



Water Framework Directive & Hydropower

Common Implementation Strategy Workshop
Berlin, 4-5 June 2007

Workshop Summary Report

June 2007

This workshop summary report was prepared by
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on behalf of the workshop co-organisers of UK, Germany, Austria and the EC.

Note on workshop summary report & key workshop conclusions

Please note that this workshop summary report is not an official Common Implementation Strategy (CIS) document. It has been compiled by Ecologic on behalf of the workshop co-organisers and will be shared and distributed to all workshop participants.

The key workshop conclusions presented in the **Annex** to this summary report were prepared taking into account the written comments of the workshop participants. The key conclusions refer in a concise way to the main outputs of this workshop and will be used to inform the Water Directors on the programme of work of the related CIS activity.

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1 Introduction

1.1 Objectives of the workshop

At their last meeting in Inari/Finland (30 November - 1 December 2006) the Water Directors agreed to continue the CIS activity on "Water Framework Directive and hydromorphological pressures". The focus of the continued activity (Phase II 2007-09) should be on the exchange of information via workshops rather than on the production of further documents. The workshop on the Water Framework Directive (WFD) & Hydropower (Berlin, 4-5 June 2007) was the first organised by the lead countries UK/DE of the CIS activity in cooperation with Austria, as part of the programme of the German EU Presidency.

The focus of the workshop was on hydropower use and the relationship to hydromorphological changes. The workshop aimed at reaching common understanding among the participants on the following main themes:

- Instruments to maintain as well as promote hydropower use and in the same time improve the ecological water status/potential.
- Effective measures enabling hydropower plant operation to be compliant with the WFD water body environmental objectives, including ecological criteria & technical standards.
- Strategies and priorities for the improvement of hydromorphological conditions in catchments used for hydropower generation. The aim was to discuss and formulate recommendations on possible strategies of prioritisation of water bodies and measures within the scope of the WFD implementation.

More than 100 delegates participated in this workshop. Delegates included representatives of numerous countries (21 Member States, Norway and Switzerland), the European Commission as well as representatives from various European-level organisations and stakeholder groups.

In order to assist participants to prepare for the workshop discussions, an issues paper was prepared and circulated to participants prior to the workshop. This issues paper introduced the key themes and problems at hand put up for discussion at the workshop and also pointed to some possible solutions and alternatives. The paper also outlined the main questions to be addressed at the workshop. The issues paper is available online on the workshop website:

<http://www.ecologic-events.de/hydropower/background.htm>

1.2 Structure of the workshop

Day 1 of the workshop explored in the plenary the role of hydropower in Europe from the perspective of key supranational organisations and selected Member States.

In the afternoon of day 1 and in the morning of day 2, participants convened in 3 moderated parallel sessions to discuss the three main themes of the workshop:

- Instruments to promote hydropower use & to improve water status (parallel session 1).
- Technical approaches for good practice in hydropower use (parallel session 2).
- Strategic approaches & priorities on catchment level (parallel session 3).

In each parallel session, participants had the opportunity to exchange information and views as well as to briefly present a summary of the relevant approaches of their Member State or their organisation. Discussions on the three main themes of the workshop also took place in the plenary following report-back presentations by the rapporteurs of the parallel sessions in the morning and in the afternoon of day 2.

Draft key conclusions on the main workshop themes were discussed in the last plenary.

1.3 Structure of this report

This report summarises the main workshop discussions. Section 2 gives an overview of the issues raised during the workshop plenary blocks. Sections 3 - 5 summarise the discussions of the 3 moderated parallel sessions on the three key themes of the workshop. Section 6 refers to the procedure followed for the development of joint key workshop conclusions. The final key workshop conclusions are presented in the **Annex** to this summary report.

The workshop programme, the workshop presentations and the list of participants are available online on the workshop website:

<http://www.ecologic-events.de/hydropower/programme.htm>

<http://www.ecologic-events.de/hydropower/presentations.htm>

<http://www.ecologic-events.de/hydropower/participants.htm>

2 Plenary blocks

Workshop Day 1

Fritz Holzwarth, Water Director of Germany, opened the first plenary block of the workshop. He emphasised that discussions in this workshop are based on previous important work already carried out in the context of the CIS activity on "WFD and hydromorphological pressures". This workshop should provide the starting point to develop a more basin-wide perspective as well as to explore the need for priority setting in the River Basin Management Plans in a transparent way. The German Water Director also emphasised the need for a life-cycle assessment of hydropower combining climate change mitigation with a focus on ecological impacts.

Following the opening speech of the German Water Director, Marieke van Nood (DG Environment, European Commission) presented relevant information from the Article 5 report analysis, whereby hydropower has been identified as a major driving force in terms of hydromorphological pressures. Her presentation also summarised key WFD requirements and challenges with a focus on hydropower.

In the following, supranational statements on the role of hydropower in Europe were made by:

- DG for Energy and Transport of the European Commission.
- Representatives of the hydropower sector (EURELECTRIC and European Small Hydropower Association).
- Representatives of environmental NGOs (WWF).

In the second plenary block of the workshop, presentations on the role of hydropower in Europe were given from the perspective of selected European countries (Slovenia, Austria, Norway, France and UK-Scotland).

The national presentations were followed by a keynote lecture on the scientific aspects of climate change and hydropower in Europe, whereby relevant observations, scenarios and projections were outlined by Fred Hattermann (Potsdam-Institute for Climate Impact Research).

Next to clarification questions posed to the different speakers on the content of their presentations, interventions by workshop participants referred to the following issues:

- Hydropower is a very important source of renewable energy whose importance may increase in the future, in particular considering current discussions on climate change. In this context, it should be explored how synergies can be created with other renewables. In the same time, however, the climate change issue should not devalue the workshop discussions on balancing the WFD objectives with hydropower use.
- Some countries with the highest potential for future hydropower development in Europe (such as Portugal and Greece) have not transposed all relevant key principles of the WFD. It was emphasised that the transposition of Article 4.7 has to be done in all Member States. Member States must transpose and implement all key EU laws relevant to hydropower, including the WFD and renewable energy policies, and use good sense to meet EU legislation.
- The three pillars of sustainability, i.e. environmental, social and economic pillars, are very important in the discussions on WFD and hydropower use.
- Regarding the definition of "go" and "no-go" areas for future hydropower development, it was mentioned that a black-&-white approach for the definition of such areas may not be appropriate. Even in "no-go" areas, there could be cases of new hydropower projects which have a small environmental footprint and could meet the WFD non-deterioration clause. More in-depth discussions on the issue of "go" and "no-go" areas were carried out later in the workshop parallel sessions.

Workshop Day 2

Day 2 of the workshop started off with a keynote lecture on hydropower and river morphology based on experiences and criteria of the World Bank (Alessandro Palmieri, World Bank Lead Dam Specialist).

The morning plenary of day 2 closed with short report-back presentations from the parallel sessions of day 1. The last plenary block of the workshop in the afternoon of day 2 included

the report-back presentations from the parallel sessions continued on day 2 as well as the discussion on draft key workshop conclusions. Details on the reports of the parallel sessions and on the key workshop conclusions are given in the following sections of this summary document.

3 Instruments to promote hydropower & to improve water status (parallel session 1)

Costs related to necessary restoration/mitigation measures in water stretches affected by hydropower are often a barrier to the protection of water ecology. However, different instrument options can be considered to provide solutions for both the hydropower operators and the water ecosystem managers. Relevant financing instruments to promote hydropower and to improve water status can be complemented with other types of instruments (such as eco-labelling). A selection of possible instruments was described in the issues paper¹ to stimulate discussions at the Berlin workshop on WFD & Hydropower.

Parallel session 1 of the Berlin workshop focused on the exchange of information and experience with different instruments applied in European countries, in order to promote hydropower and in the same time improve water status.

3.1 Key questions for discussion

The key questions for discussion in parallel session 1 of the workshop are summarised in the following box (see issues paper for more detail).

Questions on instruments to promote hydropower & to improve water status

- Should instruments to support and promote hydropower development generally be linked to ecological standards (relevant to compliance with the WFD environmental objectives)?
- Which instruments exist to promote hydropower and in the same time assure the implementation of the WFD objectives? Which are especially suitable and successful?
- What views are there on voluntary schemes to improve water status (e.g. ecolabelling)? Should criteria for ecolabelling schemes of hydropower be agreed at EU level and which form could they take?
- What kind of reductions in the authorisation process or faster implementation would you consider to be helpful or acceptable?
- Can priority sections for energy generation from hydropower be defined (sections with still economically and ecologically sustainable potential for hydropower use)? Should water sections which achieve GES and are still not used for hydropower be used for energy generation? Can consensus be reached on the necessity to define "no-go" and "go" areas for hydropower schemes?

¹ Issues Paper for CIS Workshop "WFD & Hydropower", 4-5 June 2007, Berlin. Available online: <http://www.ecologic-events.de/hydropower/background.htm>.

3.2 Discussions

After the introduction and some explanatory comments by the chair of parallel session 1, Bernhard Pelikan (ESHA), Karina Veum (DG TREN) gave an overview of existing schemes to promote hydropower. It became clear that in general not too many approaches exist (e.g. feed-in tariffs, certification and support for modernisation) and that there are differences among the Member States. During the session, a more detailed description of the French approach was given by Claire-Cecile Garnier (French Ministry of Ecology and Sustainable Development), where, for instance, simplified authorisation and licensing procedures are promoted in certain cases and special demands are to be set for regions of high ecological value.

Based on the presentations, main topics for discussion in parallel session 1 were identified. These were the following:

- Specific schemes and their effectiveness for the WFD objectives: eco-labels, ecologically bound feed-in tariffs.
- Preplanning and the designation of „go“/“no-go“ areas for new hydropower plants.
- The need to differentiate between small & large hydropower plants.
- Internalisation of environmental and resource costs – the issue of water pricing.

On day 2, after a short presentation of the Bavarian approach by Mr. Heil (Bavarian Electricity Company), discussions in parallel session 1 continued on the four topics identified above. Marieke van Nood (DG ENV) was chairing the session.

Volker Mohaupt (Germany) and Ales Bisjak (Slovenia) reported the results of session 1 back to the plenary.

Discussions can be mainly summarised as follows:

Pre-planning

Pre-planning mechanisms to facilitate the proper location of suitable areas for new hydropower projects were considered as a useful tool. The use of such preplanning systems could assist the authorisation process to be reduced or implemented faster, provided WFD article 4.7 is respected.

New hydropower plants should be acceptable in terms of the WFD and based on site-specific and basin-specific WFD criteria (environmental and socioeconomic aspects). Such a river basin planning concept that goes from general to detail has to consider cumulative effects and should be transparent. At least 3 categories of areas could be distinguished for pre-planning: suitable, less favourable and non-favourable.

Internalisation of costs & benefits

With respect to the internalisation of costs and benefits, three different situations were distinguished:

- New plants which have to be built according to the best available techniques including environmental criteria.
- Old plants which are to apply for new permits. New permits can easily be linked to environmental concerns.
- Old plants with continuing long-term permits (beyond the planning horizons 2015). Incentives to take environmental measures might be helpful. These incentives can range from payments to water pricing but have to be discussed in the context of the WFD.

In general, it became clear that there is lack of information on environmental and resource costs and benefits of hydropower and more investigations are needed soon. Especially when applying for exemptions, this information will be needed.

Specific schemes

National and European instruments (feed-in tariffs, eco-labelling and other schemes) to support and promote hydropower development should be linked to ecological criteria for the protection of water status.

Feed-in tariffs should be open to all renewable energy sectors, should be promoted regardless of the hydropower size and should be based on WFD requirements.

Eco-labelling was discussed as a promising and suitable instrument that should be promoted (possibly on EC-level). However as there are only a few examples available, there is a need for more exchange on best practice as well as for a more detailed assessment of the public opinion and public environmental awareness.

Differentiation of small & large hydropower

Finally, the need to distinguish between small and large HP was discussed. There was a common understanding that both types of hydropower should be treated equally with regard to promotion in order to avoid discrimination. Promotion should be based on basin-specific as well as site-specific WFD criteria and global environmental criteria such as climate change.

4 Technical approaches for good practice in hydropower use (parallel session 2)

Parallel session 2 of the workshop focused on the exchange of information and experience with ecological criteria and technical standards for measures to avoid and to mitigate local impacts of hydropower use on water status. The aim of this session was to pave the way towards a more common understanding of good practice in hydropower use that is compliant with the environmental objectives of the WFD.

Discussions focused on key domains, where intervention could be most effective to improve ecological status on the local level (site-specific level) and especially in water bodies directly affected by hydropower. These domains were biological continuity (mainly upstream and downstream migration), minimum flow and hydro-peaking. The main problems at hand

related to these domains were outlined in the workshop issues paper² to stimulate discussions in this session.

4.1 Key questions for discussion

The key questions selected for in-depth discussion in parallel session 2 of the workshop were (see issues paper for more detail):

Questions on technical approaches for good practice in hydropower use

- Are biological continuity, minimum flow and hydro-peaking the most important priority domains for interventions to improve ecological status on the local level at stretches directly affected by hydropower? Which other domains should be considered?

Upstream migration

- What kinds of national standards exist for measures to support upstream fish migration?
- What are the characteristics/design criteria of the most effective installations for upstream migration (considering the importance of designing fish ladders which are easily traced and passed by fish)? What are confirmed conclusions? What further knowledge and further tests are needed?
- Do we need harmonised technical standards for the design and operation of fish passes at EU level? If yes, how should such standards be set?
- Are any specific criteria/requirements being used to ensure the efficiency of upstream fish passes? How binding are these criteria/requirements?

Downstream migration

- What are the characteristics/design criteria of the most effective installations for downstream fish migration? What are confirmed conclusions? What kind of further knowledge and further tests are needed?
- Are any specific criteria/requirements being used to ensure their efficiency? How binding are these criteria/requirements?
- What alternative measures exist for downstream migration at large hydropower plants?

Minimum flow

- What is the importance of minimum flow to reduce ecological impacts from hydropower?
- Which key conditions and criteria should minimum flow fulfil?
- Does a uniform approach for the determination of minimum flow exist? Should an EU approach be developed?

Hydro-peaking

- What are possible mitigation measures for hydro-peaking?

² Issues Paper for CIS Workshop "WFD & Hydropower", 4-5 June 2007, Berlin. Available online: <http://www.ecologic-events.de/hydropower/background.htm>.

- What kind of regional methods exist to resolve hydro-peaking problems, e.g. in the alpine region? Are there any other regional approaches?

4.2 Discussions

Parallel session 2 was chaired by Jean-Michel Devernay (Eurelectric/France) on day 1 and by Tor Simon Pedersen (Norway) on day 2. Anja Skiple Ibrek (Norway) and Robert Konecny (Austria) reported the results of this session back to the plenary.

An introductory presentation was given by Stefan Schmutz (University of Natural Resources and Applied Life Sciences, Vienna), who provided a comprehensive overview of the problems at hand, but also of the potential measures and design criteria that are available.

Several participants gave brief presentations on their activities and experiences:

- Marq Redeker (European Water Association - EWA) presented the activities of EWA's working group on river continuity and called for a stronger international and European co-ordination and exchange of information.
- Arve Tvede (Statkraft Norway) presented methods and environmental parameters used by his company to assess ecological status in the River Alta.
- Cliona Ni Eidhin (Ireland) showed that a variety of different measures may be taken in combination to improve environmental conditions, using the example of the Ardnacrusha hydropower station in the Shannon river basin.
- Gerd Marmulla (Food and Agriculture Organisation - FAO) drew attention to the EIFAC³ Working Party on Fish Passage Best Practices of FAO, which aims to assist member countries in conforming with the requirements of the WFD. This Working Party will develop common methodologies to assess fish pass efficiency and produce best practice guidelines on upstream and downstream fish passage needs and facilities.
- Teresa Alvares (Portugal) presented measures used to achieve Good Ecological Potential for the Alqueva-Pedrógão multi-purpose dam system. Measures include compensation and river bank restoration. A dynamic flow regime is applied, with discharge being adjusted according to precipitation.
- Another example for a dynamic flow regime that is controlled by current climate was introduced by Steinar Sandoy (Norway), who also briefly touched upon potential ecological and possibly economic advantages of such schemes.
- Natasa Smolar-Zvanut (Slovenia) presented methods used in Slovenia for the determination of ecologically acceptable flow and emphasised the importance of a co-operative approach involving water users as well as of expert judgement.
- Andrew Scanlon (International Hydropower Association - IHA) gave an overview of the sustainability guidelines used by IHA and mentioned current discussions to use these guidelines as a basis for a hydropower certification programme.

³ European Inland Fisheries Advisory Commission.

Through discussions in this session, biological continuity and ecologically acceptable flow were identified as priority considerations for the improvement of water ecological status. "Ecologically acceptable flow" was proposed as a more suitable term than "minimum flow". Hydro-peaking is also of importance, in particular with respect to erosion and habitat degradation. Some additional issues were mentioned that might also be considered in future work, namely sediment transport, river bed incision, debris management and reservoir flushing.

According to the discussions, integrated approaches are needed in order to take account of all existing pressures and impacts in the analysis and to ensure that all causes of the deterioration of a water body are evaluated. While measures are implemented locally, they also have to be assessed in the context of the whole catchment, since the benefit of specific measures (e.g. fish passages) may depend on the overall situation (e.g. number of barriers/dams).

Continuity

Improving continuity of rivers is important, given that one third of the European fish fauna is affected by impacts from human activities. Many solutions are available for facilitating upstream migration of fish. Fish ladders and passes are a common measure, but Member States also use alternatives such as fish lifts, capture and transport of fish to spawning areas (e.g. Sweden, France), fish egg planting (e.g. Norway) or fish stocking to mitigate the negative impact of migration barriers.

Downstream migration is less well understood as a problem and the existing technical solutions are still insufficient. Further technical innovations are needed for downstream migration and with respect to measures to avoid damage from turbines. It was suggested that bypass systems which support both upstream and downstream migration would be desirable, but more work would be needed to develop such systems.

Both for upstream and downstream migration there is a lack of evidence on the efficiency of measures. Monitoring and better measuring tools are needed to assess performance. Additionally, a catchment approach is important, since the actual benefit of one fish passage depends on the overall number of obstacles.

Measures for improving continuity are important to reach the environmental objectives of the WFD. However, participants also saw a need to better define Good Ecological Status and Good Ecological Potential with respect to fish biology, since methods will depend on the gap between the status and environmental objective. Existing approaches to ensure continuity often focus on key target species, usually long-distance migrators and economically important species, while the WFD requires a broader approach and consideration of the whole biological community.

Ecologically acceptable flow

Approaches to determine ecologically acceptable flow regimes, for instance through dynamic discharge, are being developed by several European countries. There are usually no legally binding standards at national level, although standards may be applied locally through licensing procedures. There is extensive research on ecologically acceptable flow in the

Member States but research gaps still exist, in particular with respect to ecological responses and interaction of the flow regime with morphology.

Participants agreed that there is no one-size-fits-all solution to ensure ecologically acceptable flow, and that different measures need to be combined. The use of compensation measures in addition to mitigation was supported by the participants. Also, in order to assess the impact of flow regimes, other factors should be taken into account (e.g. the role of tributaries connectivity or the flood regime).

Hydro-peaking

Hydro-peaking is an issue of discussion in some countries, for example Austria and Norway. There is concern that large sudden changes in water levels may cause considerable adverse effects on habitats. Research is ongoing, and some studies identify serious ecological consequences of hydro-peaking. However, there are still knowledge gaps and many different parameters have to be considered, for instance the distance from the dam. Mitigation options are limited and often involve high costs and high energy losses. However, an example for the successful implementation of mitigation measures was also mentioned: in Austria, it has been shown that through the co-ordination of the operation of different plants, peaks can be dampened.

Standardisation

Some degree of standardisation at European level was considered desirable, but there was also an agreement that solutions for mitigation measures will have to be largely site-specific (e.g. for the definition of ecologically acceptable flow and for measures to improve continuity considering variations in target species, numbers of obstacles and land area available). Exchange of information should be promoted on standards that have been developed by different countries or organisations (e.g. UK national standards developed for continuity measures and the work of the FAO EIFAC Working Group which is developing a guideline on how to design and evaluate fish passages). Potential criteria for standardisation are available in the literature, but they need to be tested more thoroughly through case study research.

Other issues

Some other issues were touched upon but not discussed in depth:

- Little information is available on efforts to identify water bodies where measures are most urgent (prioritisation). First ideas exist in Northern Ireland, where an approach based on consultation between relevant stakeholders, responsible bodies and operators is being developed.
- The issue of disproportionate costs was briefly touched upon by participants, and it was agreed that it represents a problem of scale.
- Environmental impacts and objectives for regulated lakes and reservoirs were mentioned as an issue in Norway and Austria.
- Climate change might interfere with hydropower use and measures to reduce its environmental impacts. However, it is currently unclear what exactly the effects will be. There are some indications that warming waters may be beneficial for fish migration in

Northern Europe, in particular early in the year, while it might cause problems in Southern Europe. However, more research is needed here.

All in all, parallel session 2 of the WFD & Hydropower workshop concluded that a more collaborative approach is needed that involves all relevant stakeholders and draws on their combined expertise. In many cases, compromises between different objectives will have to be made, but there is wide scope to minimise conflicts, look for acceptable trade-offs and identify win-win solutions.

5 Strategies & priorities on catchment level (parallel session 3)

Parallel session 3 of the workshop on WFD & Hydropower dealt with possible strategic approaches for setting ecological priorities and improving hydromorphological conditions in catchments used for hydropower.

Participants of this session discussed elements of a possible strategy proposed in the workshop issues paper⁴ on prioritising water bodies and measures to improve (upstream & downstream) continuity in catchments affected by existing hydropower schemes. Discussions on setting ecological priorities at the workshop also went beyond the proposals of the issues paper.

Except for discussions on existing hydropower schemes, session 3 also dealt with the setting of strategic priorities for new hydropower developments.

5.1 Key questions for discussion

The key questions selected for in-depth discussion in parallel session 3 of the workshop were (see issues paper for more detail):

Questions on strategies & priorities

- Do we need a common approach for setting ecological priorities in Europe, river basins or in specific regions, e.g. in the alpine region?
- Is a strategic prioritisation of water bodies to achieve continuity compliant with the WFD as regards the chronological implementation of measures and the determination of different objectives?
- Which criteria are reasonable for the prioritisation of water bodies? Where (at which water bodies, water types, catchments) is restoration most appropriate from an ecological point of view?
- How can we identify subcatchments and water bodies which need to be prioritised for mitigation/restoration in order to maintain typical fish populations in whole catchments?
- What should be considered in the pre-planning of "go" and "no-go" areas for hydropower?

⁴ Issues Paper for CIS Workshop "WFD & Hydropower", 4-5 June 2007, Berlin. Available online: <http://www.ecologic-events.de/hydropower/background.htm>.

- Are there already any concrete examples of new locations for hydropower planned under WFD Article 7 from the Member States? Do new hydropower schemes endanger the achievement of the WFD objectives in the catchment?

5.2 Discussions

Parallel session 3 of the workshop was chaired on day 1 by Veronika Koller-Kreimel (Austria). The introductory presentation of Uli Dumont (Floecksmühle Consulting Engineers) gave examples of strategies for hydropower development and continuity restoration in selected regions of Germany, with focus on the total efficiency of upstream and downstream fish migration. During the session, also a detailed description of the Austrian approach and work on criteria for prioritisation was given by Helena Muehlmann (Austrian Federal Agency for Water Management).

On day 2, the discussion continued on the main topics of the session, chaired by Martin Marsden (UK-Scotland). An additional presentation was given by Günter Moser (Vorarlberger Illwerke AG, Austria) providing information on sustainable solutions promoted in the case of the diversion power plant „Walgauwerk“ in Austria.

Martin Marsden (UK-Scotland) and Birgit Vogel (ICPDR) reported the results of session 3 back to the workshop plenary.

The discussions in parallel session 3 on both workshop days can be summarised as follows:

Delivering improvements for existing hydropower

The **prioritisation of measures, catchments and rivers** is compatible with the WFD but the Member States should deliver a proportionate programme of measures. In the same time, it should be made clear what sort of exemptions are to be applied for non-priority water sections.

When setting priorities, in the first instance, the scale and the extent of the ecological problem should be defined. Secondly, ecological priorities should be defined. Thirdly, socio-economic analysis should be used to define a cost-effective programme of measures. This order of action should allow to achieve the WFD environmental objectives (GES, HES, GEP, MEP etc).

Criteria for prioritising ecological problems and action in regions affected by hydropower should be considered on different scales:

- On the European level, species and habitat issues of ecological importance should be identified, for example via the Natura 2000 designation process to achieve balance with nature policy/biodiversity strategies.
- On the catchment and regional level, longitudinal continuity for key migrating fish is especially important.
- On the level of water bodies/groups of water bodies, lateral continuity, the geographical scale of impact and severity (not just on fish but also on other aquatic species important for biodiversity) should also be considered and potentially negative trends (to prevent deterioration) should be identified.

In order to prioritise measures (in terms of ecology), we need to take into account similar scale issues (from the catchment level to the water body level), looking at the same time at the interdependency of measures. We should consider the issue of the ecological effectiveness of measures vis-a-vis the scale of improvement that can be achieved. In prioritising measures, we also need to consider issues of time-scale regarding the effect of measures and the probability of achieving the objectives within the required timeframe. Finally, we also need to consider the possible negative environmental impacts of measures (e.g. with regard to the introduction of alien species or climate change).

In discussions on the definition of common criteria and objectives for prioritisation on the catchment level, participants stressed the need to differentiate criteria depending on the scale and size of the catchment considered:

- In large catchments where international cooperation is important, migrators (longitudinal continuity – medium & long distance migrators), wetlands (lateral connectivity) as well as sediment and flow should be considered.
- On the regional/catchment level (national/regional level), also details of the water body scale and status as well as priorities regarding the improvement potential vis-a-vis the size of stretches (e.g. improvement expected in 1 or 100 km of river length) are important.

It was agreed that we should aim at achieving self-sustaining populations of migrating fish species where possible/needed at the catchment level, in particular aiming at delivering interconnectivity, adequate spawning grounds and other important habitats.

Next to the definition of ecological priorities, the use of socioeconomic analysis was discussed to define a cost-effective programme of measures. This work should ideally be undertaken at a catchment or subcatchment level, so as to maximise the ecological potential and energy production (win-win situation). Economic aspects of importance in particular for hydropower include benefits (e.g. economic importance of species, economic uses of water) and costs (financial cost of measures, environmental and resource costs). Social aspects of importance include recreational/amenity value, tourism, multifunctional use for hydropower (e.g. also for flood management (especially downstream) using a combined approach), fisheries as well as public views on the relative importance of benefits/costs (public participation).

New hydropower projects

Pre-planning mechanisms to identify suitable areas for new hydropower projects were recognised also in this parallel session as a useful tool to facilitate future decision-making (e.g. via maps of areas with ecological impact). Pre-planning could be useful to speed up application/licensing procedures for new projects and to create win-win situations for both hydropower developers and those seeking to protect the water environment.

Criteria to be used for such pre-planning were also discussed. Discussions pointed to the identification of high/medium/low value areas for hydropower, the designation of ecological conflict areas related to hydropower (high/medium/low), the designation of important migration routes, the need to integrate other interests of water use where necessary for

decision-making (flood defence, recreation etc) and the need to involve the public in such pre-planning issues. It was also proposed to incorporate uncertainty issues in pre-planning (e.g. due to climate change) and to develop a procedure of future review of areas identified as suitable or unsuitable for hydropower.

Finally, the **compatibility of new hydropower projects with Art. 4.7** of the WFD was also discussed. New hydropower projects are in general compatible with the WFD as long as they comply with the relevant tests of Art. 4.7. There is relatively little experience at the moment across Member States with the use of this test. At the workshop, relevant experiences gained so far in Austria, Netherlands and UK-Scotland were shared. The authorities need to learn how to use and further develop rules for the application of the Art. 4.7 test in a practical way. Further exchange of experience is needed in the future to develop a transparent approach. In general, not many exemptions are expected (according to the WFD). In any case, however, pre-discussions are important to ensure the transparent development of Art. 4.7 exemptions as well as screening tests to estimate the magnitude of impacts for ranking the significance of proposed projects.

In the final plenary block of the workshop, remarks after the report-back presentation on parallel session 3 additionally raised the following issues:

- It is important to assure legal and investment security for hydropower business in the context of prioritising water bodies and measures on a catchment level.
- The same weight should be given to ecological, economic and social aspects when setting strategic priorities to deal with hydropower impacts on catchment level.
- In terms of criteria for priority setting in large catchments, regions of high importance for biodiversity should be considered.
- When prioritising action, it was emphasised that the status and quality of habitats should be considered.

6 Concluding the workshop

During the final plenary block of the workshop, draft key conclusions on the main themes of the workshop were distributed and discussed. An updated version of the draft key conclusions was circulated to participants after the workshop, inviting them to submit their written comments.

The final key workshop conclusions taking into account the written comments of participants are presented in the **Annex** to this summary workshop report.

All in all, participants viewed the workshop discussions as very interesting and helpful for identifying key topics of concern to hydropower operators, country representatives and environmental NGOs with regard to the WFD implementation & hydropower generation. The workshop successfully served as a forum to exchange information and views between different parties on the European level, to identify key knowledge gaps and to contribute

towards the development of more common understanding and consistent approaches. The workshop results should be used as a solid basis to continue the multi-party dialogue on WFD & hydropower in the future and explore further possibilities for joint activities on the CIS level.

Annex: Key workshop conclusions

General remarks

1. The benefits of hydropower as a highly reliable CO₂-free and renewable source of electricity production but also the need to maintain the ecological functions of hydropower-affected water stretches have to be taken both into account to achieve a proper and well-balanced approach to meet climate, water & nature protection objectives.
2. It is important to ensure that existing and forthcoming EU policies to promote hydropower ensure coherence with the Water Framework Directive/other EU environmental legislation and clearly consider the ecological impacts on the affected water bodies and the adjacent wetlands.
3. The discussion has shown that more holistic approaches for hydropower use are needed. The focus should be on catchment level and not only site-specific or on water body level.
4. During WFD implementation, an environmental assessment based on WFD criteria is required for all water bodies including those with hydropower plants. This assessment includes other environmental criteria and a socio-economic assessment. In addition, in the River Basin Management Plans, all water uses have to be taken into account.
5. Hydropower development should take into account future climate change impacts. Possible future conflicts between new hydropower priorities due to climate change impacts and the aims of the WFD to achieve GES or GEP should be taken early into account.
6. The Berlin workshop was the first occasion, where broad and intensive discussions took place on the European level between hydropower stakeholders and those responsible for the implementation of the WFD on the national level. There is a strong recommendation to continue the discussions to achieve sustainable solutions concerning hydropower and WFD requirements.

Instruments to promote hydropower & to improve water status

7. National and European instruments (such as tradable certificates, feed-in tariffs, support schemes for renewables or ecolabelling) to support and promote hydropower development should be linked to ecological criteria for the protection of water status.
8. There should be a clear insight into all costs & benefits of hydropower. This insight will help sustainable decision-making on hydropower projects and implementing the polluter pays principle.
9. The workshop identified 3 practical approaches for integrating good water status and utilisation of hydropower. For new plants, best available techniques (BAT) should be defined and utilised. For old plants which are to apply for new permits, environmental concerns should be addressed while issuing the new permit. For old plants with continuing long-term permits, financial incentives may be helpful. Monetary or non-monetary compensation should be considered for long-term concessions.
10. The workshop participants recognised the advantages of pre-planning mechanisms to facilitate the (proper location) identification of suitable areas for new hydropower projects. These pre-planning mechanisms should take into account WFD and other environmental criteria as well as socioeconomic aspects, including other water uses. The use of such

preplanning systems could assist the authorisation process to be reduced and implemented faster, provided that the criteria of WFD Art. 4.7 are met.

11. At least 3 categories of areas could be distinguished for pre-planning: suitable, less favourable and non-favourable areas. These categories should be identified with the involvement of all stakeholders based on transparent criteria, they should be monitored and revised within a period of time.
12. Small and large hydropower should be treated equally with regard to promotion. Promotion should be based on basin-specific as well as site-specific WFD criteria and global environmental criteria (climate change) and not on the size of the hydropower plant per se.

Technical approaches for good practice in hydropower use

13. Biological continuity (upstream and downstream migration) and ecologically acceptable flow were identified as priority considerations for the improvement of water ecological status. Hydro-peaking is also of importance (e.g. erosion and habitat degradation).
14. Biological continuity: For upstream migration, many solutions are available (e.g. fish passes and fish ladders, but also fish lifts, fish stocking, catch & carry programmes etc.) to mitigate the negative impact of migration barriers – but more work needs to be done on evaluation and monitoring of effectiveness. Much research leading to technical innovations has still to be undertaken, especially related to downstream migration in combination with turbine damage.
15. Ecologically acceptable flow: Approaches to determine ecologically acceptable flow have been developed and are being further developed by several European countries. There is no one-size-fits-all approach - a combination with other mitigation measures is often necessary.
16. The use of compensating measures together with mitigating measures is highly recommended.
17. Hydro-peaking: Some studies identify serious ecological consequences of hydro-peaking, but there are still knowledge gaps. Mitigation options are limited and often involve high costs due to the loss of peak-load capacity and their designated function. However, examples for the successful implementation of mitigation measures also exist (like coordination between hydropower plants).
18. Some degree of standardisation at European level is desirable, but solutions for mitigation measures will have to be largely site-specific (e.g. definition of ecologically acceptable flow). Exchange of information should be promoted on standards that have been developed by different countries or organisations (e.g. for continuity).

Strategies & priorities on catchment level

New hydropower projects

19. New hydropower projects are compatible with the WFD as long as they comply with the Art. 4.7 test.
20. For new hydropower projects, external effects – e.g. on the water environment - should be taken into account properly by the use of the Art. 4.7 test. There is relatively little experience across Member States with the use of this test. Exchange of experience is needed to develop a transparent approach.

Delivering improvements for existing hydropower

21. It was agreed that prioritisation of measures, catchment areas and rivers is compatible with the WFD but the Member States should deliver a proportionate programme of measures.
22. Criteria for prioritising action in regions affected by hydropower should consider different scales. On the European level, species and habitat issues of ecological importance should be identified, for example via the Natura 2000 designation process. Other criteria on an international level are lateral connectivity regarding wetlands and management of water and sediment flow. On the catchment and regional level, longitudinal continuity for key migrating fish is especially important. On the level of water bodies/groups of water bodies, we should also consider lateral connectivity, the geographical scale of impact and severity and we should identify trends (to prevent deterioration). Measures that bring the highest improvement potential, calculated as e.g. river length, should be prioritised.
23. We should aim at achieving self-sustaining populations of migrating fish species where possible/needed and where historically verifiable at the catchment level, in particular aiming at delivering interconnectivity in combination with habitat and spawning ground conservation/restoration. Interdependency of measures should be regarded as well as the risk of negative impacts of measures, such as introduction of alien species and climate change.
24. In addition to the definition of ecological priorities, we should use socio-economic analysis to define a cost-effective programme of measures. This work should ideally be undertaken at a catchment or sub-catchment level, so as to maximise the ecological potential and the energy production. Economic aspects for hydropower should include a wide range of benefits (e.g. economic importance of species, economic uses of water) and costs (financial cost of measures, environmental and resource costs). Social aspects also bringing benefits include recreational/amenity value, tourism, multifunctional use for hydropower, flood protection, fisheries as well as public views on the relative importance of benefits/costs (public participation).
25. The main advantages of prioritisation for all surface waters are:
 - Provision of technical basis for the prioritisation of measures to improve hydromorphology and ecology.
 - Establishment of a strategy on catchment level to ensure a coordinated and uniform approach for delivering ecological improvement and ultimately reaching GES/GEP in the River Basin Management Plans.
 - Ensuring the selection of cost-effective and ecologically efficient measures to deliver ecological improvement, e.g. biological continuity.