European cooperation on a new planning approach for small hydro

M. Laguna, European Small Hydropower Association, Belgium
E. Houard, IED, France
M. Cahn, Energies Cités, Poland

A complex institutional framework guides the development of small hydro in Europe. The European Directives for the promotion of Renewable Energy Sources (RES) and the Water Framework Directive (WFD) do not simplify things, with objectives which could seem contradictory, depending on the strictness of implementation of the WFD. In this context, the SPLASH project, co-financed by the European Commission's Intelligent Energy for Europe programme, proposes an original approach via the development of local plans for small hydropower development.

The European Directive for the Promotion of Renewable Energy Sources (RES) electricity in the internal market was adopted on 27 September 2001. This sets indicative targets by country, and aims to achieve a contribution of 22 per cent of electricity from renewable energy sources in the public supply by 2010 compared with the 14 per cent actually supplied in 1999. For the SHP this means the ambitious target of reaching by 2010 14 GW of installed capacity, generating 55 TWh of electricity generation. Hydropower now accounts for about 84 per cent of total electricity generation from renewable sources in Europe and for 13 per cent of total electricity production in the EU-15. Electricity generation from small hydropower (SHP) contributed about 2 per cent to total electricity generation in the EU-15 in the 2001. About 9 per cent of RES electricity generation and 4 per cent of the RES primary energy in the EU-15 were produced by SHP plants in 2001. Despite this modest contribution, there is still a significant potential for development in certain countries. It constitutes an important source of production of electricity from renewable energy sources needed to fulfil the European Renewable Energy targets and its Kyoto Protocol commitments. It is estimated that about 6000 MW of additional capacity could be installed in Europe (this does not take into account the New Member States which joined the European Union on 1 May 2004).

More than 82 per cent of all economically feasible potential has already been exploited in the former EU-15 with the remaining 18 per cent amounting to some 20 TWh/year. In the new member states and the candidate countries this figure is around 26 TWh/year. The majority of this potential (roughly 80 per cent or 19,300 GWh/year) is located in Turkey.

In addition, there is a special interest, from both, the economic and environmental point of view, in the potential resulting from the rehabilitation or renovation of existing sites since about 70 per cent of the current installations are more than 40 years old.

The total installed capacity in 2003 in the EU-15 was about 10 734 MW. The first objective set for 2003 has not been reached (12 500 MW). Following the annual growth rates of 2 per cent per year in the last 10 years, the European SHP installed capacity would be around 12 000 MW in 2010. This figure is clearly far short of the European Commission's White Paper target of 14 000 MW.

The role of small hydro in the EU-15 (2003 data)

Country	Capacity in 2003 (MW)	Country share (per cent)	Progress 1992-2003 (per cent)
Italy	2330	20.8	8.9
France	2020	18.8	6.3
Spain	1722	16	58
Germany	1630	15.2	26.3
Sweden	1050	9.8	8.9
Austria	1001	9.3	29.3
Finland	327	3	9
Portugal	301	2.8	95.5
UK	160	1.5	3.6
Greece	65	0.6	116.7
Belgium	60	0.6	17.6
Ireland	34	0.3	25.9
Luxembourg	21	0.2	-22.2
Denmark	11	0.1	22.2
Netherlands	2	0	0
Total (EU-15)	10,734	99.1	21.7

Average annual growth rate 2 per cent

Existing barriers to development

Although there are various market incentives (fiscal or tariff measures) to encourage the development of the SHP in most of the member states, there are barriers which hinder its development more or less systematically for the following reasons:

- The regulatory framework and environmental constraints are becoming more and more strict. For instance, the European Water Framework Directive 2002/60 /CE and its progressive implementation in the Member States may lead to a loss of production in SHP plants.
- The long administrative procedures required to get the necessary licences. In France, for example, a period of 5 to 7 years is needed to obtain a licence to operate. This means costs in time and money, and presents a risk to investors.
- Local opposition from other water and river users.

The SPLASH project

The SPLASH project is financed by the European Commission under the ALTENER element of the IEE Programme. The project, which started in 2003 and

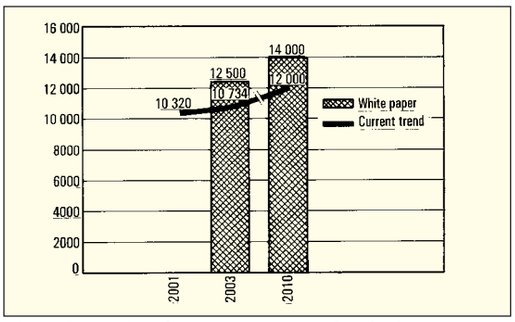


Fig. 1. Comparison between current trend and White Paper objectives (MW). Source: EurObservER, 2004.

will finish in September this year, covers five countries and includes eight partners: France (ADEME and IED), Greece (Alpha Mentor), Ireland (Cork County Council), Poland (MAES), Portugal (CEEETA). In addition ESHA, ENTEC and Energie-Cités are contributing their expertise to the various deliverables, and IED is coordinating the project.

SPLASH aims at preparing pilot spatial and policy plans for small hydro. The spatial planning process will be able to facilitate the development of SHP in the following ways:

- Upstream evaluation of the excluded areas for SHP development for administrative or technical reasons, will lead to a decrease in risks and costs of SHP development.
- Better evaluation of the impacts on the environment, by a broader analysis of the impacts and the potential interactions of SHP projects.
- Improvement of the dialogue between stakeholders and a public participation process can lead to potential compromises with other river users.

It is important to point out that the spatial planning process is not necessarily a tool for final decisions on the implementation of SHP projects, but more a tool for the structuring of data and scenarios to facilitate choice . It is in fact a form of town and country planning with a highly political basis. The spatial planning process, including multi-criteria analysis, should help to identify major factors within the decision-making process, and, as far as possible, should avoid confrontation or position-taking on matters of principle.

The SPLASH project clearly intends to take advantage of experience which has already been developed in the wind sector in Europe, for which different approaches for spatial planning have been developed. Some of the partners in the SPLASH project have already worked on this issue before. The project also tries to take into account other approaches to the spatial planning of territory.

Methodologies developed within the framework of SPLASH

The SPLASH project involves pilot projects in five countries. The partners involved are organizations with a number of different types of structure (local energy agencies, environmental or technical consultants, research institutes and so on). The expertise, local networks and approaches used are therefore very varied. This has led to several methodologies being implemented within the framework of SPLASH, rather than a single common framework. Without going into details of each of these spatial planning methodologies, we will indicate here the common principles, and also the main differences.

Potential small hydro stie in an old factory in St Julien village, France.

The main common feature of the methodologies being developed is the use of geographic information systems (GIS). This tool has become an indispensable adjunct to the spatial planning process for energy technologies. It allows one to take constraints on the area being studied into account, to understand better the issues affecting decision making. The areas studied are all river basins or portions of river basins. As a result of GIS, one is no longer obliged to limit analysis to a given point in space, but rather it is possible to take into account all the relevant parameters on a territorial scale.

Beyond this similarity, two very different methodological approaches can be distinguished:

- A ‘bottom-up’ approach, or inventory approach: this is based on the study of sites to feed information into a database and GIS. This simultaneous representation of various sites allows a more integrated appraisal to be made over a larger area. This is the method proposed by the Portuguese and Polish partners.
- A ‘top down’ approach, or "sieve map": this starts from a large area of territory and focuses in on a section of river. It is the method follow by the Irish, the French and the Greek partners. In these last two countries, the methodology also includes the implementation of multi-criteria analysis.

Table 2: Approaches adopted for the pilot projects in five countries

	France	Greece	Ireland	Poland	Portugal
Methodological approach					
Supplements to development plan					X
Invetory approach (‘bottom-up’)				X	X
Sieve maps (‘top down approach’)	X	X	X		
Weighting of constraints and multi-criteria analysis	X	X			
Type of involvement					
Institutional and regional involvement	X		X		X
Local involvement with site owner / riverside				X	For sites
Types of site identified					
River sites	X	X	X	X	X
Drinking water network			X		
Old mills	X		(*)	X	X
Scale of work	Small basin	Large basin	County	Small basin	Consortium municipalities
Expected continuation					
Call for proposals			X?		
Community development / local cooperative	X			X	
Municipal projects		X(**)			X

* Old mills avoided; ** Municipal project planned.

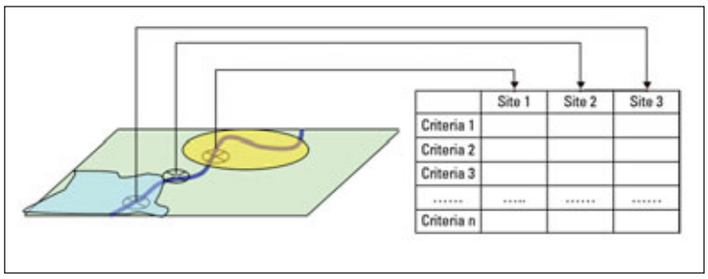


Fig. 2. The 'bottom up' approach.

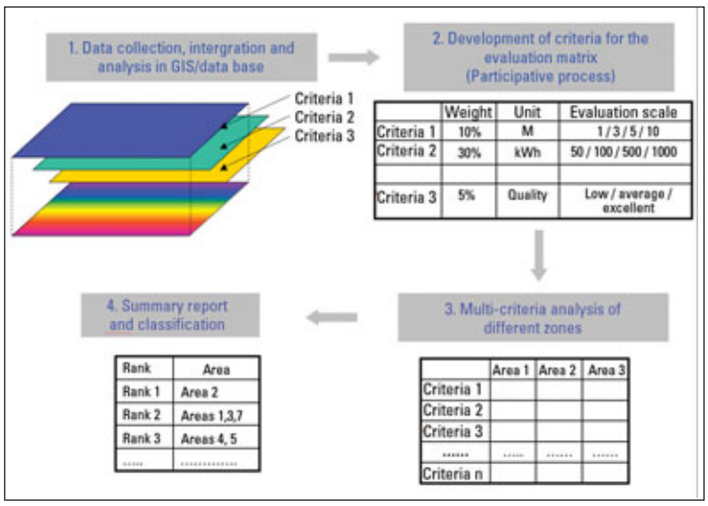
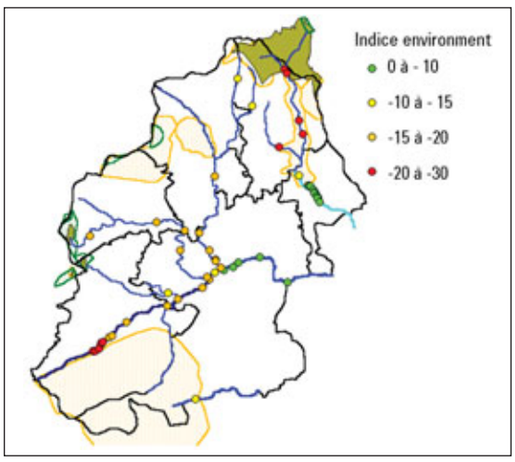


Fig. 3. The 'top down' approach.

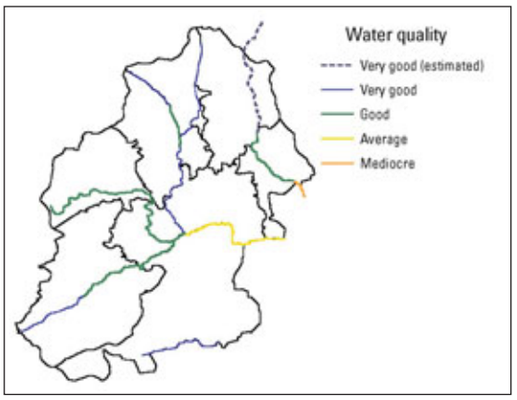
It is important to underline that, in both cases, the methodologies proposed assist the evaluation and selection of those projects that offer the best overall compromise, but they are not the optimisation tools for the SHP project.

The bottom up or inventory approach

This approach is based on fieldwork, with the identification and the development of pre-feasibility studies at various sites. The data are collected locally, complemented if necessary by more general data, and are then entered in the database. The comparison of these data with data mapped at a territorial scale allows one to the widen the vision to include the analysis of projects. At this point, this method remains essentially analytical, with the identification of a single utility function (in this case, an economic criterion, such as cost-benefit or internal rate of return criteria).



Environmental index elaborated for multi-criteria analysis in the French local plan.



Water quality map for France.

The top down approach or sieve map :

This approach consists of a method of progressive evaluation, or multi-criteria evaluation, on the scale of a territory, making it possible to go down to area of even site identification.

This approach contains the following main stages:

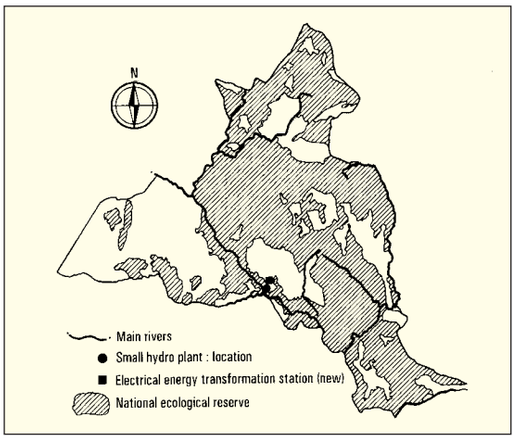
- Definition of the boundaries of the study and involvement of local players.
- Identification of the criteria for evaluation: hydrological resources, infrastructure (access, possibility of grid connection), environmental aspects, socioeconomic, and so on.
- Data collection and adaptation of the criteria.
- Integration and analysis using GIS.
- Multi-Criteria Analysis (MCA), with weighting of criteria via a steering committee.
- Cartography of the main issues and preparation of reports analysing the results.

Potential ranking of sites, based on the various quantitative and qualitative criteria taken into account

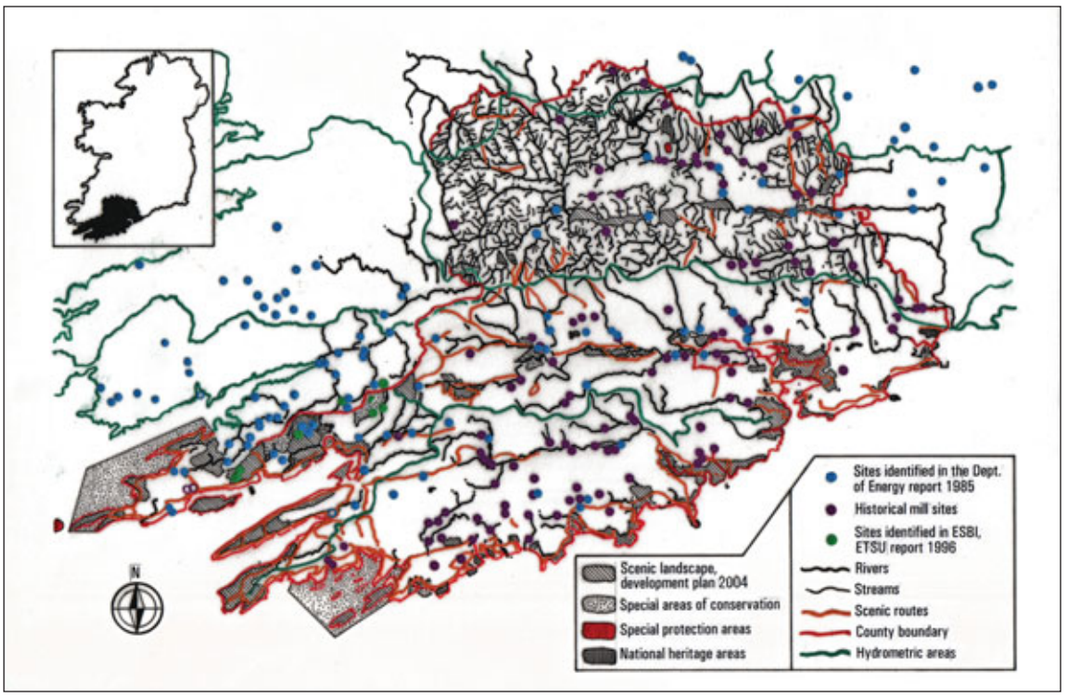
The main results, lessons learned and recommendations

The Figures show examples of some of the different maps produced during the preparation of local plans in the various partner countries.

From the SPLASH cases studies, the following



Example of a local map, for part of Portugal.



Example of a map for Ireland (detail of one region is shown below).

points seem of major importance before starting a local plan for small hydro :

• Find a key partner who is actively involved in the small hydro approval or planning process to act as a leader. This could be a local authority, the préfet, the local water agency, a national or regional park, etc. The important thing is that there is a leader who will keep the process going through the administrative treacle that will always threaten to overwhelm it, and won't take no for an answer.

• Carefully select the scale of the study area. We avoided excessively large areas of territory, since these could greatly limit the possibilities of acting locally, as well as the selection of relevant local criteria. Too small and you have no real choice. Too large and you lose the detail that is necessary when appraising small hydro sites.

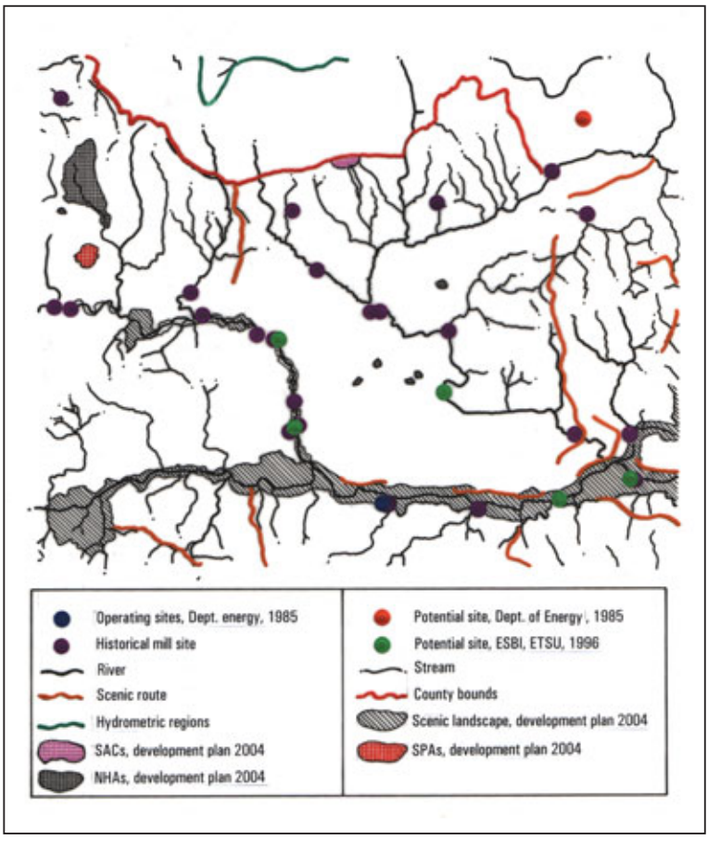
These 2 first points might be actually very connected, the 'good scale' being connected to the institutional framework for SHP or planning decision making. Splash partners worked from the scale of municipalities up to the regional scale. The final results might be very different depending on the scale retained.

Be sure to get multidisciplinary teams involved . Indeed, the development of SHP requires specific skills in a range of fields: technical, environmental, financial, social, landscaping, planning, and so on. These different forms of expertise are indispensable if you wish to obtain results providing the best understanding and consideration of all the interests and constraints

Be sure to schedule the necessary time period. Plans take time, from data collection, discussion with stakeholders and synthesis. The involvement of the local community gives you the chance to produce a document with clear recognition.

Pay particular attention to the data collection. GIS offers great opportunities for this, but depends on having good data (rubbish in, rubbish out). Put pressure on those who have data of public interest (e.g. the electricity network utility) to release essential data. Availability and cost of the digitized data, confidentiality problems, consistency of the data, and so on, all pose problems.

• Search for synergies : small hydro can have various benefits. Restoring historic mills for example allows one to maintain them as a local tourism and heritage resource. Using river bed structures to produce energy



means that there may be someone with an interest in maintaining them – important for river regulation. Search these out and promote them since these may be stronger arguments for your project than the energy produced

• Integrate your plan into the statutory planning documents if at all possible. The plan will have that much greater weight if it is part of the statutory process and this will force the different government and local government bodies to take account of it. There are various possibilities, and the priority depends on the approval process in the country concerned – local development plan, regional strategic plan, climate change strategy, etc.

• Go public. There will always be interests that don't want to participate, or simply say "No!". The planning process must be a public process. You are trying to make people participate and peer pressure helps here. Once you involve them in a team working towards the same end, sustainability, you should find that solutions are found to conflicts of interest, and they are less frightened of the problems.

Bibliographical research showed that spatial planning for SHP is not being used, or only to a very limited extent. Generally speaking, it is interesting to note that although spatial planning approaches stimulate considerable interest, most work remains methodological, and implementation is still very limited. In that context, SPLASH has permitted the testing of particularly innovative processes for the development of SHP, in the light of a better consideration of the multiple challenges relating to sustainable development and the participatory process. ◊

M. Laguna

E.Huard

M. Cahn

Maria Laguna has an MSc in Environmental Management and Policy from Lund University Sweden. Since 2003 she has been a Project Manager at ESHA. She has several years of experience in environmental and energy policy analysis and in management of EU funded projects in the field of renewable energy and climate change.

European Small Hydropower Association, 26b Rue du Trône, B-1000 Brussels, Belgium

Emmanuel Huard, MSc in industrial and environmental processes, is project manager in IED. He worked for 7 years in decentralized electrification and energy planning. He is currently based near Lyon, France.

IED,Unnovation Energie Développement, 2 chemin de la Chauderaie, F-69340, Francheville, France

Martin Cahn is a project manager with Energie-Cites, worked for 17 years as a countryside planner in a British local authority. He now lives in Poland.

Energies Cités, ul. Sikorskiego 8, 32-400 Myslenice, Poland.