RENEWABLE ENERGY LANDSCAPES – the new reality?

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1 Introduction

European Union countries are aiming to reach the goal of 20% of final energy consumption from renewable sources by 2020. To achieve this goal, each of the countries have set their own national targets being as low as 10% for Malta and as high as 49% for Sweden. According to EUROSTAT data for 2015 (the latest available year), 11 out of 28 EU countries have either reached or supersede this goal. The mix of renewables can be different but mostly the countries rely on hydro power, wind and solar energy. While hydro power is a mature renewable energy sector in Europe (contributing 38% of the total renewable electricity generation in 2015) with relatively limited potential for further growth, the wind and solar energy sectors are much smaller and younger, and are experiencing a period of very rapid expansion. For example, electricity from solar power grew from just 1.5 TWh in 2005 to 107.9 TWh in 2015 and now represents 11.2 % of generated electricity power in EU-28. On the world level, according to predictions, solar and wind could together supply up to 39% electricity by the year 2060 (Davies, 2016).

What the statistics do not tell is how reaching these goals may affect the territory and society we live in. From time to time, the evening news or daily papers report about people blocking the transportation of wind turbines or people protesting against a hydro power installation due to their potential environmental damage. This is mostly due to the foreseen impacts of these installations on the landscape and local economies. The COST RELY (Renewable Energy and Landscape qualitY) project aims to minimize these impacts and create sustainable renewable energy landscapes through international knowledge sharing of prediction, assessment, evaluation and mitigation measures.

Figure 1a-1d: Examples of the renewable energy landscapes across EU countries.(Photos: Naja Marot, Alexandra Kruse)

2 About the project

COST RELY Action is a networking project under the umbrella of Horizon 2020 EU Framework Programme, running from October 2014 until October 2018. By the end of year 2017, 201 researchers, practitioners and people from administration originating from 35 European countries have participated in the COST Action. Additionally, the action is associated with one Canadian and one Albanian university, and has observers from the US. As the RELY abbreviation indicates, the project addresses the relation between renewable energy and landscape quality. The project is consolidating and extending existing knowledge of participants to enhance the science base for decision-making, and develop guidelines for public participation in planning renewable energy systems. The results will provide better understanding of how European landscape protection management and renewable energy deployment can be reconciled to contribute to the sustainable transformation of energy systems (European Cooperation 2014).

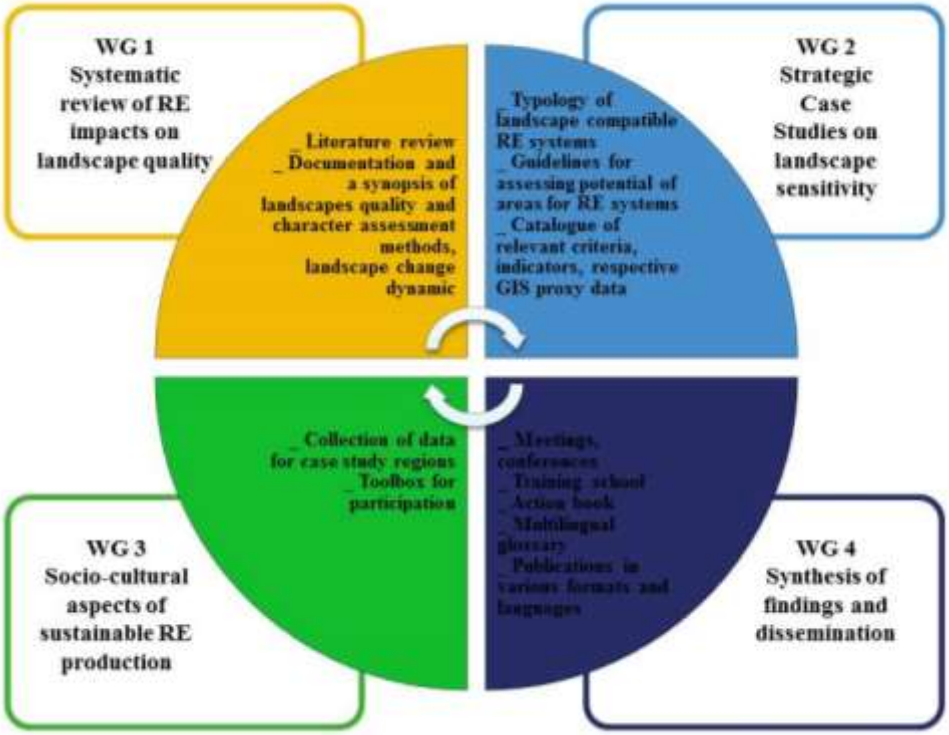

Figure 2: Working scheme of the project.

3 Project Outcomes

The first important project outcome is t**he definition of the energy landscape** and its different types. The new term/concept of energy landscape means:

'a landscape characterised by one or more elements of the energy chain (e.g. energy extraction, assimilation, conversion, storage, transport or transmission of energy). The outcome can be a multi-layer energy landscape comprising combinations of technical and natural sources of energy within a landscape.' (Kruse and Marot 2017)

The following types were listed and described more into details: wind power landscape (onshore and off-shore), hydro power landscapes, solar power landscapes (photovoltaics, solar heat and thermoelectric power), bioenergy landscapes (biomass, biofuel and biogas) and geothermal energy.

Full statistical study of different kinds of RE development in different COST action countries, their targets and policies on energy production from renewable sources (Frolova et al., 2016) was carried out. The collection of data describing a current state of RE implementation in European countries was complemented by maps showing the production in Europe. Existing studies, articles and other sources

that describe installations' **positive/negative impacts on landscape character and quality**, and the current information on the production from renewable sources in Europe (targets, policies) were collected and analysed. One such method is **a landscape (character) assessment** which is an assessment method used in landscape planning to support identification of landscape values, development opportunities and management options. A further example is a **visual impact assessment**, a systematic analysis of possible impacts on the environment, resulting from a proposed development and the investigation of the means available to mitigate the effects of such proposals prior to implementation.

The ground work on the production status of RE was followed by the inspection of the assessment of landscape functions, its quality and sensitivity, and the potential for specific renewable energy production systems. More than 50 'best practice' case studies of planning and development from 20 European countries were selected. The qualitative and quantitative analysis of these case studies aimed at identifying the criteria of smart practice and resulted in the **typology of smart practice projects**. Additionally, a questionnaire for the assessment of compatibility of specific landscape types and functions with specific renewable energy systems was formulated as an assessment matrix. The data, again collected from the participating countries, are in the evaluation process and will be presented in a table and/or a map format. The Action organised a Training School for young professionals, Master and PhD students which took place in Iceland in May 2017. The goal of the school was to assess the potential and vulnerability of specific landscape types to RE development, more specifically, one group was engaged in a research on factors influencing individual landscape perceptions and attitudes towards RE development, and techniques to be used for their assessment, e.g. semantic differential etc.

Apart from the status and assessment methods, another focus of the project was **the socio-cultural aspects of the RE installation and production**. In a first stage of the investigation, experts identified acceptance factors influencing the RE project development. Existing tool boxes for RE-planning and innovative practice examples of participatory planning in the different European regions were collected. Two on-line surveys will reveal the standard planning procedures for RE projects in Europe and provide expert assessments of the quality of these planning procedures in the case of wind energy. Innovative planning tools were evaluated in regards to the expected benefits and their compatibility with the planning culture of the countries. Based on these findings **a toolbox for effective RE spatial planning process** consisting of decision tree to select optimal planning tools and a description of these tools was prepared. An example of a tool would be a participatory mapping of landscape meanings to identify optimal RE sites.

A bunch of activities has been dedicated to the outcome transference of the whole project. It includes production of **the multilingual glossary, traveling exhibition, photo data, creation of the website and the overall dissemination of the projects** including the Action book preparation and publishing of the articles. The glossary is already prepared and it consists of 48 terms/expressions divided among three clusters resembling three dimensions of the project: landscape, renewable energy types and planning process, methods and techniques. It is available on-line on the COST RELY page and is planned to be published in the Hungarian Journal of Landscape Ecology by the end of 2017. Each entry to the glossary (they can be downloaded separately) is described by six elements: 1. The English name of the term, 2. Definition, 3. Related terms, 4. Keywords, 5. Illustration(s) and 6. Sources, and was translated into 28 European languages including Esperanto. The Glossary was developed through an exercise of cross-checking and unifying the understanding of terms and expression in the new research field since the definitions come from a group of 31 experts with different backgrounds (landscape architects, geographers, sociologist, etc.) who are often viewing the same phenomenon from different angles. Formulation of the definitions also revealed that while landscape and planning terms were not questionable in terms of available knowledge in the COST RELY project, the most unknown to the action participants were the technological terms related to the renewable energy types, e.g. all types

and possible installations of photovoltaics or solar thermal. The photo database contains few hundred photos taken during the various project activities carried out from Portugal to Hungary, and from Greece to Iceland. These photos represent a new reality of European Energy Landscapes and will enable its regional diversity to be documented, among the territorial integration of these energy systems. Additionally, the photo database was used as illustrations source for the glossary and is a part of the travelling exhibitions organised throughout the duration of the project.

4 Conclusion

The exchange of knowledge in the project revealed that the situation of RE deployment varies among the countries and regions, but as one might presume not only due to different natural conditions. The project revealed that despite many contextual differences, European countries face common challenges to increase renewable energy production whilst sustainably managing our landscapes, and consequently that there is a lot to learn from territorial comparison and the international collaboration of experts and practitioners. The major factors influencing the RE spatial development are the planning culture and the openness of the planning process for public participation, perception of the quality of different landscapes and the strategy and attitude of investors with regards to conflict mitigation. With regards to the perception and acceptance of future projects, better results are expected if the public and/or stakeholders are brought to the real landscape (intended for a development project) and the on-site contact to the territory is established. Mental mapping and other research techniques used in the real environment can reveal more and richer information for the planner than using only 'laboratory' methods with static photographs or photo-visualisations. Such and more useful outcomes of the project will be presented in several scientific articles, the final project conferences (Clermont-Ferrand, September 2018 and Brussels, October 2018) and in the project monograph, available in 2018. For more information, please do not hesitate to browse on-line (www.cost-rely.eu) or contact the project representative in your country.

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