# INDOOR MICROCLIMATE MONITORING: USE AND ISSUES. THE CASE OF THE REALM OF VENARIA REALE.

ANNA BONORA[1], KRISTIAN FABBRI[2], MARCO PRETELLI[3]
[1]Università di Bologna, Dipartimento di Architettura, anna.bonora16@gmail.com
[2]Università di Bologna, Dipartimento di Architettura, kristian.fabbri@unibo.it
[3]Università di Bologna, Dipartimento di Architettura, marco.pretelli@unibo.it

## Abstract:

With this paper we want to present a methodology for the indoor microclimate monitoring and data analysis, stating the related difficulties and issues. It will be presented the study of the indoor microclimate of two rooms, carried out in the Realm of Venaria Reale. This building is the result of six architects' work, between 1659 and 1798: Amedeo Castellamonte, Michelangelo Garove, Filippo Juvarra, Benedetto Alfieri, Giuseppe Battista Piacenza e Carlo Randoni.

The overarching aim is to involve, in the field of microclimate measurement, applicated on the Heritage Buildings', the size-time in the subject matter and which permits to obtain new data, useful under the scientific and operational point of view. On this line of thinking, Marco Pretelli e Kristian Fabbri, have defined a specific field of research: the "Historic Indoor Microclimate" (HIM), which adopts an approach designed to consider the architectural and microclimatic context, starting from the disciplines which define the indoor microclimate study, introducing the study of the physical variables that determinate the indoor microclimate in a prolonged time dimension.

Moreover, the paper is aimed to explain what are the most common issues which you could address during this kind of study, and to propose and to present a new index: the "Heritage Microclimate Risk" (HMR): the whole data and information that is possible to register by means of monitoring and which allows to identify a magnitude index to assess the HMR. In this way it is possible to evaluate the risk level to whom the goods are exposed and the level of the human's comfort, to the end to improve it, in a vision which considers the conservation of goods and the comfort of the users in a coordinated way. Indeed, the best strategy to preserve the cultural heritage is the one that allows to detect in time any potential microclimatic risk, or rather situations where there is a danger due to the fact that actual parameters of the indoor environment are going beyond the set alert thresholds. The so-called "risk situations" can be determined by physical, chemical and biological factors: principal causes of the degradation.

The study carried out on the two rooms of the Realm of Venaria Reale, includes the analysis of ten years probes' data; the realisation of a virtual building model; the construction of a virtual environment model and its validation: by comparing the virtual data to the monitored ones. It permits to evaluate the actual, past and future conditions of the building, its goods and the people thermal comfort conditions. Moreover, we can envisage alternative scenarios, pre-emptively defining which actions could aid the preservation of the good, avoiding the risk component that would be taken working on the original.

All this process entails many issues: about, for example, the data, which could have many gaps and errors, or incoherence, due to some different reasons as the malfunctioning of the probes or of the HVAC system; difficulties finding restoration data and archive documents; establishing the building's thermo-physical characteristics; managing, on the virtual building model, the UTA (air-handling unit) and of the set-point data; obtaining information from different actors; etc. In our opinion, it is substantial knowing and thrashing out these kind issues, when you want to work on the field of monitoring and microclimate control.

**Keywords**: *Historic Indoor Microclimate (HIM); Heritage Microclimate Risk (HMR); Indoor Microclimate; Heritage; Conservation.*