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Manuscript Draft

Manuscript Number: IWA-4486R1

Title: SEE Hydropower - Targeted to Improve Water Resources Management for a Growing Renewable Energy Production

Article Type: Full Paper

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Manuscript Region of Origin: AUSTRIA

SEE Hydropower - Targeted to Improve Water Resources Management for a Growing Renewable Energy Production

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Abstract Hydropower is one of the most important renewable energies in Southeast Europe. On a global scale it helps to increase the share of electricity production by renewable sources, but on a local scale it creates ecological impacts in river ecosystems. The EU-project “SEE Hydropower” deals with the optimization of water resources management and the improvement of hydropower implementation with respect to the environment. The objectives of the project are the review of the state of national legislations and the national water resources management concerning hydro power implementation as well as the summarization of different management methodologies for reservoir operation in the Southeast European partnership countries. Concerning the implementation status of the Water Framework Directive significant differences were observed in the national legislation and the national and regional water resources management in the project area. In this paper the main focus is laid on the presentation of the EU project “SEE Hydropower” and on its results concerning the implementation of the Water Framework Directive and the existing differences between the project countries.

Keywords hydropower; renewable energy; RES-e Directive; sediment transport; Southeast Europe; Water Framework Directive

INTRODUCTION

Due to the fact that in Southeast Europe (SEE) water is one of the most important resources for renewable energy production the project “SEE Hydropower” is an important part of the Southeast Europe Programme, which is funded by the European Union. The project shall contribute to improve the water resources management for a growing renewable energy production in Southeast Europe. The main objectives deal with the promotion of hydropower and the optimization of water resource exploitation in a compatible way with other water users, following environment-friendly approaches. The project’s aim is a better utilization of water concerning hydropower production regarding renewable energy sources development, preserving the environmental quality and minimizing the flood risk. SEE Hydropower is carried out by 12 partners coming from Austria, Greece, Italy, Moldova, Romania and Slovenia.

Background

In the Southeast European countries the structure of electricity production concerning the different energy sources is quite similar. As shown in figure 1 hydropower and fossil fuels are dominating the market. Regarding renewable energy production hydropower is the most important source for the generation of electricity. Therefore it plays an important role to reach the targets set by the European Union in the RES-e Directive 2001/77/EC.

According to the RES-e Directive EU countries have to increase their share of renewable electricity production. The RES-e Directive is among other directives one part of the “EU climate package”. The objectives of the climate package are to establish a reduction of CO₂ of 20%, to increase the energy efficiency compared to 2005 by 20% and to reach an overall binding target of 20% share of renewable energy sources in energy consumption by 2020 respecting the Kyoto protocol targets (Nicolosi and Fuersch, 2009; European Parliament, 2001).

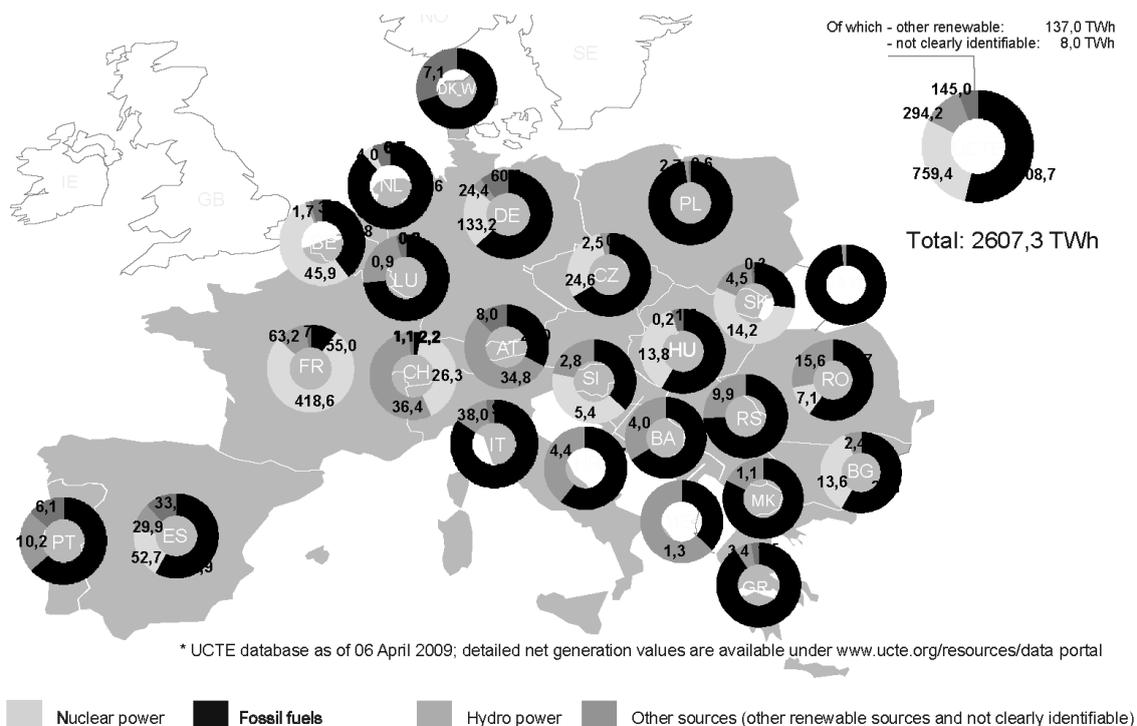


Figure 1: Electricity production in Continental Europe in TWh (source: UCTE, 2009)

The electricity production by hydropower shows advantages for the global CO₂ balance but creates at the same time ecological impacts on the river ecosystems on a local scale. Affecting the connectivity of water bodies and injuring river ecosystems has severe hydrological effects. For this reason the Water Framework Directive 2000/60/EC obliges member states to reach a "good ecological status" in water bodies by the year 2015. Administrators in Southeast Europe are facing an increasing water demand, but are lacking reliable tools to evaluate the effects of water withdrawal on river systems. In addition, competition between water users is becoming a serious problem. So there is a strong need of accurate planning and optimizing the management of water resources.

Divergent objectives in the Water Framework Directive (WFD) and the RES-e Directive

The implementation of the Water Framework Directive is a great challenge for all member states of the European Union. The purpose of the WFD is to preserve and to protect the status of aquatic ecosystems which have a "good ecological status", and to improve the status of water bodies which have a "moderate status". The classification of surface water bodies is based on biological, hydro morphological, chemical and physico-chemical quality elements (European Parliament, 2000). To reach the targets of the Water Framework Directive, the minimum instream flow of hydropower plants has to be increased and hydropeaking has to be reduced. As a consequence of these measures the hydropower production will decrease. For example in Austria the loss of hydropower production will be about 15% for small hydro power and about 9% for hydropower bigger than 10 MW (Stigler et al, 2005).

The objectives mentioned above are causing a conflict between the targets of the WFD and the aims of the RES-e Directive. On the one hand river ecosystems shall be protected, which means a decrease of hydropower production, and on the other hand the generation of electricity out of renewable sources, including hydropower as a very important source, shall be increased.

METHODS

There are 12 project partners from different countries involved in the project. This assures a broad approach to the assignment of tasks and the implementation of experience and know-how.

Partners involved in the study

The SEE Hydropower region includes 6 countries, Austria, Greece, Italy, Moldova, Romania and Slovenia. The diversities of the countries are significant for the study region. Additionally, the regional distinctions concerning economic power, innovation, competitiveness and accessibility between urban and rural areas have to be mentioned. In figure 2 the area of the Southeast Europe Programme is shown. The domiciles of the 12 SEE Hydropower project partners are indicated by stars.



Figure 2: Southeast Europe Programme region with countries of the study area (source: Southeast Europe Transnational Cooperation Programme, 2009)

The SEE Hydropower study area is characterized by broad biodiversity and natural resources of high environmental value. There are divergent environmental problems in the project area, but there is also potential for the use of environment-friendly technologies and potential for future economic and social development.

Review of the state of national legislation and the national water resources management

Based on the review of the official documents concerning the implementation of the Water Framework Directive in the member states of the European Union a questionnaire was designed and sent to all project partners. The questions were related to the status of water resources management and the national procedures concerning hydro power implementation in the SEE partnership countries. The most important part was the evaluation of the national problems and targets concerning the implementation of the Water Framework Directive and the RES-e Directive.

Especially for the WFD a lot of documents were available only in the national languages. Therefore the required data has been collected and translated by the project partners in order to give an overview of the countries involved and to be able to compare the implementation status of the different directives. (Harb et al, 2010)

RESULTS AND DISCUSSION

State of national legislation regarding the permission process for new hydropower plants

An EU Directive gains legality when it is ratified by the national legislation. The Water Framework Directive was transposed in time by all new member states including Bulgaria and Romania. In contrast, most of the former EU 15 member states did not transpose the directive in the required time, among these Belgium, Finland, France, Germany, Italy, Luxemburg, the Netherlands, Portugal, Sweden and the United Kingdom (Commission of the European Communities, 2007).

Although the Water Framework Directive has been implemented in the study area, the national legislations of the different countries are still divergent. A significant value is the duration of the permission process for hydropower plants. E.g., for hydropower plants bigger than 10 MW a variation from 18 months in Greece and Slovenia up to 60 months in Romania can be observed. For small hydro power plants less than 10 MW the duration of the permission process ranges from 12 months in Greece to 18 months in Romania. The implementation of the WFD and the RES-e Directive causes amendments and substitutions of laws concerning the permission of hydropower plants. In practice, the permission process often differs largely from the original schedule. This leads to a discouragement of potential investors and hinders investments in RES-e projects. (Harb et al, 2010)

The most important but also the most time consuming part in the permission process for new hydropower plants is the Environmental Impact Assessment (EIA). There is a wide range of necessary studies and documents for the Environmental Impact Assessment. They vary largely depending on the country, the capacity of the hydropower plant, the size of the reservoir and the ecological status of the affected river section.

Frequent problems in the permission process for hydropower plants

The divergent objectives of the Water Framework Directive and the RES-e Directive require accurate coordination of the National Action Plans. So the objectives determined in the National Action Plans according to the RES-e Directive have to be harmonized with the environmental objectives defined in the National Action Plans according to the WFD and nature preservation. The coordination of opposite interests mentioned above is not only difficult on a national level, but also on a local, regional and international level. In most countries of the SEE Hydropower study area the WFD and the RES-e Directive are under the competency of different ministries. This causes the need of harmonizing different activities on an intersectional level.

Actual status of the rivers in Southeast Europe

The implementation of the Water Framework Directive forced the EU member states to evaluate the actual status of the national river systems according to the criteria constituted by the European Union. Most of the member states succeeded in reporting the actual status in time. As one of the countries which failed to submit all the necessary information related to the actual status of the river systems, Italy has to be mentioned. There the new classification scheme in compliance with the WFD definition of the ecological status has been put into force in 2009 and will be implemented in national law in 2010. In Italy the “poor or bad ecological status” is mainly determined by biological

parameters. In Greece the ecological status of a large number of rivers (174 out of 379) is still unknown and the pollution and the chemical status of the rivers are the main problems. At a national level Romania identified as the main problems the pollution with organic substances as nutrients and with hazardous substances as well as hydro morphological alterations. Considering the different problems it becomes obvious that each country has to deal with different difficulties. In Austria, for example, the hydro morphological conditions are causing great problems (BMLF, 2005).

National state of water resources management

According to the Water Framework Directive the EU member states have to implement National Action Plans, also called River Basin Management Plans (RBMP). In most member states the first RBMPs were elaborated before December 2009 and are going to be transposed by March 22nd 2010. For the implementation of the RBMP each member state has to define its own environmental quality criteria according to the WFD, which constitutes only the framework. The targets have to be set by each member state itself. In Greece, for example, the establishment of environmental quality criteria in order to define the “good surface water status” has not been finished yet.

CONCLUSIONS

The implementation of the WFD and RES-e Directive with their evidently divergent objectives is a major task for all stakeholders. The review of the national legislation and the status of water resources management in the Southeast European countries showed that some countries have already defined their targets; others still have backlogs. The national legislation and the permission process of hydropower plants are still divergent. The modification of the permission process, especially the conditions for the Environmental Impact Assessment, has not been finished in most of the Southeast European countries. Due to this fact, it is very difficult for investors to get permissions for new hydropower plants.

The review of the national legislations and the water resources management has been the first step in the project “SEE Hydropower”. It will be followed by the summarization of different management methodologies for dynamic reservoir operation. The dynamic operation of hydropower plants is necessary for flood prevention and an optimal reservoir desiltation should be the basis for a good sediment management. This is an important part of the SEE Hydropower project, as the accumulation of sediments in reservoirs leads to problems in the reservoirs and reduces valuable morphological processes in downstream river systems affecting biological diversity and ecological dynamics. Based on the project’s results, innovative approaches will be tested in the pilot case study areas in the Mur river basin in Austria, the Piave basin in Italy, the Ialomita and Prut basins in Romania, the Seres region in Greece and the Drave basin in Slovenia.

The main targets of the project SEE Hydropower are the development of a sustainable sediment management, the application of methods for environmental flow, the assessment of conflicts among water users and the improvement of flood control management methodologies. All important stakeholders (for example inhabitants, fishermen, land owners, et cetera) will be informed adequately to reduce disputes significantly. Additionally, experiences of how to encourage locals to join the planning process will be shared within the partnership and published as recommendations to administrations and reservoir owners.

ACKNOWLEDGEMENTS

The project SEE Hydropower is funded by the Southeast Europe Programme of the European Union. The data for this report was collected by our project partners ERSE S.p.a. (Italy), University of Ljubljana (Slovenia), Ministry of Environment and Spatial Planning (Slovenia), University “Politehnica” of Bucharest (Romania), National Water Administration “APELE ROMANE” (Romania), Prefecture of Serres Province (Greece) and the Prefecture of Arta Province (Greece).

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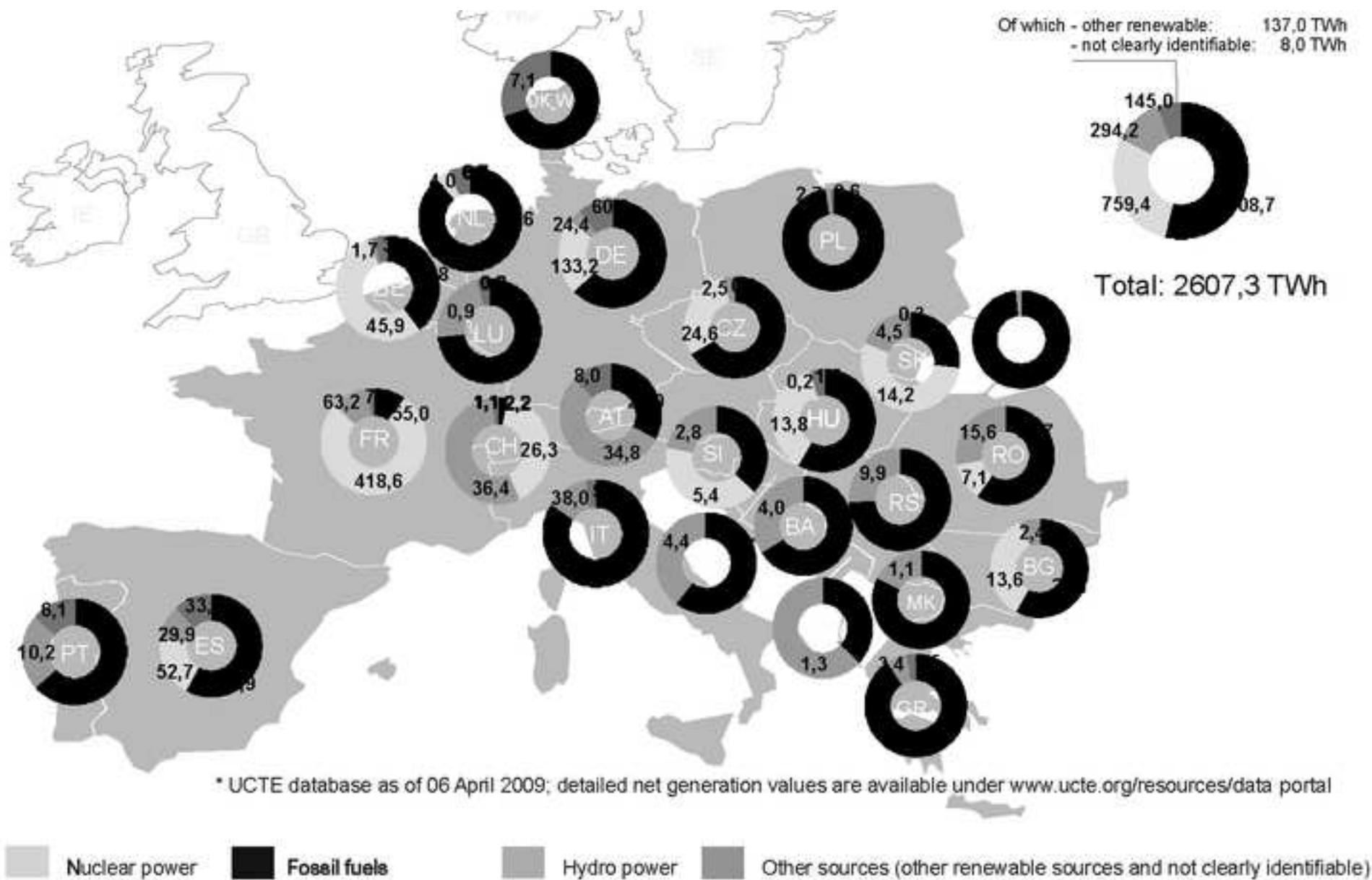
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