



**Università degli studi di Pavia**

**Dipartimento di Ingegneria Civile ed Architettura**

**Optimal spatio-temporal exploitation of renewable energy resources: biomass and wind case studies**

*Stefano Grassi*

*Department of Civil, Environmental and  
Geomatic, ETH Zurich*

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Dipartimento di Ingegneria Industriale e dell'Informazione**

**Abstract:** The talk addresses the optimal exploitation of Renewable Energy (RE) sources integrating optimization processes into GIS software. GIS software enable spatio-temporal analysis and modeling using georeferenced data that describe the land features. The integration of an optimization process into a GIS platform enables a more realistic analysis.

Two case studies applied to a micro-scale (e.g. 10kmx10km) and a macro-scale (e.g. 100kmx100km or larger) region are presented. The micro-scale case study addresses the optimal placement of Wind Turbines (WTs). In this work, the selected irregular grid denotes the areas that fulfill the technical constraints for a wind farm construction such as hilltops and ridges and distances from roads and parcels borders. The long-term spatial distribution of the wind characteristics and the wake effect of WTs have been taken into account. The layout of the WTs is determined by optimizing the Net Present Value (NPV) over 20 years.

In the second project the potential of biomass (wood and manure) of Switzerland is estimated in order to define the optimal locations of biomass CHP plants to stabilize the power grid. Biogas power plants are suitable due to short ramp times. Parameters such as the characteristics of the road network, the spatio-temporal distribution of the biomass, the operating costs and the power grid are taking into account. The optimal location of CHP biomass power plants is determined by minimizing the spatio-temporal fluctuations in the low- and middle voltage electric lines.

**Bio:** *Stefano Grassi received a MSc. in Environmental engineering at the University of Brescia and a MSc. in Energy Systems and Strategies at the University of Mines-ParisTECH in Paris. Currently he is a PhD candidate at ETH Zurich in the Department of Civil, Environmental and Geomatic. His research interests include geographic information systems, spatial modeling and analysis in the field of renewable energy. His work focuses on the technical and economic assessment of the exploitable wind and solar sources in Switzerland aimed to replace nuclear plants. He has worked a few years as project designer of renewable energy power plants.*

**Organizzatori**

Dr. Davide M. Raimondo  
Prof. Lalo Magni