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**UNIVERSITÀ
DEGLI STUDI
DI TORINO**

Doctoral Program in Urban and Regional Development (33rd Cycle)

**Beyond the Build Environment:
the Role of the Human Dimension
towards a Co-ownership in a
Sustainable Energy Community**

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Summary

Nowadays, considering the several environmental issues that are leading to changes, even important ones, in the biosphere, a paradigm shift related to our choices, in different aspect of our life, is necessary.

Climate change is a reality and only paying attention to the carbon budget, the concentration of CO₂ present in the atmosphere that is allowed to erode, and pursuing behavioural paths, it is possible to avoid an increase of the global average temperature higher than 2°C, compared to the pre-industrial average temperature. The decarbonization process and the energy transition, understood as a process aimed not only at avoiding the use of energy resources from fossil sources in favour of renewable ones, but also at improving the energy efficiency related to the energy production and at defining more conscious energy consumption and choices by users/citizens, are part of this perspective. For this purposes, with regards the construction sector, a series of laws and incentives have been enacted, in order to promote the achievement of the planned energy and environmental objectives. These provisions are aimed at achieving a certain energy efficiency requirement in a given time and, mainly, concern the envelope and the energy system, i.e. the material component of buildings. However, the city system is made up not only of buildings, technologies and infrastructures but, also, of users, citizens, that play a fundamental role. Indeed, several possible scenarios of energy retrofit, established by regulations and promoted by incentives, may not reflect the real situation of intervention. In other words, the proposed scenarios may not achievable due to the influence of individual' features: when individual/citizen is called upon to make a decision or to carry out a behaviour, various characteristics (social, demographic, economic, psychological, attitudinal, etc. drivers) intervene, determining the users' possibilities in engaging or not engaging in actions, behaviours or initiatives.

Consequently, the social component is also important and, only in recent years, a legislative framework is being formed (at different levels - national and European) paying also the attention to the users, to the citizens, promoting their active role through the establishment of an energy community (EC). An EC represents the union of several users (municipalities, small and medium-sized enterprises (SMEs) and citizens), located in a specific area, who share the willingness to self-produce and self-consume energy from renewable sources; it is an innovative model of supply, distribution and consumption of energy with the aim at facilitating its production and exchange between users. Social acceptance and sense of community play a key role in the energy communities.

The main objective, addressed by this Ph.D. research, is understood if the energy communities are potential solution to achieve energy transition objectives. In this regard, the dissertation sets the following purposes:

- to define which elements make up an energy community and which relationships are established between them.
- to structure a work path that leads to the creation of energy communities.
- to analyse and to study the existing literature in order to define a new classification of the factors/variables that affects the energy consumption and behavioural choices of users.
- to define strategies to involve citizens in active participating in an energy community;
- to extrapolate users' profiles who share the same characteristics in order to promote tailor-made environmental and energy policies.

A first study of the literature and a discussion with a panel of experts highlighted how energy communities are based on the synergy of three elements: the technical structure (building identification, data collection, definition of energy retrofit alternatives and best scenario selection), the social structure (identification of key persons, informative event and workshop organization and questionnaire administration) and the legal and financial structure (definition of financial contract/agreement and co-ownership implementation). The definition of the relationships between these elements led to the work path drafting concerning the methodology underlying the energy community creation. The research wanted to go beyond the built environment (public and/or private buildings) and, mainly, to focus its attention on the less investigated component, the human dimension. Since there is a gap between expectation and reality, the role of the user, of the citizen, as an individual with an active role (prosumer), is analysed in detail,

paying attention not only to citizens represented by men, high-income people and with a high level of education; but to different segments of population, including underrepresented and vulnerable people which are usually not included in community-based projects. On one side, through informative events and workshops citizens were actively included in the debate on energy communities; through activities tailored to each type of stakeholder, the different visions of the energy community were defined and the strengths and weaknesses were explored. Contextually, the existing scientific literature on energy saving behaviours, on energy efficiency investment actions and on engagement in renewable energy projects is studied in order to define a new classification of the factors/variables/drivers (individual self-characteristics, personal characteristics, economic characteristics, household characteristics, building characteristics, community and neighbourhood characteristics, government, regulation and policies and external characteristics) that favour or hinder the citizens' effective inclusion, participation and investment in energy community project and the citizens' making decision and action implementation. The identification of the factors, that promote individuals' behaviours and the decision-making choice, is the step preceding the characterization of the population in a given context. Indeed, the research allowed to define the methodology for a questionnaire in order to characterize the population and to understand if it is possible to divide it into clusters (characterized by level of attitude and willingness towards community projects based on renewable energy and towards energy saving practices and by feelings and level of identity towards the community/territory to which they belong) and, consequently, to promote specific inclusion strategies and tailor-made environmental, energy and social policies aimed at involvement in energy community project and to address the current issues.

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