-wastewater-treatment/
23 – 29 May, 2020	13th International Symposium on Ecohydraulics	Lyon, France	Deadline to submit abstracts: 30th October, 2019 https://symposium.inra.fr/ise2020/
11-19 June 2020	IUCN World Conservation Congress	Marseille	www.iucncongress2020.org
15-19 June 2020	16th International Symposium on Aquatic Plants	Aarhus, Denmark	http://www.internationalaquaticplantsgroup.com/
22-24 June 2020	All-Russian Water Congress	Moscow, Russia	https://www.watercongress.ru/
22-26 June 2020	XX Congress of the Iberian Association of Limnology (AIL-2020) & III Iberoamarican Congress of Lymnology (CIL-2020)	Murcia, Spain	https://limnologia2020.com/
28 June-3 July 2020	Fish Passage 2020	Lisbon, Portugal	http://fishpassage.umass.edu/
30-June-2 July	6th IAHR Europe Congress (the international Association for Hydro-Envornment Engineering and Research, IAHR)	Warsaw, Poland	https://iahr2020.pl
7-10 July 2020	River Flow 2020	Delft, Netherlands	www.riverflow2020.org
14-17 July 2020	43rd IAD Conference 2020	Neuburg/ Donau, Germany	www.iad2020.ku.de
3-7 August 2020	International Conference on the Status and Future of the World's Large Rivers	Moscow, Russia	http://worldslargerivers.boku.ac.at/wlr/
23-28 August 2020	World Water Week Conference	Stockholm, Sweden	https://www.worldwaterweek.org/about/about-world-water-week
27 September	World Rivers Day	Global	www.worldriversday.com
19-21 November 2020	2nd European Rivers Summit	Lisbon, Portugal	Contact person eef.silver@wetlands.org

Call for articles

The newsletter of the ECRR should also be a way to share with one another what interesting work is being done, information about seminars or literature. One way of doing this is by writing an article of any project, event or literature you may be acquainted with. Send this article ***(maximum of 500 words)*** to the secretariat of the ECRR at info@ecrr.org

We will take a close look to the content and if it is coherent with the philosophy of ECRR (ecological river restoration and sharing knowledge) your article will be published with pleasure in the next edition (s) of the ECRR Newsletter.

The secretariat of the ECRR hopes to receive any article on ecological river restoration from any of its members

Free ECRR Network Subscribent

All who are interested in river restoration and sustainable water management are encouraged to join the ECRR. Subscribents receive the ECRR Newsletter about four times a year and are the first to be informed about activities by the ECRR, its members and partner organisations.
To register, go to www.ecrr.org.

If you want to unsubscribe for the newsletter, please send an email to info@ecrr.org.

The network for best practices of river restoration in Greater Europe
ECRR
European Centre for River Restoration

This news letter is a co-production by the Iberian River Restoration Centre (CIREF) and the Russian Research Institute for Integrated Water Management and Protection (RosNIIVHk) as National River Restoration Centres and members of the European Centre for River Restoration (ECRR).