

ARCHITECTURAL HERITAGE & CLIMATE CHANGE

Reading & Methodological Note



BIBLIOGRAPHY

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THE AIMS OF THE PROPOSED WORK

Our work initially tried to frame the state of the art on the sustainability issues of architectural heritage in the city of Mantua through interviews with different actors working in the sector. At this stage, the results of the interviews provided useful information that was traced back to a specific methodology that will be illustrated below.

The methodology applied, together with the skills of the working group, allowed the achievement of the following objectives, which can be understood as the **general objectives of this work**:

- **identify categories of actions** to which current and future practices can be traced back. These categories have been selected because they are able to illustrate how architectural heritage is addressing climate change issues and how it could be possible to implement them;
- **provide an illustrative framework** on the current state of the art that considers both past experiences and what can be expected for future developments;
- **a space-time mappings that frame the scope of action**, the architectural heritage on the historical urban fabric of Mantua and a year calendar of the retrofitting works of three case studies selected together with the interviewed actors;
- **an analysis and assessment of the three selected case studies** that show the actions that each individual case is facing and what remains latent, through the aforementioned categories.

The proposed work represents a basis on which the various actors can work in order to build integrated strategic plans and policies.

DATA COLLECTION METHODOLOGY

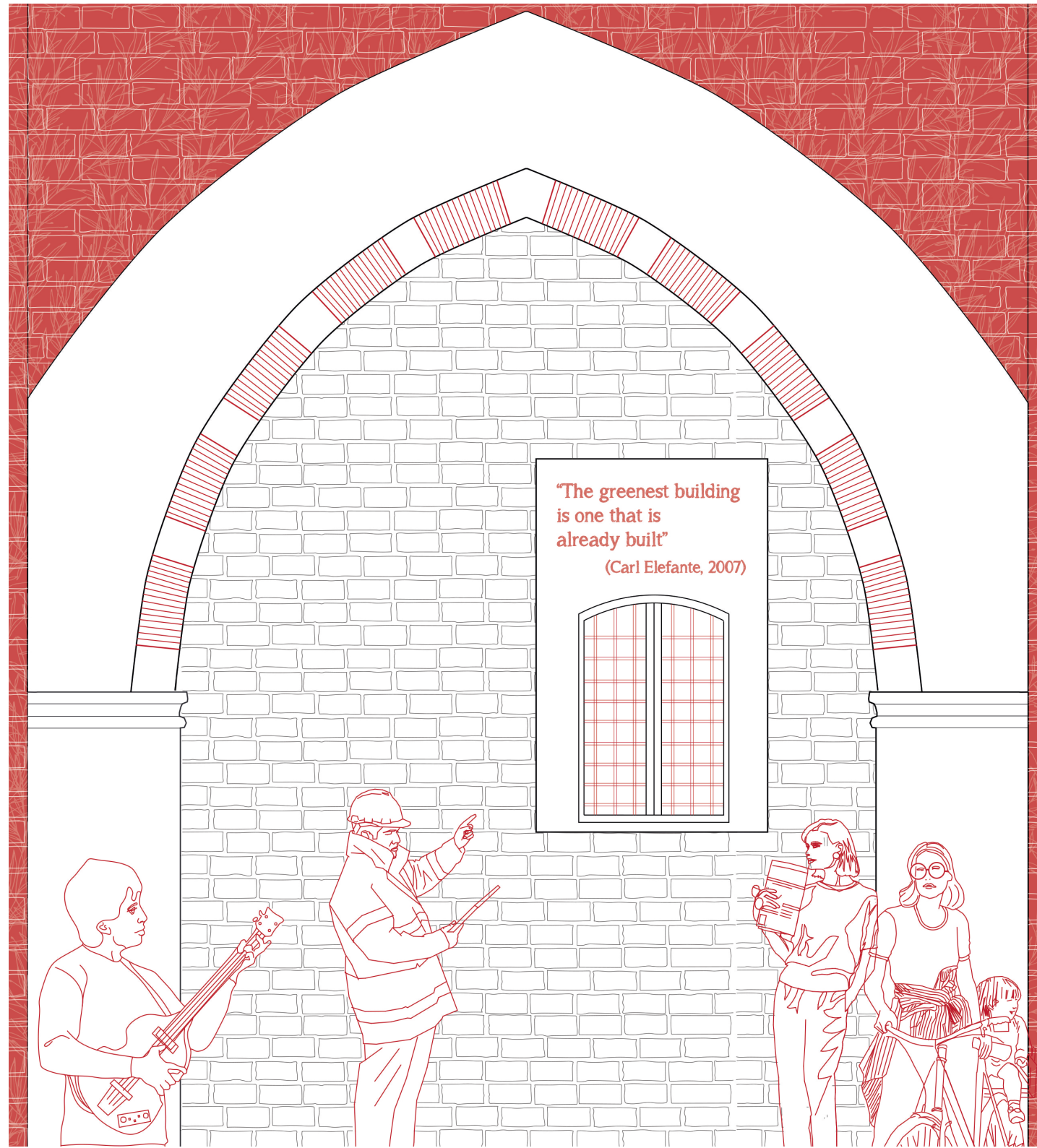
First of all, we selected the actors to be interviewed. They came from different working areas: the **Municipality of Mantua**, the **Technical Office of Urban Planning and Heritage Preservation of the Municipality**, people in charge of the **selected case studies**.

At this stage of the process, the data collection has provided useful information that has stimulated and framed the field of action of our work.

In a second phase, the field of action has been traced back to a **specific literature regarding Heritage Conservation and Environmental Sustainability** looking for a qualitative way to evaluate Built Heritage in respect of Climate Change issues.

We choose to consider the UN approach as the basis on which develop our specific methodology.

Assuming that the building sector, especially for what concerns the Museum in Architectural Heritage, has the most potential for delivering significant reductions of climate change impacts (due to the visitors' flow and energy consumptions) we have noted that proven policies, technologies, and knowledge already exist to deliver deep cuts these impacts.



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Drawn up by: Massimiliano Lepratti, Giulia Tagliente - EStà - Economia e Sostenibilità

THE METHODOLOGY APPLIED

Through the literature, we have selected 8 categories of actions able either to provide a qualitative illustrative framework that acts in time, or to immediately portray the state of the arts and the evolution of the categories as compared to some variables set out below. These categories of actions are:

- Environmental Assessment,
- Retrofitting Works,
- Indoor Environment Quality,
- Energy Efficiency,
- Staff Involvement,
- Water Management,
- Waste Management and recycling and,
- Green Mobility.

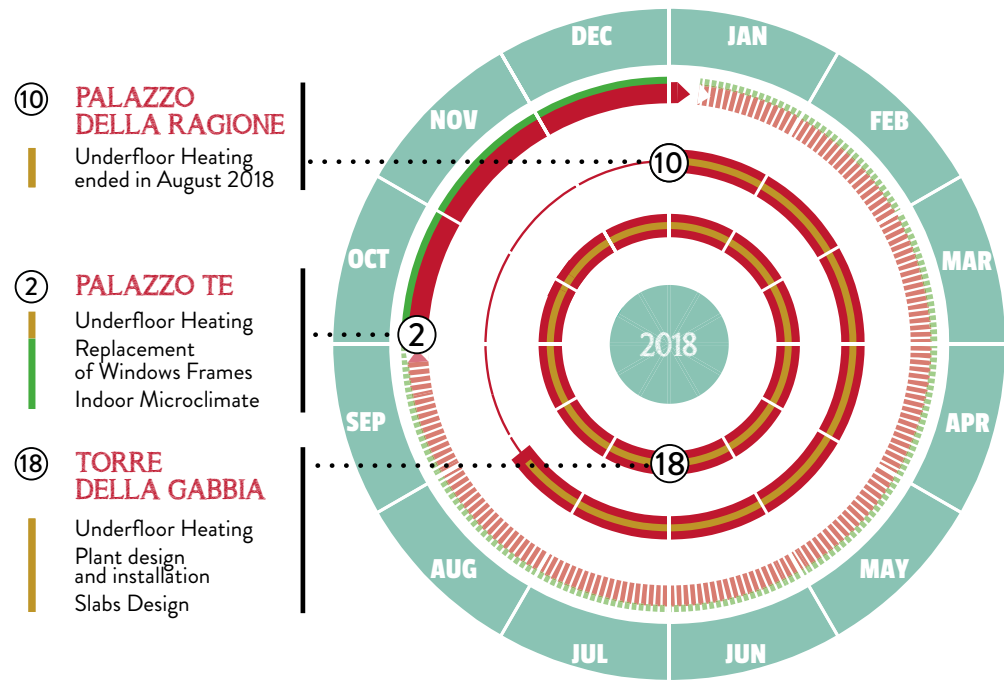
All the actions to implement each of the categories are fundamental steps to reduce the negative impacts that the cultural events has on climate change. We have chosen to assess the categories in three different times: **before our work, nowadays and future perspectives** so, in this way, it's possible to clarify which category it's been implemented, which one can be implemented more, what are the weakest categories and what are the strongest ones. To measure it, in a qualitative way, we consider the operative efforts made to improve the situation and we represent it with **semaphore ranges** with five colors combination representing five levels of efforts.

For instance, the **indoor environmental quality** in the Architectural Heritage has a very negative impact on the environment in term of consumption, even if we consider the adequacy of the construction methods. In fact, during the winter time to be usable museums require a high amount of energy to be heated and to keep the internal microclimate constant without damaging the existing artworks, frescoes, etc. **Until a few years ago, the heating system of the Architectural Heritage worked exclusively with fan coils** whose energy consumption, both for costs and quantity, were (and still are) enormous (●). The awareness of the problem has grown and more and more buildings are **replacing their heating system with the much more sustainable underfloor heating** which, being hidden, does not affect the bond of the architectural heritage preservation (●●).

So the **awareness of the problem** (💡) by the staff involved has been detected as another unit of measure for the qualitative assessment. We have chosen to assess three levels of awareness of the problem to set up the framework in time. At the same time, to improve the indoor environmental quality through the replacement of obsolete heating systems **requires large monetary efforts** in the initial phase that can be fulfilled by a plan of intervention in different phases (one for each part of the dwelling). For that reason, we have chosen the **monetary effort to reach the results** (€) as another unit of measure of our assessment. Five symbols related

to monetary efforts have been selected to set up the assessment. Lastly, the **contribution that the action gives to sustainability** (🌱) through three levels of the qualitative evaluation was considered a further fundamental aspect for our evaluation. For what concerns the future perspective we evaluate both the interviewed expectations and the real feasibility of the improvement.

2018 YEAR CALENDAR OF SELECTED RETROFITTING WORKS



THE YEAR CALENDAR OF RETROFITTING WORKS

The **solar calendar illustrates the retrofitting work in progress during 2018** for the three selected case studies: **Palazzo della Ragione, Palazzo Te and Torre della Gabbia**. In a comparative analysis of the three case studies, Palazzo Te turns out to be the architectural heritage that is investing more to reduce the negative impacts that the building has on the environment. This is also due to the fact that the other two chosen dwelling are solving structural failures and emergencies, such as the roof reinforcement, slab design, etc. In Palazzo Te, part of the dwelling is interesting in retrofitting works and two actions are really connected on climate change issue: the replacement of windows frames and the control system for the indoor microclimate. Remarkable the creation of outdoor lighting system powered by solar energy, creating a food for thought the relationship between indoor and outdoor solutions.

CONCLUSION

Finally, a general recommendation emerges from the analysis, reinforced by the existing literature on the topic. A good level of staff involvement and the related awareness of environmental issues appear to be the most effective starting point for promoting a leverage effect. This can act on all other categories of actions and can produce sustainable effects over time.

