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Knowing Earthen Architecture in Albania: Investigating some Case Studies in Tirana and Kavaje

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Abstract

This paper investigates the building techniques and related materials of some earthen constructions in Tirana and Kavaje in the framework of a scientific collaboration project between Italy and Albania. This architectural heritage is at significant risk of disappearing for many common reasons: the perception of poverty and unhealthy conditions it generates in most citizens, building speculation whereby earthen buildings are considered an obstacle to urban development, and a lack of specific laws to protect it. Furthermore, following the many earthquakes that hit Albania, the last one in 2019, the damaged earthen dwellings were replaced with fired bricks and reinforced concrete constructions. Several unprotected buildings in Kavaje and Tirana were thus studied to collect data and materials that could represent the last existing documentation. This manuscript analyses data relating to construction techniques, mineralogical and granulometric characterisation of the earthen materials constituting the bricks and mortars, and decay phenomena of the built heritage.

Keywords: *earthen architecture; Albania; qerpiç; construction techniques; conservation issues*

1. Introduction

Earth is the oldest building material in the world because of its availability and ease of use. Despite the advent of more durable and versatile building materials, earthen constructions are still used daily in numerous regions, such as North Africa, the Middle East, Central Asia, and Central and South America (Mattone, 2021). This widespread earthen-built heritage, mainly vernacular architecture, has been re-evaluated because of its cultural value and the growing interest in human settlements that are inclusive, safe, resilient, and sustainable (United Nations, 2020).

As stated by ICOMOS in 1999, vernacular architecture is “an expression of the culture of a community, of its relationship with the territory and, at the same time, this architecture manifests the world's cultural diversity”. Vernacular buildings characterise our nations’ territories, contributing to the definition of their genius loci. Unfortunately, globalisation has caused the

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progressive denaturalisation of the relationship between human beings and their surroundings. It has led to the increasing abandonment of small settlements, which, although partly uninhabited, still retain their identity features. The value of this heritage lies not only in being a testimony to the past and a valid reference point for planning the future but also in constituting a valuable architectural resource that can be used to (1) improve the quality of the rural landscape, returning an underused building heritage to the community, (2) to reduce land consumption due to new construction, (3) to enhance local particularities and (4) to promote the regeneration of territories and ancient knowledge. The 2025 World Heritage List ratified by the UNESCO World Heritage Convention certifies that 199 of the 1.200 recognised cultural properties are earthen structures. Nonetheless, earthen heritage is at risk worldwide. On the one hand, considered unhealthy, unsafe, and incompatible with modernity, earthen vernacular architecture has been gradually abandoned. Conversely, the push for modern building techniques has impacted the transmission of knowledge and skills, thus determining the lack of maintenance or unsustainable interventions. This is the central aspect of this paper since the disappearance of the earthen heritage is sometimes unnoticed, with the consequent loss of memory of this built heritage and the legacy of the communities. The knowledge, preservation and transmission of material evidence and technical knowledge are essential to safeguard this building culture and, thus, its value as an intangible heritage. This study was born from the need to address the critical issues related to the conservation of the earthen architectural heritage in Albania, which is at high risk of disappearing because this type of construction is no longer being built, and often a large part of the population does not recognise it as an integral part of their territory. In Albania and Italy, earthen buildings cannot be adequately valorised due to the perception of poverty and unhealthiness that they generate in most citizens, building speculation and the lack of specific laws for their protection. From a legislative point of view, only some Italian regions have enacted specific laws to protect earthen building heritage. At the same time, in Albania, some laws protect only the building heritage, which is defined as being of architectural interest, regardless of the material with which it was built. As a result, vernacular architecture, which is designed according to local needs and availability of building materials and reflects local traditions but does not have great architectural value, is not considered or protected. The predominant use of natural stone and wood characterises Albanian vernacular architecture. However, examples of earthen constructions can be found in some regions, where the availability and characteristics of the material determine its use for construction purposes. They are “fragile” architectures, little known or unknown at all, but no less valuable. This paper presents some of the results of a recent research activity carried out within a two-year bilateral collaboration between CNR (Italy) and MOES (Albania) and concluded at the end of 2024.

The bilateral research project entitled ‘Knowledge to protect and enhance earthen vernacular architecture’ aimed to promote the knowledge and conservation of the earthen building heritage, limited to the territory of Tirana and Kavaje, through a census and dissemination actions addressed to a broad public. The census tool allowed an estimation of the buildings present in the investigated territories and an analysis of construction techniques, building materials, and the state of conservation. The dissemination actions aimed to promote knowledge and stimulate their conservation over time by involving local authorities, conservation experts, and the population. The survey, which was conducted in the cities of Tirana and Kavaje, identified three types of housing made of earthen materials:

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- Ottoman houses protected by the Ministry of Culture and subject to recovery and enhancement (Fig.1).
- Elegant/stately houses from the early 20th century, some of which are protected by the Ministry of Culture (Fig. 2).
- Minor architecture without significant value and therefore not listed (Fig. 3).

Thus, although there are various types of earthen architecture (Figs. 1-3), the project focused on houses with little architectural significance. Consequently, these houses are not included in a conservation and safeguarding program, putting them at serious risk of disappearing (Fig.3).

This work concerns an overview of the building techniques and state of conservation of surveyed constructions, particularly those for which it was possible to sample earthen building materials (bricks and bedding mortar). The overall work on the research project will be the subject of another paper.

2. Materials and methods

The analysis of the construction techniques and state of preservation of buildings in Tirana (seven buildings) and Kavaje (three buildings) was carried out through visual inspection and documented with the acquisition of pictures. Samples of earthen brick (qerpiç) and earthen bedding mortars have been taken from the analysed buildings. Moreover, local soil has been sampled for comparison with the earthen building materials (Fig. 4). The following analyses have been carried out:

- The mineralogical composition of the earthen bricks, bedding mortars, and local soil was determined through X-ray diffraction (XRD) (X'Pert PRO diffractometer by PANalytical equipped with X'Celerator detector and HighScore software for acquisition and interpretation of data according to the following operative conditions: CuK α1= 1.545Å radiation, 40 KV, 30 mA, 2Θ = 3-70°);



Fig. 1 – *Tirana: Adem Toptani house* (Rescic, 2023).



Fig. 2 – *Tirana: stately home built in 1909* (Rescic, 2024).



Fig. 3 – *Tirana: house of no significant architectural value and therefore not protected* (Rescic, 2023).

- The mineralogical composition of the clay minerals was determined on the fraction <4 µm extracted through sedimentation according to the Stokes' law (Cipriani, 1958; Cipriani & Malesani, 1972) utilising the previous instrument according to the following operative conditions: CuK α1= 1.545Å radiation, 40 KV, 30 mA, 2Θ = 3-32°.

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- The determination of the grain size distribution has been done through sieving to separate the following fractions: sand (Ø > 63µm), silt (4µm < Ø <63µm) and clay (Ø< 4 µm) (ASTM D2217–85; ASTM D422–63).

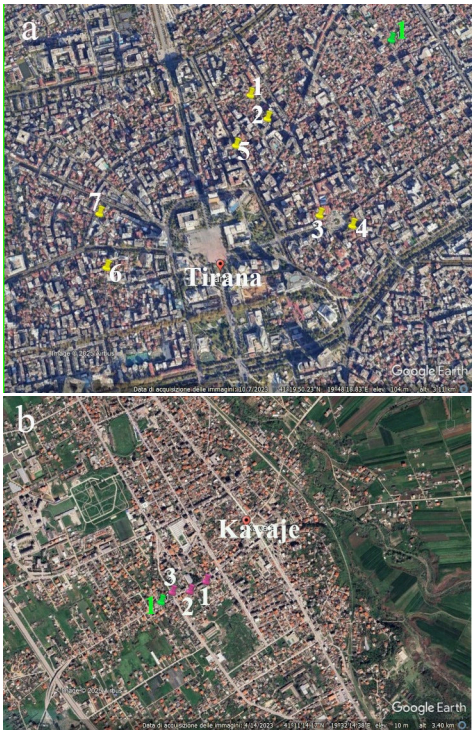

Fig. 4 – *Localization of sampled buildings (yellow and dark pink) and soils (green) in Tirana (a) and Kavaje (b)* (Edited from Google Earth, 2023).

3. Results and discussions

3.1 Building techniques and state of conservation

The surveyed buildings are mainly residential houses, generally one or two storeys above ground. The walls are about 50 cm thick and are characterised by a 40-50 cm high fired brick or stone foundation (Fig. 5). The building technique uses earthen bricks, known in Albanian as qerpiç (Dobjani & Papa, 2022), measuring approximately 20 cm x 12 cm x 10 cm and an earthen bedding mortar approximately 2 cm thick for the masonry (Fig. 5).



Fig. 5 – *Tirana: wall made of qerpiç (sun-dried earthen bricks) and reinforced with horizontal wooden beams, fired bricks are present at the base and below the roof* (Luvidi, 2024).

The earthen structures are fitted with 8-10 cm thick wooden battens to ensure greater stability in an earthquake. These are positioned horizontally along the entire length of the masonry. The battens, placed between 80 and 110 cm intervals, are made integral to the wall using minor wooden elements embedded transversely in the masonry (Fig. 6).

The walls are generally covered with lime plaster, which has been replaced by cement plaster in more recent works. The roofs are wooden double-beam structures covered with brick tiles. The roofs are slightly overhanging to protect the external vertical surfaces from water.



Fig. 6 – *Tirana: particular of wooden battens and slightly overhanging roof* (Rescic, 2024).

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In the town of Kavaje, buildings with less projecting roofs are probably observed for two reasons: in some cases, the earthen wall was protected with a single row of fired bricks; in other cases, which are more recent houses, the earthen wall was protected with a thick layer of cement mortar (Fig. 7).



Fig. 7 – *Tirana: intervention with cement mortar on qerpiç* (Rescic, 2024).

Interventions to cover the walls with cement mortar can be seen (Fig. 8). Sometimes, instead of the traditional wooden roof, metal sheets are used as a covering in what appears to be a hasty but later permanent intervention (Fig. 9).

This construction technique makes it difficult to identify earthen buildings without a collapse. The 2019 earthquake in Kavaje brought many earth structures back to light. Other examples of interventions not compatible with the earthen building technique can be seen in Fig. 9, where the roof is sometimes supported on the raw wall by reinforced concrete beams.

The plaster on the walls is often detached, leaving the earthen wall exposed to the elements (Fig.5). In buildings that have been completely abandoned, the roof is often torn off, and the walls are missing, leaving only the remains of the perimeter wall of the house (Fig. 10). In some cases, the building has been rebuilt, maintaining the external appearance of the house but using modern materials (cement and fired bricks) (Fig. 11).



Fig. 8 – *Kavaje: building after the 2019 earthquake, the collapse of the plaster shows the layer of earthen bricks and the thick layer of cement plaster; the roof does not excessively overhang* (Rescic, 2023).



Fig. 9 – *Tirana: sheet metal roofing and concrete beams in the attic* (Rescic, 2024).



Fig. 10 – *Tirana: building where roof is torn off* (Luvidi, 2024).

Unfortunately, the failure to recognise the value of the earthen building heritage and the desire for modernity has led to its rapid deterioration over the years, due both to a lack of maintenance and to interventions which, far from guaranteeing its conservation, have often led to the irretrievable loss of a significant part of this expression of material and immaterial culture, knowledge and traditions.

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Fig. 11- *Kavaje: building completely rebuilt in baked bricks and concrete after the effects of the 2019 earthquake in Fig. 6* (Çapeli, 2024).

3.2 The building materials

The main mineralogical composition of earthen building materials for both Tirana and Kavaje shows the presence of common minerals such as quartz, feldspars, and phyllosilicates. Also present in Kavaje are carbonates such as calcite and dolomite, indicating a light "marly" earthen material. Phyllosilicates include clay minerals such as illite and kaolinite for both territories, while smectite is typical for Kavaje and chlorite for Tirana (Table 1). Smectite is an expandable lattice mineral that shrinks with drying and swells with hydration. If repeated cyclically, this behaviour can induce decay phenomena caused by the mechanical stresses established by volume changes, resulting in fracturing or exfoliation. The mineralogical composition of the soil collected from some of the gardens matches that of the building materials, confirming the use of local raw materials. Regarding grain size composition, the soils in both Kavaje and Tirana are sandier than the earthen building materials (Table 2). The raw material soil was likely modified by removing some coarser fractions to make the mortars and bricks. In addition, almost all bedding mortars are slightly more clayey than bricks, following their binding function. In detail, it can be observed that:

Table 1 – *Clay minerals composition: I = Illite; K = Kaolinite; Chl = Chlorite; Sm = Smectite* (Rescic, 2025).

Sample	I	K	Sme	Chl
Tirana brick	x	x	-	x
Tirana mortar	x	x	-	x
Tirana soil	x	x	-	x
Kavaje brick	x	x	x	-
Kavaje mortar	x	x	x	-
Kavaje soil	x	x	x	-

Table 2 – *Grain size distribution* (Rescic, 2025).

Sample	Sand	Silt	Clay
	Ø> 63 µm	4 µm < Ø <63 µm	Ø < 4 µm
Tirana mortars (1-5)	27±3	40±3	33±2
Tirana mortars (6-7)	38±1	39±1	24±1
Tirana brick (1-5)	27±3	44±2	30±1
Tirana brick (6-7)	32±1	42±1	27±1
Tirana soil	48±1	31±1	21±1
Kavaje mortars	22±2	47±5	31±3
Kavaje brick	24±2	46±5	30±3
Kavaje soil	40±1	36±1	24±1

- Tirana's mortars and bricks can be divided into two groups based on the buildings investigated: 1-5 and 6 -7. Samples from 6 and 7 buildings are poorer in the finer fraction (silt-clay) than those from 1-5. There were probably different master craftsmen who adopted different modifications of the earth to make the building materials.
- Mortar and bricks from Kavaje have a more homogeneous grain composition, although the building materials from building 3 are slightly less silty with respect to the others.

Plotting the grain size distribution of the analysed samples in a ternary diagram (sand-silt-clay) makes it possible to classify the soils as silty clay for the samples from buildings 1-5 in Tirana and the Kavaje sample from building 3. While the remaining samples from Kavaje, though falling in the same field, are slightly siltier. The samples from 6 and 7 buildings of Tirana fall on the boundary between silty clay and silt (Fig. 12).

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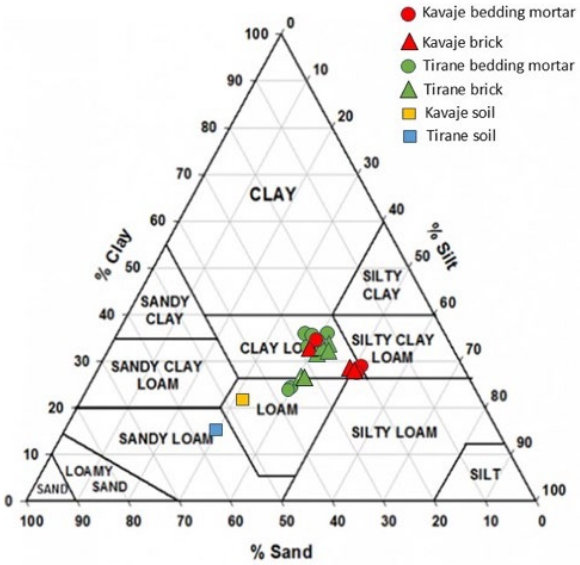

Fig. 12 – *Sand-Silt-Clay ternary diagram, showing the grain size composition of building materials and earthen soils* (Modified from FAO, 2006).

The soil falls in the sandy loam and loam fields, respectively, for Tirana and Kavaje, as had been noted, are sandier than the building materials. Overall, for both Tirana and Kavaje, this is a medium-fatty earth with a high clay content (~30-34%) and, in the case of Kavaje, the presence of expandable lattice clay minerals (smectite). In Kavaje bricks, the addition of fibres is noted, probably due both to the need to have a higher flexural strength of the brick and to decrease shrinkage due to the presence of smectite-type expandable lattice minerals (~2-5% by weight).

4. Conclusions

Earthen buildings are an architectural heritage often not recognised by the citizens or not valued. The lack of recognition of its cultural and architectural value leads to an inevitable loss of evidence of this construction technique. Tirana is experiencing a period of significant growth and urban development. Therefore, many earthen architectures have disappeared in just a few months to give way to the construction of modern skyscrapers made of materials such as cement, aluminium and glass.

The cooperation between researchers from the two countries, with different skills (urban architects, restoration architects, geologists and chemists specialising in the study and conservation of raw construction materials), has enabled the integration of various aspects, thereby improving the quality of the work. Indeed, the Albanian researchers' knowledge of local construction techniques has been complemented by the Italian researchers' knowledge about construction techniques and conservation issues of the earthen heritage.

It was possible to appreciate the important and extensive earthen heritage in Tirana and Kavaje and to promote a comprehensive census of unlisted buildings in the Tirana area by the Faculty of Architecture and Urbanism at the Polytechnic University of Tirana (UPT-FAU).

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The survey was undertaken using census forms adopted in Italy, modified and adapted to the specifics of Albanian cases. The forms proved to be a practical and user-friendly tool, even for training students. One hundred thirty-four adobe buildings were identified and analysed at the end of this process. Documentation was carried out through photographic files and GIS localisation on a map for each of them.

Furthermore, diagnostic studies on samples taken from earthen buildings have made it possible to analyse technical aspects, such as the characteristics of the building materials. Within Tirana, differences were found in the grain size of earthen samples, probably due to how workers operated. Differences were also detected in the mineralogical composition of the earthen material taken from the two cities. The analysis has shown that in Kavaje, the earth used for the bedding mortars was made up of a mixture of earth and straw. In some cases, the masonry is protected by a wall of fired bricks, thus probably influencing the type of roof adopted, which, contrary to the entire territory of Tirana, is not very protruding. These aspects allow us to affirm that those who built with raw materials knew perfectly the characteristics of the local materials and used them to the best of their ability.

Aware of the need to undertake further analyses, the research carried out so far is a first helpful step in promoting knowledge and safeguarding this heritage by re-evaluating a construction typology that is increasingly deserving of attention for its good qualities as a nature-friendly, thermally insulating and ecologically recyclable building material.

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