BACKGROUND

The following paper compiles the results of a questionnaire carried out in the frame-work of the project SHERPA, partly funded by the EACI under the IEE programme.

The aim of this research is to show in an objective way the picture of SHP that the environmental organizations and experts dealing with the preservation of the ecosys-tems have.

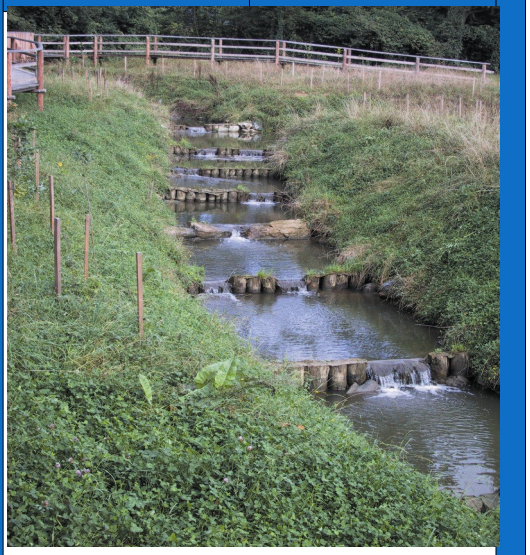
The results are given in general terms in order to preserve the identity of the experts contacted.

sherpa
small hydro in action

ENVIRONMENTAL BAROMETER ON SMALL HYDRO POWER

Intelligent Energy Europe

EUROPEAN SMALL HYDROPOWER ASSOCIATION
Rue d'Arlon 63-67
1040 Brussels—Belgium



INTENTION

ESHA, The European Small Hydropower Association is aware of the problems and the challenges related to the environmental dimension of the electrical production from Hydropower plants.

It is therefore our **intention** to use this barometer as the first step to seriously engage in **overcoming** the impacts SHP can have on the environment by approaching the experts in the field in order to create a fruitful **dialogue** and find a **compromise** between hydro electricity and nature preservation .

BAROMETER RESULTS

The results drawn from the collection and evaluation of the answers from the contacted experts are summarized in this section. As a general introduction it should be noted that the experts agreed that the term "small" is not clear even if there is a conventional limit of 10 MW of installed capacity. Indeed many people identify small hydro with old watermills and in the difference between small and large lying in the existence of water reserve. But the interviewed people also agreed that most hydraulic plants whether small or large have an impact on the environment . Some of them pointed out that small hydropower can have an important impact because they harness little watercourse and especially when there are many small plants close together along the watercourse.

It was also agreed that each hydroelectric facility is unique and therefore its effects vary depending on the different ecosystems and that the design and management of a plant from the beginning is very important to minimize the impacts. In some cases the lack of the catchment-scale approach leads to the approval of small hydropower plants that only take into account the production of energy. In contrast, if the plant is well designed and monitored, the interests are higher than the drawbacks. So, the impacts can be small or large but it does not depend on the size but rather on the mitigations.

Every change in hydromorphological conditions has an impact on the environment but how intensive this impact is depends on the water body type and the extent of other already existing impacts, the specific impact due to the type of hydropower plant, and if the plant is minimizing its negative impacts.

IMPACT ON THE ENVIRONMENT

100% of the questioned experts agree that ***SHP has an impact on the environment***. Most of them agree that there is no real difference between small or large Hydro when speaking of impact since according to them all hydro plants affect and change different aspects of the environment.

However, besides this general statement there is also the agreement that:

A) Not all the hydro plants affect the environment in the same way and in the same dimensions and size plays a factor in this respect.

B) The magnitude of the impact depends on the way the hydro plants have been designed and managed to take into account the ecosystem requirements of their locations and the issue of catchment.

TYPES OF IMPACTS

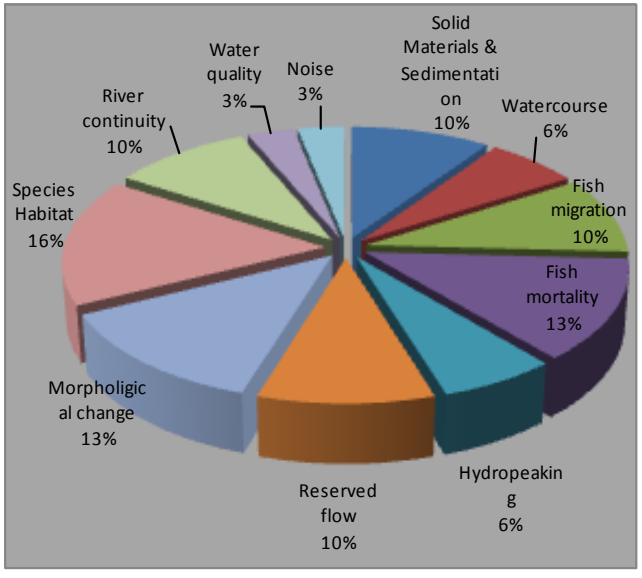
When asking about the most obvious and critical impacts of small hydropower, the answers were very diverse but somehow they focus on the same topics. For most of the interviewees one of the most critical impacts of small hydropower is that on the ***aquatic species***. Small hydropower plants are affecting not only fish but also other species living in rivers, in terms of mortality, migration and change in the conditions and quality of their habitats. The consequences can sometimes be very negative since some species are disappearing and others are arriving due to the morphological change of the river basin and/or the characteristics of the water composition due to the thermal pollution, the increased turbidity or the likely alteration of nutrients. For example, in some cases strong variation of the flow can destroy fish eggs. Also, artificial hydropeakings cause alteration of the natural hydrological regimes and therefore make difficult the establishment of new habitats and their resilience.

Another factor mentioned is the ***sedimentation*** problem. For example, in France a small dam created a reserve of 1200m3 that was full of sand. The French Water Policy Administration authorized the opening of the dam to allow the sand to be removed. However, this resulted in the transporting and spreading of sand to some 5 km circumference due to important amount of flood water. The river is now only one metre wide, full of sand and all species have disappeared from it.

Another issue connected to sedimentation is the interruption or modification of the ***river continuity*** both in spatial and temporal terms. In fact, this together with lateral connectivity have consequences in sediment transportation and movement of vegetation and species.

Other impacts strongly identified as well can be seen on chart 1.

Chart 1: Identified hydropower impacts



IMPACT EXAMPLES

In ***France*** some areas have been identified where the impacts are clear. For example in La Goule Noire, Haute et Bassse chute, Mirebel– Lanchâtre, Le Guâ, Pinsot/Breda, Les Moulins/Breda, L'Oche, Parrassa, Minoterie du Trièves, Laperelle, Fourvoirie, Chapareillan le Cernon, La Drevenne, La Drevenne, La Monta/la Vence, Pont du Prêtre, La Trinité and Sainnt Maurice en Valgaudemar there are residual flow problems. Problems with fish passes have been identified in Fourvoirie, Miribel-Lanchâtre, Pont en Royans and Goule Noire. Flow variations and hydropeaking are present in Chorange Pont-en-Royans, Engins, La Goule Blanche and there are many impacts on the river Isère. There is an initiative to recuperate the damages on the Loire river.

In ***Austria*** impacts have been identified in the river Schwarse Sulm in south of Styria, the river Mur near Graz, the river Enns in the north of Styria the river Inn in Tyrol and the area East-Tyrol.

In ***Germany***, the impacts have been located generally on tributaries of big rivers where long distance migratory species are affected and mainly close to middle range mountains.

In ***Italy***, only few Alpine rivers' stretches and streams have escaped deep alterations. In the territory of the Como Province in Lombardia, if all the current requests were approved, the water used from rivers would put in danger the achievement of the Water Framework Directive targets. The situation on the Italian side of the Alps is quite critical.

In ***Spain***, the small hydropower plants in the north coast have significantly affected the capacity of salmon to spawn in their traditional grounds.

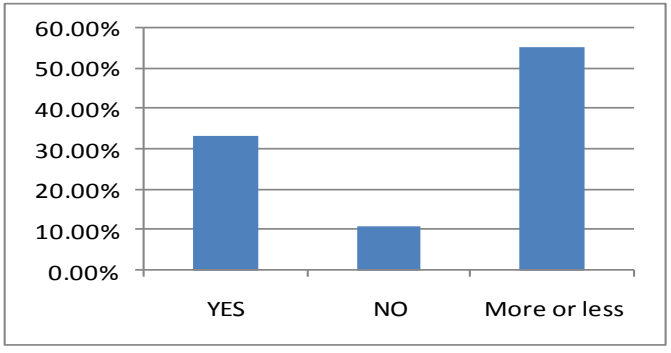
ENVIRONMENTAL INTEGRATION

When asking about the awareness of the different alternatives and improvements that the SHP sector is doing to integrate the plants into the environment, the answers are quite revealing (see chart 2). While the impacts are very clear and identified by the interviewed experts, the efforts the sector is doing and the means they are using to overcome the problems are not very well known or perceived. Some experts declared that even if there are aware of these, they do not see any relevant changes.

Nevertheless, some recognition came in the case of the initiative in Oberösterreich where the Government has established a support-programme for old SHP, which will be integrated into the environment and get more efficient; The investment is concentrated in new turbines and by-pass for fish resulting in an increase of capacity by 30-40%.

The experts underline the relevance of ecolabels for hydro production and that mitigation is not always the solution not to impact the environment. Nevertheless, some also defend the idea of a certification that is simple and credible and could satisfy both producers and NGOs. Some key issues are water abstraction, minimum flow, restoration of river continuity and compliance with the Water Framework Directive.

Chart 2: Awareness of SHP improvements



BEST PRACTICES

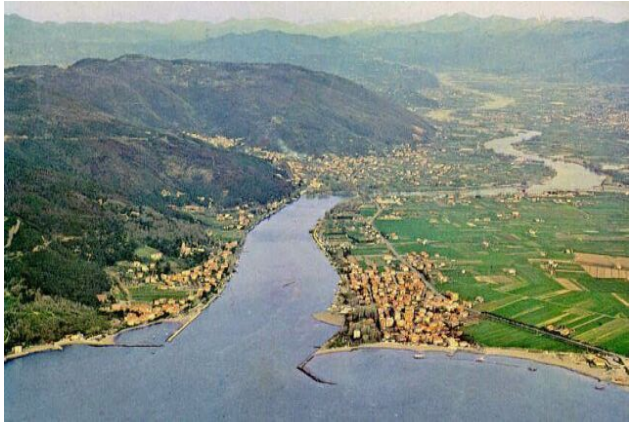
The experts were asked if they knew any SHP environmental plants in their countries and in general the answer was satisfactory.

In ***France***, there are some ongoing research for improving friendliness of hydraulic plants such as fish friendly turbines by Alstom Hydro, VLH turbine by MJ2 in Millau or "hydroliennes" but these technologies are not deployed.

For example, in ***Austria*** in the SHP Kemmelbach a new and modern fish ladder has been built. The information is available at www.wuesterstrom.at

Also the SHP plant in Oberösterreich, after fulfilling the support-programme can be consider as environmentally friendly: http://www.energiesparverband.at/esv/fileadmin/esv_files/Info_und_Service/BroKleinwasserkraft-fin-9_3.pdf

In ***Italy***, the best example is the Magra river where the competent Water Authority has developed a comprehensive river basin management plan which takes into account the ecological functionality of the river. This innovative approach is reflected in the minimum river flow. More information can be found at http://www.adbmagra.it



Examples in ***Switzerland*** includes the SHP plants in Arniet, Wespimühle and der Töss and Twannbach.

CONCLUSIONS

Small Hydro plants that are designed, monitored and managed in a sustainable way can have a reduced impact on the ecosystems and currently there are some "environmental friendly" SHP.

Nevertheless, SHP still has an impact on the environment whether larger or smaller.

The most obvious and difficult impacts to mitigate are those on fish and the river morphology with all its consequences in flow, sedimentation, continuity and so on.

Regarding fish passage experience at hydro power plants in France it has been stated that fish passes should be considered as mitigation measures and not as a measure to restore ecological connectivity, only removal of dams can be considered as a true measure for sedimentation and fish migration, the efficiency is limited to specific species and fish lengths and the maintenance is a major problem.

Interviewed experts also expressed that in general, the output of energy produced from the SHP is low compared to the damage of nature and that building a lot of new SHP won't solve the energy problem.

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+32 2 5461945

+32 2 5461947

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