HYDROPOWER AND NATURA 2000

GOOD PRACTICE GUIDE

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Hydropower and Natura 2000: good practice guide

This document reflects the view of the European Commission services and is not of a binding nature.

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TABLE OF CONTENTS

PURPOSE OF THE DOCUMENT

Hydropower is one of the most important sources of renewable energy in the EU. It offers a stable yet flexible and efficient form of electricity, producing minimal amounts of CO2 compared to other energy sources[1]. Because it is mostly produced within the EU, hydropower also significantly reduces Europe's energy dependency on external sources. As such, it plays a major role in the implementation of the Renewable Energy Directive and in achieving the EU Energy targets for 2020/2030.

As with all other energy sources, hydropower plants must operate in accordance with EU environmental policies and legislation. As a water-based activity, hydropower plants are required to conform in particular to the requirements of the Water Framework Directive, the Floods Directive and the Birds and Habitats Directives as well as the environmental impact assessment directives (EIA and SEA Directives).

The two nature directives - like the WFD - are based on the overall principle of non-deterioration, requiring Member States to ensure that water bodies, as well as the EU protected species and habitats present within them, are not allowed to deteriorate any further from their current state. Moreover, all three directives aim to ensure that water bodies achieve a good water status and that EU protected species and habitats reach a favourable conservation status while, at the same time, striking the right balance between water/nature protection and the sustainable use of natural resources.

Achieving this balance is a major challenge, requiring a holistic integrated approach, which recognises the multifunctional use of Europe's water bodies as well as the already degraded state of many of Europe's major lowland rivers. However, it can also present important new opportunities for improving the status of these degraded rivers whilst, at the same time, increasing the efficiency and productivity of existing hydropower plants.

Central to the two nature directives is the creation of a Natura 2000 network which protects core sites for the species and habitat types listed in the Annexes. According to these Directives, any new or existing hydropower activities likely to affect one or more Natura 2000 sites must, as a rule, be undertaken in a way that safeguards the species and habitat types for which the site has been designated.

In light of the above, this present document has been elaborated to illustrate on how best to ensure that activities related to the development and management of hydropower facilities are compatible with EU nature legislation. It examines the type of impacts that might occur and showcases a range of good practice examples that have been used to mitigate these impacts under a range of different conditions.

Particular attention is given to explaining how to develop integrated projects which take account of the river's ecological requirements early on in the design process and which aim for win-win solutions for both hydropower and biodiversity wherever possible.

The document goes on to describe the step by step procedure to follow when carrying out an appropriate assessment for a hydropower plan or project under Article 6 of the Habitats Directive. Clarification is also provided on certain key aspects of this approval process and of its relation with other EU environmental assessment procedures.

[1] *http://www.c2es.org/technology/factsheet/hydropower*

Experience has shown, time and again, that delays in the Article 6 approval process are very often caused by poor quality and incomplete appropriate assessments that do not allow the competent authorities to make a clear judgment on the whether or not to authorise the proposed plan or project.

The present guidance document is designed principally for use by competent authorities and developers responsible for hydropower infrastructures, as well as impact assessment consultants, in an effort to improve the quality of the AA carried out under the provisions of the nature Directives, Natura 2000 site managers and other practitioners who are involved in the planning, design, implementation or approval of such plans and projects. It has been written in consultation with a range of key stakeholder and interest groups who have provided valuable feedback on the various drafts of the guidance document.

The document focuses specifically on the development of hydropower as well as on the conservation of rivers from the perspective of protecting Europe's rare species and habitats under the EU Birds and Habitats Directives, and in the wider context of the Water Framework Directive. Other relevant EU environmental laws relating for instance to pollution, or to climate change, whilst also relevant to hydropower are not covered in this document but are mentioned where appropriate for the sake of completeness.

Its aim is to present the general principles of how to ensure hydropower is compatible with the Nature Directives, as illustrated by good practice examples from different parts of the EU and to act as a conduit for fostering synergies between EU policies and practices on Energy, Nature and Water in order to achieve EU targets in a way that is better coordination, and wherever possible, mutually supportive.

The document is intended to be bound by, and faithful to, the text of the Birds and Habitats Directives and to the wider principles underpinning EU policy on the environment and hydropower. However it is not legislative in character. The good practice procedures and proposed methodologies described in this document are not prescriptive in their intent; rather they aim to offer useful advice, ideas and suggestions based on discussions with industry representatives, national and international authorities, NGOs scientific experts and other stakeholders.

As such, the document reflects only the views of the Commission services and is not of a legally binding nature. It rests with the European Court of Justice to provide definitive interpretation of EU directives. Wherever relevant, existing case law has been included when clear positions have already been taken by the Court.

The document also does not replace the Commission's existing general interpretative and methodological guidance documents on the provisions of Article 6 of the Habitats Directive. Instead, it seeks to clarify specific aspects of these provisions and place them in the context of hydropower development and management in particular. The present guide is therefore best read in conjunction with the existing general guidance and the two directives.

1. EU POLICY AND LEGISLATIVE FRAMEWORK

This chapter outlines a number of key pieces of EU legislation that need to be taken into account when working with both new and existing hydropower facilities. It focuses on the two Nature directives in particular as this is the main theme of the present good practice guide.

1.1 The Renewable Energy Directive

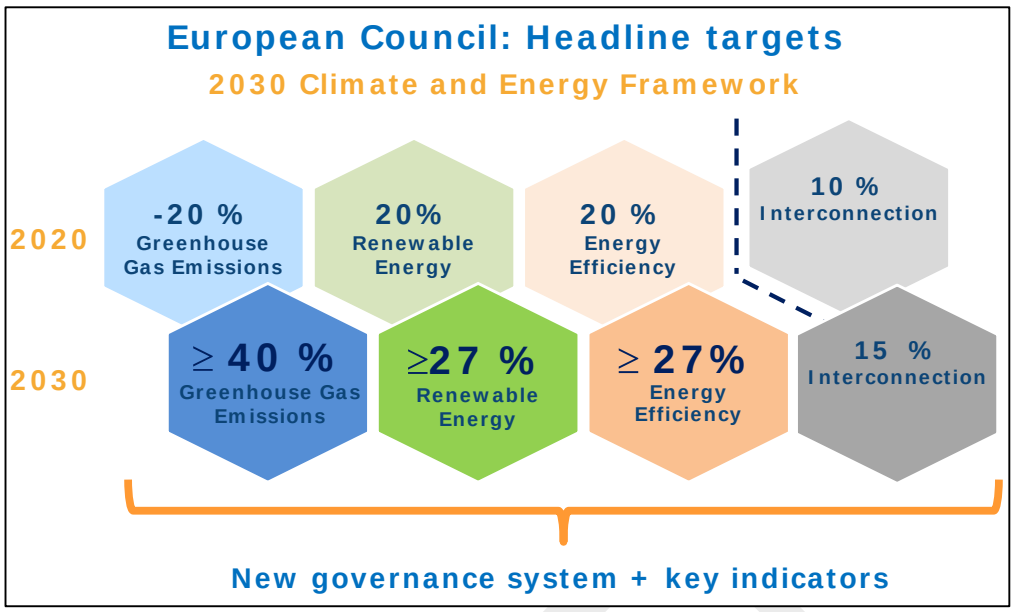
In 2009, the EU adopted an ambitious and far-reaching 'climate and energy package' to render the European economy less dependent on imported energy sources and to reduce greenhouse gas emissions. One of the key targets is to increase the share of energy from renewable sources so that they represent at least 20% of Europe's gross energy consumption by 2020. Directive 2009/28/EC[2] on the promotion of the use of energy from renewable sources (**Renewable Energy Directive**) establishes a common EU framework and sets mandatory national targets to achieve this overarching objective.

Under the terms of the Directive, Member States are required to prepare *National Renewable Energy Action Plans* (NREAPs) to demonstrate how they intend to increase the share of energy from renewable sources in their final energy consumption by 20%. Countries are free to choose their own specific mix of renewable energy sources, whether, for instance, from hydropower, wind or solar power, geothermal energy or biomass. The National Renewable Energy Action Plans should also consider other energy efficiency measures aimed at lowering the overall energy consumption.

In 2014, the EU established a 2030 climate and energy framework for a competitive, secure and low-carbon EU economy[3] which calls for:

- A binding target to reduce EU domestic greenhouse gas emissions by at least 40% below the 1990 level by 2030;
- A share of renewable sources in final energy consumption of at least 27% in 2030. This target will be binding at EU level;
- An indicative energy efficiency target of 27% to be reviewed in 2020 having 30% in mind.

[2] *Available at http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32009L0028*
[3] *http://ec.europa.eu/clima/policies/strategies/2030/index_en.htm*

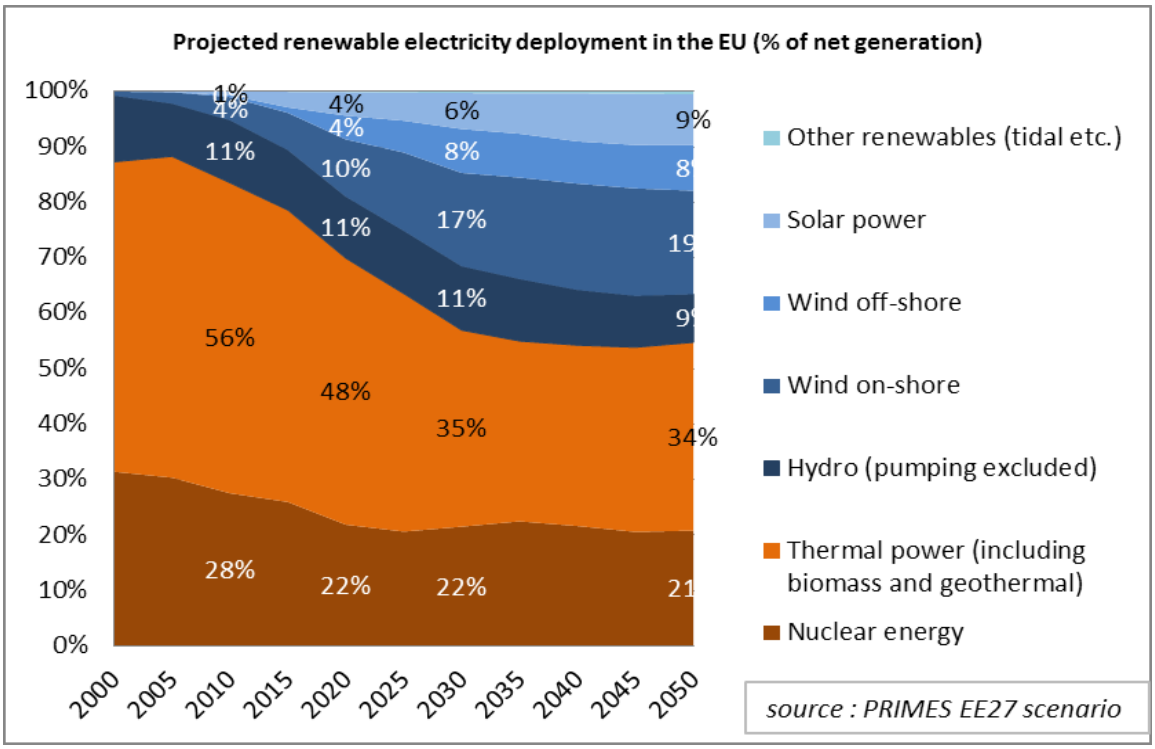


Hydropower generates by far the largest share of electricity from renewable energy sources overall within the EU. Around 23.000 hydropower installations have been recorded in the European Union in 2011, the vast majority (91%) are small (less than 10 MWH) and generate around 13% of the total production. Large hydropower plants, on the other hand, represent only 9% of all hydropower facilities but generate about 87% of the total production[4].

The EU's recent national renewable energy action plans point to an increase in hydropower production in 2010-2020 of around 8% (25TWh) although the increase in pumping hydropower by 2020 is expected to be higher, by around 35% (8,6TWh). Part of this increase will come from the refurbishment of old installations.

However, the growth of other renewables could see the overall contribution of hydropower to renewable electricity production fall. Certain countries plan an increase in electricity production from hydropower by 2020 (PT, FR, AT, DE, FI, IT, SI, SK, PL, BE, LU) whereas other countries may see the electricity production from hydropower drop by 2020 (SE, RO, CZ, LV).

[4] *Arcadis 2011: Hydropower generation in the context of the EU WFD. EC DG Environment. 168 pp. See also Water management, Water Framework Directive & Hydropower. Common Implementation Strategy Workshop" (2011)*



There are significant differences between EU countries in terms of the extent to which hydropower is used in their energy mix. This is highly influenced by geographic conditions, climate, precipitation patterns, the availability of affordable energy supply alternatives, as well as institutional capacities and technical competences.

1.2 The Birds and Habitats Directives

Halting the loss of the EU's biodiversity is also high on the political agenda. In March 2010, the EU Heads of State and Government set themselves the ambitious target of halting, and reversing, the loss of biodiversity in Europe by 2020. In May 2011, the European Commission adopted a new EU Biodiversity Strategy to 2020[5] which sets out a policy framework for achieving this.

The Birds and Habitats Directives are the cornerstones of the EU's nature and biodiversity policy. They enable all 28 EU Member States to work together, within a common legislative framework, to conserve Europe's most endangered and valuable species and habitats across their entire natural range within the EU, irrespective of political or administrative boundaries.

The overall objective of the two directives is to ensure that the species and habitat types they protect are maintained and restored to a **favourable conservation status**[6] throughout their natural range within the EU. This target is defined in positive terms, oriented towards a favourable situation which needs to be reached and maintained. It therefore goes beyond the basic requirement of avoiding deterioration.

[5] *see http://ec.europa.eu/environment/nature/biodiversity/comm2006/2020.htm*

[6] *The concept of "favourable conservation status" is not mentioned in the Birds Directive but there are analogous requirements for SPAs.*

To achieve this objective, the EU Nature Directives require Member States to implement two main types of measures:

- The designation and **conservation of core sites** for the protection of species and habitat types listed in Annex I and II of the Habitats Directive and Annex I of the Birds Directive, as well as for all migratory birds. These sites make up the EU-wide Natura 2000 Network;
- The establishment of **a species protection regime** for all wild European bird species and other endangered species listed in Annex IV of the Habitats Directive. These measures apply across the species' entire natural range within the EU, i.e. also outside protected sites such as Natura 2000.

To date, the Natura 2000 network contains over 27,000 sites. Together, they cover around 18% of the land area in the EU-28 as well as significant marine areas[7]. Lake and river ecosystems cover around 4% of the total surface area of Natura 2000 (EEA, 2010). These sites have been designated for some 19 freshwater habitat types, 128 bird species and 236 other species that are listed in the two nature Directives.

Natura 2000 site protection provisions

The **protection and management of Natura 2000 sites** is governed by the provisions of Article 6 of the Habitats Directive, which also determines the relationship between the site's conservation and other land-uses, such as hydropower, in and around the area[8]. Article 6 is divided into two types of measures:

- The first concerns the conservation management of all Natura 2000 sites. It requires Member States to a) take positive conservation measures that are necessary to maintain or restore habitat types and species for which the site has been designated (Article 6.1); and b) to take appropriate measures to avoid any deterioration of habitat types or any significant disturbance of the species present (Article 6.2).

  Although not obligatory, the Habitats Directive strongly recommends the use of Natura 2000 management plans as a means of setting conservation objectives and identifying measures for Natura 2000 sites in an open and transparent manner. They are useful tools for helping to build a consensus view on the long-term management solutions for the site amongst all stakeholders and interest groups, and for creating a sense of shared ownership and responsibility for the final outcome. They also provide a mechanism for integrating conservation measures for Natura 2000 into the wider WFD Programme of Measures;

[7] *There is sometimes considerable overlap between SPAs and SCIs so the figures are not cumulative.*

[8] Details of all the guidance available on the management of Natura 2000 is given on http://ec.europa.eu/environment/nature/natura2000/management/index_en.htm

- The second measure (governed by Article 6.3) concerns the assessment procedure for any plan or project that could affect one or more Natura 2000 site (see chapter 5 for full details). In essence, the assessment procedure requires that any plan or project that is likely to have a significant effect on a Natura 2000 site undergoes an appropriate assessment (AA) to study these effects in detail, in view of the site's conservation objectives. The competent authority can only agree to the plan or project if, based on the findings of the AA, it has ascertained that it will not have an adverse effect on the integrity of the site concerned. It is important to note that the onus is on demonstrating the absence (rather than the presence) of significant negative impacts.

  In exceptional circumstances, a derogation (Article 6.4) may be invoked to approve a plan or project having an adverse effect on the integrity of a Natura 2000 site if it can be demonstrated that there is an absence of less damaging alternatives *and* the plan or project is considered to be necessary for imperative reasons of overriding public interest**.** In such cases, adequate compensation measures will need to be put in place beforehand to ensure that the overall coherence of the Natura 2000 network is protected.

  It is important to note that the permit procedure under the Habitats Directive is not the same as that foreseen under the EIA or SEA Directives[9] and Article 4.7 of the WFD even if they may be integrated. Full details are provided below and in chapter 5.

- *Species protection provisions*

The second set of provisions of the nature Directives concerns the protection of certain species across their entire natural range within the EU, i.e. also outside Natura 2000 sites. These provisions also need to be taken into account for hydropower plants, especially on rivers harbouring migratory species, such as the European sea sturgeon *Acipenser sturio* or the apron *Zingel asper* both of which are listed in Annex IV of the Habitats Directive.

The species protection measures apply to species listed in Annex IV of the Habitats Directive as well as all wild bird species in the EU. The exact terms are laid down in Article 5 of the Birds Directive and Article 12 (for animals) and Article 13 (for plants) of the Habitats Directive.

In essence they require Member States to prohibit, for these species:

- Their deliberate disturbance during breeding, rearing, hibernation and migration;
- The deterioration or destruction of breeding sites or resting places;
- The deliberate destruction of nests or eggs, or the uprooting or destruction of protected plants.

Derogations to the species protection provisions are allowed in some circumstances provided that there is no other satisfactory solution and the consequences of these derogations are not incompatible with the overall aims of the Directives. The conditions for applying derogations are set out in Article 9 of the Birds Directive and Article 16 of the Habitats Directive[10].

[9] *EC web pages on EIA and SEA - http://ec.europa.eu/environment/eia/eia-legalcontext.htm and http://ec.europa.eu/environment/eia/sea-legalcontext.htm*

[10] *Commission Guidance document on the strict protection of animal species of Community interest under the 'Habitats' Directive http://ec.europa.eu/environment/nature/conservation/species/guidance/index_en.htm*

1.3 The Water Framework Directive

The Water Framework Directive (WFD) establishes a framework for the protection of inland surface waters (rivers and lakes), transitional waters (estuaries), coastal waters and groundwater. It aims to ensure that all aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands meet 'good status' as a rule by 2015 (except for heavily modified water bodies where the objective is to achieve a good ecological *potential).* It therefore goes beyond the basic requirement of preventing the further deterioration of water bodies, and their associated aquatic and terrestrial ecosystems. In the case of surface waters, water quality is defined in terms of their biology, chemistry and hydromorphology.

The WFD Directive requires Member States to establish a River Basin Management Plan (RBMP) for each River Basin District. The Directive envisages a cyclical process where river basin management plans are prepared, implemented and reviewed every six years. There are four distinct elements to the river basin planning cycle:

- characterisation and assessment of impacts on river basin districts;
- environmental monitoring;
- the setting of environmental objectives; and
- the design and implementation of a programme of measures needed to achieve these objectives.

1.4 Coordination between the WFD and the two Nature Directives

The Water Framework Directive and the two nature Directives are closely interlinked and should be implemented in a coordinated way. They do however also carry some important distinctions which need to be borne in mind by hydropower planners. The following highlights some of the key points of interaction between the WFD and the two Nature Directives that are relevant in this case[11].

Differing objectives between WFD and Nature Directives

The WFD and the Birds and Habitats Directives all operate, at least in part, on the same environment and have broadly similar ambitions in terms of ensuring the non-deterioration of rivers and improving the status of aquatic ecosystems. However they have different objectives. The WFD aims to protect and enhance all surface waters and groundwater so that they reach a good status by 2015. The Birds and Habitats Directives, on the other hand, aim to protect, maintain and restore *specific species and habitat types* within these waters in order to bring them up to a favourable conservation status across their natural range within the EU.

Achieving good ecological status under the WFD can contribute to achieving the conservation objectives of water-dependent habitats and species in a Natura 2000 site, However, this might not be sufficient every time for achieving a favourable conservation status under the Nature Directives. There will be occasions additional conservation measures need to be implemented that go beyond good ecological status in order to achieve the Natura 2000 site's conservation objectives.

[11] *See also the Commission FAQ on the WFD and Nature Directives: http://ec.europa.eu/environment/nature/natura2000/management/docs/FAQ-WFD%20final.pdf*

Article 4.2 of the WFD states that '*where more than one of the objectives […] relates to a given body of water, the* ***most stringent shall apply'***. For instance, if a Natura 2000 site is designated for otters, additional conservation measures beyond those required for achieving good ecological status of the water body may be necessary for the species, (e.g. to regulate overfishing). These measures are not relevant for fulfilling the 'good ecological status' (GES) objective of the WFD but they will be necessary under the Habitats Directive and must therefore be implemented in addition to the measures foreseen for reaching GES. These additional requirements are also integrated into the WFD by specific provisions regarding protected areas (see Article 4(1)c).

Heavily modified water bodies or artificial water bodies and Natura 2000

According to Article 4.3 of the WFD, some water bodies that are significantly modified by human activities in their physical characteristics may be designated as heavily modified water bodies (HMWB) [12]. Water bodies that have been created by human activity where there was no water body before (e.g. a man made reservoir or an artificial navigation canal) can be designated as artificial water bodies (AWB). For HMWB and AWB the WFD objective of 'good ecological potential' applies (instead of good ecological status), which in plain words means the best practicable ecological condition that is compatible with the legitimate use that has been the basis of the designation.

A HMWB or AWB can still be designated under Natura 2000 for instance if it harbours a rare bird like the kingfisher. In such cases, appropriate conservation measures will need to be implemented for that species or habitat. These measures are often stricter than those required for achieving "good ecological potential" under the WFD and must once again be integrated into the WFD by specific provisions regarding protected areas (see Article 4(1)c).

Assessing new developments under the WFD

According to Article 4(7) of the WFD, exemptions can be made for new modifications and sustainable human development activities that result in the deterioration of the status of the water body or that prevent the achievement of good ecological status or potential, or good groundwater status under certain conditions. This potentially includes new developments related to hydropower[13].

If the development potentially affects both a WFD objective and a Natura 2000 site then both the Article 4(7) procedure described above, and the Natura 2000 permit procedure under Article 6.3 of the Habitats Directive must be undertaken (they may of course be coordinated). The reason is that each has a different legal focus: one will assess if the project is likely to compromise the objectives of the WFD, the other will assess whether it will adversely affect the integrity of a Natura 2000 site.

The WFD also makes it clear that a development cannot go ahead if it is not consistent with other EU environmental legislation. In other words, if the project does not compromise the objectives of the WFD but does adversely affect the integrity of a Natura 2000 then it cannot be approved under the WFD unless the derogation procedure under Article 6.4 of the Habitats Directive has also been accepted.[14]

[12] *Heavily Modified Water Bodies are ones which as a result of physical alterations by human activity are substantially changed in character and cannot, therefore, meet the 'good ecological status' (GES).*
[13] For jurisprudence on the application of Article 4(7) to hydropower see Court ruling in case C-346/14.
[14] European Court of Justice ruling C-461/13,

1.5 The Floods Directive

In November 2007, Directive 2007/60/EC was adopted. It establishes a framework for the assessment and management of flood risks, aiming at the reduction of the adverse consequences for human health, the environment, cultural heritage and economic activity associated with floods. The Directive requires Member States to undertake:

- A preliminary flood risk assessment, which identifies areas where serious floods have occurred in the past and/or where there is a likelihood of significant floods again in the future (deadline December 2011).
- Flood hazard and flood risk maps, which map out the identified flood risk areas per river basin (or other agreed unit area of management). These maps should also show the potential adverse consequences associated with different flood scenarios, including information on potential sources of environmental pollution as a consequence of floods, as well as protected areas such as the Birds and Habitats Directives in those areas (deadline December 2013).
- Flood risk management plans on the basis of the above. Flood risk management plans should be established focusing on managing and reducing the potential adverse consequences of flooding. These plans should include a prioritised set of measures, addressing all aspects of flood risk management from prevention and protection to preparedness (e.g. flood forecasts and early warning systems) taking into account the characteristics of the particular river basin or sub-basin (deadline December 2015).

As regards the relations between the Floods Directive and EU nature legislation, besides the headline requirement to reduce potential adverse consequences of flooding to the environment, there is a requirement to include protected areas in the flood risk maps to take into account the environmental objectives of the WFD (that are linked as discussed above with nature legislation objectives), and to take into account nature conservation, natural floodplains and the improvement of water retention in the flood risk management plans (Article 7).

Through the links to the WFD it is also clear that all activities under the Floods Directive must be in line with the requirements of the Nature directives. For instance if a flood protection measure risks affecting one or more Natura 2000 sites, it too, must follow the procedure under Article 6 of the Habitats Directive, and where necessary an appropriate assessment should be carried out to assess the potential effects of the plan or project on the integrity of the Natura 2000 site(s).

1.6 The SEA Directive and the EIA Directive

Two other key pieces of EU environmental legislation are directly relevant to hydropower developments:

- Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment (commonly referred to as "SEA Directive"); and
- Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment, – commonly referred to as the "EIA Directive" as amended by Directive 2014/52/EU.

The SEA Directive

The SEA Directive aims to provide for a high level of protection of the environment by ensuring that the environmental consequences of certain **plans and programmes** are identified, assessed and taken into account during their preparation and before their adoption.

In this respect, Member States are required to prepare an environmental assessment report that identifies and assesses the likely significant environmental effects of the plans and programmes, and of any reasonable alternatives. In addition they must provide certain authorities and the general public with an opportunity to express their opinion on the environmental report as well as on the draft plan or programme.

The process of developing the SEA is intended to be coordinated with the plan's development leading to the integration of environmental considerations into the final version of this plan. Once the plan or programme is adopted, the environmental authorities and the public are informed and relevant information is made available to them. Moreover, in order to identify unforeseen adverse effects at an early stage, any significant environmental effects of the plan or programme must be monitored.

An SEA (strategic environmental assessment) is mandatory for a variety of plans and programmes which set the framework for future development consent of projects listed in the EIA Directive. **It is also mandatory for any plans or programmes, which, in view of the likely significant effect on sites, have been determined to require an assessment pursuant to Article 6.3 of the Habitats Directive.**

Ultimately, the strategic environmental assessment aims to encourage a more integrated and efficient approach to territorial planning where environment, including biodiversity considerations, are taken into account much earlier on in the planning process and at a much more strategic level. This should lead to fewer conflicts further down the line at the level of individual projects. It also allows for a more appropriate siting of future developments away from areas of potential conflict with Natura 2000.

The EIA Directive

While the SEA process operates at the level of plans and programmes, the EIA Directive operates at the level of individual public and private projects. Thus, the development consent for projects[15] which are likely to have significant effects on the environment should be granted only after an assessment of its likely environmental effects has been carried out.

The EIA Directive distinguishes between projects requiring a mandatory EIA (so-called "Annex I projects") and those where Member State authorities must determine, in a procedure called "screening", if projects are likely to have significant effects, taking into account criteria in Annex III of the Directive (so-called "Annex II projects"). Most installations for hydroelectric energy production are Annex II projects[16].

[15] *The EIA Directive defines "project" as the execution of construction works or of other installations, schemes, or interventions in the natural surroundings and landscape.*

[16] *Projects that fall under Annex I include those for "dams and other installations designed for the holding back or permanent storage of water, where a new or additional amount of water held back or stored exceeds 10 million cubic meters'.*

The relationship between SEA, EIA and Article 6.3 of the Habitats Directive

According to the new EIA Directive, in the case of projects for which the obligation to carry out assessments of the effects on the environment arises simultaneously from this Directive and from the two EU nature directives, Member States shall, where appropriate, ensure that coordinated and/or joint procedures are provided for.

Under the coordinated procedure, Member States must endeavour to coordinate the various individual environmental assessments of a particular project by designating an authority for this purpose and providing, wherever possible, for a single assessment of the environmental impact of a particular project.

Nevertheless, **the appropriate assessment under EU nature legislation should remain a clearly distinguishable and identifiable part of the overall environmental report**. This is because the Habitats Directive's appropriate assessment measures different aspects of the natural environment and has different criteria for determining "significance" than the EIA /SEAs. The latter consider all aspects of biodiversity whereas the nature directives focus specifically on possible impacts on the species and habitat types of European importance for which the Natura 2000 site has been designated.

Also the scope of each is different: SEAs/EIAs apply in the case of all plans and projects that fall within their remit irrespective of where they are to be located. The appropriate assessment, on the other hand, is only applicable to those plans and projects that could have a negative effect on a Natura 2000 site – be it within or outside a Natura 2000 (e.g. upstream from a Natura 2000 site)

There is moreover a distinction as regards the outcome of the assessment. The assessments under the SEA and EIA lay down procedural requirements but do not establish obligatory environmental standards. The assessment under the Habitats Directive, on the other hand, lays down obligations of substance.

In other words, if the appropriate assessment cannot ascertain that the plan or project will not adversely affect the integrity of a Natura 2000 site, **the authority cannot agree to the plan or project as it stands** unless, in exceptional cases, they invoke special procedures under Article 6.4.

Thus, an **SEA and EIA cannot replace, or be a substitute for, an appropriate assessment** as neither procedure overrides the other.

2. FRESHWATER ECOSYSTEMS AND HYDROPOWER GENERATION IN THE EU

2.1 State of the EU's river and lake ecosystems

Rivers are an important multi-functional resource for Europe's economy and social well-being, servicing a large number of different sectors. Healthy river ecosystems also deliver many important goods and services to society. They are a major source of freshwater and act as purification centres, removing excess nutrients and pollutants from the water course and the surrounding catchment area. They prevent erosion and retain soils, nutrients and sediments and are a vital natural buffer against floods, absorbing excess rainwater during periods of high discharge.

The structural complexity and highly dynamic nature of rivers also makes them exceptionally rich ecosystems, bringing lifeblood, or in this case water, to large parts of the surrounding countryside. As well as being valuable habitats in their own right, they act as vital ecological corridors, encouraging species dispersal and migration over long distances and through different biogeographical zones. They are also responsible for the development of a rich mosaic of interconnected, water dependent, wetlands such as floodplain forests, marshes, fens, wet meadows, etc., all of which further enhance their overall biodiversity.

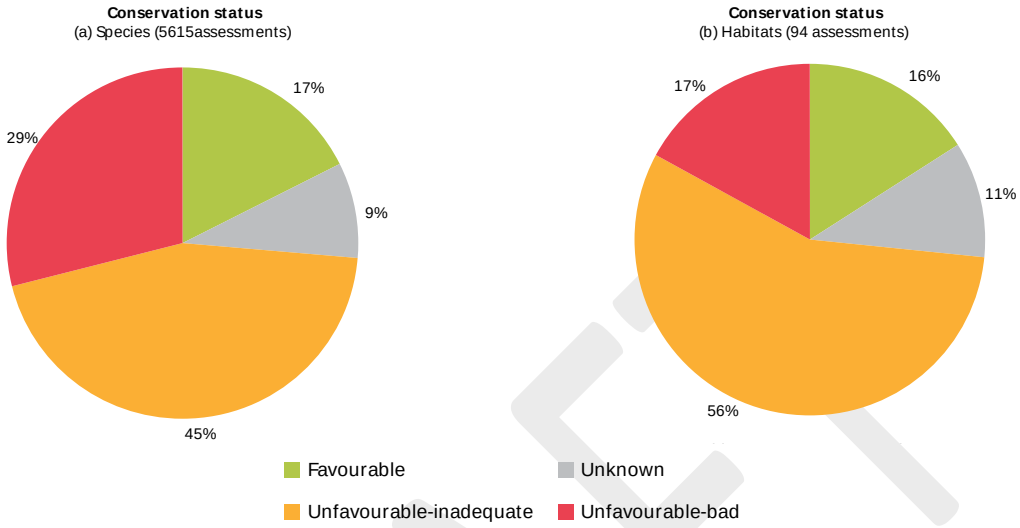
Healthy natural rivers and associated floodplains provide important habitats for a significant number of Europe's wild fauna and flora species, including some 400 rare and threatened species listed in the Birds and Habitats Directives. Altogether, lakes and rivers cover around 4% of the surface of Natura 2000, having been designated for species such as the Atlantic salmon *Salmo salar*, otter *Lutra lutra*, kingfisher *Alcedo atthis,* white-clawed crayfish *Austropotamobius pallipes*, thick-shelled river mussel (*Unio crassus*) or European river lamprey *Lampetra fluviatilis* as well as habitat types such as water courses of plain to montane levels, alluvial forests, wet meadows, humid grasslands and fens.

The multiple usages of Europe's rivers have however put immense pressure on this valuable resource over the last 150 years, with the result that few of the major lowland rivers are now in an entirely natural state. In addition to being subjected to varying degrees of pollution and high nutrient loads, which have led to degradation in water quality, many rivers have also undergone major hydro-morphological changes for a variety of reasons.

In 2015, the European Environment Agency published a report on the State of Europe's environment[17]. It concluded that more than half of the rivers and lakes in Europe had not reached a good ecological status or potential. In 2009, only 43% of surface water bodies were in a good or high ecological status. The situation was not expected to improve much by 2015 with only 53% of water bodies expected to reach a good ecological status. This is far removed from the targets set by the WFD.

[17] http://www.eea.europa.eu/soer

In terms of EU protected freshwater species and habitats, the situation is also very negative. According to the Commission's 2015 report on the conservation status of river and lake habitats and species protected under the two nature Directives for the period 2007–2012[18], 74% of freshwater species and 73% of freshwater habitat types had an unfavourable-inadequate or unfavourable-bad status. By contrast, only 17% and 16% respectively had a favourable status.



Conservation status and trends of species (a) and habitats (b) (Habitats Directive) associated with rivers and lakes ecosystem. Source EEA, 2015b, Article 17 reports and assessments. Right: Population status bird species associated with rivers and lakes ecosystem

The overall poor status of Europe's rivers is a significant cause for concern. It not only indicates that many of Europe's rivers are already in a degraded state but also that much still needs to be done to meet the objectives of the WFD and the two Nature Directives. This can only be achieved if the priority is given to improving their water status and going beyond merely preventing their further deterioration.

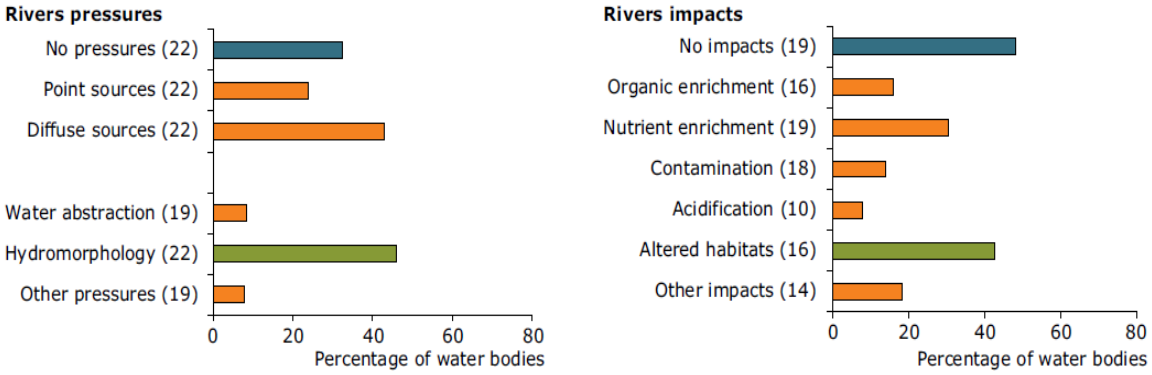
2.2 Pressures and threats of Europe's freshwater ecosystems

Classified water bodies are under pressure from a variety of activities on rivers. According to recent studies, more than 40% of river and transitional water bodies are affected by hydro-morphological pressures, which are caused mainly by man-made structures and activities impacting on the ecological functioning of European rivers.

Based on the first characterisation of river basins in relation to the WFD[19], the majority of EU Member States indicated that pressures related to urban development, flood defence, power generation including hydropower, inland water navigation, straightening and land drainage for agriculture are the most important, and affect the hydro-morphological status of water bodies to the highest degree.

[18] http://www.eea.europa.eu/publications/state-of-nature-in-the-eu

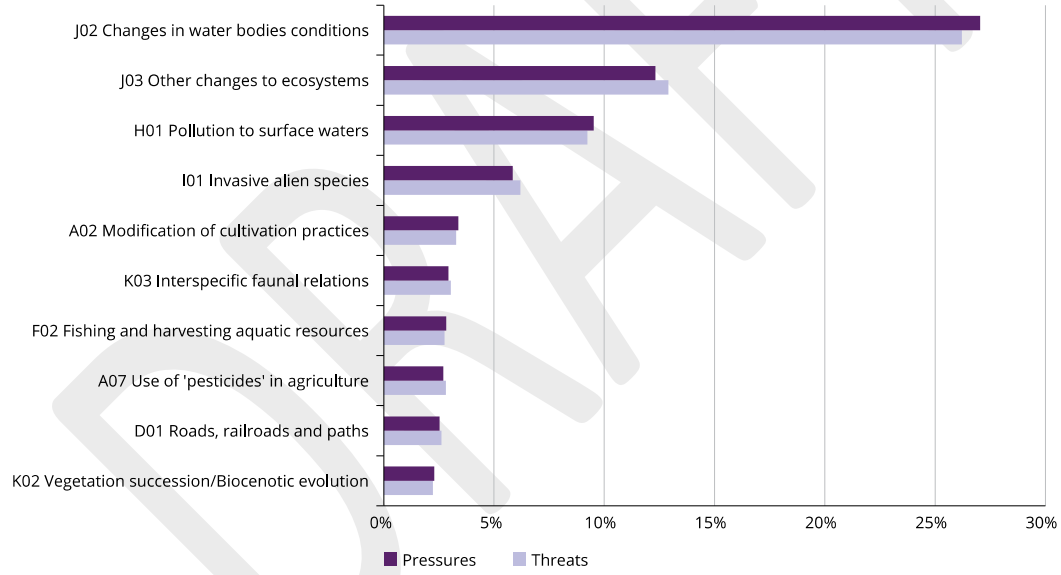
[19] Commission Communication : Towards Sustainable Water Management in the European Union' First stage in the implementation of the Water Framework Directive 2000/60/EC [COM(2007) 128 final].



Significant pressures (left) and impacts (right) for rivers, the number of MS included is indicated in parentheses (European waters - assessment of status and pressures 2012)

In terms of threats and pressures on Natura 2000 freshwater bodies in particular, the State of Nature report identifies 'changes in water bodies conditions' as the most frequent by far, as compared to other threats and pressures.

Figure 4.37 Top 10 (% of frequency) reported high-ranked pressures and threats for species (Habitats Directive) associated with rivers and lakes ecosystem



State of Nature report, EEA 2015

2.3 Types of hydropower and potential effects on Natura 2000

Hydropower generation can have a range of different types of impacts on species and habitat types protected under the two EU nature directives. Planners who are aware of these potential effects and who have an understanding of the complexities of the riverine ecosystems will be better placed to carry out the appropriate impact assessments and, where possible, plan for a more integrated project that takes account of the ecological and other river user's requirements already at the start of the design process. This will not only help to improve the quality of the appropriate assessment under Article 6 of the Habitats Directive, but should also speed up the decision making process.

Clearly the impacts will vary considerably from one site to another depending on the individual characteristics of the river, its physical and ecological state, the type and scale of hydropower facilities proposed as well as the species and habitats for which the site has been designated. There is therefore a need to look at each facility **on a case-by-case basis**.

Types of hydropower facilities

Hydropower (or hydroelectric power) schemes harness the energy from flowing water to generate electricity, using a turbine or other device. The amount of hydropower generated depends on the water flow and the vertical distance (the 'head') the water falls through. Turbines placed within the flow of water extract its kinetic energy and convert it to mechanical energy; a generator then converts this to electrical energy.

The following hydropower facilities are most frequently used:

Run-of-river hydropower plants. In the run-of-river hydropower systems, electricity production is driven by the natural flow and drop in elevation of a river. This type of installation uses the natural flow of a water course in order to generate electricity. There is no intention to store water and to use it later on. This type is most common for small hydropower stations but can also be found with large stations. The run-of-river schemes are often found downstream of reservoirs.

Storage run of the river hydropower schemes: A storage reservoir offers the opportunity to store water during periods of low demand and release it during peak periods. The generating capacity is therefore less dependent on availability of the water flow.

Such reservoirs can comprise daily, seasonal or yearly storage. Thus allowing it to meet peak electricity demands.

Reservoir hydropower plants. The conventional reservoir plant has a reservoir of a big enough size to permit the storage of water during both wet and dry seasons. Water is stored behind the dam and is available to the plant as and when required. Such a plant can be used efficiently throughout the year, either as a base load plant or as a peak load plant as required.

Pumped-storage hydropower plants. They are based on reservoirs at different elevations, which make it possible to generate supplementary electricity during high peak demands. The water is pumped to the higher reservoir at the time of a lower demand and released down through turbines when the demand is high. Pumped-storage hydroelectric power stations are not excluded from the Renewable Energy Directive but they are not taken into consideration for renewable energies statistics.

Types of hydropower turbines

There are two main types of hydro turbines: **impulse and reaction**. The type of turbine used is based on the height of standing water - referred to as "head" - and the flow or volume of water at the site. Other deciding factors include depth to which the turbine has to be set, efficiency, and cost.

Impulse turbines generally use the velocity of the water to move the runner and discharges to atmospheric pressure. The water stream hits each bucket on the runner. There is no suction on the down side of the turbine, and the water flows out from the bottom of the turbine housing after hitting the runner. The impulse turbine is generally suitable for high head and low flow applications. *Pelton turbines* (wheels) are preferable for high-head hydropower plants, special multi-jet Pelton can be utilized for medium-head plants. *Turgo turbines* (wheels) are used for high-head or medium-head plants. For low head hydropower plants a special cross-flow (Archimides screw) turbine is developed.

Reaction turbines develop power from the combined action of pressure and moving water. The runner is placed directly in the water stream flowing over the blades rather than striking each individually. Reaction turbines are generally used for sites with lower head and higher flows compared to the impulse turbines. *Propeller turbine* has a runner with three to six blades in which the water is in contact with all of the blades at all times. The pitch of the blades may be fixed or adjustable. There are several types of the propeller turbine – Kaplan, Straflo, Bulb and Tube turbines. *Francis turbine* has a runner with fixed buckets (vanes), usually nine or more. Water is introduced just above the runner and all around it and then falls through turbine, causing it to spin.

The remainder of this chapter outlines the type of possible effects that hydropower generation can have on habitats and species under the EU nature directives in particular.

- *Changes in river morphology and riverine habitats*

The physical modification of water bodies can affect the normal hydrological processes and disrupt the ecological continuity[20],of freshwater systems both longitudinally and laterally (e.g. by disconnecting rivers from their surrounding floodplains and wetlands,). This in turn results in the loss, degradation and fragmentation of natural habitats and species which depend on these habitats for their existence. The significance of loss depends on scale of the impact as well as on the rarity and vulnerability of the habitats and species affected.

The most obvious form of habitat loss is the direct physical destruction of the habitats themselves upstream (e.g. land take, inundation, removal of riparian vegetation or physical structures in the river). But the disruption of natural hydromorphological processes can also lead to significant habitat loss, degradation and fragmentation. Additionally, it can lead to the colonisation of degraded habitats by invasive species that end up displacing the natural fauna.

- *Barriers to migration and dispersal of protected species*

Rivers and riparian zones play an important role in the dispersal and migration of freshwater species and in more localised movements between different feeding and nesting areas. They act as vital ecological corridors or stepping stones across the landscape. It is estimated there are currently about 7000 large dams[21] along Europe's rivers but the vast majority of barriers are created by smaller obstacles, including more than 21 000 small hydropower plants in the EU[22].

Hydropower installations can either directly or indirectly disrupt or prevent species dispersal and migration. The most obvious are dams and impounded areas which present physical barriers to fish migration, thereby preventing them from travelling up and down the river. This has had major impacts on the populations of long distance migrators in particular and has resulted in the fragmentation and isolation of remaining freshwater populations. Artificial canals can also act as barriers to species movement by causing habitat fragmentation across the terrestrial landscape.

Upstream migration is most important for populations of anadromous fish and lamprey species like *Salmo salar*, sea lampreys *Petromyzon marinus* and *Lampetra fluviatilis* or some sturgeons as *Acipenser sturio* because of their need of periodical (optimally annual)

[20] further details provided in Common Implementation Strategy for the Water Framework Directive, WFD and hydromorphological pressures, Technical Report, Good practice in managing the ecological impacts of hydropower schemes. https://circabc.europa.eu/sd/a/68065c2b-1b08-462d-9f07-413ae896ba67/HyMo_Technical_Report.pdf

[21] *http://www.eea.europa.eu/themes/water/european-waters/reservoirs-and-dams*

[22] *http://setis.ec.europa.eu/technologies/Hydropower/info*

long-distances migrations. Downstream migrations are essential for their juveniles and adults of catadromous fish such as the eel *Anguilla anguilla*, which is protected under the Eel Regulation[23].

- *Disruption of sediment dynamics*

Sediments are a natural part of aquatic ecosystems and are essential for the hydrological, geomorphological and ecological functioning of these systems. Sediment forms a variety of habitats which directly and indirectly support a broad range of species. Transverse structures such as weirs or dams tend to disrupt the natural sediment dynamics. Large reservoirs can trap over 90% of incoming sediment which can lead to increased erosion of the river bed and banks downstream as well as the local destruction of important hydromorphological structures such as gravel bars. Maintenance works on weirs and dams involving the periodic flushing of sediments (especially in summer when there is water scarcity) can also be detrimental for habitats and species if not managed properly.

Upstream of a dam, in a reservoir or in impounded sections, the reduction of the sediment transport capacity causes sediment to accumulate which can have a negative effect on both species and habitats, e.g. by promoting the growth of algae and other aquatic weeds that crowd out the protected species. The accumulation of gravel or other silty sediments on the riverbed or in the water column may be especially detrimental to lithophile species, such as grayling *Thymallus thymallus*, which use these areas as spawning grounds or the freshwater pearl mussel *Margaritifera margaritifera* and the thick shelled river mussel *Unio crassus*. Also, for some bird species, such as the plover or sandpiper, the dry gravel beds are very important nesting places.

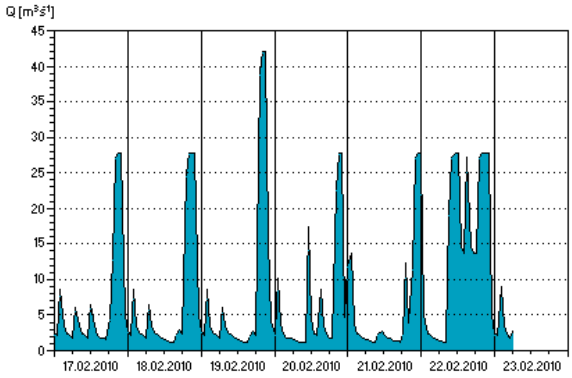
- *Changes of the flow regime by diversion hydropower plants*

Ecological flows are an important mechanism to maintain essential processes of healthy river ecosystems upon which EU protected species and habitats depend and to ensure a good ecological status of the water bodies[24][25]. In diversion hydropower plants, the water is supplied to the turbine through an artificial channel. Water is piped directly from the main river flow and discharged from the turbine back into the river. Such watercourses can lead to insufficient or the complete lack of water over several kilometres along some river stretches, impacting aquatic habitats and river continuity. Too little water flow can dry out spawning sites of fish and lamprey species or already developing fish eggs and juveniles.

Inadequate flow rates in the original riverbed can cause the water to overheat and contain insufficient oxygenation (as described above), which creates unsuitable living conditions for species such as fish, crayfish and lamprey species, bivalve molluscs, or dragonflies dependent on flowing water habitats.

[23] Available under: http://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A32007R1100
[24] *Securing Water for Ecosystems and Human Well-being: The Importance of Environmental Flows*
[25] *"Ecological flows in the implementation of the Water Framework Directive"* - *https://circabc.europa.eu/sd/a/4063d635-957b-4b6f-bfd4-b51b0acb2570/Guidance%20No%2031%20-%20Ecological%20flows%20%28final%20version%29.pdf*

- *Changes of the flow regime by peaking hydropower plants*



Another problem is hydropeaking which results in strong daily oscillations of discharge due to peak production. During the peak demand for electricity the power plant discharges the accumulated water from the reservoir through a turbine, thereby increasing the flow downstream. This sudden rush of water can cause dramatic changes in the ecosystem.

Hydropeaking also stresses organisms living in affected parts of the watercourse, especially those that are unable to handle sudden changes in water levels, like juvenile fish, or other slow moving or static organisms (especially plant species). The hydropeaking regime influences also the behaviour of the prey of protected species and consequently influences their fitness levels. The impact of hydropeaking is of fundamental importance during particularly sensitive periods (e.g. periods of drought or frost) and is increasingly relevant in view of climate change.

- *Changes in seasonal flood cycles*

When constructing a dam for a hydropower plant, measures are sometimes used to modify streambeds in order to be able to control better the flow of water. Interventions in flow control can result in the disruption of the seasonal flood cycles, causing sometimes a complete disappearance of the target habitat types and organisms connected to these cycles from surrounding habitats. Examples of impacted habitats include alluvial forests, temporary ponds and oxbow lakes and rivers and their associated species.

- *Water chemical and temperature changes*

Dams fundamentally can change the chemical quality and mineral composition of the river downstream. In karst areas or areas with limestone rocks such changes lead to the dissolution of the rocks and an accumulation of these substances in the environment which in turn result in changes of pH. Likewise, pH changes occur in the reservoir where rocks are used that contain salt or iron. All these changes influence the composition of plant and animal communities present. Organisms are influenced also by changes of water temperature and connected alterations of oxygen concentration. Reservoirs can lead to an important increase of temperature but also to a reduction in temperature if the water is taken from the bottom.

- *Injuries and killing of individual animals*

Fish and sometimes other species passing through a hydropower plant can be injured or killed. A hydropower plan can cause[26]:

- injuries through physical contact with guide vanes, turbine runner or turbine casing
- damage from pressure fluctuations during the turbine passage
- wedging onto intake screens or injuries caused by cleaning machines
- injuries caused by intense flow and constructions of overflow in spillways

[26] *Arcadis 2011: Hydropower generation in the context of the EU WFD. EC DG Environment.168 pp.*

- susceptibility to predation due to the disorientation.

The degree of mortality can vary from 0 to 100 % at a single hydro power plant[27]. Much depends on the type of fish present as well as on the type of hydropower construction and the mitigation measures used. The mortality rate of turbines increases with velocity of rotor blades and number of rotor blades and with decreasing distance between the blades (Kaplan). Mortality can reach 100 % when fish pass through turbines that are mainly in high-pressure plants (e.g. with Pelton turbine).

- *Displacement and disturbance*

River engineering works may cause disturbance to certain species and disrupt their life cycles, especially in the case of benthic fauna and flora which rely on a high water quality. This may affect the species ability to breed, feed, rest or disperse and migrate. If the disturbance reaches significant levels it can lead to the exclusion of the species from that area and hence the loss of habitat use or it can result in poorer survival and/or breeding success. In the case of rare and endangered species even small or temporary disturbances can have serious repercussions for their long-term survival in the region.

Removing barriers on the Danube River Basin District (DRBD)

Hydropower generation accounts for around 45% river and habitat continuity interruptions in the DRBD. A total of 1,688 barriers are located in DRBD rivers with catchment areas >4,000 km. 600 of these are dams/weirs, 729 are ramps/sills and 359 are classed as other types of interruptions. 756 are currently indicated to be equipped with functional fish migration aids. 932 continuity interruptions (55%) remain a hindrance for fish migration as of 2009 and are currently classified as significant pressures.

[27] *References: Ferguson, Absolon, Carlson and Sandford 2006. Transaction of the American Fisheries Society 135:139-150). Calles and Greenberg 2009. River Research and Applications 25:1268-1286. Gustafsson 2010.*

According to the latest Danube Basin River Management Plan, the Danube countries plan to significantly reduce the continuity interruption by dams by 2021.

Danube River Basin District: River and habitat continuity interruption –(above) current situation 2015; (1st map) expected improvements by 2021 (2nd map) – Source DRBMP https://www.icpdr.org/main/management-plans-danube-river-basin-published

2.4 Cumulative effects

As shown in the EEA's State of the Environment report, most European rivers are in a degraded state and some have reached a saturation point whereby they can no longer host new hydropower developments without causing a further significant deterioration of the river's status. Special consideration must therefore be given to assessing the potential cumulative effects of hydropower plants on one or more Natura 2000 site(s).

This should consider all of the hydropower plants that are situated in or outside the Natura 2000 sites. It may be that one hydropower project, taken on its own, will not have a significant effect, but if its impact is added to those of other already existing plants or foreseen projects in the area their combined effects can become significant.

This is especially relevant for small hydropower plants where more than one hydropower facility on a particular stretch of river hosting Natura 2000 sites or EU protected species may present an unacceptably high impact even if the impact of the plant, considered on its own, would be considered insignificant for the purposes of the Appropriate Assessment.

Article 6(3) clearly states that: *Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or* ***in combination with other plans or projects****, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives.*

The underlying intention is to take account of cumulative impacts, and these will often only occur over time. In that context, one must consider all plans or projects that are ***completed, approved,*** *or* ***proposed*** during the assessment. This includes:

- Already completed plans and projects or existing activities which already influence the integrity of the site.
- Plans and projects which have been approved in the past but which have not yet been implemented or completed.

The plans and projects must also be assessed in relation to the existing pressures on the site, e.g. existing landuse or level of pollution. In this context the information on pressures and impacts available in the context of the WFD RBMPs may be useful. Existing plants may also raise issues under Article 6(1) and Article 6(2) of the Habitats Directive if their effects give rise to a need for remedial conservation measures, or measures to avoid habitat deterioration or species disturbance. This will be reflected in the site's conservation objectives.

Moreover, in considering a proposed plan or project, it must be understood that this does not create a presumption in favour of other as yet unproposed plans or projects in the future. For example, if a hydropower development does not to give rise to a significant effect and is therefore approved, the approval does not create a presumption in favour of further hydropower developments in the future. On the contrary, the approval of this project may mean that the river will have reached its carrying capacity and will not be able to tolerate any further developments however small.

In addition, it is important to note that the assessment of cumulative and in combination effects is not restricted to the assessment of similar types of plans or projects covering the same sector of activity. All types of plans or projects that could, in combination with the plan or project under investigation, have a significant effect, should be taken into account during the assessment. Potential cumulative impacts should be assessed using sound baseline data and not rely on qualitative criteria. They should also be assessed as an integral part of the overall assessment and not be treated merely as an 'afterthought' at the end of the assessment process.

In conclusion, for each AA of each project a thorough analysis in space and time must be carried out. One of the best ways to anticipate this is to consider adopting an early strategic planning approach (see. Chapter 4).

Recommendations on small hydropower plants, Federal Environment Agency, Germany

In Germany, by the year 2000, around 70% of the usable hydropower potential had already been exploited. The technological potential was also largely exhausted. This was reflected in the relatively low rates of support available for hydropower use in support programmes. The remaining exploitable potential therefore mainly concerns small, previously undeveloped, virtually undisturbed waters. Because of this, a **considerable conflict a**rises between the objectives of climate protection, on the one side, and water and nature protection on the other, **particularly as possible growth in small and micro hydroelectric power plants could contribute only very little to a reduction in CO2 reductions in Germany.**

Possible harmful ecological effects, particularly on the few remaining virtually undisturbed watercourses in Germany, could be considerable. This conflict, between positive effects in relation to climate protection and negative effects in relation to species and biotope conservation, becomes all the more intense the smaller – and therefore less effective – the hydropower installation and the more natural the affected watercourse.

Macro-economic cost-benefit analysis shows also that the economic costs can be considerable, compared with the benefit. The smaller the installation's capacity and the more natural the watercourse, the less favourable the cost-benefit analysis. Economic evaluations show that, especially with **small hydroelectric power plants with a capacity of up to 100 kW**, in all three cases of new construction, modernization and reactivation, the cost of producing energy is higher than the rates of payment under the Renewable Energy Act, and therefore in many cases, even in favourable circumstances, **electricity can hardly be produced economically.**

Economic considerations show, that a subsidy that covers the operating costs of small hydroelectric power plants – in particular plants with a capacity of under 100 kW – leads to high macro-economic costs for the avoidance of CO2 emissions. Against the background of negative ecological effects, further exploitation of the potential of small hydroelectric power plants is not a priority for climate protection.

Considering prevailing legal provisions and the requirements of the EC Water Framework Directive the following recommendations are put forward:

- On account of their higher efficiency, **large hydroelectric power plants are generally to be given preference to small and micro-installations** for secondary use on waters already developed and impounded. In the development of hydropower capacity attention should be focused on their optimization.
- **With virtually undisturbed waters, or those where renaturalization is planned, the use of hydropower should be renounced.**
- The construction and reactivation of **small hydroelectric power plants is unproblematic at existing weirs that cannot be demolished**, in particular when, at the same time, ecological improvements – for instance, restoring free passage – can be achieved.
- With the reactivation of installations currently not in operation, and the renewal of water rights, concerns of water protection should be more strongly considered and conditions laid down (for example, functional fish ladders, structurally-guaranteed dynamic minimum water flow, exclusion of flash floods downstream dams).
- I**n the case of new installations, impounding of a water body for diversion is to be avoided**. Constructional methods should be chosen, which divert the water used in such a way that the free passage and character of the watercourse is maintained (for

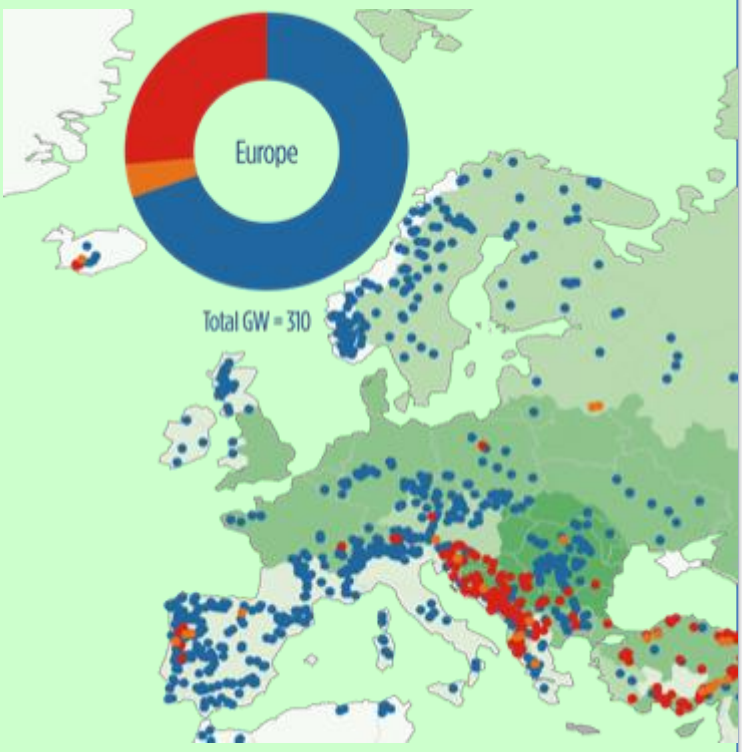
example, lateral water intake with a diversion structure in the water body). Requirements are to be issued on minimum flow and on measures for the avoidance of damage to fish from turbines. Flash floods downstream dams are to be prohibited.

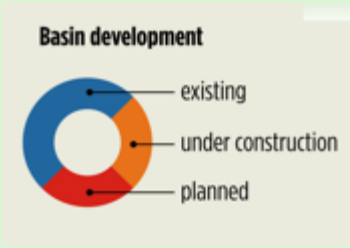
- **Positive mapping of all potential sites is recommended, where, taking account of environmental concerns, small hydroelectric power plants with a capacity of up to 1,000 kW can be economically operated**, such as has already taken place in Baden-Würrtemberg.

Abstract from: Hydroelectric Power Plants as a Source of Renewable Energy - legal and ecological aspects –Umweltbundesamt, November 2003
http://www.umweltbundesamt.de/sites/default/files/medien/publikation/long/2544.pdf

A review of potential hydropower projects in protected areas on the Balkans

According to a study published by EuroNatur and Riverwatch in May 2015, a total of 1,640 hydropower plants (HPPs) are foreseen on the Balkan Peninsula. It is estimated that 32% are planned in strictly protected areas while another 17% are foreseen to be constructed in other protected areas. 131 hydropower plants are planned in Natura 2000 sites of EU countries on the Balkans (SI, HR, BG, GR) in particular.





This indicates a very high pressure from hydropower on protected sites, the Balkans being considered as one of the main "hot spots" for HP development in the world for the future (Power of rivers, TNC,…2015). There is also a strong increase of projected and constructed small hydropower plants (< 1 MW) across the entire Balkan region.

As many of the existing and candidate countries concerned are seeking funds from European Multilateral development banks (EBRD/EIB/WB) for these projects, it will be essential that their environmental impact assessments are carried out to the same high quality and level of detail as is required for the Appropriate Assessment procedure under the Habitats Directive and the Article 4.7 exemption procedure under the Water Framework Directive.

This is a legal requirement for the EU Member States and part of the agreed environmental acquis for candidate EU countries. This should include a full and **detailed assessment of the cumulative effects** considering the very large number of hydropower projects foreseen and under construction on these rivers. Proper strategic planning is therefore essential.

Source: Hydropower Projects on the Balkan Rivers – Update September 2015http://www.balkanrivers.net. The power of rivers- finding balance between energy and conservation in hydropower development; The Nature Conservancy, August 2015 https://global.nature.org/content/power-of-rivers-report

2.5 Distinguishing between significant and insignificant effects

Identifying the range of impacts on the species and habitats that are likely to be affected by a hydropower development plan or project is the first step of any impact assessment. After that, it is necessary to determine whether the impact is significant or not in view of the Natura 2000 site's conservation objectives. Clearly, the assessment of significance needs to be done on a case-by-case basis, in function of the species and habitats present and of the precise characteristics of the project itself (for full details see chapter 5).

The loss of a few individuals may be insignificant for some species but may have serious consequences for others. Population size, distribution, range, reproductive strategy and life-span will all influence the significance of the effects and this will vary from one Natura 2000 site to another, even if they are designated for the same species.

The interconnectivity of effects should also be taken into account, for instance land take, on its own, may not be significant for a particular species, but when combined with major disruptions to natural river flows, the impact may become significant.

The assessment of significance should also be considered over an appropriate geographical scale. For migratory species that move over very long distances (such as Atlantic salmon *Salmo salar*), the impact at a specific site may have consequences for the species over a larger geographical area (river basin). Likewise, for resident species with large territories or changing habitat uses, it may be necessary to consider potential impacts on a regional, rather than a local scale.

The appropriate assessment must also be based on the best available data. This may require dedicated field surveys or monitoring programmes some time in advance of the project. The investor has to be able to anticipate this in their planning and ensure the relevant data from biological and hydrological surveillance includes information on all important aspects (life cycle and seasonal variability). Such studies can sometimes take several years in order to be able to capture sufficiently the life cycle of the species and habitat types concerned (see chapter 5 for details).

3. GOOD PRACTICE EXAMPLES IN MITIGATING IMPACTS OF HYDROPOWER

3.1 Ensuring the best practicable ecological condition of rivers in the context of hydropower development

As stated in the previous chapter, few of Europe's large lowland rivers remain in a relatively natural state, having been physically altered over the years for a wide variety of reasons. Modern hydropower can sometimes apply a range of measures to mitigate their impacts on the river ecosystems and the surrounding habitats and species, and even help improve its conservation state wherever possible. In the case of existing hydropower plants, this may be a legal requirement under article 6.2 of the HD (see section 3.4).

On already degraded rivers there are often opportunities to find win-win solutions that improve energy production and at the same time help to improve the ecology and natural functioning of the river in a way that benefits both the energy sector and the river's ecological condition. Ecologically-orientated river engineering started on a local scale in the 1980s but is now becoming more commonplace, and is now seen as an important element in achieving the objectives of the WFD Directive and the two Nature Directives, which aim at improving the ecological status of Europe's water bodies - and consequently water-dependent habitats and species - across the EU. The technical upgrading of existing hydropower plants should therefore take precedence over the installation of new hydropower developments unless there is clear overriding interest for the latter. It should also be linked to ecological criteria for the protection and improvement of water status[28] and the improvement of Natura 2000 habitats and species.

Once again, the possibilities for technically upgrading hydropower installations and introducing ecological restoration measures must be evaluated on a case by case basis and must at all times take account of their cumulative effects.. The type of ecological measures that can be implemented will depend very much on local circumstances, such as the condition of the river, other pressures and the facilities already in place as well as the type of hydrological conditions present.

Opportunities may also arise to decommission inefficient or obsolete installations and remove them entirely from the river system. It should be recalled that the default action to be taken under the WFD in case of a water body degraded by an existing obsolete installation is to restore the river to good ecological status. Significant physical modifications can only be maintained if they serve a legitimate purpose that cannot be achieved by other means that constitute a significantly better environmental option (See WFD Article 4(3)). This decommissioning must nevertheless still undergo an impact assessment to ensure that it leads to a positive long- term improvement in the river's ecology, even there is some short-term degradation during the decommissioning phase.

[28] See recommendations for better policy integration in CIS for the WFD 2006: WFD and Hydro-morphological pressures - Policy Paper. December 2006. https://circabc.europa.eu/sd/a/3dac5b10-1a16-4a31-a178-2f5401f30c50/Final%20Hydromorphology%20Policy%20paper.pdf

3.2 Introducing mitigation and ecological restoration measures

A wide range of mitigation/ecological restoration measures can be introduced for both existing and new hydropower plants. They can for instance involve:

- The restoration of river continuity and fish migration by building fish passes, or by removing old or obsolete structures;
- The reduction in fish mortality through the installation of screens at inlets and fish friendly turbines;
- The restoration of an ecological minimum flow and the sediment dynamics;
- The reduction of water level/flow fluctuations (hydropeaking) through changes in the released flow at different time scales;
- The restoration /recreation of valuable natural riverine habitats, morphological structures and habitats for rare and endangered species to help compensate for the habitats damaged or lost as a result of the hydropower plant or to make a net positive contribution to improving the ecological condition of an already degraded river in line with the objectives of the WFD and that Nature Directives.

The type of mitigation measures to be used will depend very much on the ecological condition of the water body in question and the type of hydropower facility present as well as the overall cost and the potential for improving its efficiency and generating capacity. Once implemented, monitoring systems should be put in place to ensure that the mitigation measures are having the desired effect, and where this is not the case, remedial measures can be taken to address any failings.

Table: Overview of the most widespread key measures to mitigate water storage, related to mitigation measures in the CIS reporting guidance 2016

Hydromorphological alteration	**Main ecological impact***	**Mitigation for**	**Mitigation measures options**
River continuity for upstream fish migration reduced or interrupted	Fish: Populations of migratory fish absent or abundance reduced	**Upstream continuity for fish**	Ramp Fish pass By-pass channel Catch, transport & release Stock from hatchery
River continuity for downstream fish migration reduced or interrupted	Fish: Populations of migratory fish absent or abundance reduced	**Downstream continuity for fish**	Fish-friendly turbines Fish screens By-pass channel Trap, transport & release Fish pass
Artificially extreme low flows or extended low flows	Reduced abundance of plant & animal species. Alterations to composition of plant & animal species	**Low flow**	Provide additional flow River morphology changes

Hydromorphological alteration	Main ecological impact*	Mitigation for	Mitigation measures options
Loss of, or reduction in, flows sufficient to trigger & sustain fish migrations	Migratory fish absent or abundance reduced	**Fish flow**	Provide fish flow
Loss, reduction or absence of variable flows sufficient for flushing	Alteration/reduced abundance of fish & invertebrate species	**Variable flow**	Passive flow variability Active flow variability
Rapidly changing flows (including hydro peaking)	Reduction in animal & plant species abundance due to stranding & wash out	**Rapidly changing flows**	Balancing reservoir(s) (internal) Relocate tailrace Reduce rate Modify river morphology Balancing reservoir(s) (external) Fish stocking
Alteration of general physico-chemical conditions downstream (e.g. temperature, super saturation etc.)	Altered composition or growth of macro invertebrate communities and fish or fish mortality	**Physico-chemical alteration**	Flexible intake Multiple intakes Manage reservoir level
River continuity for sediment disrupted or reduced leading to changes in substrate composition	Reduction in fish & invertebrate abundance & alterations in species composition	**Sediment alteration**	Mechanical break-up of bed armouring Removal of sediment Re-introduce sediment (intake structures) Re-introduce sediment (reservoirs) Restore lateral erosion processes Introduce mobilising flows Fish stocking
Artificially extreme changes in lake level, reductions in quality and extent of shallow water & shore zone habitat	Reduction in abundance of plant & animal species. Alterations to species composition	**Lake level alteration**	Reduce abstraction Increased inflows Create embayment(s) Manage shore/shallow habitats Connectivity to tributaries Artificial floating islands Fish stocking

Source : WG ECOSTAT report on common understanding of using mitigation measures for reaching Good Ecological Potential for heavily modified water bodies Part 2: Impacted by water storage https://circabc.europa.eu/sd/a/d83fb50d-eadb-469d-9f69-11f34a9c8c83/3%20-%20GEP_Part2_Water%20storage_consult%20ECOSTAT20161103.pdf

The following good practice examples illustrate how various types of mitigation and ecological restoration measures have been introduced to hydropower installations under a range of different circumstances.

Restoring river connectivity in Austria

Austria's National Water Framework Plan (NGP), recognizes that **the lack of longitudinal and lateral continuity is one of the principal pressures** on its rivers and that a good ecological status under the WFD is only achievable if the migration of aquatic species and the transportation of sediment is made possible both from the river's head to the mouth, as well as from the river to its wetlands. It is also vital for the recovery of EU protected species and habitats under the two nature directives.

The restoration of the longitudinal continuum is therefore seen as one of the primary goals of the NGP. Having **identified priority areas for the removal of migratory barriers in 2009, a number of river restoration projects have since been implemented**. Several have been co-financed under the EU LIFE programme. This has ensured that the restoration measures introduced are not only improving the river's connectivity for the benefits of the WFD and migratory fish, but also enhancing the overall conservation state of the various Natura 2000 sites along the river.

In 2011, these efforts were taken to new level with the launch of a major new LIFE+ project designed to implement an extensive network of measures on the Austrian part of the Danube. Called 'LIFE+ Network Danube', it is the **largest project of its kind in Austria so far, with a total budget of €25 million**. The project is run by VERBUND, Austria's leading electricity company with the support of the federal Ministry of Environment as well as the Fishing Associations. It aims to build on the efforts done under previous LIFE projects along the Danube which, together, have already succeeded in making 20 kms of the rivers Melk, Pielach and Ybbs passable for migrating fish species.

The project will implement a whole range of different actions along the upper part of the Danube in order to improve its overall ecological status and to enhance the conservation status of some 17 fish species listed in the Habitats Directive in particular. **Ecological stepping stones will also be created** between four major Natura 2000 sites along the river which should enhance their overall conservation status as well.

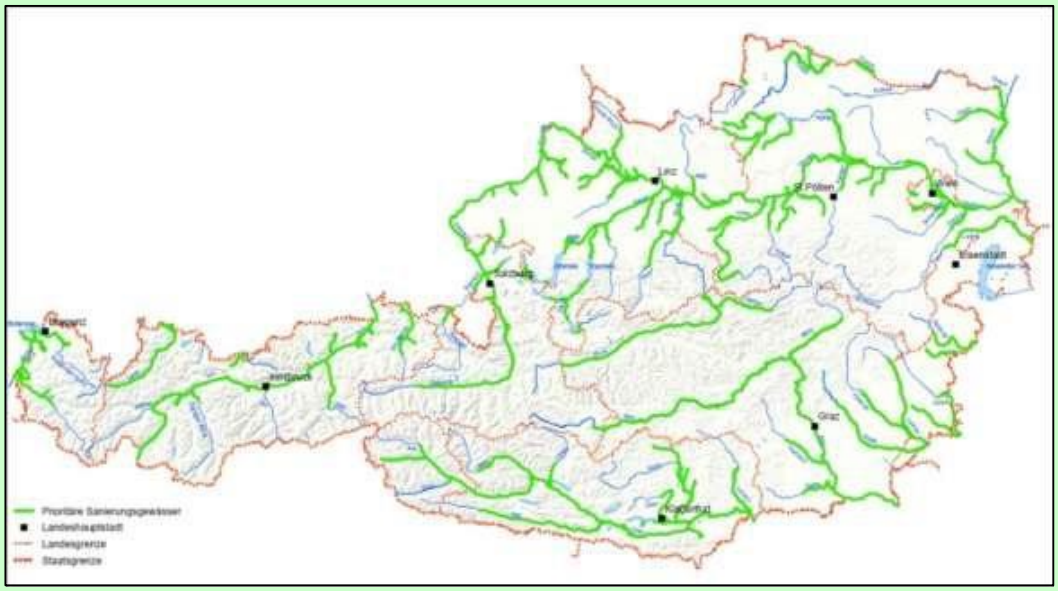
More specifically, "Network Danube" will **restore uninterrupted, natural fish migration paths (at least 22 km) at five of the largest run-of-river power plants along the Austrian Danube** using a multitude of ecological measures. It will also **recreate important gravel habitats** (gravel banks, gravel islands) in the reservoirs of these five power plants and **restore 500m of river branches** on the shores of the Danube. Flood protection will also be included in the process.

The individual projects are currently being discussed regionally and will be submitted to the responsible authorities for approval before being rolled out. One of them, the *Ottensheim-Wilhering* bypass channel, will be **Austria's longest fish ladder to date**. The 14.2-km bypass route is being created through the Innbach-Aschach channel using the highest technical and ecological standards available. It is expected to be completed in autumn 2016 at a total cost of around 8 million euros.

VERBUND's **ultimate goal is to make the entire Danube (some 352 kms) in Austria passable for fish by 2020.**
http://www.life-netzwerk-donau.at/de/

Hydromorphological restoration priorities in Austria

Hydromorphological pressures, such as water abstraction, impoundments and discharges are affecting significant parts of Austria's water bodies. It is largely the reason why two thirds of the rivers do not have good ecological status under the WFD (BMLFUW 2014). Austria's latest National Water Framework Plan (NGP), adopted in 2015 in accordance with the WFD, **gives priority to improving the hydromorphology of its rivers**. It places strong emphasis on the need for **largescale environmental revitalisation programmes to improve the river structure and aid the recovery of endangered rheophilic fish species**. Restoring dynamic floodplains and their drift zones will not only help to improve the ecological status of the rivers under the WFD but should also enhance the conservation condition of the Natura 2000 sites, species and habitats present.



Priority areas for revitalisation – hydromorphological pressures (Source: @ **NGP 2015)**[8]

Considered a priority for hydromorphological restoration under both the WFD and Natura 2000, the Upper River Mur has been the focus of several major restoration projects, two of which have been co-financed under the EU LIFE fund.

Thanks to these projects **new river structures were created and meanders were re-connected** to the River Mur. **Artificial bank reinforcement structures were also partially removed** over a total length of 4.7 km. This opened up over 90 kilometres of the river for the free passage of fish. A second LIFE project is continuing the works on a further seven new sections of the river. However, there remains the challenge how to reconcile the needs of the WFD, Natura 2000 and the Floods Directive on the one hand, and the requirement to renewable energy production on the other over of the entire length (330km) of the river in Austria. To address this, the authorities, in consultation with stakeholders, developed a new management plan to agree on the criteria (and acceptable compromises) for the river's future use.

After many years of intensive discussion **the energy providers and the river experts have agreed to a plan that includes a carefully drawn up zoning scheme with ecological priority zones, trade off zones and zone with no particular restrictions or interest** (mainly in the middle to lower stretches of the river). This plan, which is valid until 2022, sets the foundations for complying with the mandatory energy targets, while maintaining/improving its ecological status in accordance with EU environmental laws.

The Kembs project: environmental integration of a large existing hydropower scheme, France

Kembs dam derivates waters to the 'Grand Canal d'Alsace' which is equipped with four hydropower plants. The Old Rhine River downstream of the dam is 50km long and has been strongly affected by dykes since the 19th Century. As the Kembs scheme concerns three countries with varying views on how to deal with environment, EDF decided to take an **integrated approach** to achieving environmental improvements instead of a strict "impact/mitigation" balance.

The project acts on complementary parts of the aquatic and riparian environment, to **create synergies and amplify the environmental gain**. This has resulted in:

- A **significant increase of the ecological flow**: with a variable regime the released flow varies daily depending on the natural flow entering the reservoir. A new plant (8.5 MW, 28 GWh) was built to limit the energetic losses and to ensure the daily modulation of the flow in the Old Rhin.
- Strong **geomorphological actions** in the Old Rhin, with the supply of gravels from the new plant's works and the implementation of the original concept of "controlled erosion
- Actions to **ensure fish migration** (longitudinal and lateral) and the **recovery of wetland**s.

Examples of environmental measures include:
Connection between the 'Grand Canal d'Alsace' and the wetland of the 'Petite Camargue Alsacienne'. This protected area includes **a network of ponds and small waterways** that are reconnected to the Grand Canal d'Alsace as well as two new fishpasses.

Controlled erosion: This innovative concept aims at using the floods **natural erosion capacity to resupply the Old Rhin River with aggregates**, after dismantling the dykes. The recovery of a non-fixed gravel bed will (in conjunction with the variable flow rate) enable fish spawning and the growth of pioneer vegetation. A small scale model was used to determine the minimum excavations needed to activate the erosion.

Retrieval of an ancient Rhin River arm and its connected environment: A large restoration project started in 2013. It involves the **conversion of a 100ha cornfield and the renaturalisation of a 8km long old river arm.** This re-natured area is now included in the Petite Camargue Alsacienne protected area, which is a partner in the project.

This integrated project has enhanced the environmental quality of the hydropower complex despite the energetic losses due to the increased ecological flow (partially recovered by the new plant). In so doing it perpetuates the legitimacy of the Kembs powerplant to sustainably produce a green energy over time.
http://alsace.edf.com/wp-content/uploads/2015/06/20150610-Renaturation-Kembs-EDF-PCA.pdf

Reactivation of sediment transport across a series of 11 hydropower stations along the transboundary High Rhine

In total 73 km of the whole Rhine River from Lake Constance to Basel is impounded, and only three free flowing stretches provide more near natural conditions. The sediment transport and balance are disrupted and highly disturbed not only by the dams and weirs in the main river, but also by the highly reduced sediment input from major tributaries and from bank erosion due to extensive rip-rap constructions.

From 1990, during the long process of issuing new concessions for individual hydropower plants the problem of bed load sediment transport across the weirs was debated only within the concession perimeter. However, **river sediment transport is clearly a large-scale, basin wide issue,** and if there is a chain of hydropower stations, it must be tackled in a cooperative manner.

Upon an initiative of the Swiss environmental NGO (Rheinaubund) the 11 hydropower plants, loosely organized in a hydropower association (VAR, Verband der Aare-Rhein-Kraftwerke), decided in 2006 to form a common platform (PGG, Projekt-Gruppe Geschiebe) and, together with the responsible governmental authorities (Bundesamt für Energie, BFE, Switzerland and Regierungspräsidium Freiburg, RPF, Germany), to launch and finance **a Master Plan (MP) for the reactivation of sediment transport and ecological revitalization in the High Rhine**. The PGG has only advisory function, but the MP is admitted by national and regional authorities as an expert study.

The organisation is as follows: (1) the PGG-Core Group of experts prepares the tender and contract, and the scientific/technical review of the MP; (2) the PGG-Forum made up of delegates of various key stakeholders reviews the process of the Core Group and drafts of the MP; (3) the PGG-Plenum, composed of all interested stakeholders, is informed in a first workshop about the planned project, then by short reports about the progress of work, and in a final workshop about the end version of the MP.

The goal of the MP is to provide a **scientific review of the natural and present status of sediment transport** (i.e. without and with hydropower plants), to provide basic scientific background knowledge about sediment transport mechanisms and modelling, to describe all possible and technically feasible measures and scenarios to improve sediment transport and fish habitats along the whole impacted river section.

The first phase (establishing the organization of the PGG and preparing the MP) lasted from 2007 to 2013. In a second phase, under the lead of the Swiss and German authorities, the Plenum should discuss the political feasibility of recommended individual or combined measures, and find solutions to implement certain measures in follow-up actions, step-by-step, according to priority, restoration potential, cost-benefit analysis and risk assessment.

For further information please visit: www.energiedienst.de

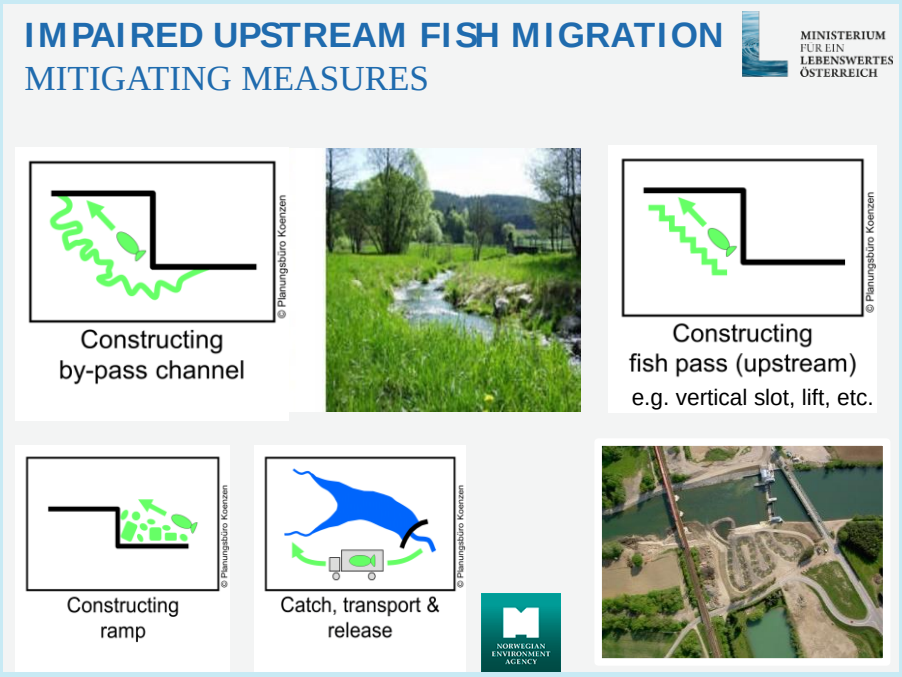
3.3 Fish migration aids

Particular attention is paid in this next section to the potential range of mitigation techniques that can by used to improve the upstream and downstream movement of fish and other aquatic fauna within river systems. This is an evolving science in which a wide variety of techniques and innovative solutions are regularly trialled out and re-evaluated. The aim in this section is therefore to summarise some of the key concepts and illustrate these with good practice examples from within the EU[29] [30] rather than provide a detailed manual on fish migration aids.

Fish migration aids usually fall into three main categories:

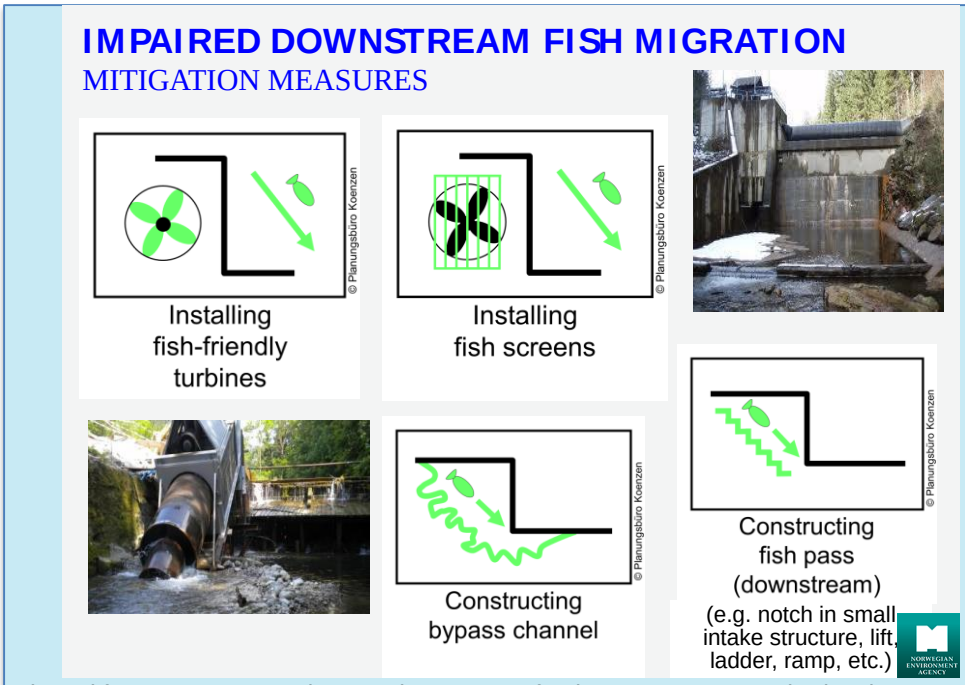
- **Fish passes** can be applied to watercourses where natural or human placed obstructions such as dams, weirs, or culverts prevent or interfere with fish migration. The type of fish pass needed to maximise fish passage will depend upon the site conditions and the species requirements within the river system.
- **Fish friendly turbines** can be used (i.e. screens) to prevent the intake of fish by pumping stations or other structures which extract from the water environment.
- **Bypass channels** can also be can be designed around barriers. Such artificial river channels normally have a low gradient and extend from below the obstruction to a considerable distance upstream.

Examples of mitigation measures for ensuring up and downstream fish migration



[29] http://fishpassageconference.com

[30] – **AG-FAH (2011):** Basics for an Austrian guideline for the construction of fish passes (see BMLFUW 2012) ; **BMLFUW (2012):** Guideline for the construction of fish passes (Austria) ; **Seifert (2012):** Handbook "Fish passes in Bavaria" (Germany) ; **BAFU (2012):** Restoration of up- and downstream fish migration at hydropower plants (Swiss Agency for the Environment, Forests and Landscape) ; **DWA (2010, draft):** Fish passes and fish-passable barriers – planning, dimensioning and quality management (Germany) ; **Dumont et al. (2005):** Barrier manual (Germany: North Rhine-Westphalia)



Adapted from: Common Implementation Strategy for the Water Framework Directive. WG ECOSTAT report on common understanding of using mitigation measures for reaching Good Ecological Potential for heavily modified water bodies. Part 2: Impacted by water storage.

Fish passes

The building of fish passes at weirs and dams can be a highly effective mitigation measure but it is not without technical problems and must therefore be carefully and fully investigated beforehand to ensure that the investment will give the desired results. The choice of the most suitable type of fishpass (e.g. vertical slot, bypass, rock-ramp, lift) strongly depends on local conditions (height of barrier, character of the stream, usability of neighbouring sites etc.) and requires careful study on a case by case basis.

ICPDR Technical paper: Measures for ensuring fish migration at transversal structures

This document aims to inform the Danubian countries on existing technical solutions for restoring river continuity for fish migration. All guidelines currently available in the upper Danube catchment were considered. Their comparison showed that their overall structure and content is basically consistent and that deviations are only marginal in most cases. Since most guiding documents are only available in German language, this document aims to provide the most important facts in English language and is complemented by further literature research.

https://www.icpdr.org/main/practical-advice-building-fish-migration-aids

The planning of fish passes construction should also be dependent on evaluation of the cumulative impact of the barriers in the wider river system. Building one fish pass along a river riddled with barriers may prove to be both expensive and inefficient. It is important therefore to look more strategically at all the barriers on that river stretch in order to decide a prioritised course of remedial action.

The newly constructed fish passes usually have appropriate slopes surmountable for all types of fish and lampreys inhabiting the streams. Care should be taken however not to locate fish passes next to the mouth of the corridor, which makes it difficult for fish to find. The most important parameters of fish passes are therefore the slope, flow and mouth localization in relation to the main discharge and the hydropower plant facilities.

In initial ichthyological survey is highly recommended to determine the fish pass parameters according to the composition of the local ichthyofauna and any migrating species of fish and lampreys in the river system. An important complement to a fish pass is a monitoring device that can verify its effectiveness and address any insufficiencies in functionality in the future. In addition, migration prediction systems like the Migromat system, as well as fish traps and tracking measures could be used.

When focussing on the upstream migration and dispersal of fish and lampreys, it is important to keep in mind also the downstream migration and dispersal which may be different for different fish and other species. The downstream migration is particularly essential for juveniles of anadromous species like the Atlantic salmon *Salmo salar* and adults of catadromous fish species like the Eel *Anguilla anguilla*.

Finally it is essential to have a regular maintenance plan for all new constructions. Many fish passes will no longer be effective over the long-term if they are not sufficiently regularly maintained.

Fish friendly turbines

The impact of turbines on fish can be reduced and minimised by using certain adaptations to the turbine geometry and their mode of operation. Fish-friendly turbines are designed to reduce or eliminate factors injuring the fish like blade strikes, fish getting stuck between the blades and the housing, flow shear, velocity and pressure gradients.

In low-pressure plants the mortality or damage rate depends on the diameter of the rotor and the distance between the rotor blades, rotation speed and pressure differences during turbine passage.

Behaviour barriers are also increasingly being used. These are facilities that produce a stimulus for fish (repulsive or attractive), which helps prevent the fish from entering the turbines: electrical screens, bubble screens, sound screens, fixed/mobile screens, light screens, surface guide walls, Louvre screens. However, in Europe majority of these technologies has not proven efficient yet.

Behaviour barriers can also supplement physical barriers. Sufficiently fine screens can protect the majority of fish species (at least adults). Along with the screens, the redirection of the downstream migrating animals to a fish pass allowing them to overcome safely the transverse barrier can be considered. But it is important to note that the density of screens also affects the water flow to the turbine which can significantly reduce the efficiency of the turbine and generation of electricity. Fine screens can also cause injuries of fish squeezed on them, depending on the inflow velocity.

Fish electric guidance and deterrence could be also used. For example acoustic deterrence water guns offer a method to deter aquatic species using underwater sound/pressure waves. The water gun technology can be operated both in static and mobile applications, depending on the fisheries´ needs and resource settings. Sound source and output pressure can vary and is determined by the water gun chamber size and the applied air pressure.

Fischpass Gars on the Inn River, Austria

In 2015, VERBUND constructed 4 **fish ladders** at the Inn power plants of Feldkirchen, Neuötting, Teufelsbruck and Gars at a total investment of 9.7 Mio.€. Different construction methods were used to meet site specific requirements. The fish ladders offers domestic fish, such as Danube salmon, greyling, barb and nase, as well as other aquatic organisms, the possibility to circumnavigate the power plants.

The fish ladder concept was agreed in advance with the nature conservation authority, the Rosenheim water management board, the local fishing association and fishing industry experts. A number of artificial ox bows, spawning grounds, rebuilt river training structures, etc. have been implemented. The planning and implementation phase was fully supported by local authorities and NGOs.

A **scientific fish monitoring** following the next 10 years is expected to confirm the positive effect on the fish population in the river Inn but it has been found that the Danube salmon is once again spawning in the nature like fish pass around Gars. This is a major success for such a rare and threatened species.

S**turgeon 2020: A Strategic programme for the Sturgeon in the Danube**

Sturgeons constitute an important part of the natural heritage of the Danube River Basin and the Black Sea. They serve as **excellent indicators of good water and habitat quality**. Today four out of the six species are critically endangered, one is considered vulnerable and one is extinct. All are **now protected under the EU Habitats Directive**

In June 2011, the EU Strategy for the Danube Region (EUSDR) set as one of its targets (PA6 target) to '*secure viable populations of Danube sturgeon species and other indigenous fish species by 2020'.* A '**Danube Sturgeon Task Force'** (DSTF) was created a year later in January 2012 to determine how to work together towards achieving this target. It brought together sturgeon experts, NGO delegates, and representatives of the ICPDR, the Danube Strategy and national government.

One of the Task Force's first actions was to draw up a "Sturgeon 2020" programme, to act as a framework for concerted action. The "**Sturgeon 2020" Programme** is a living document and its success depends on the long-term commitment and the implementation power of the countries concerned, since it requires complex cooperation between governments, decision makers, local communities, stakeholders, scientists and NGOs.

One obvious vehicle for taking the measures forward proposed under the Sturgeon 2020 Programme is the Danube River Basin Management Plan (DRBMP) and its Joint Program of Measures. The 2Nd draft DRBMP, updated in 2015, sets as one of its visions and management objectives '*that anthropogenic barriers and habitat deficits do not hinder fish migration and spawning anymore – sturgeon species and specified other migratory species are able to access the Danube River and relevant tributaries. Sturgeon species and specified other migratory species are represented with self-sustaining populations in the DRBD according to their historical distribution".*

The following are amongst the identified measures to be implemented in order to reach this management objective:

- **Specification of number and location of fish migration aids** and other measures to achieve / improve river continuity, which will be implemented by 2021 by each country.
- Specification of location and extent of measures for the improvement of river morphology through restoration, conservation and improvements, which will be implemented by 2021 by each country.
- **Avoidance of new barriers for fish migration** imposed by new infrastructure projects; unavoidable new barriers will incorporate the necessary mitigation measures like fish migration aids or other suitable measures already in the project design according to BEP and BAT.
- **Closing the knowledge gaps** on the possibility for sturgeon and specified other migratory species to migrate upstream and downstream through the Iron Gate I & II dams including habitat surveys, based on progress achieved on this issue. If the results of these investigations will be positive the respective measures should be implemented and step by step a similar feasibility study will be performed for the Gabcikovo Dam and in case of positive results also for the Upper Danube.

According to the DRBMP, by 2021, **140 fish migration aids** are planned to be constructed in the River Basin (120 have already been constructed since the first DRBMP.) These should ensure the migration of all fish species, including sturgeons, and age classes according to best available techniques. **Around a further 330 measures to restore river continuity interruptions** are planned to be implemented after 2021 (WFD Article 4(4)).
http://www.dstf.eu

3.4 Dealing with existing hydropower having a negative effect on a Natura 2000 site

The Natura 2000 permit procedure under Article 6.3 of the Habitats Directive does not in principle apply to existing hydropower plants, unless there is a proposal for plan or project to modernise or renovate the existing facilities. If this renovation work is likely to have a significant negative impact on the Natura 2000 site then it will need to go through an appropriate assessment before it can be approved. **However, existing hydropower facilities located within Natura 2000 sites must still conform to the provisions of Article 6.1 and Article 6.2 of the Habitats Directive.** In addition, the WFD objectives and obligations ensure that the existing facilities are also subject to measures to mitigate their impact on the aquatic ecosystem.

This means there is a legal obligation for Member States to investigate the threats and pressures brought about by the presence of the hydropower facilities on the species and habitat types for which the site has been designated and, if they are deemed to be causing the further decline or degradation of the conservation condition of the EU protected species and habitats present below the level when the site was designated, then necessary remedial measures will need to be implemented to stop this decline or degradation.

More specifically, **Article 6.2 imposes an obligation of non-deterioration of the site as compared to the state it was in when it was first designated**. This means that Member States should take all appropriate actions which it may be reasonably expected to take, to ensure that no deterioration or significant disturbance of species occurs. This applies to both man made and natural deterioration or significant disturbance. This also means that the Member State should have the knowledge on the state of the Natura 2000 site when it was designated (see page 68 for details)

Article 6.2 is applicable also to activities that do not require prior authorisation. Thus, if an already existing activity in a Natura 2000 site causes deterioration of natural habitats or disturbance of species for which the area has been designated, then the necessary conservation measures must be implemented as foreseen under article 6.1. This may require, if appropriate, bringing the negative impact to an end either by stopping the activity or by taking mitigating measures.

This is supported by the *Owenduff* Case (C-117/00)[31] where the Court of Justice ruled that Article 6.2 was infringed because measures had not been adopted to prevent deterioration, in an SPA, of the habitats of the species for which the SPA was designated. Several CJEU Cases[32] have further clarified the type of legal protection regime that needs to be put in place for the purposes of Articles 4.1 and 4.2 of the Birds Directive and Article 6.2 of the Habitats Directive. They stress in particular the need for the legal regime to be specific, coherent and complete, capable of ensuring the sustainable management and the effective protection of the sites concerned (C-293/07).

The Court also identified infringements in cases where the regime in place was *'too general and did not concern specifically the SPA or the species that live in it'* (C-166/04), measures taken were *'too partial, isolated measures, only some of which promote*

[31] *see also C-75/01, C-418/04, C-508/04*
[32] *See also Cases C-166/97, C-96/98, C-57/89, C-44/95, C-75/01, C-415/01, C-6/04, C-508/04, , C-241/08, C-491/08, C-90/10*

conservation of the bird populations concerned, and so did not constitute a coherent whole' (C-418/04), or SPAs were submitted to *'heterogeneous legal regimes which did not confer on the SPAs a sufficient protection'* (C-93/07). The Court also considered that purely administrative measures or voluntary measures were not sufficient for the purposes of Article 6.2 (C-98/06).

Article 6.1 further requires Member States to take positive conservation and remedial measures that are necessary to maintain or restore habitat types and species for which the site has been designated in line with the site's conservation objectives. Although not obligatory, the Habitats Directive encourages nature authorities to elaborate Natura 2000 management plans in close cooperation with local stakeholders and land owners concerned to identify the threats and pressures on each Natura 2000 site and to determine the necessary conservation measures that need to be implemented.

For sites where existing hydropower plants are degrading or deteriorating the condition of the aquatic ecosystem the site management plans are a useful tool for analysing the exact nature and magnitude of the problems caused by the hydropower facility and for identifying the right kind of conservation measures that are needed to remedy these. Good communication of hydropower operators with authorities and/or bodies in charge of management planning is essential and can lead to the inclusion of such measures which both benefit the conservation objectives and the hydropower operation.

The conservation measures under Article 6 for existing hydropower plants in Natura 2000 sites, as far as they relate to water related objectives, should also be integrated into the Programme of Measures within the RBMP.

Conserving the Freshwater Pearl Mussel in Ireland's sub-river basins

The freshwater pearl mussel *Margaritifera margaritifera* is one of the longest-living invertebrates on earth. Owing to its complicated life history and its need for near natural, clean flowing waters, it is a key biological indicator species for the quality of river ecosystems. The species is protected under the EU Habitats Directive but is in an unfavourable state throughout Ireland. Sedimentation or sedimentation with nutrient enrichment have been identified as the main causes.

In 2009, national legislation was developed to support the achievement of favourable conservation status for the Freshwater Pearl Mussel. This legislation set **obligatory environmental quality objectives for freshwater pearl mussel habitats within Natura 2000** sites. It also required that **sub-basin management plans (SBMP)** be prepared **along with a programme of measures.** The purpose of these plans was to **address the catchment-wide issue**s that are contributing to the species decline. The format used mirrored that of the river basin management plans under the WFD in order that the SBMPs can operate under the umbrella of the RBMPs later on.

In Ireland, the close linkages between the Habitats and Birds Directives, and the Water Framework Directive (WFD) were highlighted at an early stage. In 2009, the National Technical Co-ordination Group (NTCG) for the Water Framework Directive established a subcommittee - **the National Conservation Working Group (**NCWG), - to work on the **development of nature conservation aspects of the WFD**. The core objective of the Group was to ensure that activities in relation to nature conservation aspects of the Water Framework Directive were **well co-ordinated and supported** within Ireland and to facilitate effective communication between the relevant government agencies involved.

In relation to the sub-basin plans for the freshwater Pearl mussels the Group played a key role in refining and further developing **a national set ("toolkit") of standard catchment measures for freshwater pearl mussels** that are practical, functional and cost effective. It also reviewed the plans to ensure their practicality and effectiveness, and identified policy and guidance gaps, which would hinder their implementation.

National Framework Strategy for Migratory Fish in France

France's rivers host eleven species of diadromous fish that migrate long distances between the sea and freshwater to complete their complex lifecycles. Many are protected under the EU Habitats Directive, such as European sturgeon, the Atlantic salmon, the Allis shad, and the river lamprey in view of their precarious state. But, despite the efforts undertaken to conserve these species over the years, they all remain in an unfavourable condition in France, and elsewhere in the EU.

Recognising the scale of the problems facing these species in France, the Ministry for Ecology and Sustainable Development launched **a national strategy for the conservation of migratory fish species** in 2010. Designed as an evolving framework strategy, it sets a number of overall targets and objectives that can be adjusted over time in function of the species ability to recover.

Because of the large number of different administrations and stakeholders implicated, or potentially affected by, the conservation, use and restoration these migratory fish, a major effort was made right from the start to **associate everyone in the development of the strateg**y so that they endorsed the overall approach taken and were ready to contribute to its implementation. The Framework Strategy was formally adopted in 2010 by the Ministry of Sustainable Development and endorsed by all those involved.

There are seven **river basin management plans** in metropolitan France (known as *Schémas directeurs d'amenagement et de gestion des eaux,* SDAGE). The latest plans for 2015 have recently been adopted and several **propose an important number of measures to improve the migratory species present as defined in the national strategy.**

A **national plan for the restoration of river continuity**, adopted in 2010 is also playing an important role in the implementation of the national strategy for migratory species. It is built on five pillars:

- Create an **national inventory** of the 60,000 obstacles that have important repercussions for the functioning of the aquatic ecosystem
- **Define priority areas** for intervention at the level of each of the river basins (in line also with the Plan Grenelle for a green and blue infrastructure)
- Revise the programmes of the Water Agencies to **liberate the necessary finances for implementing the restoration works** in priority areas
- **Mobilise the services of the water police** within the framework of a multiannual programme of controls on those obstacles that are the most disruptive for fish migration.
- **Evaluate the environmental benefits** of the restoration measures and ensure a close surveillance of their impacts

Referenciel des obstables a L'ecoulement: une cartographe nationale des obstacles sur les cours d'eau ; http://www.eaufrance.fr/referentiel-des-obstacles-a-l

4. APPLYING AN INTEGRATED PLANNING APPROACH TO HYDROPOWER GENERATION

4.1 The benefits of integrated planning

The requirement to increase the production and use of energy from renewable sources and reduce greenhouse gases in line with the objectives of the EU Renewable Energy Directive represents a significant driver for the development and use of hydropower and other sources of renewable energy. At the same time, Member States must also meet the objectives of the Water Framework Directive and the EU Nature Directives in terms of ensuring that Europe's water bodies reach a good status (or potential), and that EU protected species and habitats achieve a favourable conservation status across the EU.

This challenging task is best achieved through a strategic and integrated planning approach linked to the National Renewable Action Plans, River Basin Management Plans and the conservation objectives of Natura 2000 sites. The 2nd CIS Workshop on the EU WFD and hydropower held in Brussels 2011 recommended adopting a strategic approach to hydropower generation in view of its many advantages [33].

A strategic planning approach:

- is a key opportunity to facilitate the integration of water, nature and energy policy objectives as well as the objectives of other key policy areas;
- It allows linking strategic planning for the aquatic environment and nature conservation with the national energy planning on renewable electricity;
- It allows for the involvement of all interested parties which can reduce potential conflicts afterwards together with securing the projects;
- Using the planning process helps setting priorities (e.g. with respect to balancing energy, nature and water management priorities);
- Good strategic planning can help streamline the authorisation process on proposed new hydropower developments and improve transparency and predictability for hydropower developers;
- Strategic planning allows for the proper assessment of best environmental options and overriding public interest of the project;
- The approach provides upfront information to developers about where (geographically) gaining authorisation is likely to be possible as it allows the identification of the most suitable and less suitable areas;
- Using the policies and criteria established can help to manage risk of cumulative impacts from hydropower plants;
- The river basin management planning process provides an opportunity to integrate a strategic planning approach for hydropower development with water environment objectives, taking also into account the conservation objectives of the Natura 2000 sites involved.

[33] Conclusions of 2nd CIS Workshop on the EU WFD and hydropower held in Brussels 2011 https://circabc.europa.eu/sd/a/23d94d2d-6b9c-4f17-9e15-14045cd541f3/Issue%20Paper_final.pdf

EU Water Directors Statement on Hydropower development under the WFD, 2010[34]

In 2010 the EU's Water Directors endorsed a statement on 'Hydropower development under the WFD'[35] summarising the key principles and recommendations agreed during the Common Implementation Strategy process (CIS). This Statement was mainly based on elements of the CIS Policy Paper on WFD and Hydro- morphological pressures[36], the CIS Guidance Document No. 20 on Exemptions to the Environmental Objectives[37] and the Conclusions of the 1st CIS Workshop on WFD and Hydropower[38].

- Pre-planning mechanisms allocating "no-go" areas for new hydro-power projects should be developed. This designation should be based on a dialogue between the different competent authorities, stakeholders and NGOs.
- In order to minimize the need for new sites, the development of hydropower capacities could be supported by the modernisation and the upgrading of existing infrastructures.
- The development of hydropower should be accompanied by an improvement of water ecology, through clear ecological standards for new facilities, or for existing facilities through their modernisation as well as the improvement of operation conditions. New hydropower plants should for example all have fish passages and they should respect a minimum ecological flow.
- An analysis of costs and benefits of the project is necessary to enable a judgment on whether the benefits to the environment and to society preventing deterioration of status or restoring a water body to good status are outweighed by the benefits of the new modifications. This does not mean that it will be necessary to monetise or even quantify all costs and benefits to make such judgment.
- The size of the project is not the relevant criteria to trigger Article 4.7. The relevant approach is to assess if a given project will result in deterioration of the status of a water body. Thus, projects of any size may fall under article 4.7.

The EU Blueprint to Safeguard Europe's Water Resources, adopted in 2012, also stresses the importance of strategic integrated planning: .. *in the context of Article 4.7, .. hydropower deserves specific attention …refurbishing and expanding existing installations should be given priority over new developments which should be underpinned by* ***a strategic assessment at the river basin scale, selecting optimal locations in terms of energy production and lower environmental impact****.*

[34] WD meeting, Segovia, 27-28 May 2010

[35] Final Synthesis of Informal meeting of Water and Marine Directors of the European Union, Candidate and EFTA Countries, Segovia, 27-28 May 2010. https://circabc.europa.eu/w/browse/6414c39b-3d08-433a-8e00-0d20bcb249ad

[36] Common Implementation Strategy for the Water Framework Directive 2006: WFD and Hydro-morphological pressures - Policy Paper. December 2006. https://circabc.europa.eu/sd/a/3dac5b10-1a16-4a31-a178-2f5401f30c50/Final%20Hydromorphology%20Policy%20paper.pdf

[37] Common Implementation Strategy for the Water Framework Directive 2009: Guidance Document No. 20 on exemptions to the environmental objectives. Technical Report - 2009 – 027. https://circabc.europa.eu/sd/a/2a3ec00a-d0e6-405f-bf66-60e212555db1/Guidance_documentN%C2%B020_Mars09.pdf

[38] Key Conclusions, Common Implementation Strategy Workshop on WFD & Hydropower, Berlin, 4-5 June 2007. https://circabc.europa.eu/w/browse/062ef598-2126-4e76-a481-cfa68a28435c

The integrated strategic planning approach is equally important when dealing with developments that may affect Natura 2000 sites as it will enable the planners to take specific account of these objectives, as well as those of the WFD and any other EU laws at an early stage in the planning process when more options are available.

It is clear that such an integrated planning process requires a more substantial initial investment for the public authorities concerned but all evidence to date shows that, in the long run, it can deliver substantial benefits for all concerned – be it for the energy sector, the WFD objectives, the N2000 objectives or other interests. Often these far exceed the initial extra investment required.

Strategic integrated planning should take place on several different levels and stages of the planning process. It should be used in particular when:

- **Selecting the type of renewable energy source** that aims to achieve the objectives of the RES Directive while offering the best option for the environment. A situation can arise where an alternative source of renewable energy, for instance wind power or the introduction of greater energy efficiency measures, is capable of delivering the same results as hydropower in terms of energy generation but with a lower impact on the environment. This search for alternative solutions is enshrined in both the Art 4.7 WFD exemptions procedure and in the Article 6 Appropriate Assessment procedure under the Habitats Directive but is equally important during the strategic planning phase or when establishing national/regional renewable energy plans. To note that Article 6 assessments must be undertaken of both plans and projects (see chapter 5);

- **Identifying the most suitable locations** for hydropower generation that are potentially appropriate from both an energy and an environmental perspective. At the same time it helps to identify areas where there is a high risk of significant impacts and where, as a consequence, there is little chance of obtaining a permit under the Article 4.7 WFD exemptions procedure or the Article 6 Appropriate Assessment Procedure under the Habitats Directive. Developing such risk assessments or biodiversity sensitivity maps early on in the planning process can help avoid or reduce the number of potential site-specific conflicts at a later stage in the development process, when financial resources have been committed and there is less room for manoeuvre. It also provides developers with a more transparent and stable regulatory environment which offers them greater certainty over the likely success of their planning application.

- **Choosing whether to renovate already existing hydropower schemes or developing new hydropower facilities**. As stated before many factors have to be taken into consideration such as the state of the water body under the WFD and HDB and the objectives in terms of reaching the target of GES or FCS. The river assessments and Natura 2000 conservation objectives also help reveal the extent to which the river can absorb further developments in a way that prevents the deterioration of the water body or avoids adversely affecting the integrity of one or more Natura 2000 sites.

- **Selecting the most appropriate project design** that takes account of the potential impacts already from the outset and builds into the initial design plan a series of mitigation measures that eliminates, or at least reduces, the final impact of the project on the aquatic environment and on Natura 2000 in particular. The old-fashioned way of developing a plan or project, be it for hydropower or for any other interests, is to first design the plan or project for its purpose and then, later on, to consider wider environmental and other use issues. However, this often results in potential conflicts

being taken into consideration at a relatively late stage in the planning process, at a time when there is less room for manoeuvre. In practice, it also means that project or plan developers have little interaction with experts from the environmental sector before the project is submitted for an appropriate assessment.

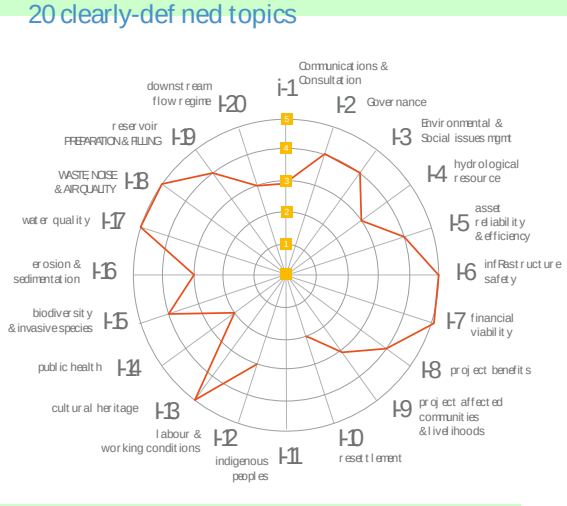
When the design concept is already so far progressed, the environmental impact assessment often becomes an exercise in damage limitation and, even though all the rules governing such assessments, including those under the Habitats Directive were followed thoroughly, there is no guarantee of success. This traditional approach to project or plan design can also lead to long discussions with planning authorities, other interest groups and NGOs during the public consultation phase which can, in turn, cause significant delays to the planning process and incur additional costs.

Recognising these difficulties, more and more infrastructure planners are now adopting a more integrated approach to project planning and design, one that considers both the infrastructure and the ecological needs of the site at the outset and factors these into the initial project design, together with other land uses of the river. This also promotes a more interactive and transparent planning process and encourages the active assistance and input from ecologists and other stakeholders from the beginning.

The Hydropower Sustainability Assessment Protocol

Hydro4LIFE project, run by the International Hydropower Association (IHA), aims to help support the implementation of a Hydropower Sustainability Assessment Protocol within the EU. The Protocol proposes a **methodology** to measure the performance of a hydropower project across twenty environmental, social, technical and economic topics. It provides **a common language** to allow governments, civil society, financial institutions and the hydropower sector to talk about, and **evaluate, sustainability issues**. The Protocol is the result of intensive work by the Hydropower Sustainability Assessment Forum, a global multi-stakeholder body with representatives from social and environmental NGOs, governments, banks and the hydropower sector.

Assessments cover all stages of the project: Early Stage, Preparation, Implementation and Operation. Each project is given a score from 1 to 5 (5 being proven best practice) for each one of the 20 topics. **One of the topics concerns biodiversity and invasive species.** During the project preparation phase particular attention is paid to ecosystem values, habitat as well as specific issues such as threatened species and fish passage in the catchment, reservoir and downstream areas, and potential impacts arising from invasive species associated with the planned project.



http://www.hydrosustainability.org/Protocol/The-Protocol-Documents.aspx

ICPDR Sustainable Hydropower Development in the Danube Basin: Guiding Principles

In 2010, the Ministers of the Danube countries asked for Guiding Principles to be developed on integrating environmental aspects in the use of hydropower in order to ensure a balanced and integrated development, dealing with the potential conflict of interest from the beginning. The Guiding Principles were elaborated in the frame of a broad participative process, with the involvement of representatives from administrations (energy and environment), the hydropower sector, NGOs and the scientific community. They were adopted by the ICPDR in 2013. They set out the following key recommendations.

General principles for sustainable hydropower development

1) Hydropower development needs to respect the principles of sustainability, taking into account environmental, social and economic factors in an equally balanced way.
2) Renewable energy generation like hydropower should be part of a holistic approach of energy policies (National Energy Plan, including Renewable Energy Action Plans). Untapped renewable energy potential, energy saving and increase of energy efficiency are important elements that should be considered in this approach.
3) In order to ensure a sustainable hydropower development and to weigh the different public interests in a balanced way, national/regional hydropower strategies should be elaborated based on these basin-wide Guiding Principles. These strategies should consider the multifunctional use of hydropower infrastructure (e.g. flood control, water supply, etc.) and impacts (including cumulative ones) on the environment.
4) Weighing the public interests on national/regional level has to be done in a transparent, structured and reproducible way based on criteria and relevant information, involving public participation in an early stage of the decision making process.
5) Renewable energy production as such is not being regarded as overriding public interest in general in relation to other public interests. A hydropower project is not automatically of overriding public interest just because it will generate renewable energy. Each case has to be assessed on its own merits according to national legislation.
6) The role of citizens and citizens‘ groups, interested parties and non-governmental organisations whose interests are being affected by a certain hydropower project, is crucial to optimise planning processes and to develop a common understanding and acceptance in the practical implementation of new hydropower projects.
7) Hydropower development has to take into account effects of climate change on the aquatic ecosystems and water resources (resilience of river habitats, quantity of flow, seasonal changes of flow, ...).

Technical upgrade of existing hydropower plants and ecological restoration

8) Technical upgrading of existing hydropower plants should be promoted to increase the energy production. These types of improvements represent the most environmental friendly actions in relation to environmental objectives (EU WFD, etc.).
9) The technical upgrading of existing hydropower plants should be linked to ecological criteria for the protection and improvement of the water status and promoted as well as financially supported by means of incentives or eco-labels by national energy strategies and instruments.
10) The combination of technical upgrading with ecological restoration of existing hydropower installations implies a win-win situation for energy production on the one side as well as for the improvement of the environmental conditions on the other side.

Strategic planning approach for new hydropower development

11) A strategic planning approach (linked to the Renewable Energy Action Plan and the River Basin Management Plan) is recommended for the development of new hydropower stations; this approach should be based on a two level assessment (including lists of recommended criteria), the national/regional assessment followed by the project specific assessment. This approach is in line with the prevention and precautionary principle as well as the polluter pays principle.
12) In a first step those river stretches are identified where hydropower development is forbidden by national or regional legislation/agreements (exclusion zones). In a second step all other stretches will be assessed using the assessment matrix and classification scheme (Figure 14 and 15).
13) The national/regional assessment is an instrument for administrations in the process of directing new hydropower stations to those areas where minimum impacts on the environment are expected. This can be achieved by an integration of hydropower production and ecosystem demands as well as by supporting decision making through clear and transparent criteria, including aspects of energy management as well as environment and landscape aspects. Danube-basin wide or transborder aspects need to be taken into account where appropriate.
14) The national/regional assessment is beneficial and provides gains for both, the environment and water sector but also for the hydropower sector by increasing predictability of the decision making process and making transparent where licences for new projects are likely to be issued.
15) While the assessment on national/regional level is more of general nature, classifying the appropriateness of river stretches for potential hydropower use, the project specific assessment provides a more detailed and in-depth assessment of the benefits and impacts of a concrete project in order to assess whether a project is appropriately tailored to a specific location. The assessment on the project level is carried out in response to an application for issuing the licence for a new hydropower plant and therefore especially depends on the specific project design.
16) Current and new policy developments, in particular the implementation of EU legislation and the EU Danube Strategy, should be reflected accordingly.
17) In order to support hydropower in the most sustainable way, incentive schemes for new hydropower projects should take into account the results of the strategic planning approach and adequate mitigation measures.

Mitigation of negative impacts of hydropower

18) Mitigation measures have to be set to minimize the negative impacts of hydropower installations on aquatic ecosystems. If foreseen by national legislation losses of hydropower generation from existing HPPs due to the implementation of mitigation measures may be compensated.
19) Ensuring fish migration and ecological flows are priority measures for the maintenance and improvement of the ecological status of waters.
20) Other mitigation measures like improving sediment management, minimising negative effects of artificial water level fluctuations (hydropeaking), maintaining groundwater conditions or restoring type specific habitats and riparian zones are important for riverine ecology and wetlands directly depending on aquatic ecosystems and should therefore be considered in the project design, taking into account most cost effective measures and security of electricity supply.

https://www.icpdr.org/main/activities-projects/hydropower

4.2 Integrated national or regional hydropower plans

Enacted at national, regional or local levels depending on the laws in place in each country, spatial plans enable different demands on the land to be examined across a broad geographical area so that an integrated sustainable development strategy can be drawn up that searches for synergies, and minimises conflicts, wherever possible.

It also provides for a more balanced development framework because it enables wider societal and environmental concerns to be taken into account early on in the planning process. This tends to lead to a more predictable and stable planning framework for all concerned which should help reduce the risk of difficulties and delays at later stages, for instance at the level of individual projects. In addition, it encourages different economic sectors, interest groups and the general public to become engaged through public consultation, thereby ensuring greater transparency in the decision making process.

Spatial planning, and indeed sectoral planning, is therefore an important tool for the industry. In the case of hydropower energy generation, a number of countries have developed specific hydropower plans at national or regional level to decide on future developments in function of demand and opportunities. In addition, all Member States are required to elaborate National Renewable Energy Plans under the RES Directive in order to decide the most appropriate mix of renewable energy measures for a particular country or region in terms of meeting the RES targets.

Both types of plan not only enable an analysis of projected needs for different types of renewable energies, including hydropower generation, but also provide an opportunity to take into account wider socio-economic considerations (RBMP or N2000) at an early and strategic stage in the planning process.

4.3 Wildlife sensitivity maps and zoning

Land use or sectoral plans usually cover a broad geographical area. This scale, combined with the spatial nature of the plans, enables strategic decisions to be made about the capacity and location of hydropower developments over a broad area, whilst taking into account the multifunctional role of the rivers and their potential environmental impact. In this context, one of the most effective ways of avoiding or minimising potential conflicts with Natura 2000 sites is to identify locations along a river that are considered suitable for hydropower and then to overlay this on a map showing the nature conservation interests of the river -eg protected sites such as Natura 2000 sites, or migratory routes for EU protected species.

Wildlife sensitivity maps are useful tools in helping to locate hydropower developments in areas that are most likely to be compatible with nature conservation requirements and away from those where there is a high risk of significant impacts and where the various environmental permit procedures, be they under the WFD, Habitats Directive or EIA Directive, will necessarily be more onerous and less likely to give a positive outcome.

Sensitivity maps can be developed for selected categories of species (e.g. fish species of European importance) or particular types of habitats or protected areas over a pre-determined area. It is important that the mapping is based on the best available data and information and that the criteria for selection are transparent and clear for all concerned (and eventually subject to public consultation).

The other significant advantage of wildlife sensitivity maps over larger scales is that they help pre-empt any potential conflicts with Articles 5 of Birds Directive and 12&13 of Habitats Directive. As explained in chapter 1, these provisions aim to ensure the protection of species of European Importance across their entire natural range in the EU, irrespective of whether they are in a Natura 2000 site or not. Hydropower developers or planners must therefore be able to demonstrate that they have taken the necessary precautions to avoid compromising this species protection regime.

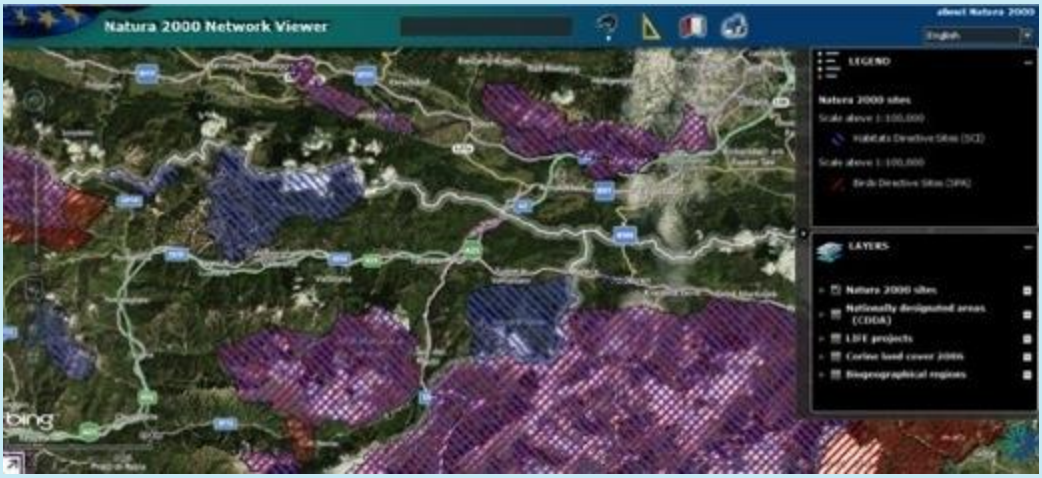
Once hydropower maps and wildlife sensitivity maps have been developed they can be overlaid and different stretches of the river can be allocated to one or more of the following broad categories:

- Favourable zones - those areas that show good hydropower potential (also in terms of upgrading existing facilities) but where there is a low risk of conflict with nature conservation interests – eg on a heavily modified water body of low ecological interest and or where there are no Natura 2000 sites or EU protected migratory species.

- Less favourable areas –where there is some risk of conflict with one or more Natura 2000 sites or EU protected species along the river;

- Non-favourable areas – where there is a high risk of conflict with one or more Natura 2000 sites or EU protected species along the river. These areas are best avoided because it will be very difficult or impossible to meet all the conditions of the Article 6 permit procedure under the Habitats Directive and the exemptions procedure under Article 4.7 of the WFD.

THE NATURA 2000 VIEWER: a useful tool for developers
http://natura2000.eea.europa.eu/



The Natura 2000 viewer is an on-line GIS mapping system that enables developers to locate and explore each Natura 2000 site in the EU Network. The sites can be examined at a very fine scale (1:500). This shows the boundaries of the site and its main landscape features at a very high resolution. For each site, a Standard Data Form (SDF) can be downloaded which lists the species and habitat types for which it was designated, as well as their estimated population size and conservation status on the site, and the importance of that site for the species or habitat type.

However, it should be noted this can only provide a broad orientation of areas of potentially high (where new developments are best avoided altogether), medium- (where mitigation measures may be possible), and low risk (where the impact is expected to be limited or low). As such they are not a substitute for Environmental Impact Assessments (EIA) or Appropriate Assessments (AA) at project level. These may still need to be undertaken for individual hydropower development projects.

Comprehensive species surveys within the EIA or AA at individual site level will be able to determine more precisely for each site which specific nature values and risks of impact are likely. In this context, the strategic level maps can already help to indicate the required level of assessment that would be needed for more detailed and stringent baseline studies at individual project level.

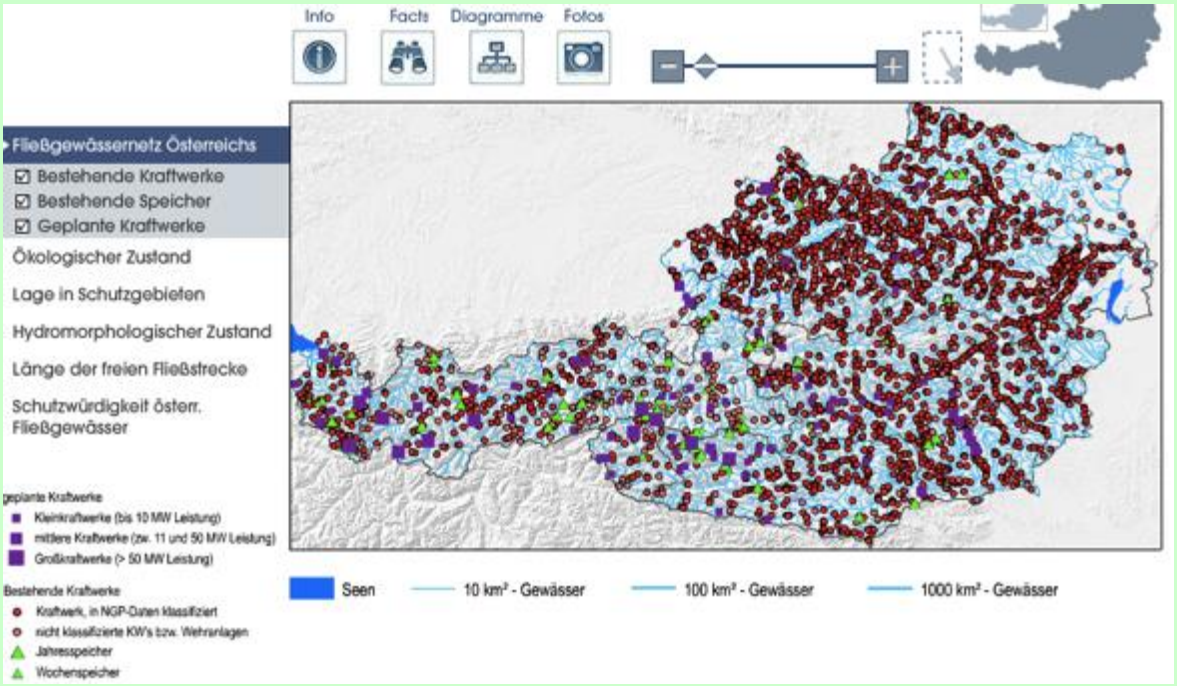
An eco master plan mapping tool for Austria's rivers - WWF

For WWF Austria it is important that future hydropower developments follow a strategic approach so that the remaining significant, sensitive and intact stretches of river can be safeguarded. WWF is not opposed to hydropower as such provided it is done in an ecologically sustainable manner. To support this, WWF has prepared an eco-masterplan in order to provide a technically sound decision basis for assessing the need to protect the Austrian waters, (WWF Ökomasterplan , 2009).

The study which was published in 2009 provided, for the first time, and assessment of the ecological significance of 53 of the largest rivers in Austria with a catchment area larger than 500 square kilometers (catchment area> 500 km2). This study also presents the official data of the actual status analysis of the Ministry responsible for the implementation the EU WFD and conservation-related information, such as Natura 2000 sites and other protected areas. Each of the water stretches was categorized and prioritized in order of importance according to different selection criteria (for example, ecological status, situation in protected areas, hydromorphology, length of contiguous free flow path)

Thus, each river stretch was ranked according to the following sensitivity classes :

- Sensitivity Class 1: very high merit protection based on the ecological status
- Sensitivity class 2: very high merit protection due to the situation in reserve (s)
- Sensitivity class 3: highly deserving of protection on the basis of morphology
- Sensitivity class 4: highly worthy of protection due to the length of the contiguous free flow path
- Sensitivity Class 5: potentially worthy of protection as data base for safe environmental condition assessment is missing
- Sensitivity class 6: potentially worthy of protection
- Sensitivity Class 7: low merit of protection
- Sensitivity Class 8: existing energy economic use
- Data deficient (ecological status , hydromorphology)



http://www.oekomasterplan.at/home.html

Planning instruments to balance hydropower development and restoration of aquatic environments in France

In 2008, The French Ministry of Ecology, Sustainable Development and Energy held a round table discussion on how to further develop sustainable hydropower in compliance with the restoration of the aquatic environment in France. Two objectives had to be achieved: the generation of an additional 3TWH in terms of annual production by 2020 and the achievement of good status on 66% of surface water bodies by 2015.

After extensive discussions with local elected authorities, hydropower producers, the national committee for professional freshwater fishing and a number of NGOS, the Ministry signed an agreement containing four key objectives:

- To support hydropower through an on-going process of shared research into environmental integration, monitoring and controls;
- To modernise and optimise existing plants by working towards an effective implementation of the regulations concerning the raising of the minimum flow by January 2014 and the introduction of obligatory fish passes. Further, any renewal of concessions should be accompanied by measures to improve both the energy and environmental performance of the plant;
- To remove the most problematic obstacles to ecological continuity which have been identified in the national programme and to implement these restoration schemes with the help of funds from water supply agencies;

- To develop a 'high environmental quality' hydropower development scheme with minimum effect on the environment. Construction of new plants must be sought and identified preferentially in areas where few environmental stakes exist and avoid areas of rich biodiversity (eg no go rivers and continuity rivers).

In respect of the latter, the government has, between 2012 and 2015, adopted two lists of protected rivers to ensure compliance with the WFD. The first list contains no-go rivers or preserved rivers where the construction of any new obstacle cannot be authorised and existing dams must ensure ecological continuity at the moment their licence is renewed. The second list contains rivers where continuity restoration on existing dams is a priority. On these rivers, existing dams must be adjusted within 5 years to ensure both up- and downstream fish migration and a sufficient transfer of sediments.

In the case of List 1 the following criteria are applied: high status rivers (eg in Natura 2000), diadromous migratory fish rivers (also often in Natura 2000) and biological reservoirs. Together they represent around 25-30% of the watercourses in France. The selection of rivers for the 2Nd List is based on: other diadromous migratory fish rivers, rivers at risk of failing the environmental objectives due to hydromorphological pressure and efficient functioning of biological reservoirs as determined in the RBMP. Together, they represent around 10% of the watercourses.

The identification of potential areas for new hydropower under the regional Renewable Energy Plans is based mainly on hydropower data and on compatibility with lists 1 and 2 which identifies areas that are considered appropriate, less appropriate or not appropriate.

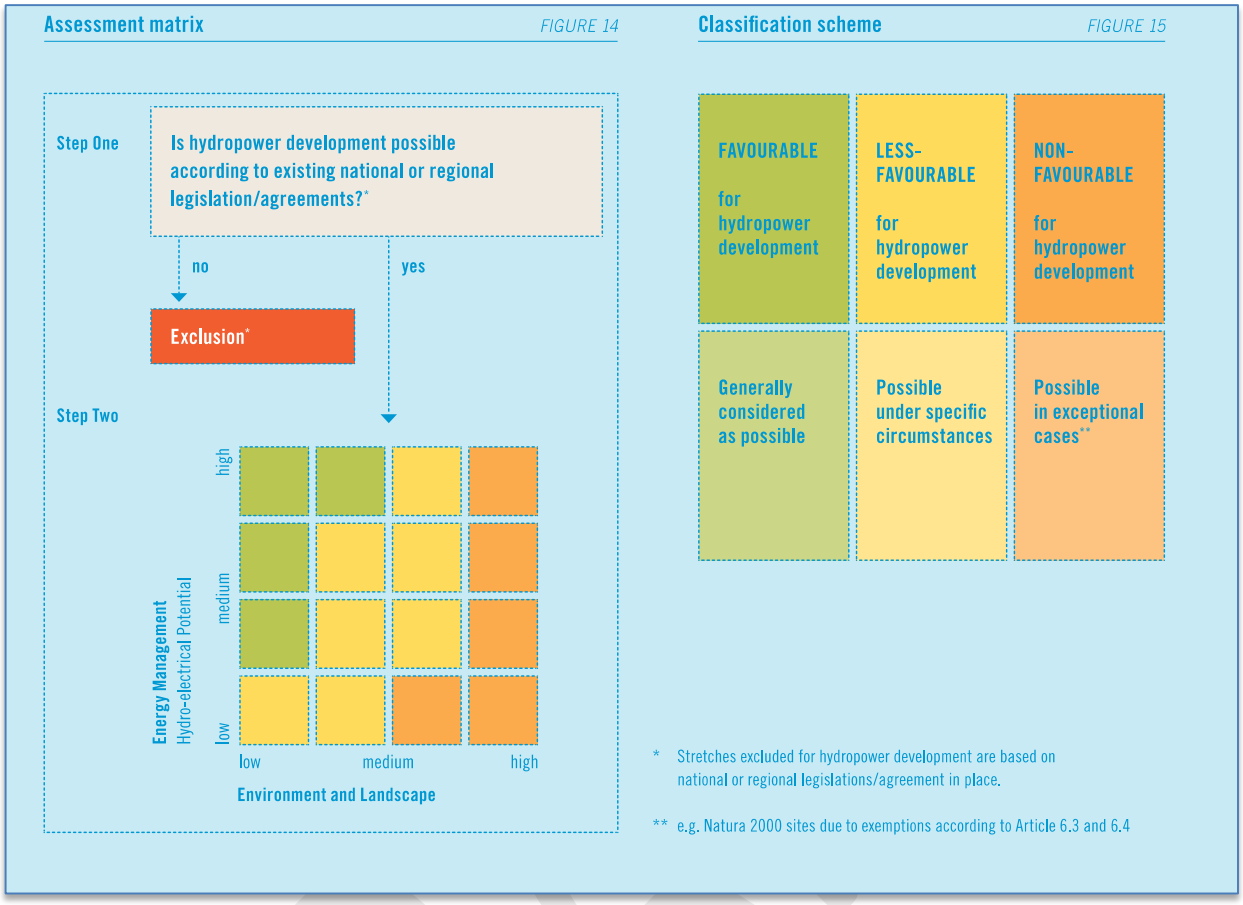
Source **https://www.icpdr.org/main/activities-projects/hydropower**

ICPDR recommendations for National/Regional assessment and criteria

The ICPDR guiding principles recommend a two step process for strategic zonal planning of hydropower generation at a national or regional level. As a first step, river stretches should be identified where hydropower development is forbidden according to relevant international, national or regional legislation/agreements (exclusion zones).

In a second step, all other stretches should be assessed using a predetermined classification scheme based on agreed criteria (Figure 14 and 15). It is important that the assessment on national/regional level is technically feasible and based on data and information possible to be acquired on this level.

The resulting matrix provides a decision support tool to provide a balanced achievement of energy and environmental objectives. This weighing process should be carried out by the competent authority for the national/regional level within each Danube country in the frame of a public participation process. The results should also feed into the River Basin Management Plans and the Renewable Energy Action Plans.



4.4 Early consultation

Early consultation with environmental stakeholders, and indeed all stakeholders, is important in ensuring that acceptable and sustainable solutions are found. It is equally important in reaching a common understanding of the issues at stake and to foster a co-operative search for solutions, especially if the ecological impacts of a project prove not to be amenable to conventional mitigation approaches.

Often, conflicts have stemmed from a failure to involve environmental stakeholders early enough in the planning procedure resulting in lengthy and costly delays. Ideally, stakeholders and the wider public should participate in all stages of project or plan development. Participation is especially important in the project or plan definition phase and in the process of working out realistic alternative solutions for problematic areas.

European legislation and procedures are not very specific about the requirement for public consultation and participation and usually envisage formal steps for public consultation only after completion of environmental impact studies and submission of plans of projects for approval. But, this should not prevent planners and developers from making their own arrangements for organising the process of public consultation from as early on as possible.

The general objectives of any public participation strategy should be to:

- Ensure a transparent planning and decision-making process of the infrastructure plan or project and an openness as regarding all relevant information and data;

- Raise awareness about the overall plan or project objectives and related issues;
- Gain public support for the planning process and for project or plan implementation;
- Integrate key stakeholders in the planning phase to create an atmosphere of mutual trust and respect, and thus facilitate the public acceptance and successful implementation of the plan or project.

In practice the following are particularly important for ensuring a successful stakeholder consultation and participation process:

- **Timing of public participation:** Stakeholder involvement should begin in the earliest stages of a plan or project so that environmental information can be used in the consideration of alternatives for design, location and financial arrangements. Stakeholder consultation should continue throughout the environmental assessment process and the plan or project's cycle.

- **Identifying relevant interest groups:** Identification of the relevant interest groups or stakeholders is critical to successful public involvement, whether it concerns a policy, plan, program (e.g. sectoral or regional) or project. Analysis of the social composition of the society in which the plan or project is planned will also help ensure that all relevant social actors or stakeholders are identified and included in consultation. In addition, social analysis will identify local values, organisational structures and approaches to communication, negotiation and decision making.

- **Choosing the right form of communication and consultation:** Public involvement can range from simple dissemination of information to consultation and through to full participation in decision making:
    - *Informing:* one-way flow of information from proponent to public.
    - *Consulting*: two-way flow of information between proponent and public, giving the latter an opportunity to express views.
    - *Participating:* two-way flow of information and ideas in which the proponent and the public are involved in shared analysis and agenda setting and the public is voluntarily involved in decision making on project design and management through consensus on the main elements. It should be noted that good public participation processes go beyond simply introducing formal consultation procedures. They enable stakeholders who are participating to also provide technically qualified and relevant contributions.
      The level of public involvement required for a specific plan or project will vary according to the social and political context. A participation matrix can be drawn up for each of the main stakeholder groups to help determine the appropriate degree of participation. The matrix also can be used as a systematic tool for defining roles and responsibilities of a stakeholder and identifying areas of potential disagreement between groups.
    - "*Ownership" and commitment*: Early consultations with potentially affected groups can improve the environmental information supplied to decision makers (e.g. through identification of environmental impacts or the design of suitable mitigation measures), and help minimize potential conflicts and delays. In addition, genuine efforts to provide the public with information and respond to suggestions or concerns helps prevent miss understandings and can result in more widely accepted projects with a greater sense of local ownership.

Undoubtedly, public consultation and participation can be time-consuming and demanding, but when used positively they can improve a plan or project, reduce antagonism and enhance the potential for long-term success.

Strategic planning and collaborative working at catchment level in England

The Catchment Based Approach (CaBA) embeds collaborative working at a river catchment scale to deliver cross cutting improvements to our water environments. Community partnerships, bringing local knowledge and expertise, are active in each of the 100+ Water Framework Directive catchments across England, including those cross border with Wales. More than 1500 organisations are engaged with CaBA nationwide including NGOs, Water Companies, Local Authorities, Government Agencies, Landowners, Angling Clubs, Farmer Representative Bodies, Academia and Local Businesses.

The CABA partnerships drive cost-effective practical delivery on the ground, resulting in multiple benefits including improvements to water quality, enhanced biodiversity, reduced flood risk, resilience to climate change and greater community engagement with their local river. Partnerships provide a catalyst to attract additional funds and to date some have levered up to 8 times the initial investment.

A number of research projects have now been able to demonstrate that an empowered catchment area partnership comprised of diverse stakeholders and technical specialists from in and around a catchment, can be responsible for coordinating the planning, funding and delivery of good ecological health for that river and its catchment. They have also shown that an integrated stakeholder-driven assessment of a catchment can help develop a comprehensive understanding of the challenges and, following this, to develop a strategic, targeted, balanced and therefore cost-effective catchment management intervention plan.

http://www.catchmentbasedapproach.org/

5 THE PERMIT PROCEDURE UNDER THE HABITATS DIRECTIVE

5.1 Introduction

EU nature legislation requires that any plan or project that is likely to have a significant negative effect on one or more Natura 2000 sites undergoes an appropriate assessment (AA) in accordance with Article 6.3 of the Habitats Directive.

This chapter provides a step-by-step guide on undertaking the appropriate assessment in the context of hydropower plans and projects in particular. Because Natura 2000 concerns Europe's most valuable and endangered habitats and species, it is logical that the procedures for approving developments likely to have a significant negative effect on these sites are sufficiently rigorous to avoid undermining the overall objectives of the Birds and Habitats Directives.

Particular attention is therefore given to the need for decisions to be taken on the basis of sound scientific information and expertise. Delays in the approval process are very often caused by poor quality AA that does not allow the competent authorities to make a clear judgement on the impacts of the plan or project.

It is also important to avoid confusion over the environmental assessments carried out under the EIA and SEA Directives, the exemptions procedure under Article 4.7 of the WFD Directive and the AA carried out under Article 6.3 of the Habitats Directive, as described in this chapter. Whilst these assessments are very often carried out together, each assessment has a different purpose and assesses impacts on different aspects of the environment. **They cannot therefore replace, or be a substitute for, an AA.**

Article 6.3
Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.

Article 6.4
If, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, the Member State shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted.

As stated in chapter 1, the focus of the AA is on species and habitat types protected by the Birds and Habitats Directives, and in particular those species and habitats for which the Natura 2000 site has been designated. An AA under Article 6.3 is therefore narrower in scope than an assessment under WFD, EIA and SEA Directives, being confined to implications for Natura 2000 sites in view of their conservation objectives.

The outcome of each assessment procedure is also different. In the case of the EIA or SEA assessment, the authorities have to take the impacts into account. For the AA and the WFD, **the outcome is legally binding** for the competent authority and conditions its final decision. Thus, if the AA has ascertained that there will be an adverse effect on the integrity of the Natura 2000 site, despite the introduction of mitigation measures, then the plan or project can only be approved if the conditions foreseen under Article 6.4 are met.

5.2 When is the Article 6 procedure required?

The procedural and substantive safeguards that must be applied to any plan and project likely to have a significant effect on a Natura 2000 site(s) are laid down in Article 6 of the Habitats Directive. This procedure is designed to:

- Assess the implications of a plan or project that is likely to have a significant effect on a Natura 2000 in view of the site's conservation objectives;
- Ascertain whether these implications will adversely affect the integrity of the site;
- Provide a derogation mechanism for approving plans and projects that have an adverse effect if they are considered to be necessary for imperative reasons of overriding public interest and if no less damaging alternative solutions exist. In such case compensatory measures must be taken to ensure the overall coherence of Natura 2000 is protected.

Several terms are used in article 6(3) to define when an appropriate assessment is required. It is required for if all of the following criteria are met:

- concerns a plan or a project;
- which is likely to have a significant effect on at least one Natura 2000 site;
- alone or in combination with other plans or projects;
- but which is not directly connected with the conservation management of the site.

The directive does not define the scope of the term "plan" or a "project" by reference to particular categories. Instead, the key defining factor is whether or not they are likely to have a significant effect on a site. The term "project" should therefore be given a broad interpretation to include both construction works and any other interventions in the natural environment[39]. It also concerns projects that aim to upgrade or modernize an existing hydropower if it is deemed this might have a significant effect on a Natura 2000 site.

As regards its geographical scope, the provisions of Article 6.3 are not restricted to plans and projects carried out exclusively in a Natura 2000 site; they also target developments situated outside Natura 2000 sites but which are likely to have a significant effect thereon. Just because a proposed development is not within the boundary of a Natura 2000 site, this does not exclude it from requiring an appropriate assessment under Article 6(3).

[39] European Court of Justice Ruling C-127/02.

The trigger for such an assessment is not based on whether it is likely to have a significant effect on a Natura 2000 site and its conservation objectives. For instance a project located upstream of a Natura 2000 site may still cause negative effects to the site located downstream as a result of water flow disruptions or barriers to species migration. In such cases, the project would still need to be assessed according to the Article 6(3) procedure.

This includes the consideration of any likely transboundary effects. If a plan or project in one country is likely to have a significant effect on Natura 2000 site in a second country, either individually or in combination with other plans or projects, then an appropriate assessment must be undertaken which assesses, inter alia, the effects on the integrity of Natura 2000 sites in that second country. This is in line with the Espoo Convention which is implemented within the EU through the EIA and SEA Directives. As those directives cover plans or projects that are likely to require an assessment pursuant to Article 6(3) of the Habitats Directive, it follows that transboundary effects must also be studied in the context of appropriate assessments undertaken under the Habitats Directive.

As stated above the effects need to be determined in function of the species and habitat types for which a particular site has been designated. This will influence how far from the project area one should look for possible effects. For instance, a Natura 2000 protected for a plant which only occurs under very specialised conditions may only be affected by projects in the immediate vicinity whereas a migratory species which has wider habitat requirements may be affected by plans or projects further afield.

Guidance Document "Streamlining environmental assessment procedures for energy infrastructure 'Projects of Common Interest' (PCIs)

Like all other development projects, hydropower is subject to a number of environment assessment procedures. The Commission has issued guidance[40] on how to streamline these various procedures, in particular for Projects of Community Interest (PCIs) under the Ten-T Regulation, whilst at the same time ensuring the maximum level of environmental protection in accordance with EU environmental law.

The Commission guidance makes a series of recommendations, which, although designed with PCIs in mind, are also relevant for all energy plans or projects, including hydropower developments. The recommendations focus in particular on:

- Early planning, "roadmapping" and scoping of assessments;
- Early and effective integration of environmental assessments and of other environmental requirements;
- Procedural co-ordination and time limits;
- Data collection, data sharing and quality control;
- Cross-border co-operation, and
- Early and effective public participation.

http://ec.europa.eu/energy/infrastructure/pci/doc/20130724_pci_guidance.pdf

5.3 A step-by-step procedure for carrying out appropriate assessments

The procedure laid out in Articles 6.3 must be carried out in sequential order. Every step determines whether a further step in the process is required. For instance if, after the screening, it is concluded that there will be no negative effects on the Natura 2000 site, then the plan or project can be approved without the need for further assessment.

The steps are as follows (see diagram):

- Step one: screening – this initial step is to determine whether a plan or project has to undergo an appropriate assessment or not. If it is likely to have a significant negative effect on a Natura 2000 site, then an appropriate assessment is required.

- Step two: appropriate assessment – once it has been decided that an AA is required, a detailed analysis must be undertaken of the potential impacts of the plan or project, alone or in combination with other plans or projects, on the integrity of Natura 2000 site(s) in view of its conservation objectives.

- Step three: decision making - If the appropriate assessment concludes that there is an adverse effect on integrity of the site and these cannot be mitigated against then the competent authorities will need to refuse the plan or project.

Article 6.4 provide for certain derogations to this general rule. Thus, if it is concluded that the plan or project will have an adverse effect on a Natura 2000 site, it can still be approved under exceptional circumstances provided the conditions of Article 6.4 are met.

It is clear from the above that this decision-making process is underpinned by the precautionary principle. The emphasis is on objectively demonstrating, with reliable supporting evidence, that there will be no adverse effects on the Natura 2000 site.

Step one: Screening

The first step in the Article 6.3 procedure is to determine whether or not an AA is actually needed, i.e. if a plan or project is **likely** to have a significant effect on a Natura 2000 site. If it can be determined with sufficient certainty that the plan or project is **not** likely to have a significant effect, either individually or in combination with other plans or projects, then it can be approved without further assessment.

However, if there is any doubt, an AA must be undertaken so that these effects can be studied in full. This was confirmed by the ECJ in the Waddensea ruling (C- 127/02) in which the Court concluded that: "*the environmental protection mechanism provided for in Article 6.3 does not presume that the plan or project considered definitely has significant effects on the site concerned but follows from the mere probability that such an effect attaches to that plan or project. In case of doubt as to the absence of significant effects such an assessment must be carried out, this makes it possible to ensure effectively that plans or projects which adversely affect the integrity of the site concerned are not authorised, and thereby contributes to achieving, the overall objectives of the Habitats Directive.*"

The reasons for the final decision as to whether or not to carry out an AA should be recorded and sufficient information should be given to justify the conclusion that has been reached.

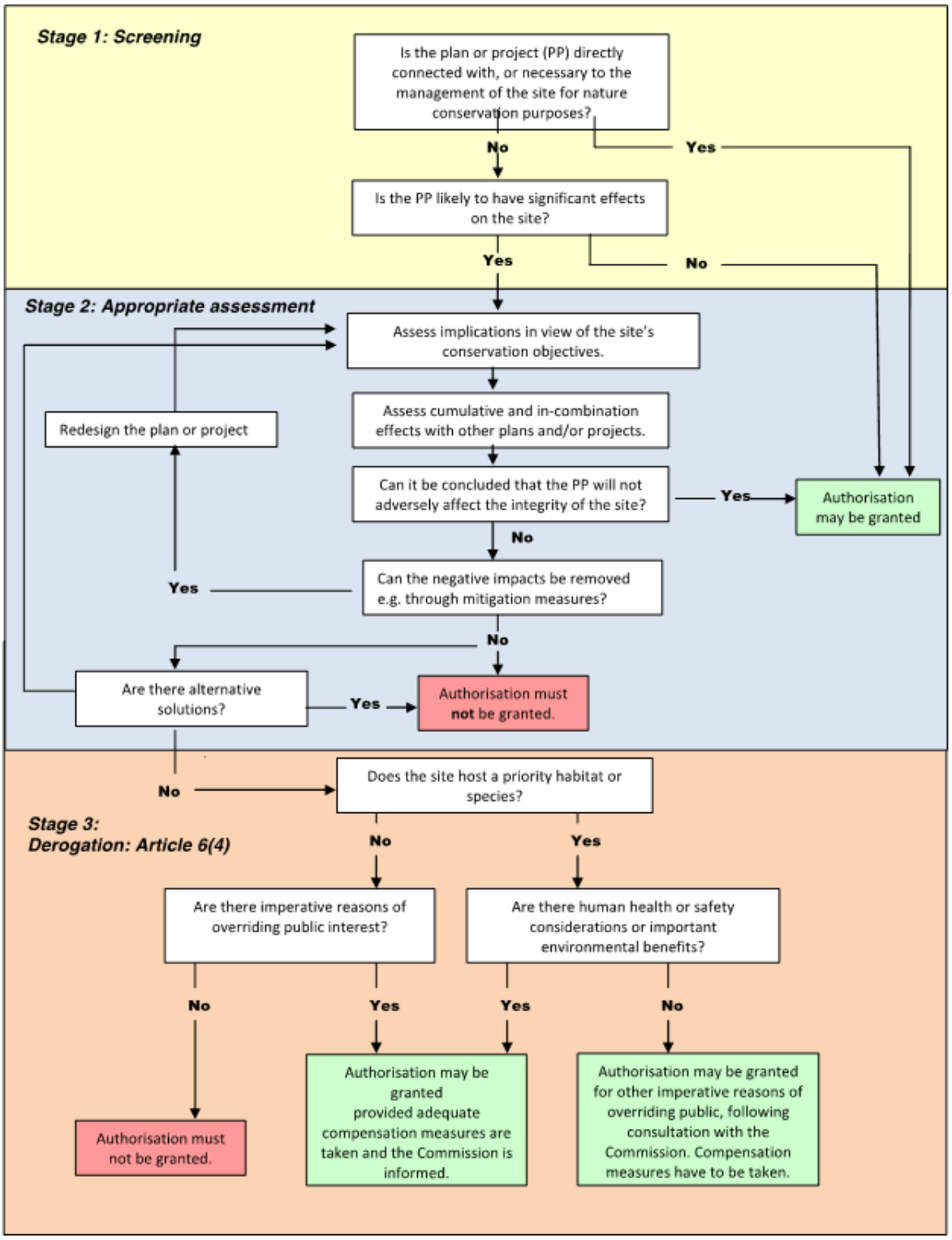


Figure 6: Flow chart of Article 6.3 and 6.4 procedure (based on European Commission methodological guide)

Environmental Permit for Hydropower Scheme

The UK government has introduced an electronic application form - called the "Environmental site audit checklist for hydropower schemes" - for hydropower plants in order to assist with the screening of potential projects at a pre planning stage. The checklist also helps the applicant to identify the information that needs to be sent to the competent authorities so that they can fully assess the impact of the proposed hydro electric scheme and provides them with an opportunity to seek initial advice on the planned project. This may help to avoid time and resources being spent on projects that have poor chances of obtaining a permit.

Applicants are specifically asked to complete a checklist containing questions on:

1. Water abstraction and flow management
2. Conservation
3. Water quality
4. Biodiversity and fisheries
5. Managing flood risk
6. Navigation

2 Conservation

For further information, see our advice note on:
Water Framework Directive, nature conservation and heritage

	Yes	No
Is the scheme within, or likely to affect, a Site of Special Scientific Interest (SSSI)? (See note 2a)		
Is the scheme within, or likely to affect, a Special Area of Conservation (SAC)? (See note 2b)		
Is the scheme within, or likely to affect, a Special Protected Area (SPA)? (See note 2c)		
Is the scheme within, or likely to affect, a national nature reserve? (See note 2d)		
Is the scheme within, or likely to affect, a local nature reserve? (See note 2d)		
Is the scheme within an Area of Outstanding Natural Beauty (AONB)? (See note 2e)		
Is the scheme within a national park? (See note 2f)		
Is the scheme likely to affect any waterfall, public footpath, heritage feature or conservation area? (See note 2g)		
Have formal ecological surveys been carried out on the site? (See note 2h)		
Does the scheme take account of protected species that may live at the site or nearby? (See note 2i)		

The government has also issued a series of guidance documents to help developers with applications for run of the river hydropower schemes. These documents explain

- how the UK Environment Agency regulates hydropower;
- the environmental issues to consider;
- advice on how to design a scheme;
- how to apply for the necessary permits and licenses

https://www.gov.uk/government/publications/wr325-hydropower-schemes-environmental-site-audit-checklist
https://www.gov.uk/government/publications/good-practice-guidelines-to-the-environment-agency-hydropower-handbook

Appropriate Assessment of Plans

Appropriate assessments are also required for plans and programmes, for instance national or regional hydropower plans or Renewable Energy Action Plans. The European Court of Justice confirmed that Article 6(3) of the Habitats Directive must also be applied to land- use plans likely to have a significant effect on a Natura 2000 site[41]

An appropriate assessment of a plan or programme will of course be at a more strategic level but the process is essentially the same as for projects. Thus, the appropriate assessment should consider the effect of the plan or programme on the integrity of the Natura 2000 sites, alone and in combination with other plans or projects.

The comprehensiveness of the assessment work undertaken should be proportionate to the geographical scope of the plan and the nature and extent of any effects identified. However, sufficient information must be obtained to allow the appropriate assessment to be carried out. This may require additional surveys. The underlying aim at all times is to avoid or remove any foreseeable adverse effect on the integrity of Natura 2000 sites, or to remove any reasonable grounds for concern that such an adverse effect may occur. If the plan changes significantly at any time before adoption, the changes should be also addressed in the appropriate assessment.

A key benefit of carrying out appropriate assessments at a plan level is that it can pre-empt any potential conflicts with Natura 2000 sites later on, when it comes to assessing the impacts of individual projects by, for instance, zoning activities away from Natura 2000 sites. It also requires those involved to consider less damaging solutions to meet the plan's objectives at a very early stage in the planning process and encourages them to develop a more integrated and holistic approach to hydropower development.

Step two: Appropriate Assessment

Once it has been decided that an AA is required, such an assessment will need to be carried out before the competent authority makes its decision on whether or not to authorise the plan or project (according to the Judgment of the Court C-127/02[42]). As stated above the purpose of the AA is to assess the implications of the plan or project on the site in view of its conservation objectives, either individually or in combination with other plans or projects.

The term "appropriate" essentially means that the assessment needs to be appropriate to its purpose under the Birds and Habitats Directives, i.e. that of safeguarding species and habitat types listed under the two directives. "Appropriate" also means that the assessment has to be a reasoned decision. If the report does not include a sufficiently detailed assessment of the effects of the Natura 2000 site or does not provide enough evidence to draw clear conclusions as to whether or not the site's integrity is adversely affected then the assessment does not fulfil its purpose and cannot be considered "appropriate" for the purposes of Article 6.3.

[41] . ECJ ruling on case C-6/04, Commission v. United Kingdom, 20 October 2005.
[42] *Judgment of the Court C-127/02 - Waddenvereniging and Vogelsbeschermingvereniging*

This has been confirmed by the European Court of Justice which has ruled that "*the appropriate assessment should contain complete, precise and definitive conclusions capable of removing all reasonable scientific doubt as to the effects of the works proposed on the site concerned*" (Commission/Italy, C-304/05).

The Court also emphasised the importance of using **best scientific knowledge** when carrying out the AA in order to enable the competent authorities to conclude with a sufficient degree of certainty that there will be no adverse effects on the site's integrity. In this respect it considered that "*all the aspects of the plan or project which can, either individually or in combination with other plans or projects, affect those objectives must be identified in the light of the best scientific knowledge in the field*." (C-127/02, Para 54).

Because of the specialised nature of the AA, it is strongly recommended that the assessment be based on analyses carried out by suitably qualified ecologists.

The appropriate assessment report should in particular:

- Describe the project or plan in sufficient detail for members of the public to understand its size, scale and objectives;
- Describe the baseline conditions and conservation objectives of the Natura 2000 site;
- Analyse the interaction between those characteristics of the project and the ecological requirements of the HABITATS AND SPECIES in order to identify the adverse effects of the project or plan on the Natura 2000 site;
- Explain how those effects will be avoided or mitigated;
- Set out a timescale and identify the mechanisms through which the mitigation measures will be secured, implemented and monitored
- Contain a reference list of all sources of information.

Finally, it should be noted that, whilst it may be the project proponent who undertakes or commissions the AA, it is the competent authorities' responsibility to ensure that the AA has been carried out correctly and is capable of objectively demonstrating, with supporting evidence, that there will not be any adverse effects on the integrity of the Natura 2000 site, in light of its conservation objectives.

Assessing effects in light of the site's conservation objectives

After having read this below paragraph, I would change the order saying that, based on the SDF we should normally have now CO against what we carry out the APPROPRIATE ASSESSMENT. In case there is no CO, then the SDF is the "reference" for not deteriorating.

As stated above, the assessment should assess the possible implications for the site of the plan or project in view of the site's conservation objectives. At a minimum level the conservation objective will be to prevent the species and habitats for which the site was designated from deteriorating further.

The conservation value of the site at the time of designation is recorded in a **Standard Data Form** (SDF). This provides the site's formal identification code, its name, location and size, and detailed map. It also records the ecological characteristics of the site which led to its designation as a Natura 2000 site and provides a broad assessment of the conservation condition of each species or habitat type on that site (scored A to D).

However, the overall objectives of the Habitats and Birds Directives go beyond simply preventing further deterioration. They aim to ensure that EU protected species and habitat types reach a favourable conservation state across their natural range in the EU. Thus more ambitious conservation objectives may be required to *restore* and *improve* the conservation condition of the EU protected species and habitat types present on that site under Article 6.1.

Where more ambitious conservation objectives have been set, then the impacts of the plan or project must be measured against these more ambitious objectives. For instance, if the objective is to restore the population of kingfisher to a certain population level within 8 years, it has to be assessed if the plan or project will prevent this conservation objective from being realised, and not merely whether the kingfisher population will remain stable.

It is recommended that the project planner consults with the competent authorities responsible for the Natura 2000 sites as early as possible to find out about the Natura 2000 site, its conservation objectives and the conservation condition of the habitat types and species for which it is designated. They will also be to indicate if there are more detailed sources of information available on this – for instance a management plan adopted for the site or monitoring reports and studies about the conservation condition of the species and habitat types concerned within that region, or country.

Natura 2000 Standard Data Form
The Standard Data Forms which have been compiled for each site contain information about the surface area, representativity and conservation status of the habitats present in the site, as well as the global assessment of the value of the site for the conservation of the natural habitat types concerned. For the species present in the site, information is provided on their populations, status (resident, breeding, wintering, migratory) and on the site's value for the species in question.

Conservation status of habitats and species
According to the provisions of Article 17 of the Habitat Directive, the EU 25 Member States (i.e. excluding Romania and Bulgaria) reported, in 2008, on the conservation status of all the species and habitats listed in the annexes of the Habitats Directive which occur in their territory. On the basis of this, the Commission produced a consolidated report on the conservation status of each species and habitat type at a biogeographical and EU level. These reports provide useful contextual information[123]

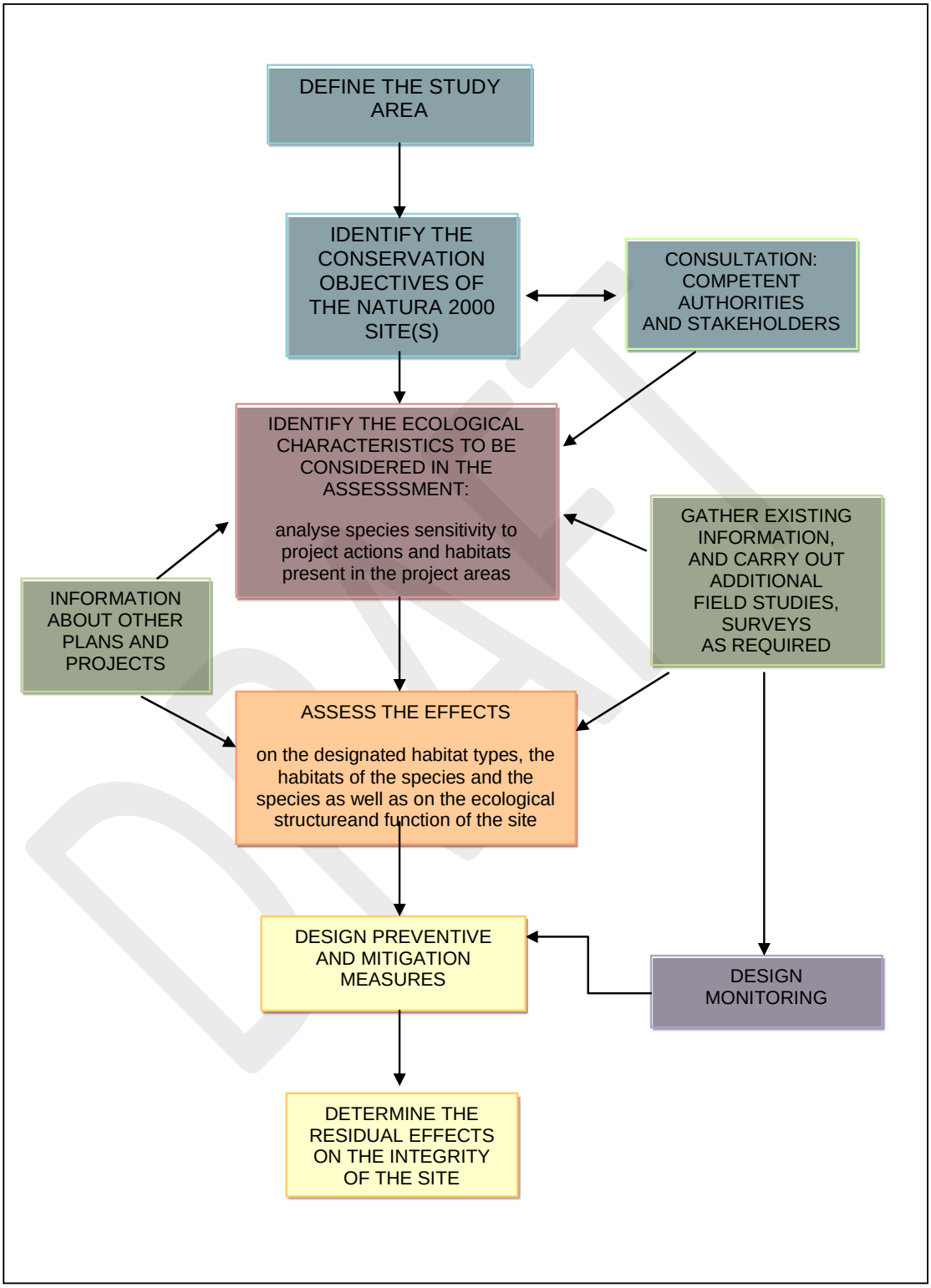
Natura 2000 Management plans
Some sites have a Natura 2000 management plan with important elements such as the conservation objectives for the site, the species and habitats, theirs status, threats, etc, which can be useful for the screening stage and for the Appropriate Assessment.

Collecting the necessary information for the AA

Gathering all the necessary information on both the project and the Natura 2000 site is an important first step of the AA. This is usually an iterative process. If the first identification and analysis reveals that there are important gaps in knowledge, then further baseline ecological and survey field work may be necessary to supplement existing data. As stated before it is important that the AA is **based on the best scientific knowledge in the field** and is capable of removing all reasonable scientific doubt as to the effects of the works proposed on the site concerned.

Detailed surveys and fieldwork should focus on those target features that are sensitive to the project actions. Sensitivity should be analysed taking into account the possible interactions between the project activities (nature, extent, methods, etc.) and the habitats and species concerned (location, ecological requirements, vital areas, behaviour, etc.).

Steps to be undertaken as part of the appropriate assessment



European Commission, 2014

Any field studies must be sufficiently robust and long-lasting to take account of the fact that ecological conditions may vary significantly according to the seasons. For instance, undertaking a field survey on a species for a few days in winter will not capture their habitat usage during other more important periods of the year (e.g. during migration or breeding).

Consulting with nature authorities, other scientific experts and conservation organisations early on will help ensure that as complete a picture as possible is built up about the site, the species/habitats present and the type of effects to be analysed. They can also offer advice on the updated scientific information that is available on the site and its EU protected species and habitat types (including Natura 2000 management plans) and on what additional baseline studies and field surveys may be needed in order to assess the likely impacts of the project. Other stakeholders such as conservation NGOs, research institutions or local organisations may also be able to provide further local knowledge and ecological information useful for the AA.

Identifying negative impacts

Once all of the necessary baseline data has been gathered, the assessment of the implications of the plan or project on the Natura site can be undertaken. The description of potential negative impacts of hydropower facility projects as described in Chapter 4 should help to identify the type of effects to look out for.

It is evident that the effects of each project will be unique and must be evaluated on a case-by-case basis. This is in line with the ECJ Waddensea ruling: "*in assessing the potential effects of a plan or project, their significance must be established in the light, inter alia, of the characteristics and specific environmental conditions of the site concerned by that plan or project*."

The first step is to identify which target features (ie EU protected species or habitats for which the site has been designated) within each site could be potentially affected and should be subject to further assessment. This is important as every species and habitat type has its own ecological lifecycle and conservation requirements. The impacts on each will also vary from one site to another depending on their conservation state and the underlying ecological conditions of that particular site. For each effect identified, the assessment should also look at the magnitude of the impact, type of impact, extent, duration, intensity and timing.

The AA also involves looking at all aspects of the plan or project that could have implications for the site. Each aspect of the plan or project should be examined in turn (eg not just the dam to be built but also any new access roads that are foreseen to the hydropower plant) and the potential effects of that aspect should be considered in relation to each of the species or habitat types for which the site has been designated Thereafter, the effects of the different features should be looked at together, and in relation to one another, so that the interactions between them can be identified.

Whilst the focus should be on the species and habitats of EU interest that have justified the site designation, it should not be forgotten that these target features also interact with other species and habitats, as well as with the physical environment in complex ways. It is therefore important that all the elements considered essential for the structure, functioning, and dynamics of the river ecosystem are examined as any alteration could also have a negative effect on the habitat types and species present.

Impacts should be predicted as precisely as possible, and the basis of these predictions should be made clear and recorded in the AA (this means also including some explanation of the degree of certainty in the prediction of effects). As with all impact assessments, the AA should be undertaken within a structured framework to ensure that the predictions can be made as objectively as possible, using quantifiable criteria wherever possible. This will also facilitate the task of designing mitigation measures that can help remove the predicted effects or reduce them to a non- significant level.

Finally, when assessing the potential impacts it is important to bear in mind that these can also appear during any one of the phases of the hydropower development from the initial construction phase to the actual operation and management and, on to the re- powering or decommissioning phases. As a result, the impacts may be temporary or permanent, on-site or off-site, cumulative and may come into play at different times during the project cycle.

Predicting the likely impacts can be complex as one needs a good understanding of ecological processes and conservation requirements of particular species or habitat types likely to be affected. It is therefore recommended that the necessary expert advice and scientific support is secured when carrying out the AA.

Commonly used methods for predicting impacts:

The AA should also apply the best available techniques and methods to estimate the extent of the effects.

- Direct measurements, for example of areas of habitat lost or affected, proportionate losses from species populations, habitats and communities.
- Flow charts, networks and systems diagrams to identify chains of impacts resulting from direct impacts; indirect impacts are termed secondary, tertiary, etc. impacts in line with how they are caused. Systems diagrams are more flexible than networks in illustrating interrelationships and
- Quantitative predictive models to provide mathematically derived predictions based on data and assumptions about the force and direction of impacts. Models may extrapolate predictions that are consistent with past and present data (trend analysis, scenarios, analogies which transfer information from other relevant locations) and intuitive forecasting. Normative approaches to modelling work backwards from a desired outcome to assess whether the proposed project will achieve these aims. Predictive modelling often plays an important role as the main impacts often follow from changing in hydromorphological structures resulting in changes in sedimentation regime with serious consequences for the underwater biota.
- Population level studies are potentially beneficial for determining population level effects of impacts to bird or bat or marine mammal species, for instance.
- Geographical information systems (GIS) used to produce models of spatial relationships, such as constraint overlays, or to map sensitive areas and locations of habitat loss. GIS are a combination of computerised cartography, storing map data, and a database-management system storing attributes such as land use or slope. GIS enable the variables stored to be displayed, combined, and analysed speedily.
- Information from previous similar projects may be useful, especially if quantitative predictions were made and have been monitored in operation.
- Expert opinion and judgment derived from previous experience and consultations on similar inland waterway development projects.

- Description and correlation: physical factors (e.g. water regime, current, substrate) may be directly related to distribution and abundance of species. If future physical conditions can be predicted then it may be possible to predict future developments of habitats and populations or responses of species and habitats on this basis.
- Capacity analyses involve identifying the threshold of stress below which populations and ecosystem functions can be sustained. It involves the identification of potentially limiting factors, and mathematical equations are developed to describe the capacity of the resource or system in terms of the threshold imposed by each limiting factor.

Adapted from: Methodological guidance on the provisions of Article 6.3 and 6.4 of the Habitats Directive

Assessing potential cumulative effects

As mentioned above, the cumulative effects must not be overlooked during the assessment; not only is this a legal requirement but it can also have major implications for the plan or project, as well as other subsequent plans or projects which are put forward in the same area.

A series of individually modest impacts may on their own be insignificant but when seen together they can lead to a significant impact. Article 6.3 addresses this by taking into account the combination of effects from other plans or projects. Article 6.3 does not explicitly define which other plans and projects are within the scope of the combination provision but it is clear that one should consider plans or projects which are completed, approved but uncompleted, or actually proposed.

It should be understood that, in considering a proposed plan or project, Member States do not create a presumption in favour of other similar, but as yet not proposed, plans or projects in the future. On the contrary, if one or more projects have already been approved in an area, this may lower the ecological threshold as regards the significance of the impacts for future plans or projects in that area.

For instance, if a hydropower facility within or around a series of Natura 2000 sites are submitted one after another, it could well be that the assessment of the first or second projects concludes that the projects will not adversely affect the Natura 2000, but then later projects may not be approved because their effects when combined with those of the previous projects becomes significant enough that the site's integrity will be adversely affected. In this context, it is important for hydropower projects are looked at strategically and in combination with each other over a reasonably larger geographical area, and not simply viewed as individual isolated projects.

In the context of assessing cumulative impacts, the information contained in the WFD RBMPs may be useful as it compiles information on all pressures and impacts on the aquatic environment at the level of the entire catchment .

Determining the significance of the effects

Once the effects have been identified (see also the Chapter 4.7), there needs to be an appraisal of their significance for the site and its target features. The following parameters can be considered when assessing significance:

- Quantitative parameters of the target feature: for instance, how much habitat is lost for that species or habitat type. For some the loss of even single units or small percentage areas of occurrence within a given Natura 2000 site (e.g. for priority habitat types and species) should be taken as being a significant impact. For others the significance threshold may be higher. Again it depends on the species and habitat types, their state of conservation in that site as well as their future prospects.

- Qualitative parameters of the target feature: independent of these quantitative parameters, the significance of the impacts should also take account of the quality of occurrence of the target feature, for instance it may be:
  - the only site in a particular region/ country where the target features is present (i.e. the target feature may be rather abundant in a given site but this is the only place where it occurs and is protected);
  - a site with an important occurrence of the species (e.g. a core area for the occurrence, larger areas of representative stands, etc.);
  - a site where the species is at the limit of its existing distribution range.

- Importance of the site from the point of view of the species´ biology e.g. site of reproduction (nesting places, spawning area, etc.); feeding habitat; sheltering possibilities; migration pathways.

- Ecological functions necessary for maintenance of target features as well as site integrity.

Where there is doubt or differences of opinion over the degree of significance, it is best to find a broader agreement amongst relevant experts, e.g. regional and/or national specialists in the affected target feature so that a consensus be built up over this.

Guidance on setting thresholds of significance in Germany

In Germany, as elsewhere, the assessment of significance of impacts on Natura 2000 target features, which is the core of the AA, used to be hampered by a high level of subjectivity. Because of this the competent authorities often did not have the reasonable scientific certainty they needed to underpin their decisions on whether or not to grant authorisation of a plan or project. It also left them open to legal challenges.

To address this problem and ensure a more uniform and consistent approach to the assessment of the impact significance in practice, the Federal Agency for Nature Protection (BfN) commissioned a research project to provide scientifically tested rules and conventions for all habitat types and species listed in of Birds and Habitats Directives occurring in Germany.[43] The resulting guidance document was published in 2007.

[43] Lambrecht H., Trautner J. (2007) Fachinformationssystem und Fachkonventionen zur Bestimmung der Erheblichkeit im Rahmen der FFH-VP – Endbericht zum Teil Fachkonventionen, Schlussstand Juni 2007. (Expert information system and expert rules for significance assessment within the framework of Appropriate Assessment – Final report part Expert rules, final status June 2007. In German.)

The starting premise for the guide is that any permanent loss of habitat types and habitats for species in a Natura 2000 site should be considered a significant impact. However, a certain level of loss could nevertheless be treated as insignificant for some habitat types and species under certain conditions.
The guide provides scientifically agreed thresholds and criteria for determining significance, which are based on qualitative as well as functional aspects – not just quantitative criteria.

Thus, for an impact to be considered insignificant all the following conditions must be met:

- Specific features of the given habitat/ habitat for species or key habitats of the typical species must remain unaltered,
- Tentative values of "quantitatively – absolute area loss" is not exceeded,
- Supplementary values of "quantitative – relative area loss" of 1 % is not exceeded,
- Cumulative effects with other projects does not lead to exceeding the above threshold values, and
- Cumulative effects with other factors do not occur.

For the 2nd indent, 7 size classes for habitats and 8 for species were developed, providing ranges in which the threshold values for every habitat type/species lie; 3 threshold degrees for each class were set.

In practice this means that for 21 of the 91 habitat types occurring in Germany, no loss is acceptable while for the remaining habitats some loss may be considered insignificant if it is scaled according to size classes and degrees. As for the 53 species from Annex II, no tentative threshold values exist for 16 of them, nor for 20 of the 98 Birds Directive species. In other words, no impact is likely to be acceptable. All these conclusions/ figures/ thresholds are intended to act as guidance only which means that a case-by-case approach within each AA is still required.

Since its publication, the guidance document has been successfully tested in the German courts and is now applied across the country providing both developers and authorities as well as NGOs, with a robust and consistent approach to the assessment of impacts and their significance levels.

http://www.bfn.de/0306_ffhvp.html

Scales used by experts licensed for AA in the Czech Republic

A practical issue is the scale used for evaluation of the significance of impacts during the AA. There is no prescription but based on long-lasting practical experience, the following scale has been recommended to be used by AA experts licensed by law in the Czech Republic [44]: Assessment of impact significance is to be carried out against each target feature of the given site. If the impact on even a single target feature is marked with "-2" it automatically means the site integrity is adversely affected and such a project must not be granted permit within the Article 6.3 procedure.

Value	Term	Description	Examples
-2	Significant adverse impact	**Significant adverse impact. Excludes plan/project implementation** Significant disturbance or destructive impact on habitat or species population or its substantial part; significant disturbance of ecological demands of the habitat or species; significant impact on the habitat or natural development of a species. Under certain conditions, the impact can be lowered by mitigation measures.	Disruption of migration routes to spawning places of anadromous species Destruction of habitat by inundation because of new dam Hydrological changes because of derivation significantly influencing population
-1	Moderately adverse impact	Limited/moderate/non-significant adverse impact **Plan/project implementation is not excluded.** Moderate troublesome impact to habitat or species population; moderate disruption of ecological demands of habitat or species; marginal impact on habitat or natural development of a species. Its elimination through mitigation measures is possible but application of mitigation measures cannot be enforced, unless national legislation asks differently.	Modernization – using fish-friendly technology, building fish passes on existing barriers Impact on margin parts of population Influence on habitat common in surrounding area
0	Zero impact	The plan/project has no demonstrable impact.	Outside area of occurrence
+1	Moderately positive impact	Moderate favourable impact on habitat or species population; moderate improvement of ecological demands of the habitat or a species; moderate favourable impact on the habitat or on the natural development of a species.	Reconstruction of peaking hydropower to run-of-river hydropower without weir or dam
+2	Significantly positive impact	Significant favourable impact on habitat or species population; significant improvement of ecological demands of habitat or a species, significant favourable impact on the habitat or natural development of a species.	Demolition of hydropower plant

[44] *This scale has been recommended to and used by experts licensed for AA by law in the Czech Republic since 2007 - http://www.mzp.cz/cz/hodnoceni_vyznamnosti_vlivu_koncepci*

Determining whether the site's integrity is affected

Once the effects of the project have been predicted as accurately as possible, their level of significance assessed and all possible mitigation measures have been explored, the AA must reach a final conclusion as to whether they will adversely affect the integrity of the Natura 2000 site.

The term "integrity" clearly relates to **ecological integrity**. The "integrity of the site" can be usefully defined as the coherent sum of the site's ecological structure, function and ecological processes, across its whole area, or the habitats, complex of habitats and/or populations of species for which the site is designated. A site can be described as having a high degree of integrity where the inherent potential for meeting site conservation objectives is realised, the capacity for self-repair and self-renewal under dynamic conditions is maintained, and a minimum of external management support is required.

If a plan or project adversely affects the integrity of a site only in a visual sense or causes significant effects to habitat types or species other than those for which the site was designated as Natura 2000, this is not an adverse effect for purposes of Article 6.3. On the other hand, if one of the species or habitat types for which the site has been designated is significantly affected then the site integrity is necessarily also adversely affected.

The expression "integrity of the site" shows that the focus is on the specific site. Thus, an argumentation that damage to a site or part of it can be justified on the basis that the conservation status of the habitat types and species it hosts will anyway remain favourable within the European territory of the Member State cannot be accepted.

In practice the assessment of site integrity should focus in particular on identifying whether the project:

- causes changes to significant ecological functions necessary for the target features;
- significantly reduces the area of occurrence of habitat types (even of those of lower quality) or viability of species populations in the given site which are target features;
- reduces the site diversity;
- leads to the site fragmentation;
- leads to a loss or reduction of the key site characteristics (e.g. tree cover, regular annual flooding) which the status of the target feature depends on;
- prevents meeting the site conservation objectives.

Introducing mitigation measures to remove adverse effects

When the assessment of a hydropower development plan or project undertaken under Article 6 of the Habitats Directive identifies a number of negative effects on a Natura 2000 site, the plan or project is not automatically rejected. Depending on the severity of the potential impacts, it may be possible to introduce mitigation measures that will eliminate, or at least reduce to an insignificant level, the potential negative impacts of a plan or project.

Approach to mitigation	Preference
Avoid impacts at source	Highest
Reduce impacts at source	
Abate impacts on site	
Abate impacts at receptor	Lowest

Effective mitigation of adverse effects on Natura 2000 sites can only take place once the potential negative effects have been fully recognised, assessed and reported. The identification of mitigation measures, like the impact assessment itself, must be based on a sound understanding of the species/ habitats concerned and on dialogue between investor, competent authority and conservation experts.

Mitigation measures can involve modifications to the size, location, design and technology used by the hydropower plan or project (e.g. avoid formation of migration barrier and/or injuries of fish caused by turbines). Or they can take the form of temporal adjustments during the construction and operational phases (e.g. avoiding water pollution if sensitive parts or populations of target species are located downstream). See chapter 3 for more information of potential mitigation measures for hydropower.

For each mitigation measure proposed, it is important to:

- explain how the measures will avoid or reduce to a non-significant level the identified adverse impacts on the site;
- provide evidence of how they will be secured and implemented and by whom;
- provide evidence of the degree of confidence in their likely success;
- provide a timescale, relative to the project or plan, when they will be implemented;
- provide evidence of how the measures will be monitored and how additional measures will be introduced if the mitigation proves not to be sufficient.

Once suitable mitigation measures have been identified and worked out in detail, the plan or project may be approved under the Article 6 Habitats Directive permit procedure on condition that these mitigation measures ensure that the impacts are not significant in view of the conservation objectives of the site, and the mitigation measures are implemented in accordance with the instructions given by the competent authority.

If however there is still a significant residual effect on the site, even after the introduction of mitigation measures[45], then alternative solutions will need to be examined instead (e.g. different location of the project, different scales or designs of development, or alternative processes. If these do not exist then the plan or project may still be approved in exceptional cases, provided that the conditions of Article 6.4 are respected and suitable compensation measures are approved that will compensate for the remaining negative significant effects so that the Natura 2000 network is not compromised.

Step three: Conclusions of the appropriate assessment

It lies with the competent national authorities, in the light of the conclusions of the AA, to approve the plan or project. This can be done only after having ascertained that it will not adversely affect the integrity of that site. If the conclusions are positive, in the sense that no reasonable scientific doubt remains as to the absence of effects on the site, the competent authorities can give their consent to the plan or project.

The onus is therefore on proving the absence of effects rather than their presence, reflecting the precautionary principle (Case C-157/96). This has been confirmed by several ECJ rulings. In the Waddensea case (C-127/02) the Court confirmed that "a plan or project [...] may be granted authorisation only on the condition that the competent

[45] *Mitigation measures are not the same a compensatory measures – see the Chapter 6 for details.*

national authorities are convinced that it will not adversely affect the integrity of the site concerned.

Where doubt remains as to the absence of adverse effects on the integrity of the site linked to the plan or project being considered, the competent authority will have to refuse authorization.[...] the competent national authorities are to authorise (a plan or project) only if they have made certain that it will not adversely affect the integrity of that site. That is the case where no reasonable scientific doubt remains as to the absence of such effects."

The AA and its conclusions should be clearly recorded. In this respect, the AA report should be sufficiently detailed to demonstrate how the final decision was reached, and on what scientific grounds the decision was made.

5.4 The derogation procedure under Article 6.4

Article 6.4 provides for exceptions to the general rule of Article 6.3. This is not an automatic process, it is up to the project or plan proponent to decide whether they wish to apply for a derogation. Article 6.4 lays down the conditions that need to be respected in such cases and the steps that need to be followed before a competent national authority can authorise a plan or project that has been assessed as adversely affecting the integrity of a site under Article 6.3.

Article 6.4 requires that the competent authorities ensure the following conditions are respected before a decision can be taken on whether or not to authorise a plan or project that may adversely affect a site:

- The **alternative** put forward for approval is the least damaging for habitats, for species and for the integrity of a Natura 2000 site, and no other feasible alternative exists that would not affect the integrity of the site.
- There are **imperative reasons of overriding public interest** that justify the authorisation of the plan or project, including those of a social or economic nature.
- All **compensatory measures** required to ensure the protection of the overall coherence of the Natura 2000 network have been taken.

The order in which these conditions are examined is important as each step determines whether the next step is required. If, for instance, it is found that there is an alternative to the plan or project in question, then there is not point in examining whether the original plan or project is of overriding public interest or to develop suitable compensation measures since that plan or project could not, in any case, be authorised if a viable alternative exists.

Demonstrating the absence of alternative solutions

The search for alternatives can be quite broad and should be linked to the public interest objectives of the plan or project. It could involve alternative locations, different scales or designs of development, different methods of construction or alternative processes and approaches to producing renewable energy. This requirement is also strongly linked to the condition d in WFD Article 4(7), which requires authorities to ensure that there is no better environmental option[46].

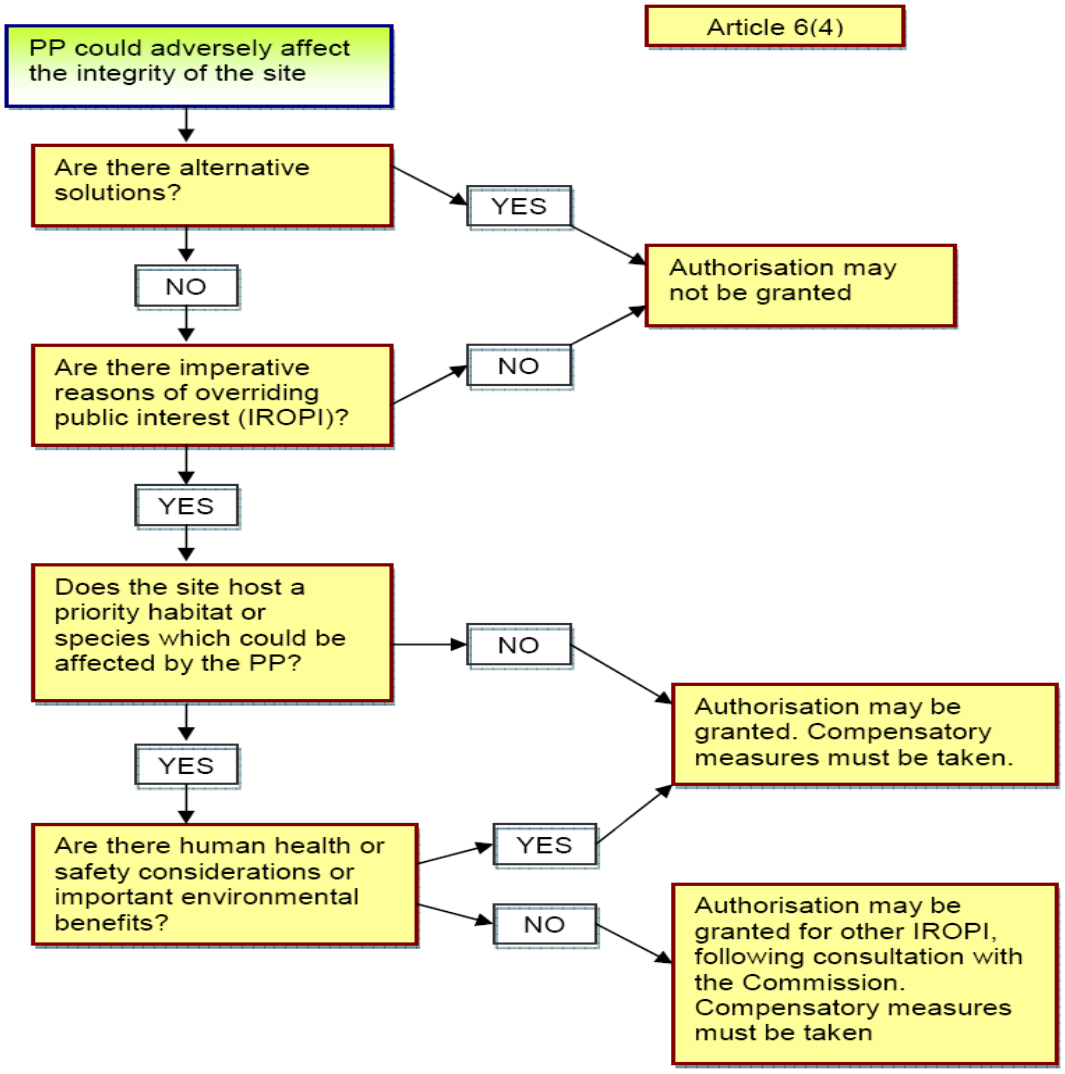
Although the requirement to search for alternatives falls within the scope of Article 6.4, in practice it is useful for the planner to consider all possible alternatives as early as possible when initially planning their development project. If an appropriate alternative is found at this stage which is not likely to have a significant effect on a Natura 2000 site, then it can be approved immediately and an appropriate assessment will not be required.

However, in the case where the project has gone through an AA which has concluded that there will be an adverse effect on the integrity of the site, it is then for the competent authority to determine whether alternative solutions exist. All feasible alternatives, in particular, their relative performance with regard to the conservation objectives of the Natura 2000 site and the site's integrity should be analysed.

The alternative solutions chosen should also be subject to a new appropriate assessment if it is likely to have a significant effect on the same or another Natura 2000 site. Usually, if the alternative is similar to the original proposal, the new assessment may be able to draw a lot of the information needed from the first appropriate assessment.

[46] See CIS guidance number 20.

Flow chart of the Article 6(4) conditions



Imperative reasons of overriding public interest

In the absence of alternative solutions, or in the presence of solutions having even more negative effects on the conservation objectives or integrity of the site concerned, the competent authorities must examine whether there are imperative reasons of overriding public interest[47] which justify the authorisation of the plan or project in spite of that fact that it may adversely affect the integrity of a Natura 2000 site(s).

The concept of "imperative reason of overriding public interest" is not defined in the directive. However it is clear from the wording that, for a plan or project to be authorised in the context of Article 6.4, it must meet all three of the following conditions:

[47] This concept is also used in Article 4(7) of the WFD.

- there must be **imperative** reasons for undertaking the plan or project – imperative in this sense clearly means that the project is essential for society, rather than merely desirable or useful;
- the plan or project must be of **overriding interest** – in other words it must be demonstrated that implementing the plan or project is even more important than fulfilling the objectives of the Birds and Habitats Directives. It is clear that not every kind of public interest of a social or economic nature is sufficient, in particular when seen against the particular weight of the interests protected by the directive (see e.g. its 4th recital stating "Community's natural heritage"). It seems also reasonable to assume that the public interest can only be overriding if it is a long-term interest; short term economic interests or other interests which would only yield short-term benefits for the society would not be sufficient to outweigh the long-term conservation interests protected by the directive.
- be of **public interest** - it is clear from the wording that only public interests, can be balanced against the conservation aims of the directive. Thus, projects developed by private bodies can only be considered where such public interests are served and demonstrated.

Article 6.4 second subparagraph mentions human health, public safety and beneficial consequences of primary importance for the environment as examples of such imperative reasons of overriding public interests. It also refers to "other imperative reasons of overriding public interest" of social or economic nature.

It should be noted that the conditions of overriding public interest are even stricter when it comes to the realisation of a plan or project likely to adversely affect the integrity of a Natura 2000 site that hosts priority habitat types and/or species, where those habitat types and/or species are affected.

These can only be justified if the imperative reasons of overriding public interest concern:
- human health and public safety or;
- overriding beneficial consequences for the environment, or;
- for other imperative reasons if, before granting approval to the plan or project, the opinion of the Commission has been given.

Compensatory measures

If the above two conditions are met then the authorities must also ensure that compensatory measures are adopted and put in place before the project can begin. Compensatory measures therefore constitute the "last resort" and are used only when the decision has been taken to proceed with a plan or project because it has been demonstrated that there are no alternative solutions and that the project is necessary for imperative reasons of overriding public interest under the conditions described above.

Compensatory measures under Article 6.4 are clearly distinct from the mitigation measures introduced through Article 6.3. Mitigation measures are those measures which aim to minimise, or even cancel, the negative impacts on a site that are likely to arise as a result of the implementation of a plan or project. Compensatory measures on the other hand are *sensu stricto* independent of the project.

They are intended to make up for or offset the residual negative effects of the plan or project (after all possible mitigation measures have been introduced to the plan or project)

so that the overall ecological coherence of the Natura 2000 network is maintained. The compensatory measures must be able to compensate fully for the damaged caused to the site and to its target features and must be sufficient to ensure that the overall coherence of Natura 2000 is protected.

To ensure that the overall coherence of Natura 2000 is protected, the compensatory measures proposed for a plan or project should in particular:

- contribute to the conservation of affected habitat types and species within the biogeographical region concerned or within the same range, migration route or wintering area for species in the Member State concerned;
- provide functions comparable to those which had justified the selection of the original site, particularly regarding the adequate geographical distribution;
- have to be additional to the normal duties under the directive, i.e. they cannot substitute existing commitments, such as the implementation of Natura 2000 management plans.

According to existing Commission guidance, compensatory measures under Article 6.4 can consist of one or more of the following:

- the recreation of a comparable habitat or the biological improvement of a substandard habitat within an existing designated site provided this goes beyond the site's conservation objectives;
- the addition to the Natura 2000 network of a new site of comparable or better quality and condition to the original site;
- the recreation of a comparable habitat or the biological improvement of a substandard habitat outside a designated site which is then included in the Natura 2000 network.

The habitat types and species negatively affected must as a minimum be compensated for in comparable proportions, but, considering the high risks and scientific uncertainty involved in attempting to recreate or restore substandard habitats it is strongly recommended that ratios well above 1:1 or more are applied to be sure that the measures really do deliver the necessary compensation.

It is considered good practice to adopt compensatory measures as close as possible to the affected area in order to maximise chances of protecting the overall coherence of the Natura 2000 network. Therefore, locating compensation within or nearby the Natura 2000 site concerned in a location showing suitable conditions for the measures to be successful is the most preferred option. However, this is not always possible and it is necessary to set a range of priorities to be applied when searching locations that meet the requirements of the Habitats Directive. Under these circumstances, the likelihood of long-term success is best evaluated by peer-reviewed scientific studies of trends.

Member States should pay particular attention when the negative effects of a plan or project are produced in rare natural habitats or in natural habitats that need a long period of time to provide the same ecological functionality. For some habitats and species it may simply not be possible to compensate for any loss within a reasonable time frame as their development may take decades.

Finally, the compensatory measures should be in place and fully functional before the work on the plan or project has begun. This is to help buffer the damaging effects of the project on the species and habitats by offering them suitable alternative locations in the compensation area. If this is not fully achievable, the competent authorities should require extra compensation for the interim losses that would occur in the meantime.

The information on the compensatory measures should be submitted to the Commission before they are implemented and before the realisation of the plan or project concerned. It is therefore advised that information on compensatory measures should be submitted to the Commission as soon as they have been adopted in the planning process in order to allow the Commission, within its competence of guardian of the treaty, to assess whether the provisions of the directive are being correctly applied.

Acronyms

AA	Appropriate assessment according to the Article 6.3 of the Habitats Directive
EEA	European Environment Agency (http://www.eea.europa.eu/)
EIA	Environmental Impact Assessment of projects
EU	European Union (EU 28)
FCS	Favourable Conservation Status – main objective of measures according to the Habitats Directive
NGOs	non-governmental organizations
PCIs	Projects of Community Interest
pSCI	proposed Site of Community Importance to the Commission
RBMP	River Basin Management Plan according to the Water Framework Directive
SAC	Special Area of Conservation with necessary conservation measures applied
SCI	Site of Community Importance approved by the Commission
SDF	Standard Data Form of Natura 2000 site
SEA	Strategic Environmental Assessment of plans and programmes
SPA	Special Protection Area designated in accordance with the Birds Directive
WFD	Water Framework Directive