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F O R U M
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& FISCHABSTIEG

Fish Protection Targets in Europe

Overview of the European legal basis for fish protection at hydraulic construction sites

Key messages

» Legal regulations for fish protection at hydropower sites are in force in many European countries.

» The improvement of downstream continuity is often made via case-by-case decisions and supported by strategic concepts for hydropower utilisation.

» European countries implement various measures for fish protection and downstream fish migration.

Many legal regulations of the EU have to be taken into account for fish protection

Fish protection and downstream continuity at hydraulic constructions are not explicitly listed in European legislation. When deriving targets for fish protection and downstream fish migration, the following laws and directives must be taken into account:

- Water Framework Directive (WFD) 2000/60/EC
- Regulation EC/1100/2007 establishing measures for the recovery of the stock of European eel
- Directive 92/43/EEC 1992 on the conservation of natural habitats and of wild fauna and flora (with Natura 2000 sites/SAC)
- Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment
- Directive 2014/52/EU on the assessment of the effects of certain public and private projects on the environment
- Directive 2004/35/EC on environmental liability with regard to the prevention and remedying of environmental damage

Other regulations not mentioned here may have to be taken into account.

Legal regulations for fish protection at hydropower sites apply in many European countries

A total of thirteen European countries are known to have introduced and apply national legal regulations and/or recommendations (UK only) for fish protection at hydropower sites or for ensuring downstream continuity. Comparability was not considered in the context of this compilation. However, it can be assumed that the regulations of the countries differ in content. In nine European countries, even irrespective of whether national legal regulations are in place, it is decided on a case-by-case basis which measures are to be implemented at a hydropower site to protect fish. The number of countries that do not have specific legal requirements is significantly lower. Fish protection and downstream continuity are therefore an important issue at the European level.

Overview of the legal regulations for fish protection at hydropower sites in Europe

	Legal regulation in place	Recommendation in place	Case-by-case decisions	No concrete specifications
Belgium	1)		3)	
Bulgaria				3)
Germany	2)	3)		
England	1)			
Finland				3)
France	2)		3)	
Great Britain		3)		
Iceland			3)	
Latvia			3)	
Lithuania*	1)			3)
Italy			3)	
Luxembourg	1)		3)	
Netherlands	2)	3)		
Norway			3)	
Austria			3)	
Portugal			3)	
Romania	3)			
Sweden				3)
Switzerland	2)			
Slovakia	3)			
Slovenia	3)			
Spain	2)			
South Tyrol (Italy)	1)			
Czech Republic			3)	
Total	13	3	10	4

applies / is / are available

Source: 1) REDEKER 2019, 2) Common Implementation Strategy (2011a, 2011b), FIThydro (2017), REDEKER 2019, 3) Common Implementation Strategy (2011a, 2011b).

* The sources on Lithuania are contradictory.

Further explanations on the legal instruments for selected European countries

In Belgium, the Decision of the Ministerial Conference of the Benelux Economic Union on the free migration of fish in river systems (Décision Benelux relative à la libre circulation des poissons dans les réseaux hydrographiques Benelux, 2009) and the Administrative Circular Letter „Hydropower“ are in force, by which the same measures apply as in France. Downstream continuity must be ensured in shipping routes.

The central instrument of water law in Germany is the Federal Water Act (Wasserhaushaltsgesetz, WHG 2009), which requires the protection of fish populations (Article 35 WHG), the continuity of water bodies (Article 34 WHG) and sufficient minimum water flow (Article 33 WHG). In addition, due to the federal structure, some state water laws, but especially fishery laws and Federal State fishery regulations relate directly to fish protection and downstream fish migration (see Fact Sheet No. 2 [German]).

In Great Britain, national regulatory provisions are in place to establish downstream continuity. Where appropriate, hydropower operators can be required to establish downstream continuity. This always applies to newly constructed hydropower sites in specially designated water bodies.

England has already had legislation in place since the 1990s demanding the construction and operation of fish passes as well as screens and bypasses. Since 2009, there have been special regulations for eels with site-specific specifications for the dimension and type of the fish protection system incl. the bypass.

In France, there are various laws demanding fish protection for specific target species (silver eels, lampreys, allis shad, as well as salmon and sea trout smolts). If the environmental assessment identifies negative impacts due to insufficient continuity, the hydropower operator must reduce these impacts. This is generally done through the construction of an upstream fish migration facility or through operational measures (upstream and downstream fish migration). Strategically, the water bodies are divided into certain priority water bodies, for which there are specific requirements. For specially designated water bodies, the establishment of continuity (upstream and downstream fish migration, sediment transport) at all new or existing obstacles is a priority and must be implemented within 5 years. Exceptions exist for water bodies with natural falls.

In South Tyrol (Italy), a maximum bar spacing of 15 mm is required by law.

Lithuania enacted a water law in 2017 demanding fishways for newly constructed hydropower sites. Existing sites are not affected. Furthermore, 170 water bodies have been designated in which hydropower utilisation is excluded.

In Luxembourg, a site-specific overall concept for the creation of continuity (fish protection as well as upstream and downstream fish migration) must be developed when applying for a new permit. The objectives are based on French or German requirements.

In an assessment framework for hydropower sites in Dutch waterways (Toetsingskader voor waterkrachtcentrales in Nederlandse Rijkswateren, 2014), the Netherlands demands that cumulative fish mortality be limited to a maximum of 10 % for salmon and eel as key species. Furthermore, the new construction of a maximum of five additional power plants with zero mortality (≤0.1%) is permitted nationwide. In canals and other ecologically less important water bodies, the best available fish protection and turbine technology is to be applied, but no specific fish mortality requirements apply.

In Switzerland, the revised Water Protection Act (Gewässerschutzgesetz) came into force in 2011. It concerns the restoration of water bodies and obliges owners of hydropower sites to eliminate ecological impairments caused by hydropower utilisation by 2030 (e.g. mitigation measures for interrupted continuity). Migration must be ensured at new installations. Functional monitoring must be carried out by the authorities. In order to restore upstream and downstream fish migration at hydropower plants, the Swiss Federal Office for the Environment has published a “Strategic Planning” (2012) and a “Checklist Best practice” (2012), which set concrete targets or technical specifications for fish protection and downstream migration.

Spain has national as well as regional laws on water, nature conservation, fisheries, EIA and water infrastructure. There is a national strategy for water body development. In addition, regional water authorities can set their own fish protection targets, e.g. in Galicia and Castilla y León. As a rule, measure-specific regulations are made in the context of environmental impact assessments.

In the Czech Republic, new hydropower sites must ensure downstream continuity (Water Act, Article 15). Existing hydropower sites have been approved by the water authorities with different conditions.

Strategic concepts are used by many European States for the utilisation of hydropower

Many European countries have developed strategic concepts for the utilisation of hydropower. In particular, the designation of priority water bodies and water bodies for target species is used as a strategic instrument. Within these water bodies increased fish protection requirements apply.

In France, Belgium, Luxembourg and some German Federal States, corresponding water bodies with increased fish protection targets have been designated. Here, for example, narrower bar spacing at the screen is required than in the other water bodies.

Finland’s fish passage strategy commits to multi-criteria prioritisation and assessment of fish passage projects, as well as the development of legal requirements to ensure river continuity for fish.

In its master plan for the management of watercourses (Samlet-Masterplan) Norway has specified in which water bodies hydropower utilisation could and could not take place.

Sweden has developed a National Hydropower Strategy to be implemented over a period of 20 years. The strategy includes time-limited environmental requirements with a maximum duration of 40 years. This national plan is ready for legislation in 2020.

Austria has also drawn up a catalogue of criteria for hydropower utilisation. This describes, among other things, ecological criteria for the evaluation of hydropower projects or sections of water bodies with regard to their suitability for hydropower utilisation.

The improvement of downstream continuity is often made via case-by-case decisions

Due to the difficulties in defining a state of the art for the construction and operation of fish protection and downstream fish migration facilities, only three countries have introduced a generally applicable set of rules or recommendations (five countries) for ensuring downstream continuity. Most countries (twelve) define measures for fish protection and downstream fish migration at the specific site. In France, Norway, Spain, Portugal, and some German Federal States case-by-case decisions are made in water bodies not listed as priority water bodies in the legislation or the strategy papers. In seven countries there are general but no specific requirements.

In Germany at the Federal level, there is a guiding publication by the German Association for Water, Wastewater and Waste (Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall e. V. - DWA) (DWA 2005) as well as standard literature for the construction of horizontal screens with bypass facilities (Ebel 2013), which are used as guidelines by many authorities. In addition, some Federal States have published their own recommendations for the planning of fish protection and downstream fish migration facilities. These mainly refer to the construction of mechanical barriers with specifications for the bar spacing (between 10 mm and 20 mm depending on the target species) and the maximum approach flow velocity (0.5 m/s). Specifications are rarely made for the discharge and other parameters of the downstream fish migration facility (see also Fact Sheet 02 [German]). The DWA is currently working on a new set of rules for fish protection and downstream fish migration facilities.

In England and Wales, regulations exist for the construction of fish protection facilities, which specify maximum screen bar spacing and approach flow velocities depending on the fish species. Technical guidelines exist at regional level and are provided by the environmental authorities. The technology which is used is decided on a case-by-case basis. Mechanical barriers or operational management measures are common. The strictest regulation is found in the Hydropower Guidance Note 9 for Wales, which requires a bar spacing on the screen of no more than 6 mm for juvenile fish. However, the screen only needs to be used during the time when protection of juvenile fish is required.

Prevalence of strategic concepts for hydropower utilisation and general methods or recommendations for ensuring downstream continuity in Europe

	Strategic concept for hydropower utilisation	Standard / set of rules available	Recommenda-tion available	Decisions on a case-by-case basis	No concrete specifications
Belgium	1)			2)	
Bulgaria		2)			2)
Germany	1)		2)		
England			1)		
Finland	1)				2)
France	1)			2)	
Great Britain			2)	2)	
Iceland				2)	
Latvia				2)	
Lithuania*	1)	2)			2)
Italy				2)	
Luxembourg	1)			2)	
Netherlands	1)		2)		
Norway				2)	
Austria					2)
Portugal					2)
Romania		2)		2)	
Sweden					
Switzerland	1)			2)	
Slovakia					2)
Slovenia				2)	
Spain	1)				2)
South Tyrol (Italy)	1)				
Czech Republic				2)	
Wales			1)		
Total	10	3	5	12	7

applies / is / are available

Source: 1) REDEKER 2019, 2) Common Implementation Strategy (2011a, 2011b).

In Finland there is no general recommendation for the implementation of fish protection and downstream fish migration measures. There is a legal requirement to protect fish from entering turbines. Fish losses due to hydropower sites and water control are in principle fully compensated by stocking measures or fishery fees. Catch and transport measures are mainly used upstream.

France already developed a guideline in 2008 in which biological criteria for the protection of smolts of Atlantic salmon and sea trout as well as silver eel were proposed for both horizontal and vertical screens. According to this, the approach flow velocity should not exceed 0.5 m/s when the screen is partially clogged. Screen bar spacing of 25 mm (behavioural barrier for smolts), 10 - 15 mm (physical barrier for smolts) or 15 - 20 mm (physical barrier for eels) are required. The bypass discharge should be 2 - 10 % of the turbine discharge. The cross-section at the by-pass inlet should have a size of at least 0.5 m x 0.5 m. Catch and transport measures are only used if there are no better options (e.g. for multiple reservoirs).

In Iceland, hydropower sites are always assessed on a case-by-case basis. Various measures are used for fish protection and downstream fish migration.

Also in Latvia, different measures are used for fish protection and downstream fish migration. Mechanical barriers must have bar spacing of 20 - 35 mm.

In Lithuania, operational management for hydropower sites is required during spawning and migration periods. The management plans promote the use of more fish-friendly turbines. In addition, other measures for fish protection and downstream fish migration are applied.

In Norway, decisions are made on a case-by-case basis to establish downstream continuity. The measures for fish protection and downstream fish migration are chosen in consideration of energy production. New sites and existing sites are treated equally. Similar to Finland, stocking measures play a role as compensation for fish losses.

Austria has submitted a Water Management Plan (Gewässerbewirtschaft-ungsplan, 2015), which postulates that many questions remain open with regard to well-functioning fish protection and downstream fish migration facilities at hydropower sites. Consequently, there are no legal requirements for the estab-lishment of downstream continuity and no general recommendations or similar for the implementation of fish protection and downstream fish migration measures. Pilot projects for fish protection are being implemented at some sites and a re-search project was carried out by the University of Natural Resources and Life Sciences, Vienna from 11/2015 to 10/2019. The focus was on the elaboration of basic facts on fish ecology and technologies, which were used to clarify the importance of downstream fish migration for typical fish species and populations, as well as the necessity of measures and the development of effective measures. There are plans to specify the requirements for fish protection and downstream fisch migration after 2021.

In Portugal, no general recommendations are given for the implementation of fish protection and downstream fish migration measures. The range of measures for fish protection includes operational management, catch and transport measures and more fish-friendly turbines.

In Sweden, the 2014 amendment to the Nature Conservation Act has not been adopted. Therefore, a stakeholder dialogue has been initiated, led by the Swedish Agency for Marine and Water Management. Currently, there is a preference for screens with bar spacing between 10 and 18 mm and bypass water volumes of at least 2 % of the turbine discharge. A pilot site has been installed on the river Ätran to gain more knowledge.

European countries implement various measures for fish protection and downstream fish migration.

Various measures are applied to improve downstream continuity at hydropower sites. The extent to which the specifications for the individual measures are comparable with each other was not examined in the context of this compilation.

In eleven countries, mechanical barriers are basically always used or used in certain cases (e.g. only for diadromous migratory waters) or as pilot projects. The dimensioning of the bar spacing (Latvia: 20 - 35 mm, Germany: 10 - 20 mm, France: 20 mm) and the approach flow velocity differ. Bypasses or flushing channels are used for downstream fish migration (ten countries). Nine countries resort to operational management measures. In Lithuania, operational management is necessary during spawning and migration periods, and in France during eel migration. More fish-friendly turbines are used in nine countries (e.g. Latvia fish-friendly turbine in combination with mechanical barriers). Some EU Member States also use measures to compensate for fish losses, e.g. when losses cannot be compensated by technical measures (France, Sweden, Austria). Compensation of fish losses through stocking measures plays a role mainly in Sweden, Norway and Finland and is used in six countries in total. Lithuania and Germany use this measure on a case-by-case basis (e.g. Daugava, Moselle). Catch and transport measures are used in seven EU countries.

Measures for fish protection and downstream fish migration

	Mechanical barrier	Bypasses / flushing channel	Operational management	Catch and transport measures	Fish-friendly turbine	Compensation for fish losses: monetary	Compensation for fish losses: Stocking	Compensation for fish losses: Restoration
Belgium	✓	✓			✓	✓		
Germany	✓	✓	✓	✓			✓	✓
Finland	✓	✓			✓	✓	✓	✓
France	✓	✓	✓	✓	✓	✓		✓
England	✓	✓	✓	✓	✓		✓	
Iceland	✓	✓	✓	✓		✓		✓
Latvia	✓	✓			✓	✓	✓	
Lithuania*	✓	✓	✓		✓			
Luxembourg	✓	✓	✓	✓				
Netherlands			✓					
Norway	✓	✓	✓	✓	✓	✓	✓	✓
Austria	✓	✓			✓	✓		✓
Portugal			✓	✓	✓			
Romania	✓	✓						
Sweden	✓	✓	✓	✓	✓	✓	✓	
Spain	✓	✓	✓		✓			
Czech Republic	✓	✓	✓					
Total	15	15	12	8	11	8	6	6

✓ applies / is / are available

Source: Common Implementation Strategy (2011a, 2011b).

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About the German Participatory Forum on Fish Protection & Downstream Migration

The German Participatory Forum on Fish Protection & Downstream Migration is a series of events that serves to exchange information and experiences on fish protection and downstream fish migration from a professional point of view across interests. In the context of the forum, fish protection is understood to be plant-related fish protection and not the general protection of fish to preserve the population and the species.

The Forum was founded by the German Federal Environment Agency in 2012. It is funded within the framework of the Environmental Research Plan of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.

More information on the forum, on the results of the workshops, on fish protection and fish descent facilities as well as on research projects is available at: www.forum-fischschutz.de [German].