SOCIAL, ENVIRONMENTAL AND PLANNING CONIDERATIONS OF WIND ENERGY TECHNOLOGY IN THE BUILT ENVIRONMENT. WORK GROUP 3: INTRODUCTION

Ruben Paul Borg[a], Stefanie E. Huber[b]

[a] *Chairman WG3, Faculty for the Built Environment, University of Malta, Malta;*
[b] *Vice-Chairman WG3, ENCO Energie-Consulting AG, Switzerland*

1 Introduction

The climate and energy package of the European Union, consists of binding legislation which aims to ensure that the European Union meets its ambitious climate and energy targets for 2020 [1].These targets, known as the "20-20-20" targets, set three key objectives for 2020:

- A 20% reduction in EU greenhouse gas emissions from 1990 levels;
- Raising the share of EU energy consumption produced from renewable resources to 20%;
- A 20% improvement in the EU's energy efficiency.

The major contributors to locally produced renewable energy are principally photovoltaic systems, solar panels and combined heat power systems, whereas there is also a significant potential contribution from small and medium (15kW-100kW) wind turbines. In recent years, a significant growth in the sector of small and medium turbines has been noted with further expansion of this sector being expected in the coming years.

In this framework, COST Action TU1304 WINERCOST (WINd Energy technology Reconsideration to enhance the COncept of Smart ciTies) addresses the objective of wind energy integration into urban and suburban built environment and identifies methods towards the acceleration of related applications to overcome technological, societal and other barriers [2]. For the purposes of this research activity, the COST Action aims at gathering the existing knowledge on onshore and offshore wind energy technology and to address the built environment wind energy technology. The aim is to provide the necessary tools and to contribute towards the strategy for Future Smart Cities.

2. Wind Energy Technology Reconsideration and Smart Cities.

The feasibility of installations of Small and Medium Wind energy Technologies (SMWT) in urban areas is significantly influenced by the acceptance of the local communities. A catalogue on social acceptance at the European level does not exist yet, although there have been some preliminary initiatives in international energy fora. This results from a different understanding and acceptance of SMWT. Nevertheless a thorough investigation of the social acceptance criteria is required and needs to be based on the existing knowledge about wind power in general, SMWT and the first examples of wind power in the built environment. This required research in different countries based on case studies. It is therefore crucial to discuss European energy policy and strategy for advancement of the BWT with consumers, municipalities, industry (turbine manufacturers) and grid operators. The investigation of optimized centralised or de-centralised grid-integration needs to be considered.

During Phase 1 of the WINERCOST Action, existing knowledge on on-shore, off-shore WT and other application of wind energy structures in particular BWT including Building-Integrated-Wind-Energy Technology applications, shall be assessed.

During Phase 2 of the WINERCOST Action, the activities shall focus on the development of a strategy to enhance the Smart Cities Concept by effectively introducing WT projects in the built environment. The activities also address barriers for technological implementation, possible non-technical negative effects (e.g. noise, production/installation costs, logistics, reliability, integrity, system robustness, aesthetic) and European energy policy as well as societal acceptance issues.

In this sense, the WINERCOST network of all relevant BWT-stakeholders will develop an overall view on required research needs and necessary research and development actions for the future of BWT in urban environments.

3. Challenges in Wind Energy Technology in the Built Environment

Built environment Wind energy Technologies (BWT) and related structures and infrastructure are expected to form an integral part of the Smart Cities of the future. Wind Technologies are expected to be integrated into urban spaces and closer to spaces were people. As past and current experience with wind energy shows, large WT moving structures very often receive significant opposition from the communities. This is most often relevant for new technologies and changes in society, and may relate to aesthetics, nuisance, processes or communication issues. Therefore, acceptance issues have to be considered when addressing new technologies including in particular BWT, both in the general planning as well as for integration in specific projects. The factors that need to be considered carefully include aspects related to policy, legislation, planning and environmental issues. Communication and processes also need to be respected while industry needs to address the challenges to design and produce socially acceptable products.

Working Group 3 targets at gathering information on the current state of knowledge and also in comparing the situation in various European countries. This is achieved through the review of published sources and literature but also through surveys and interviews with stakeholders, interested parties and groups in society. Based on the findings of this assessment, some approaches are developed for future implementation. In the last phase, a strategy for stakeholder dialogue is proposed bringing together the authorities, industry and research entities to test the approaches and to prepare the ground for the BWT to become reality through implementation in Smart Cities.

In Working Group 3 (WG3) of the COST Action TU1304 the aim is to provide an improved understanding of the challenges in the implementation of WT in the Built Environment. WG3 focuses on social, environmental and strategic planning aspects of Wind Energy Technology. This will be achieved through two phases: WG3A and WG3B. WG3A focuses on non-technical issues of WET including societal acceptance, European energy policy and municipalities-researchers-industries dialogue. WG3B will focus in more detail on societal acceptance, European BWT policy and other non-technical BWT issues. The WINERCOST aims to contribute to the advancement of the Wind Energy harvesting in the urban habitat by enhancing the Future Smart City concept

4. Social, Environmental and Strategic Planning Considerations

The proceedings present the contributions of Work Group 3, focusing on Social, Environmental and Strategic Planning issues and Wind Energy Technology.

4.1 Non-Technical Issues

Non-technical issues play an important role to be able to implement wind power in a specific environment. This was demonstrated through various debates on various projects in past years. Huber presents a review of Non-Technical Issues and Wind Power in the context of municipal energy and climate policy, based on the general acceptance of wind power and smart city approaches. There is a lot of knowledge and experience on non-technical issues of wind power as well as smart cities that can be used as a basis for the activities of WINERCOST, but further investigations and eventually case studies for wind power in the urban context are required [3].

4.2 Life Cycle Impact Analysis

Renewable Energy (RE) sources, such as wind energy, are preferred over non-renewable sources, due to the potential reduction in greenhouse gases (GHG) emissions. On the other hand, large scale WT also present significant challenges. Recent developments in micro-generation, and hence small scale WTs, relate to state-of-the-art technologies to effectively manage the demand, load and instabilities through effective planning, control and efficiency yield. A life cycle assessment (LCA) allows for environmental impact evaluation during the whole life cycle stages from production, to operation and generation of energy on site. In this way a LCA leads to a comprehensive evaluation of performance of a technology. This paper presents a comprehensive life cycle assessment review of Wind Turbine (WT) technology. Bertasiane, Borg and Azzopardi present a review of Life Cycle Impact Analysis of Wind Energy Systems [4].

4.3 Planning and Environmental Considerations.

Norton draws from current theory and practice to set out the main environmental and planning considerations relating to planning and developing wind energy in the urban environment in Europe. The role of wind energy in the urban environment within the renewable energy sector and progress to date on technical and wind resource issues are considered. A set of environmental considerations that are appropriate to the urban environment are identified and the main functions and considerations for spatial planning systems in the development of wind energy in the urban environment are presented. Recent practice guidance for spatial planning and a wind energy project in a new neighbourhood are presented as better recent practice in this area [5].

4.4 Local Authorities & Wind Trubines in Urban Areas.

Europe faces moments of transition. One of the main goals of Europe for the next decades is the implementation of clean and efficient energy, not only from the environmental point of view, but also considering financial, employment and security aspects. Meeting EU's objective of achieving 20% of renewable energy by 2020 has the potential to create more than 600,000 jobs and result in a reduction of €60 billion in oil and gas imports by 2020. Towards this goal, local authorities have an important role to conduct, concerning both large energy projects as well as urban energy facilities like photovoltaic systems and built environment wind energy technology. Efstathiades addresses the role of Local Authorities in the engagement of Wind Turbines in Urban Areas [6].

4.5 Social acceptance: Urban Wind Energy

Apart from urban wind turbines' contested energy generation capability, research undertaken so far is inconclusive on the social acceptance of the visual exposure to and physical presence of urban wind turbines. Research suggests that when the public are asked about their acceptance of a new technology, they show higher levels then when asked after it is actually built and its performance scrutinized in the media. Parallels will be drawn with the realm of the 'High tech' style in architecture and architects' attempts to deal with public perception. This leaves us with the following questions: How much of it do we need to expose of what is considered a supporting energy generation technology to urban living? What hypothesis can be drawn on challenges facing the public acceptance of urban wind and its possible appreciation as a reliable mechanism as well as a desired symbol for urban sustainability? Hamza explores the mutually exclusive relationship between public acceptance, its impact on building policies and the current architectural endeavours and their attempts to integrate this technology [7].

4.6 Economic, Environment, Social Factors and Efficiency: Lithuania

Marčiukaitis et al examine developments in wind power and future prospects in Lithuania. Additionally, the performance of operating wind farms is analysed comparing their technical parameters and economic indicators. Analysis has shown that the main factors influencing the efficiency of wind turbines are tower height and the distance from the Baltic sea. Also, environmental aspects and permission requirements are analysed and the main barriers for wind power development are identified. Despite numerous hindrances related to administrative procedures, planning system, technical aspects and social acceptance, wind energy may be considered as one solution to reduce Lithuania's energy dependence [8].

5 Conclusions

Social, Environmental and Planning considerations offer significant challenges for wind energy technology. The challenges are even more significant for WT in the Built Environment. Acceptance of Wind Technology, is a wide field with a large number of factors to be taken into account including economic, planning, ecological and health issues. Municipal and community-based energy and climate policies are key for the implementation of WT in the built environment. The strategy should be based on existing programmes and on past experience, but Wind Technology should also link with the concept of "smart cities". The cities and urban environments offer challenges for redevelopment but also opportunities for integration of new technologies in the urban areas and the built environment, particularly for site redevelopment as in the upgrading of industrial sites. WT and wind energy harvesting in the urban habitat promises to

contribute towards the concept of the Future Smart City. The effective implementation of the integration of WT in smart cities requires the contribution of different experts from specialised fields and necessitates an inter-disciplinary approach. This can be achieved through a collaborative approach by bringing different stakeholders together and through the assessment of case studies and the adaptation of existing experience.

6 References

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