# Supervisor Expression of Interest
**MSCA - Marie Sklodowska Curie Action - (PF) Postdoctoral Fellowship 2021**

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<thead>
<tr>
<th><strong>Supervisor name:</strong></th>
<th>Marco Scaioni</th>
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<tbody>
<tr>
<td><strong>Email address:</strong></td>
<td><a href="mailto:marco.scaioni@polimi.it">marco.scaioni@polimi.it</a></td>
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<tr>
<td><strong>Department Name:</strong></td>
<td>DABC – Architecture Built Environment Construction Engineering Dept.</td>
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**Research topic:**

**Research Topic 1.**
TECHNOLOGICAL AND DIGITAL TRANSFORMATION FOR BUILT ENVIRONMENT AND CONSTRUCTION INDUSTRY
- SH7_10 GIS, spatial analysis; big data in geographical studies
- PE6_11 Machine learning, statistical data processing and applications using signal processing

**Research Topic 2.**
RISKS MITIGATION STRATEGY FOR BUILT ENVIRONMENT
- SH7_7 City, urban and rural studies
- SH2_7 environmental and climate change, societal impact and policy
- PE8_11 environmental engineering

**MSCA-PF Research Area Panels:**
- CHE_Chemistry
- ECO_Economic Sciences
- ENG_Information Science and Engineering
- ENV_Environmental and Geosciences
- LIF_Life Sciences
- MAT_Mathematics
- PHY_Physics
- SOC_Social Sciences and Humanities

**Politecnico di Milano Areas:**
- Cultural Heritage
- Smart Cities
- Horizon Europe Missions (climate-neutral and smart cities)
- Health
- Industry 4.0
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<tr>
<th>Title and brief description of the Department and Research Group (including URL if applicable):</th>
<th>People's vulnerability analysis and the resilience of buildings in different built environments under ordinary and extra-ordinary conditions.</th>
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<td>DABC is engaged in: design, manufacturing, construction, operation and maintenance, transformation/renovation and decommissioning of building and built environment; and management of processes, data and information workflows. DABC’s research is organized by multidisciplinary groupings that are constituted to define and solve complex multi-scale and multi-factor problems related to built environment design/construction/maintenance and related processes, having as reference the strategic lines of research that are the drivers of aggregation of knowledge, expertise and skills (link DABC website).</td>
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<td>The Research will be multi-disciplinary and involve the following DABC domains and expertise: Data Driven Engineering, Performance based-design and Artificial Intelligence applied to Geomatics (3D multi-scale, GIS, remote sensing, Earth Observation), management and sharing of multi-scale data of the built environment (Prof. Marco Scaioni, Supervisor), applied economics for the value and transformation potentials assessment of the built environment (Prof. R. Capello, co-Supervisor link CV), environmental health strategy assessment (Prof. S. Capolongo, co-Supervisor link CV), Building Technology and Building and Construction Engineering for the development of user/community-centered design and built adaptation strategies (Prof. T. Poli, co- Supervisor link CV), multi-hazard and multi-risk analysis and assessment (Prof. S. Menoni, co- Supervisor link CV).</td>
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<td>The candidate should also benefit from the facilities of the integrated DABC Laboratory (link DABC Lab).</td>
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In the past century, building in urban areas has been modified to take into account the social and economic development as well as to face natural and industrial risks. In the past, the resistance to seismic or environmental factors has been given a primary attention. More recently, new challenges have been added to the attention of scientists, such as energy efficiency, eco-sustainability, climate change mitigation, etc. [4]. Within this process, the COVID-19 pandemic is already highlighting a need of major resilience against a global event that quickly has changed the habits, the health conditions and lifestyle of people in cities [3].

The adaptability of buildings, and their ability to mitigate users’ vulnerability under different critical scenarios, depends on the building's technology, its use and users, and the interaction users/building. Therefore, to improve resilience we should investigate some aspects of the building at multiple scales (architectural organization/technical solutions) and some others related to user grouping with variable capacity of adaptability.

The assessment of the resilience of buildings needs the development of a multidisciplinary/integrated evaluation system which should be composed of three main elements: (1) acquisition of those parameters that allow to describe and interpret the indoor living conditions, and the outer boundary factors which may influence the life of people; (2) mapping the resiliency degree of the built environment as function of the building characteristics and use, as well as the surrounding; (3) an approach to measure the effect and feasibility of different strategies for building resilience and user vulnerability mitigation.

The analysis of parameters and mapping has necessarily to deal with the analysis of big data and crowdsourcing information [1]. On one side, indoor information may come from the impressive number of sensors which people already keep in their houses. Built environment information will be derived from geospatial databases and Earth Observation networks (e.g., Copernicus) [2].

The measure of the effects of new strategies will be based on their positive economic impact on the individual’s health and wellbeing [5]. This approach would be able to quantitatively evaluate the follow up of any strategies, and to consider also the corroborative (or disruptive) effect of multiple integrated strategies. The proposed research project should focus on: how to integrate into a unique and consistent framework all those tools necessary for big data acquisition and analysis; the development of a tool for information mapping and interactive quantitative visualization of building/built environment resilience.

References: