

URBAN AND REGIONAL DEVELOPMENT

PostCarbon Cities and Renewable Energy Communities

Funded By	Ministero dell'Università e della Ricerca - MUR [P.iva/CF:96446770586]
Supervisor	SANTANGELO MARCO - marco.santangelo@polito.it
Contact	MUTANI GUGLIELMINA - guglielmina.mutani@polito.it
Context of the research activity	<p>The research context of the PhD fellowship aims to fill the lack of adequate investigation in the field of energy planning tools and models at different spatial scales and their integration in territorial governance and spatial plans.</p>
	<p>The research project refers to the international framework of strategies and policies on climate changes:</p> <ul style="list-style-type: none">• the Paris Agreement (United Nations, COP21 2015),• the 2030 Agenda for Sustainable Development (2015) and the 17 United Nations Sustainable Development Goals• the Intergovernmental Panel on Climate Change (IPCC). <p>In these last years, various strategies were identified to mitigate climate changes especially in urban environments and related to the use of energy and fossil fuels.</p> <p>More recently an international competition “C40 Reinventing Cities” drives the acceleration of decarbonised and resilient urban regeneration in some brownfield districts around the world. Moreover, 100 European cities were</p>

Objectives

selected to join the project “100 Climate-neutral and smart cities by 2030” to scale and speed up climate actions, becoming climate neutral by 2030. Starting from these experiences, the aim of this research is to reduce greenhouse gas (GHG) emissions, mainly related to the energy sector, in order to contain global warming and its environmental consequences, improving energy self-sufficiency in territories.

The more ambitious goal of achieving climate neutrality by 2050 implies that the energy planning must be an integral part of planning and territorial governance at different scales. Therefore, energy planning is intended in a holistic, multidisciplinary and interscalar vision that considers all plans and territory governance in which the energy systems drive economic, environmental and social challenges. These aspects are closely related to the importance of spatial proximity between energy supply and demand. In this perspective, Renewable Energy Communities (RECs) meet the needs of energy security and equity towards a clean energy economy, making urban areas more self-sufficient and therefore more resilient.

The new energy communities, introduced with the Clean Energy Package with the RED and RED II Directives (2018/2001/EU), have started a national experimentation phase (DL 162/2019 Art.42bis). Through the exchange and sharing of locally produced energy from renewable sources by different members (companies, municipalities, and citizens) some energy, economic, environmental and social benefits can be achieved.

Frontier research on this topic is currently ongoing through the development of place-based tools and models capable of highlighting local specificities, assessing the available RES, evaluating the distribution of energy demand and optimize the aggregation of energy users, producers and prosumers. Place-based assessments allow to take into account the environmental, economic and social context and ensure feasibility and sustainability of RECs projects over time, defining the most appropriate scale depending on the context.

The goal of the research is to combine:

- the harmonization of spatial data (open source) at different scales
- the development of models, tools and platforms to optimize energy demand with the energy supply system, reducing GHG emissions with economic and social benefits
- the identification of strategies to promote post-carbon cities and communities in different climates and contexts
- the integration of these strategies in plans and territorial governance
- the identification of effective policies, incentives and target indicators for each territory.

The research centers and Universities that could host the PhD student and that collaborate on these issues are:

- Ecole Polytechnique Fédérale de Lausanne (EPFL)
- Ryerson University, Toronto CA

- Institut Dalle molle d'Intelligence Artificielle Perceptive (Idiap), Martigny CH
- School Built Environment, Faculty Art Design and Architecture, University New South Wales, Sydney Australia.

The first three goals can be effectively implemented with a multilevel coordination among public authorities and private stakeholders. This work has the opportunity to start from the experiences of the city of Turin and Milan that joined the project "100 Climate-neutral and smart cities by 2030".

The result of this research will focus on the implementation of energy models and tools at territory scale with a place-based approach, creating an interactive platform for post-carbon cities and renewable energy communities and to support energy planning at different scales.

The resulting platform, tools and models will be tested and applied on the cities of Turin and Milan and on the Pinerolo Energy Community, corresponding to the homogeneous area V of the Metropolitan City of Turin.

Skills and competencies for the development of the activity

- Background in the area of energy system modelling
- Experiences with energy software on energy performance at building and district/urban scales
- Elementary experience on data analysis and elaboration
- Experience on multi-disciplinary team-working
- Experience on international research projects