An interview with
Prof. Francesca Romana D'Ambrosio

INTERVIEWED BY
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Q.1) It is well known that worldwide there is an increasing need for an energy transition. Let us focus on HVAC and building sector. Since nowadays it consumes more than 40% of final energy consumption and causes 36% of the total energy-related CO_2 emissions, it will play a crucial role in the realization of such transition. In your opinion, which could be the solutions or actions that could help the achievement of a low-carbon built environment?

Prof. Francesca Romana D'Ambrosio: Today, also the building sector should be the driver for spreading technological innovation. In this direction, the most recent European Directive on buildings' energy performances (EPBD) combines the aspects related to the building and HVAC technologies with the world of digitalization. In fact, it translates the current necessities of reducing the energy demand from the building sector on the maximization of the HVAC systems' efficiency, also through the integration of Renewable Energy Sources (RES) on the building-plant system. Coupling these aspects with the emerging digital instruments,

which allows the monitoring and interpretation of the building energy behaviour, the most suitable actions to guide the building sector towards the energy transition can be identified, integrating a network of energy suppliers and energy consumers where the buildings can play a crucial role.

Q.2) The European building stock is characterized by high percentages of buildings built before 1980, when energy efficiency requirements were not in place. In your opinion, which could be the opportunities for improving the energy behaviour of these buildings? Which will be their role in the transition of the building sector?

Prof. Francesca Romana D'Ambrosio: The European building sector's energy transition inevitably relies on the implementation of efficient policies regarding the existing building stock. The building boom of the second half of 20th century took place when the attention to energy efficiency was very limited. It is evident for everyone that acting on the existing building stock requires more difficult political and technical paths compared to the ones that would be necessary to build new, since the implementation of new technologies has to face several boundary constraints. At the same time, the low energy performances of our existing building stock represent a huge opportunity of enhancement. In these terms, there are two possible paths. On one side, there is the possibility of focusing the policies on the achievement of relatively small improvements on large building stock categories. On the other one, policies could pursue major energy savings on a limited quantity of buildings or building categories. Another aspect to take into account is the necessity of clearly characterize which is the relation between the energy intervention solutions and their economic and financial implications, both in terms of initial investment and global cost. In fact, in the current market, the technological penetration cannot take place if not guided by economic and financial analyses, that should be exploited both at a National and European level.

Q.3) Several forecasting scenarios look at electrification as a possible pathway for realizing the transition of the HVAC technologies and the building sector. Do you agree with this consideration? If yes, which technologies would enhance the electrification of buildings final uses (e.g. RES integration)? Conversely, if not, which will be the technologies that will drive the transition (e.g. district heating)?

Prof. Francesca Romana D'Ambrosio: I will answer to the second question first. District heating relies on a territorial policy. The implementation of policies allowing the electric energy penetration in the building sector relies on individuals' choices. These are two different possible paths. The first requires that the territorial planner introduce district heating as a development action in an urban settlement. This is a meritorious action but requires a long implementation time and a political endorsement. The other requires, from a policy maker side, the introduction of guiding or facilitating instruments for the implementation of electric technologies to substitute the non-electric systems, such as boilers. However, focusing for example in the transition from gas boilers to electric heat pumps, this introduces also infrastructural problems. In fact, a large diffusion of electric heat pumps would require an electric infrastructure capable of supporting the required energy loads and power. At the same time, referring again to this type of choice (the introduction of an electric generator such as a heat pump), this would require also the integration of low-temperature terminals in order to maximize the energy efficiency of the whole building-plant system. Looking at this perspective, the theme of economic and financial analyses represents, again, a fundamental aspect to evaluate the viability of these solutions.

Q.4) Nowadays, digitalization is spreading, and this is already affecting the building sector. In particular, buildings are moving from highly consuming units to energy producing ones, shifting the role of occupants from pure consumers to prosumers. In your opinion, which will be the positive and/or negative effects that this phenomenon will have on society? Which are the opportunities for future development of flexible and digital devices in buildings?

Prof. Francesca Romana D'Ambrosio: An objective analysis of the current society brings to the evidence of an evolution towards a system in which data are fundamental to convey all individuals' actions to the policy makers. At the same time, the evidence that a digitalization process could interpret the building and its dynamic behaviour requires it to participate to the evolutionary transition of the society. As for the mobility sector, the buildings' one is moving along its digitalization path. However, this is a fundamental process to cover through digitalization all the other aspects of human life. Moreover, we cannot think to an evolution of the energy market in terms of use and production of different entities and subjects (like in the case of prosumers) without a building connected to the network and exchanging data with the surrounding. In these terms, the development of a society in which the building becomes part of a connected network is fundamental for a transition towards a system in which the energy market becomes, really, a free one. ■