PH.D. RESULTS

Potential of regeneration for small historical centers in Italy.
Guidelines for the reduction of acoustic impact produced by the Micro-Wind power system

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In Italy there are numerous historical centers, that are divided in principal historical centers, smaller historical centers and small villages, and they represent a notable historical, cultural and economic patrimony.
The recovery can be the solution to valorize such inhabited centers, considered remarkable for different reasons:

- a new economic source for the population;
- a new destination of use or it redelivers it to the people;
- the values of the place;
- the history of the place;

In opposition to the demands that are previously listed it is needed to consider the problems related to the recovery, or rather the economic and social aspects, to the costs for the maintenance and exercise, to the destination of use, to the degrade and to the repopulation.
The assignment of this experimentation is to identify best practices for the restoration of these realities of our Country, through a village in the south of Italy, Village SERRONE. In particular, I focus on the detailed energetic costs for the management of the historical center using a source of renewable energy as small-scale wind turbines and mitigating the level of criticality in the use of such energy source.
To reach these objectives, a methodology of study was elaborated, supported by guidelines that allow the insertion of Eolic energy in small historical centers.
In the preliminary phase, an analysis of the state of the art of the place and small-scale wind energy is made. Then, we analyze the different correlated problem list to a possible insertion of small-scale wind turbines inside historical centers and we study the potentialities of insertion, studying cases similar to this.
The preliminary phase has been supported by experimental actions, with the aid of scientific measurement tools, and simulations through software.
The experimental phase has given a great knowledge of local wind conditions, through a survey on the spot with anemometer. At the same time, this study has given an acoustic state of the place. From this last phase, with the aid of an app, the state of quiet of the place has emerged, considered an important element if a 'noisy' small scale wind plant is inserted in the historical centre.
The simulation phase, instead, with the aid of the 3D model and Flow Design software, has allowed to know the course of incompressible flow, local wind, and to analyze its distribution at a specific height.
The effects of the simulation were compared with the effects of the experimentation, then we elaborated a model of evaluation "ad hoc" for the matter of small-scale wind power in historical centers,VaME (Environmental Evaluation of the Microeolic power).
The principal matrix of the system has been elaborated during a search of the former Department of Configuration and Realization of the architecture of the University of Naples "Federico II", coordinated by prof. Francese and subsequently modified by architect Cristian Filagrossi in his Ph.D. thesis. In particular, in the VaME, we analyze two different impact categories that the analyzed element has on the environment, that are echo-sustainability and bio-compatibility, adding subsequently the category of convenience.
The final footstep has been the elaboration of guidelines that tie two factors:

- The Uni Norms 11277 of 2008;
- The analysis of the case study.

The guidelines would be a valid tool and fit manual to sustain a harmonic relationship between renewable energy plants - as small-scale wind turbines - and the social and environmental recovery of small historical centers in which the demands (the objective), the requisite (the performances), the indications (the actions to be effected) and the indicators (the actions to be developed) are analyzed.
The present scheme, together with the methodology able to deal with the insertion of a small-scale wind plant in a historical center, with opportune changes, could be destined to whoever wanted a small-scale wind plant as source of energy, in any housing center, not only in a small historical center.