LOW CARBON CLAY-BASED PLASTER FOR EARTHEN BUILDING CONSERVATION

Francesca THIEBAT - *Politecnico di Torino |francesca.thiebat@polito.it*
Francesca POLLET - *Università di Ferrara | pllfnc1@unife.it*
Manuela MATTONE - *Politecnico di Torino | manuela.mattone@polito.it*
Corrado CARBONARO - *Politecnico di Torino | corrado.carbonaro@polito.it*

Abstract. Earthen heritage represents a cultural and environmental resource of considerable significance, particularly in regional contexts such as Piedmont, Italy, where numerous vernacular buildings using traditional materials are still preserved. However, the fragility of these structures and the limited availability of technical knowledge constitute significant challenges for their active conservation and valorisation. At the same time, the need for decarbonization in the construction sector calls for a reconsideration of traditional materials and techniques in response to current environmental challenges.

This study is part of a research project conducted by Politecnico di Torino that aims at investigating the potential of earthen plasters for both the conservation of built heritage and new building applications. Several plaster formulations were experimentally tested and some of them were enriched with corn cob due to its insulating properties and regional availability. The paper focuses on the environmental impacts of six plasters assessed through a Life Cycle Assessment (LCA), considering modules A1–A3 (cradle-to-gate) from raw material extraction to the packaging of the final product. Direct data were combined with secondary data from Environmental Product Declarations (EPDs) and literature.

The results shows that plasters containing hydrated lime exhibit the highest Global Warming Potential (GWP), while clay-based formulations have significantly lower impacts. Plasters stabilized with gypsum present intermediate GWP values and demonstrate the best environmental performance when considering both sustainability and potential mechanical improvements. Corn cob inclusion increases GWP but may enhance thermal performance, offering potential benefits during the building use phase in terms of energy efficiency and comfort.

These findings highlight that combining agriculture by-products such as corn cob and clay allows traditional construction techniques to be reinterpreted through a circular economy perspective, strengthening the link between innovation, local identity, and sustainability.

Keywords: earthen heritage, plaster, corn cob, LCA, local materials, clay.

Earthen heritage and environmental sustainability. Widely spread in many countries all over the world (in 2023, 167 out of 1157 cultural properties inscribed in the World Heritage List have earth structures), earth constructions represent not only a thousand-year tradition, but above all, constitute a testimony of knowledge, skills, habits of the peasant civilizations. In the early Eighties, one third of the world population was estimated to live in earthen buildings. More recently the United Nations statistics, taking into account urban and rural settlements even of new realization, underline that this datum is under evaluated and it is more correct to assume an amount of about 50% (Guillaud, 2008). Unfortunately, the progressive abandonment of earth construction techniques and the loss of connections with modern civilization have led to the deterioration of lots of earthen heritage.

Since the beginning of the seventies of the XX century, the spread of a renewed interest in earth buildings (thanks also to initiatives of organizations such as ICOMOS, which in 1972 organized the Premier Colloque International sur la Conservation des Monuments en Briques crues) promoted the rediscovery of this valuable architectural heritage by encouraging the study of methodologies aimed at fostering its protection and ensuring its conservation over time. As for the Italian territory, the desire to define concrete actions aimed at safeguarding this heritage was manifested by both researchers and public authorities through the development of investigation campaign, the organization of meetings and conferences, and the issue of regional laws, such as 17/1997 in Abruzzo and 2/2006 in Piedmont (Bertagnini et al., 1999; Mattone, 2010; Bollini, 2008; Fratini et al. 2020). Highlighting the value of this heritage, actions were carried out to promote its conservation and enhancement and to actualize knowledge and construction techniques in a perspective of economic-cultural sustainability and environmental compatibility.

Earthen heritage represents a cultural, architectural and environmental resource of considerable significance. Unfortunately, earthen buildings are often abandoned because considered unhealthy and unstable, but, above all, because incompatible with the concept of modernity which people aspires to. The lack of maintenance, the execution of inappropriate interventions together with the fragility of these structures and the limited availability of technical knowledge constitute significant issues for their active conservation and valorization. The earthen heritage is a cultural testimony of the past but also a source of knowledge and valuable know-how for a new sustainable architecture.

The protection of the built heritage, transfer of knowledge concerning material and construction techniques and development of preventive conservation intervention are fundamental actions for the safeguard of the earthen culture. The preservation of historical earthen buildings, but also the relaunch of the use of earth in contemporary architecture implies the development of components and appropriate intervention techniques in order to minimize and, if possible, prevent any alteration which may compromise them over time. Although specific measures were and are still adopted to ensure its effective protection against weathering (such as stone foundations or roofs particularly jutting out), constant maintenance is required and the adoption of protective layers is needed.

It is a widespread practice to apply plasters in order to guarantee protection of earthen structures. Today, as well as in the past, different types of plaster are used: earthen plasters, not very long lasting and therefore needing frequent maintenance interventions, lime plasters or cement plasters, more durable but not compatible with the earthen walls [9]. In the last few years, tests have been carried out in order to identify suitable

coatings adopting different types of stabilizers and additives (natural and synthetic) to improve their performances (Eires, 2015; Guerrero, 2011; Mattone et al. 2016; Mattone et al. 2017).

Nowadays, interest in using earth as a building material has been revitalized in response to the environmental challenges facing the construction sector. Earth is a readily available, locally sourced, and waste-free material. From a hygrothermal perspective, earthen structures perform exceptionally well in retaining heat and naturally regulating humidity and temperature, even when employing passive design approaches.

Recent developments in the integration of natural fibres, wood waste, and biopolymers highlight their strong potential to enhance the functional performance of earthen materials, meeting both environmental and technical requirements. The incorporation of fibrous materials has deep historical legacy and remains evident in many forms of vernacular architecture. Traditionally, natural fibres in earthen mixtures were primarily used to improve moisture distribution, reduce shrinkage cracking, and ease the mixing process. Today, materials such as bamboo, jute, flax, rice husk, straw, corncob, and hemp are increasingly valued for their sustainable nature and their competitive performance relative to synthetic fibres, particularly in aspects such as thermal efficiency.

From an environmental perspective, earthen plasters present one of the lowest cradle-to-gate impacts among wall-finishing materials (Arduin et al. 2022). Several studies based on Life Cycle Assessment (LCA) have shown that earthen plaster requires less energy and results in lower CO_2 emissions compared to cement and lime mortars (Santos et al. 2021). Melià et al. (2014) estimated that Greenhouse gas emissions for producing 1 m2 of 15 mm of earthen base plaster (0.88 kg CO2eq) are about one-sixth of those associated with a 1 m2 of hydraulic lime plaster (6.37 kg CO2eq) and cement plaster (5.86 kg CO2eq).

The integration of agricultural residues further enhances the environmental and circular performance of these materials (Giuffrida et al., 2024). These fibres represent renewable and locally available by-products, whose use reduces the demand for primary raw resources and mitigates emissions associated with crop-residue burning or disposal (Kong et al., 2024). The incorporation of natural fibres such as straw and hemp in earthen mixtures contributes to CO_2 storage, partially or fully compensating the carbon footprint of the entire wall system. The analysis of Giuffrida et al. (2024) shows that systems using cement stabilization (e.g., stabilized rammed earth) have higher carbon and water footprints due to the cement content, while those without chemical stabilization, such as light earth and modular biobased reinforced rammed earth, shows lower impacts.

Moreover, during the end-of-life stage, non-stabilized earthen materials can be reused or reintegrated into the natural environment, avoiding landfill disposal and supporting circularity. Conversely, stabilized mixtures limit reuse potential. In particular, at the end of their service life, earthen plasters can be mechanically disaggregated, re-hydrated, and reused without significant loss of mineral cohesion or mechanical performance (Faria, 2022). This reversibility, combined with low processing energy and local material sourcing, positions fibre-reinforced earthen plasters within the framework of circular construction materials, achieving nearly closed-loop life cycles with minimal embodied energy and high recyclability (Laborel-Préneron et al., 2016). In addition to these benefits, LCA can help to identify some critical factors, such as the impact associated with the transportation and binder based on chemical stabilization that significantly affect environmental performance.

Experimental earthen plaster: materials and methods. This study is part of a research project conducted by Politecnico di Torino, which aims to investigate the potential of earthen plasters for both the conservation of earthen-built heritage and new construction applications. Specifically, the paper focuses on the experimentation of six plasters that were tested and assessed from an environmental perspective. Corn cob, an agricultural by-product chosen for its insulating properties and regional availability, was added to three of the six formulations. Production of the experimental plaster samples, including the design, mixing and assessment, was conducted at the Laboratory of Innovative Technological Systems (LaSTIn) of the Department of Architecture and Design at Politecnico di Torino.

The plaster samples were developed by selecting and analysing raw materials, consisting of mineral binders (clay, hydrated lime, and gypsum) and vegetal or mineral aggreg ates (i.e. granular corn cob, straw, and sand). The grain sizes of the aggregates are 1-2 mm for corn cob and straw fibres, and 0.1-0.3 mm for silica sand. And the binders and aggregates were mixed dry. The mixture was then hydrated by adding water weighed out in advance, with a contribution calculated as a percentage of dry mix weight. Mixing was performed using either a drill mixer or manually, and then all the experimental plasters were left to cure at room temperature in the laboratory, with a curing time of approx. 30s days (Figure 1).

Initially, fourteen different clay-based plaster mixes were configured and produced, changing percentages of aggregates and binders. Samples measuring 4 cm x 4 cm x 16 cm were produced using steel moulds and polystyrene formworks. During this process, the density and cohesion of the samples, the compatibility between the ingredients in the mix, and the presence of cracks in the samples were evaluated. The aim was to select the mixtures with the lowest density but the best cohesion and compactness. Six of the fourteen samples, listed in Table 1, were then selected to be tested by the research units involved in the project. This paper focuses on the environmental assessment. Further publications will then address on the results of tests conducted, such as resistance to water erosion, mechanical and thermal performance.

The environmental impacts of the six experimental plasters selected were quantified using the Life Cycle Assessment (LCA) methodology, in accordance with ISO 14040/44 and EN 15804:2021. The main goal was to compare the environmental impact of three earthen plasters containing corn cob, with two earthen plasters without corncob and one clay and sand plaster benchmark. Furthermore, two other mixtures have been identified from literature and Ecoinvent 3.7.1 database to verify the environmental results of experimental plasters (Table 1).

The inventory analysis of the study is based on both direct and indirect data. Direct data are mainly related to the ingredients of the plaster mix which have been achieved by the suppliers and from the laboratory samples production. When direct information was not available, indirect data have been used. These secondary data were collected from published reports and documentation, including Environmental Product Declarations (EPDs), technical data sheets, and datasets from Ecoinvent database. The inventory has been modeled using SimaPro 9.2.0.2.

The impact assessment analysis is focused on the Global Warming Potential (GWP) indicator. The assessment method adopted was IPCC 2013 GWP 100a, which enabled the evaluation of four impact categories: Climate change Fossil, Climate change Biogenic, Climate change LULUC (Land Use and Land Use Change), and Climate change Total. All results are expressed in kg CO_2 eq. (Greenhouse Gases – GHGs), with two functional units: "1 kg of packed raw material" and "1 kg of packed plaster". The study does not consider the CO2 uptake.

Enviromental results: raw materials and earthen plaster samples. The study has been carried out in two different phases. The first one, called "Cradle to Gate 1," aimed at analyzing the following raw materials included in the plaster mixtures: hydrated lime, gypsum, clay, corn cob, and silica sand. For each raw material, the study considered every production stage from the resource's extraction to the packed final product. Gate 1 represents the supply companies of raw materials. The functional unit of this phase is "1 kg of packed raw material". This analysis leads up to the next step to support the comparison of different mixtures in term of environmental impacts.

The second phase, "Cradle + Gate 1 to Gate 2", aimed at comparing the six plasters selected in the laboratory test and based on different mix of raw materials. The processes include raw material supply, transportation and plasters manufacturing processes. Gate 2 corresponds to the company where the plaster ingredients are mixed up. The functional unit is "1 kg of packed plaster." It is important to note that the amount of water required to prepare the plaster mixture has been excluded from the analysis.

A detailed analysis of the impacts associated with the raw materials investigated in the first phase "Cradle to Gate 1" (Figure 2) indicates that hydrated lime and gypsum exhibit the highest 'GWP Total' values, whereas clay shows a lower contribution in terms of kg CO_2 eq emissions. This result can be attributed to the energy-intensive manufacture processes involved in producing lime and gypsum, which generate significant CO_2 emissions during the production process. By contrast, clay extraction and transport require minimal energy (in the geographical context of this study), resulting in a much lower environmental impact. Moreover, the impact related to the corn cob granulated is quite high since it is treated as a by-product of maize grain cultivation rather than as mere waste. This approach was adopted from a previous study by the authors (Carbonaro et al., 2016) and from other studies (Santolini et al., 2021), in which a share of the impact of maize cultivation process was considered, in a range between 0% to 20%. For this reason, a mass-based allocation approach was applied at the A1 stage of the product system in accordance with ISO 14044:2006. Data related to the transport and production of corn cob granulates (Modules A2–A3) were sourced from peer-reviewed literature to ensure methodological consistency and data reliability (Carbonaro & Thiebat, 2013).

The raw materials 'GWP Total' obtained from the LCA model were then validated by the comparison with similar products reported in Environmental Product Declarations (EPDs) and Ecoinvent database. The EPDs for hydrated lime and silica sand have been selected according to the manufacturing companies associated with the raw materials investigated in the research project.

To provide a comprehensive overview, a graphical representation was developed to illustrate the positioning of the project results relative to the reference datasets (Figure 3). Since EPD data for clay was unavailable, the comparison for this material was carried out exclusively using data from the Ecoinvent database ('Clay {CH}| market for | Cut-off'). Corn cob was excluded from this step due to the lack of relevant data in both EPD and database sources. As result, the 'GWP Total' values of the study carried on by the authors fall within an intermediate range compared with those reported in Environmental Product Declarations (EPDs) and in the scientific literature. This consistency demonstrates a good level of reliability of the model input data, confirming the robustness of the LCA model and providing a solid basis for the next phase of the study.

In the second phase "Cradle + Gate 1 to Gate 2", six plaster formulations prepared and tested in the laboratory were analysed and compared to quantify their emissions of Greenhouse Gases (Figure 4). The environmental impacts of each plaster were calculated by comparing a benchmark plaster, based on clay and sand (sample 'TS1-B'), with five other plasters containing different amount of lime, gypsum, and corn cob. The comparison was based on the 'GWP Total' per functional unit, enabling the identification of the specific environmental contribution of each ingredient. As in the first phase of the study, the results were compared with two reference plaster mixes: one derived from literature (Meliá et al., 2014) and one from the Ecoinvent database ('Clay plaster {GLO}| market for | Cut-off'). This approach provided a comprehensive evaluation of the experimental plasters.

The comparison highlights that plasters containing hydrated lime have the highest environmental impact, confirming the trends observed in the first phase, while plasters containing gypsum presents medium value compared to the overall range of the analysis.

As demonstrated by many authors the use of clay as the main binder in plaster mixes provides significant CO_2 savings related to conventional materials (Santos et al. 2021). However, the limitations of this material must also be considered. The main barriers to the wider use of clay in earthen construction are its sourcing methods and the lack of technical standards to allow large-scale application. Furthermore, the material's intrinsic variability and high sensitivity to water require stabilization techniques, such as the addition of lime or gypsum, which could increase the overall impacts in terms of Global Warming Potential (GWP) compared

to traditional earthen plasters as shown in the results (such as TS1-B in Figure 4). Nevertheless, considering the overall objectives of the research project, the plasters demonstrating the less environmental impact are those stabilised with gypsum, as they ensure reduced environmental impact while improving the potential mechanical resistance.

Another consideration is the use of corn cob in plasters as additive to improve thermal performance. The addition of agriculture by product or waste in the mixture increase 'GWP Total' values, primarily due to the cultivation process. However, its potential benefits during the building's operational phase, particularly in terms of energy efficiency and thermal comfort, and in the energy recovery at the end of life, could offset its initial embodied emissions.

Further ongoing research steps are being implemented to quantify such trade-offs, including an assessment of the physical and thermal properties of these bio-based plasters and the CO_2 uptake during plant growth. Moreover, through an in-situ experimentation, an additional step of the research will investigate the construction stage (Modules A4-A5), the use stage (Modules B1-B7) and the end-of-life stage (Modules C1-C4) to evaluate the environmental impacts during the whole life cycle of the plasters. The extended analysis will consider the mechanical and thermal performance integrated on the functional unit to compare plasters with different characteristics and durability.

Conclusion. With the recent implementation of the European regulations on energy efficiency and environmental sustainability, particularly Directive (EU) 2024/1275 on the energy performance of buildings (EPBD IV; European Parliament and Council, 2024), the construction sector is mandated to renovate the existing building stock and to account for embodied energy and CO_2 emissions throughout the entire building life cycle. In this context, the use of earthen plasters enhanced with natural fibre-based additives represents a solution for traditional building conservation. On the one hand, it helps to protect and maintain the earthen heritage enhancing low-carbon materials and techniques, while on the other hand, it contributes to the improvement of the thermal insulation properties of the building envelope during the use the use phase. This approach promotes a more sustainable and circular construction model, consistent with the objectives of the European Green Deal and climate neutrality by 2050.

Although traditional earth plaster has the lowest environmental impact in the Piedmont region, the study shows that combining it with binders and additives improves its technical performance and durability without significantly compromising its eco-compatibility. However, the results suggest that a detailed analysis of raw materials could be a useful tool for evaluating and selecting ingredients from an environmental perspective. In this study, from cradle to gate, gypsum emitted fewer GHGs than hydrated lime among the analysed binders, while it could offer the same technical performance, which is currently being analysed by the research group.

It should also be noted that using biogenic additives increases the emissions incorporated into the product. This increase is mainly due to agricultural activities, but it should also be considered in relation to other stages of the product's life cycle in order to assess it consistently. The embodied carbon associated with the material could be offset by the operational carbon linked to reduced energy consumption during use. Therefore, it would also be useful to extend the system boundaries to cover the whole life cycle of the plaster, in order to take into account the amount of CO_2 stored by the plant and soil prior to harvesting or extraction, and to balance this at the end of the plaster's life. The environmental impact of transport is fairly low, as most of the ingredients are sourced locally. Further research could focus on experimenting with different natural fibres to enhance and diversify by-products and waste from local agricultural supply chains. Additionally, it could focus on recovering excavated soil from the construction sector.

Through a series of tests and analyses, this research attempts to encourage researchers, architects, construction companies and clients to recover earth technology, bringing together different disciplines to implement, consolidate and innovate collective know-how.

Acknowledgements. This study is part of the research project EVER EARTH – Enhance VERnacular EARThen Heritage– CUP E53C24003350006- Grant Assignment Decree No. 20442 adopted on 06 November 2024 by the Italian Ministry of University and Research (MUR).

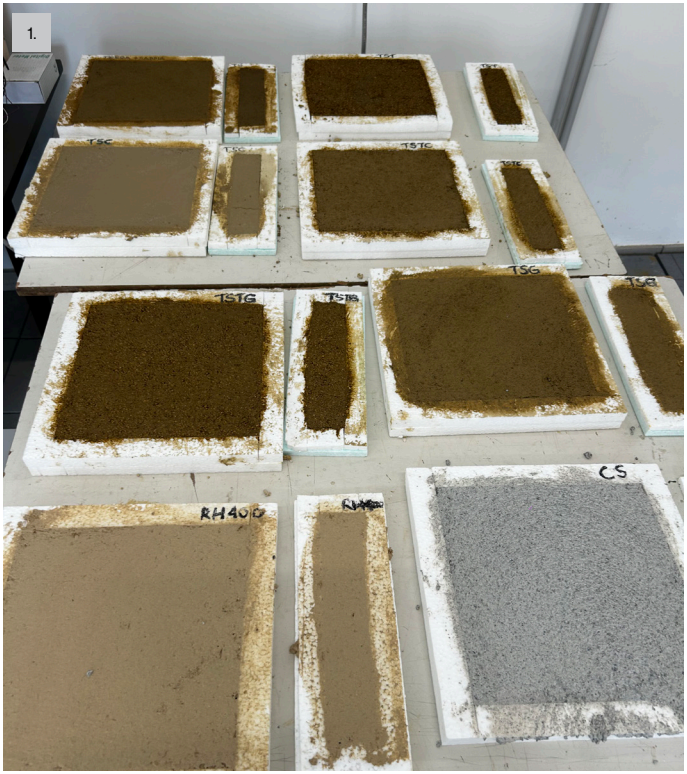
References.

1. Bertagnin, M., et al. (1999). Architetture di terra in Italia: Tipologie, tecnologie e culture costruttive. Edicom Ed.
2. Bollini, G. (Ed.). (2008). Terra cruda tra tradizione e innovazione. Edicom Ed.
3. Bollini, G., & Lion, M. (Eds.). (2005). La costruzione in terra cruda in Italia: Verso una normativa nazionale. Cagliari.
4. Carbonaro, C., & Thiebat, F. (2013). Materie vegetali per l'edilizia: Life cycle assessment del tutolo di mais. In S. Scalbi & F. Reale (Eds.), VII Convegno scientifico della Rete Italiana di LCA: Life cycle assessment e ottimizzazione ambientale – esempi applicativi e sviluppi metodologici (pp. 185–192).
5. Carbonaro, C., Tedesco, S., Thiebat, F., Fantucci, S., Serra, V., & Dutto, M. (2016). An integrated design approach to the development of a vegetal-based thermal plaster for the energy retrofit of buildings. Energy and Buildings, 124, 46–59. https://doi.org/10.1016/j.enbuild.2016.03.063
6. Eires, R., et al. (2015). Ancient materials and techniques to improve the earthen building durability. Key Engineering Materials, 634, 357–366.
7. Fratini, F., Mattone, M., Rescic, S., & Rovero, L. (2020). Analysis of earthen architectural heritage in Piedmont (Northern Italy): Typologies, construction techniques and materials. Revista Gremium, 7(14), 41–52.
8. Guerrero Baca, L. (2011). Revestimientos. In C. Neves & O. Borges (Eds.), Técnicas de construcción con tierra (pp. 72–77). PROTERRA.
9. Guillaud, H. (2008). A global challenge: Preserving earthen architecture. World Heritage, 48, 4–15.
10. Jaquin, P., & Augarde, C. (2012). Earth building: History, science and conservation. HSbrepress.
11. Mattone, M., Ibnoussina, M., Rescic, S., Fratini, F., Magrini, D., Mecchi, A. M., & Nocairi, M. (2016). Stabilization of earthen plasters: Exchange of knowledge and experiences between Italy and Morocco. Journal of Materials and Environmental Science, 7(10), 3647–3655.
12. Mattone, M., Rescic, S., Fratini, F., & Manganelli Del Fa, R. (2017). Experimentation of earth-gypsum plasters for the conservation of earthen constructions. International Journal of Architectural Heritage, 11(6), 763–772. https://doi.org/1

0.1080/15583058.2017.1290850
13. Mattone, R. (2010). Il paesaggio delle case di terra. L'Artistica.
14. Melià, P., Ruggieri, G., Sabbadini, S., & Dotelli, G. (2014). Environmental impacts of natural and conventional building materials: A case study on earth plasters. Journal of Cleaner Production, 80, 179–186. https://doi.org/10.1016/j.jclepro.2014.05.073
15. Santolini, E., Bovo, M., Barbaresi, A., Torreggiani, D., & Tassinari, P. (2021). Turning agricultural wastes into biomaterials: Assessing the sustainability of scenarios of circular valorization of corn cob in a life-cycle perspective. Applied Sciences, 11, 6281. https://doi.org/10.3390/app11146281

Figures.
Figure 1 – Experimental plasters samples / Image credits: photo by the authors.
Figure 2 – Phase "Cradle to Gate 1" GHGs emissions per 1 kg of packed raw material/ Image credits: authors.
Figure 3 – Phase "Cradle to Gate 1" raw materials comparison: GHGs emissions per 1 kg of packed raw material / Image credits: authors.
Figure 4 – Phase "Cradle + Gate 1 to Gate 2" plaster comparison: GHGs emissions per 1 kg of packed plaster / Image credits: authors.

1.



2.



4.

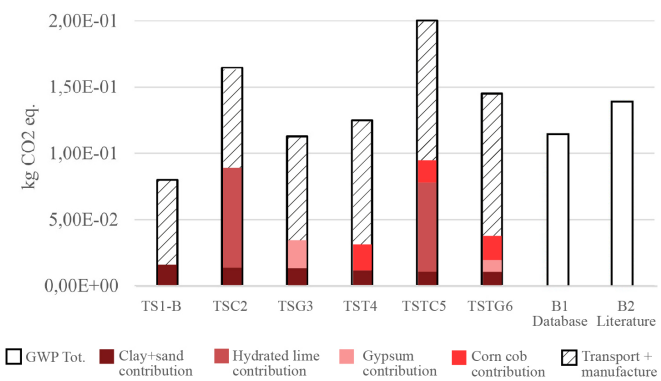
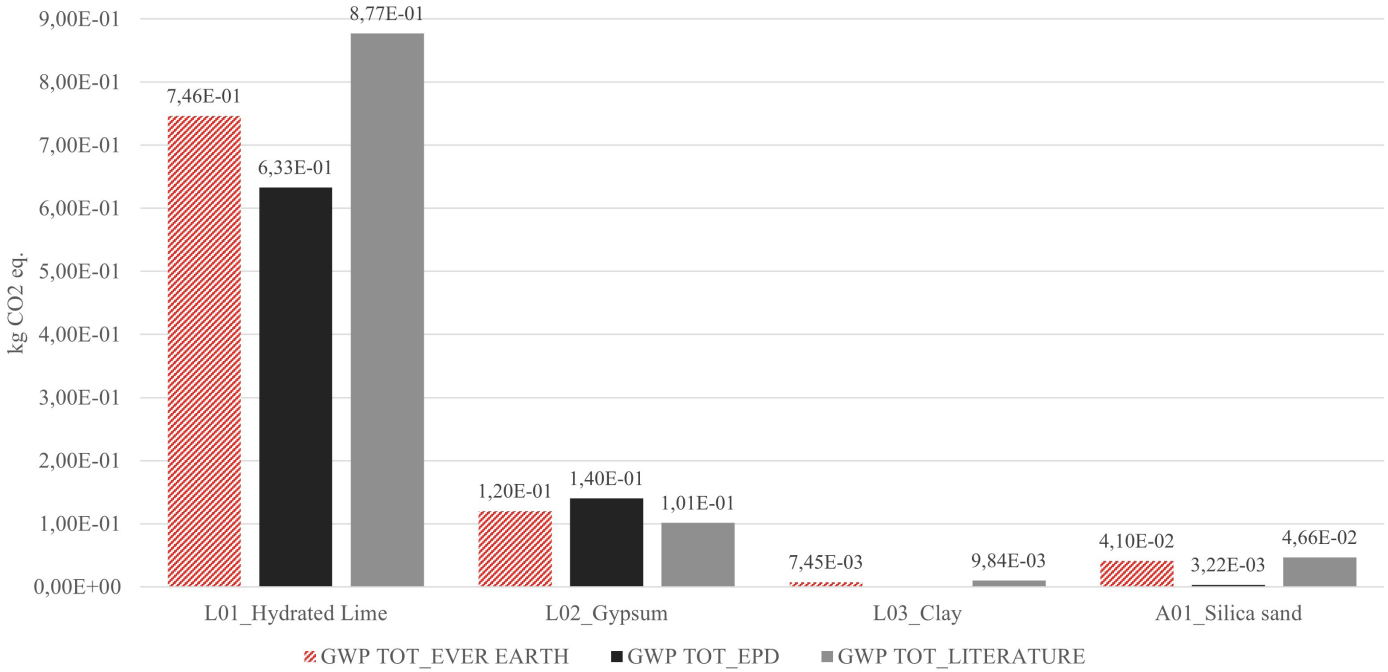


Table 1. Plasters under investigation.

Code	Plaster mix	Ingredients
TS1-B	Benchmark mix	Clay, sand
TSC2	Experimental mix	Clay, sand, hydrated lime
TSG3	Experimental mix	Clay, sand, gypsum
TST4	Experimental mix	Clay, sand, corn cob
TSTC5	Experimental mix	Clay, sand, hydrated lime, corn cob
TSTG6	Experimental mix	Clay, sand, gypsum, corn cob
B1-Database	Database mix (EcoInvent: Clay plaster, CH)	Clay, sand
B2-Literature	Literature mix (Melià et alii, 2014)	Clay, sand, natural fibers

3.



RUINS, MEMORY, AND THE MUSEALIZATION OF ABSENCE: THE CASE OF POGGIOREALE

Francesco LEONIL - *Politecnico di Torino | francesco.leoni@polito.it*
Amath Luca DIATTA - *Politecnico di Torino | luca.diatta@gmail.com*

Abstract. In the heart of western Sicily, Poggioreale lies as a suspended town, abandoned since the 1968 Belice earthquake. Among its ruins, abandonment becomes a form of evidence: fragments of domestic life, traces of interrupted routines and the slow sedimentation of time. This condition places Poggioreale within a wider geography of impressive ghost towns such as Craco, Pripyat and Kayaköy, where catastrophe has transformed architecture into testimony and absence into material memory. The purpose of this research is to move beyond the traditional musealization of absence and explore how Poggioreale can generate new forms of interpretation and design through the notion of regenerative memory. Rather than treating the ruin as a fixed relic, the study examines how fragility, incompletion and erosion can become active components of cultural and territorial regeneration. The methodology draws on extensive fieldwork conducted between 2020 and 2025, integrating walking exploration, sensory observation and collaborative photographic documentation. This embodied approach reveals how atmospheres, material traces and spatial discontinuities contribute to a layered reading of the site that cannot be captured through archives alone. The principal results show that Poggioreale operates as a counterpoint to the failed modern utopias of the Belìce Valley. Its suspended state preserves spatial legibility and demonstrates how abandoned settlements can be understood as living systems, where time acts as material and memory continues to shape form. Its suspended state allows the ruin to operate as a living system, where incompletion and erosion acquire the dignity of form and suggest alternative ways of understanding resilience. Rather than concluding with a definitive model, this reflection opens a space for possibilities: a way of approaching fragile territories through attention, slowness and care, shaped by walking the site, listening to its traces and observing how memory persists in the silence of the ruin.

Keywords: Ruin, Memory, Care, Museography, Regeneration

Introduction

In Terry Gilliam's 1995 movie 12 Monkeys, humanity is forced to live underground to escape a contagion that has exterminated 99% of the population. Prisoners sent to the surface encounter a world crystallized in the moment of exodus, where nature has reclaimed the urban landscape, a haunting metaphor for the coexistence of ruin and rebirth. A similar, though painfully real, experience occurred after the earthquake that struck L'Aquila in 2009. During my early inspections as part of the city's reconstruction, I encountered a landscape frozen at the very instant of catastrophe: coffee cups left on tables, paintings hanging askew, carpets dangling through the ruptures of collapsed floors. A pale dust veiled everything, muting sound and time alike. Such landscapes, at once metaphysical and apocalyptic, possess a dark fascination that powerfully affects both perception and collective imagination. They reveal how tragedy can transform ordinary places into mnemonic and aesthetic spaces, where destruction itself becomes a form of storytelling. If those sites risk turning into monuments to their own demise, they also develop unique museographic and cultural potential. Their evocative power lends them easily to reuse as spaces for artistic representation, cinematic, theatrical, or memorial (Augé, 2004).

Within this framework, the paper aims to analyze the town of Poggioreale in Sicily, abandoned following the Belice earthquake, as a potential case of interest for cultural enhancement and revitalization through tourism, also considering its proximity to Alberto Burri's Grande Cretto, located on the site of the other earthquake-stricken town of Gibellina Vecchia.

Case Studies

To introduce the research topic, we intend to present three case studies which, for different reasons, illustrate how abandonment has acted as a trigger for a very specific form of tourism, turning ghost towns into hubs of attraction with potential not only related to simple visitation, but also to cinematic and artistic uses.

Craco

Rising from a clay hill in Basilicata, Craco appears like a stone labyrinth overlooking the valley, dominated by a Norman tower and surrounded by the eroded calanchi. For centuries, it was a living village, yet the ground beneath it was unstable. In the 1950s and 1960s, landslides intensified due to the clay-rich soil and unsustainable agricultural practices. The situation culminated with the 1963 Irpinia earthquake, which rendered the town unsafe and triggered a gradual evacuation. By the early 1980s, following further collapses caused by the 1980 quake, Craco had become a ghost town. For decades, silence and decay defined its landscape. Over time, however, its spectral beauty began to attract artists, scholars, and filmmakers. In the 2000s, the Municipality of Craco and the Fondazione Craco Ricerche launched a conservation and musealization project, securing paths, stabilizing structures, and creating guided visitor routes. Access are now regulated through the Craco Card, allowing safe exploration while protecting the ruins. Craco's haunting appearance made it a symbolic and cinematic site that became a perfect set for movies like Christ Stopped at Eboli (1978), The Passion of the Christ (2004), Quantum of Solace (2008) or Basilicata Coast to Coast (2010). In 2010, the World Monuments Fund listed Craco among the world's endangered heritage sites. The subsequent creation of the Museo Emozionale di Craco (MEC) established a cultural and interpretive framework that narrates its history through immersive exhibitions and research initiatives. Today, Craco is not simply a ruin but a living scenography, a natural theatre where time itself performs. It embodies a new paradigm of heritage as process, where decay becomes narrative and memory a form of presence.