'Burning the bones of the earth'

Documenting the traditional lime kilns technology across the Albanian-Greek border

Guide to the project & dataset

1. Introduction| A few lines on lime

Commercial names: Air lime/ Slaked lime/Hydrated lime
Mineralogical name: Portlandite
Chemical formula: $Ca(OH)_2$

Air lime, one of the oldest building materials known to mankind, has been used as a binder in mortars, plasters, renders, concretes, wall paintings and decorative elements, since prehistoric times. Apart from its architectural performance, lime has been employed in multiple environmental and agricultural applications in a traditional household; in Greece, the Balkans and other Mediterranean countries, lime-washing of the external walls would take place every spring to sanitise the houses, associated with the symbolic value of celebrating springtime.

Lime has been a core building material in monumental constructions; diverse mixes with sands, gravels, organic and inorganic additives etc. have shaped a long recipe-book of lime-based materials used in architecture and art; a great amount of research is being conducted both in decoding the lime use technology and in reclaiming the knowledge for the compatible restoration of artworks and monuments.

The craft of lime kilns includes the elaborate building and low-fire calcination of dome structures made of highly pure limestone (in terms of calcite content – $CaCO_3$) to produce the quicklime (CaO); afterwards quicklime is slaked in water and stored in pits for ageing before use. Traditionally, different types of wood are used as a fuel, usually the leftovers from logging activities. Lime kilns technology is strongly associated with the geological background of each area; depending on the limestone characteristics different qualities of lime would be obtained. Each stage of this historical *chaîne opératoire* entails knowledge and skills intertwined with forest management, building and landscape practices.

The construction and firing of the limestone dome are harsh and elaborate tasks which necessitate great skills and monitoring of the process. The kiln is designed both to maintain its structural integrity despite the intensive and prolonged thermal stresses during calcination, but also to ensure the proper thermal decomposition of the stone batch.
Since the mid-20th century, the traditional craft is on the verge of distinction due to industrialisation and urbanisation processes that have subsumed most of such traditional practices. Though, both the urge to decarbonise the modern building sector in view of the climate crisis and the demand of compatible restoration materials have induced a shift towards lime's renaissance and use in architecture nowadays, as a less carbon-intensive and culturally consistent material, especially when produced in small-scale and non-industrialised process.

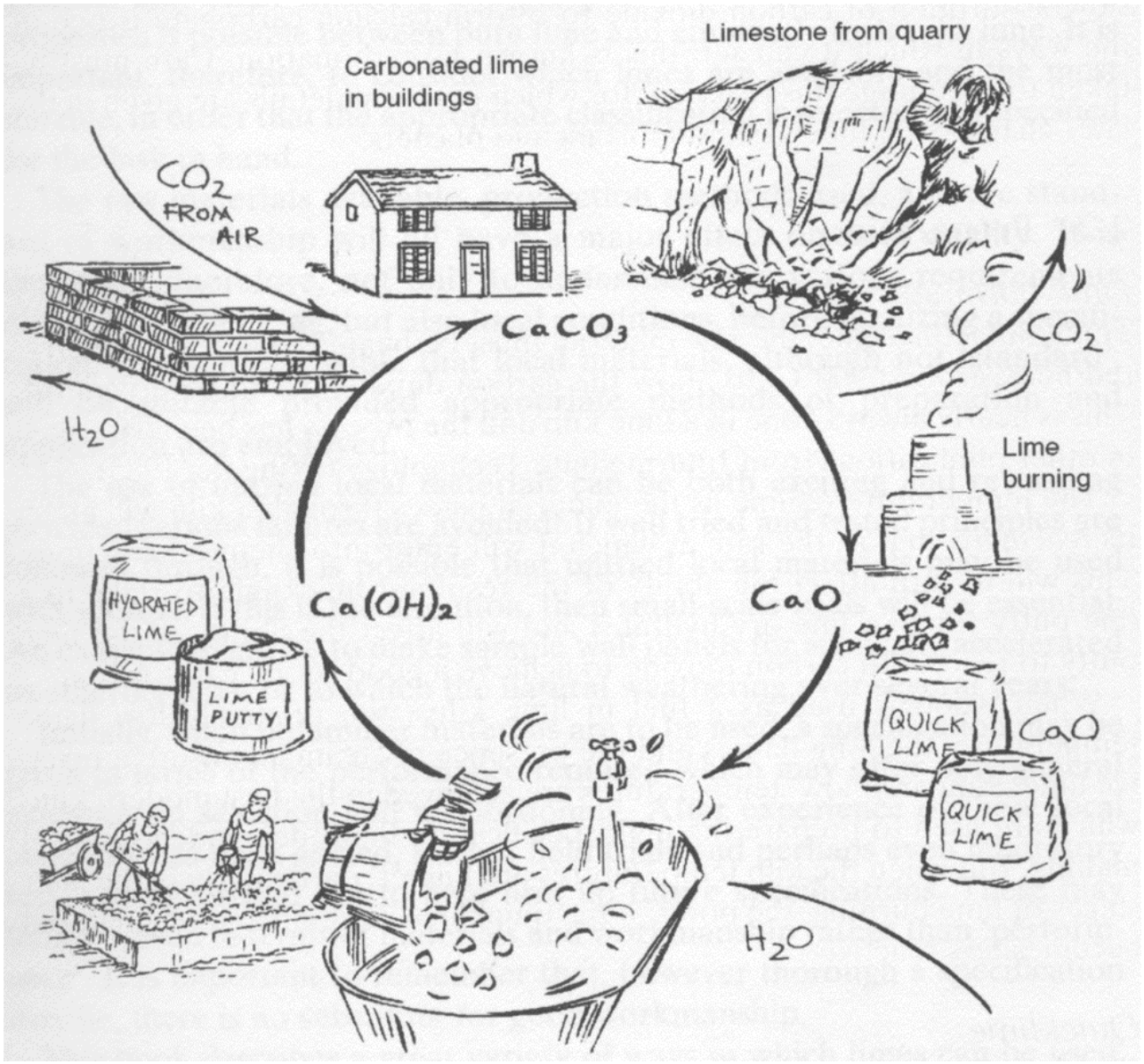


Figure 1. The lime cycle (adopted by Holmes and Wingate (2008, p.8))

2. The project

Kilns on the border

The project was initiated in November 2021 and concluded two years later and after extensive field research in several locations of Epirus in NW Greece and in regions of S. Albania.
Its objective was to **trace and document the traditional craftsmanship of wood-fired, flare-type lime kilns on both sides of the border**; to explore the knowledge, practice and social dimensions regarding the lime kiln technology and the ways it evolved in the two neighbouring countries.

The traditional lime kiln structures under investigation belong to the pre-industrial typology of intermittently operating, continuous loading flare kilns, i.e. funnel-shaped dry stone structures used for the calcination of a single limestone batch and lit by wood for several days in a row. In many cases, perimeter walling is, also, built as a permanent structure which infers reduction of heat losses during the burning stage and reflects a more permanent kiln workshop and/or a more standardised production.

Material vestiges of pre-industrial lime kilns and community memoirs of this practice are still detected in the Greek regions, despite the fact that the traditional practice has been totally subsumed by industrial products since the 1960's. The traditional practice was followed in Albania, until the early '90s, during the communist regime and within the framework of agricultural cooperatives. In fact there are, also, cases of revival of the traditional practice after 2000s. In Southern Albania, in the area of Leshnjë, near the town of Korçë, there is still a lime practitioner following the traditional process and maintaining an open-air lime kiln workshop.

Employing **a multi-level and multimedia documentation methodology**, a rich digital archive of audiovisual material, architectural drawings, interviews, field notes and geographical mapping was developed.

The project evokes the interest on traditional lime manufacturing and its **modern implications for natural resources management and architectural heritage.** It, furthermore, aims to reveal the importance of **preserving traditional skills and practices that have historically shaped the built environment in Greece, Albania and the Balkans**; as well as to foster the modern use of air building lime in architecture, restoration and modern design, as a less carbon-intensive and culturally consistent material, compared to Portland cement and commercial hydraulic lime products.

3. Geographical areas of study

There were 4 clusters of geographical areas visited and examined (Fig. 1, 2), listed below according to the chronological order of field visits:

- **Villages/cities in Vlorë & Gjirokastër Counties, Southern Albania**: Shëndre (Άγιος Ανδρέας), Leshnicë e Sipërme (Άνω Λεσινίτσα), Delvinë, area of Gjirokastër (Kardhiq), Dropull (Δερόπολη). This is an area with a very large part of Greek minority communities (the ones referred to, also, with their Greek names).

- **Area of Leshnjë**, approximately 20 km from the town of Korçë. This is the place where the active lime kiln practitioner operates his business and where all different stage of the artisanal practice were recorded.

- **The mountainous areas of Tzoumerka and Zagori**, in NW Greece, where numerous villages were visited. These are both areas of unique architectural heritage and craftsmanship legacy. The region is known for the itinerant guilds (Ott. esnaf) of craftspeople, called 'bouloukia', who mobilised until the early 20th century around the Balkans and beyond undertaking big construction projects.

- **The cross-border area of Pogon(i)** which is shared between the two countries and, is, also, a nucleus of Greek minority villages in the Albanian part. Our research initiated from the Albanian part, where we visited the Greek minority villages of Hllomo (Χλωμό) and Poliçan (Πολύτσανη). In the Greek territory we visited the villages of Delvinaki, Ktismata, Pogoniani and Kryoneri.

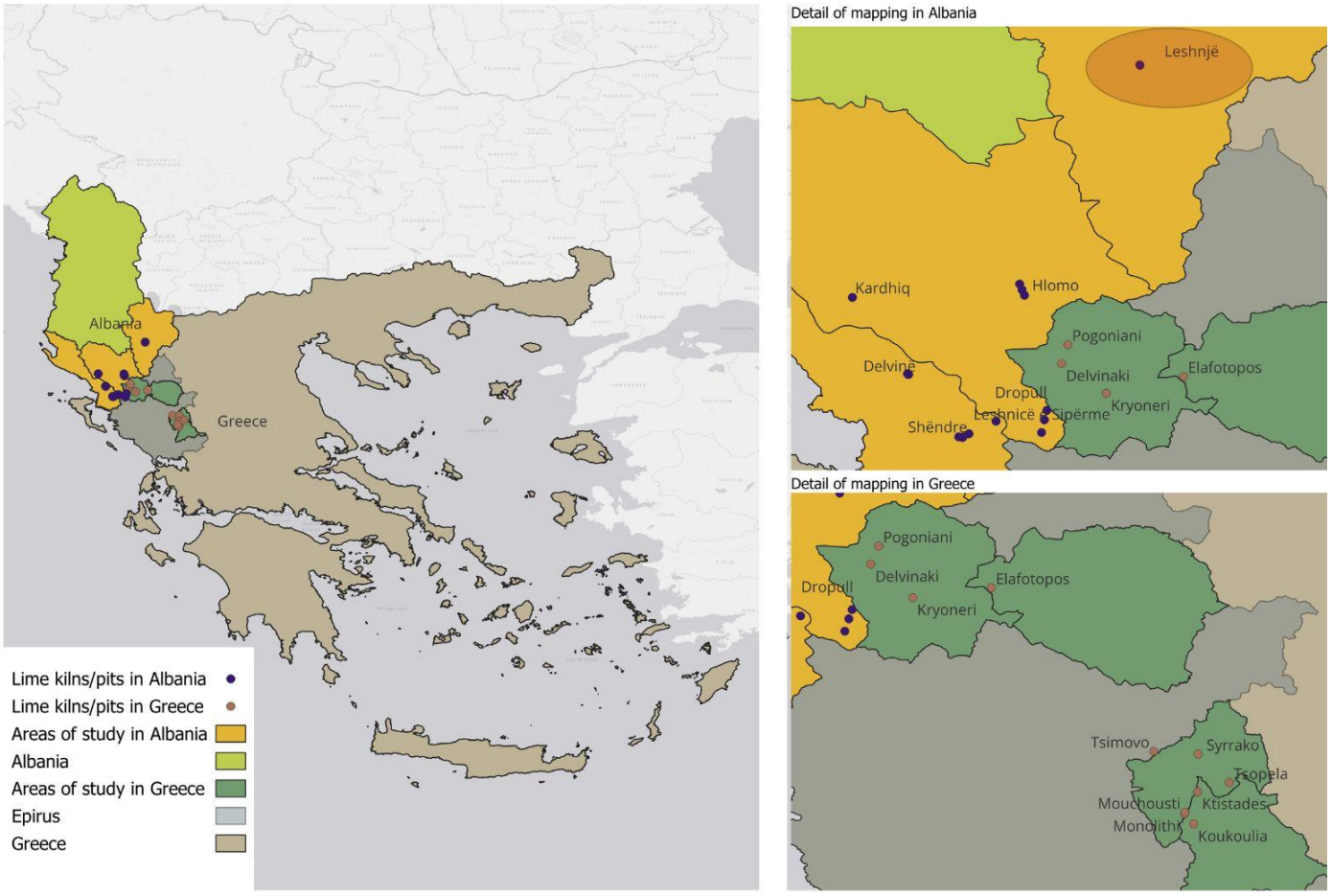
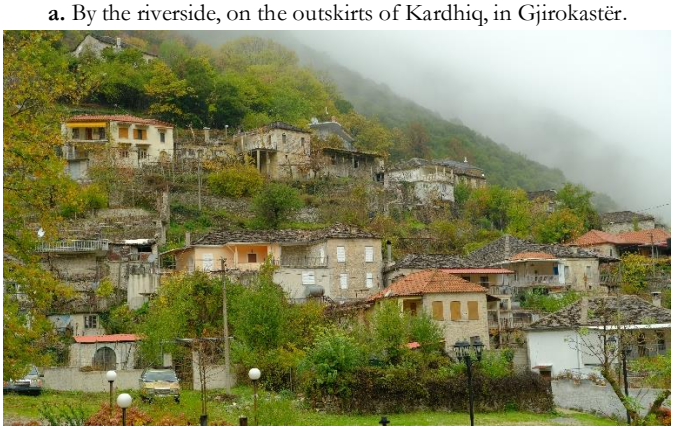


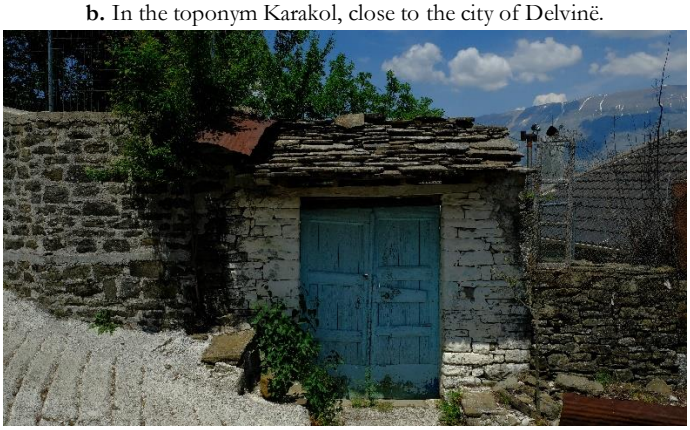
Figure 1. Depiction of areas under study during the project

a. By the riverside, on the outskirts of Kardhiq, in Gjirokastër.

b. In the toponym Karakol, close to the city of Delvinë.



c. The village of Sotirë (Σωτήρας) in Dropull.



c. In the village of Hllomo, in Pogon.

Figure 2. Aspects of different natural and anthropogenic landscapes where fieldwork took place.

4. Methodology & Equipment

The research methodology (Fig. 3) included the following levels:

- **Geographical mapping and photo documentation of sites where traditional kilns operated** (built structures or landscape remnants/traces). According to the state of preservation, **architectural drawings of selected structures** were, also, developed to showcase the differences and similarities from place to place (in shape, volume, materials used etc.).

- **Interviews in audiovisual format**, with key-informants from the source communities, from both countries. This material was essential for understanding the technical parameters, and further socioeconomic dimensions, such as the social organization of the agricultural cooperatives in Albania during the communist regime, folklore traditions and tacit knowledge on natural resources management, stories that connect with the modern history of the two countries etc. The encounter of common words in both languages describing elements of the traditional process was, also, an interesting aspect of the documentation.

- **Videos** documenting all stages of the traditional process: the building of the dome-shaped drystone kiln, the firing for 3 days in a row with constant wood fueling, the disassembly and quality control on the ultimate production, the slaking into water tanks to produce the final product,

hydrated lime. In total, 14 videos with a duration 3-10 minutes each, depict all stages of the process; it is to our knowledge the most accurate documentation of this traditional process,a t least regarding the Balkans region.

- **Field notes** from the interviews collection and the process documentation supplement the above data with stories and notes recorded during our encounters with locals (practitioners or not) or further explain technical details of the process.

The following **equipment and softwares** were used in field and post-fieldwork:

⇒ All geographical locations were recorded with a hand-held Garmin GPS and were initially overviewed with BaseCamp and finally processed in the QGIS environment.

⇒ A Fujifilm XT with a Fujinon XF18-55mm F2.8-4 lens was chosen as the main camera for photos and videos. It was proven a quite difficult to use setting, in terms of the practice it needed for using it on a professional level. But the quality of the final images and videos was proven superior to other equipment (in my opinion). All peripherals (hoya filters, cleaning it, tripode etc) were proven more than essential for effective fieldwork. Other team members, also, used their cameras and some photos were taken with different Canon cameras. Photos were edited in Adobe Photoshop or Windows Photo viewer. Videos were edited in Adobe Premiere Pro. Drone images were, also, taken.

⇒ All audio files were collected with a hand-held recorder (Saramonic) and a Rycote shotgun microphone and Rode wireless go microphones, connected with the video camera. Accessories such as furry windscreens were proven necessary for the field and in cases where they were not properly used, impaired quality of data was observed. Audacity and Adobe Premiere Pro were used for editing audio files.

⇒ Architectural drawings were initially hand-drawn and scanned, and afterwards developed in Autocad.

⇒ Elan software was used for transcribing/annotating all interviews. Trint, an AI based application, was also used for a first rough transcription of the interviews' files in Greek.

Figure 3. Moments from fieldwork; collective walks and on site documentation.

5. Dataset structure

⇒ An archive of a total of 247 assets was developed, fully detailed in the relevant Metadata file.

⇒ All data are divided into six (6) strands annotated with the letters I, K, P, L, M, R.

⇒ Strands are further divided into one or more sessions

⇒ Each session has a unique name/unique identifier: a letter followed by two digits. (R01, I01, K01-K08, L01, P01-P21)

⇒ The unique identifier is followed by a unique 4-digit numeric code, denoting a different asset delivered for every session.

⇒ Table 1 depicts the general data organisation schema followed for the project while further description is provided for all data sessions.

An arbitrary distinction between kilns and pits was set to group the built vestiges of traditional lime making in two categories and two respective strands K & P:

1. *Kilns:* elaborate structures where a perimeter dome-shaped stone and/or brick walling serves as a permanent infrastructure for the internal limestone dome to be built and burnt.

Both types refer to the pre-industrial type of stone structures used as burning chambers for the limestone calcination and lit with wood for several days

3. *Pits:* the simplest type of ephemeral dome-shaped constructions that collapsed after their burning and had no perimeter walling as a permanent structure. In most cases they are mostly traced as big pits dug into inclined terrains and fully embedded to the landscape. Only few built parts are evident mainly around the entrance (located in the bottom and used for feeding the wood) or in the perimeter of the landslide to stabilize the ground.

Table 1. General data organisation schema for EMKP project 2021SG05

Data Strand	Sessions	Description	File Name Sample
I (Interviews)	I01	All video/ audio, txt/pdf (transcription/translation), annotation files (eaf), and photos related with a specific interview	2021SG05_I01_0164
K (Kilns)	K01-K08	All photos and drawings related with a specific lime kiln	2021SG05_K05_0024
P (Pits)	P01-P21	All photos and drawings related with a specific lime pit	2021SG05_P01_0045
L (Lime)	L01	All photos and videos related with the documentation of different stages of the lime kiln process	2021SG05_L03_0138
M (Mapping)	M01	All data developed from the geographical mapping M01: shp &associated files recording 30 locations of traditional lime kilns practice	2021SG05_M01_0193
R (Research)	R01	Files related with the research itself Consent Forms, Field Notes, Guide to the dataset, Extra material	2021SG05_R01_0208

Further clarifications are provided per strand to assist the navigation through the archive:

I: In total 9 interviews are included in the archive, collected from key-informants in Greece and Albania. The session I01 contains the video or audio file of the interview (3 videos & 6 audio files), the annotation file through Elan software and a pdf with the full transcription of the interview in original language and ots translation in English (+any additional comments of the annotator).

K: 8 kiln structures were documented through photos, 6 of them, also, through architectural drawings. Only one of these structures is located in Greece.

P: 21 pits are documented through photos, 2 of them, also, through architectural drawings.

L: The process documentation strand of assets contains videos & photos from the following 4 stages:

- The building process
- The firing process
- The collecting and quality control of the final product
- The slaking process

M: A zipped file with all .shp & associated fiels developed in QGIS environment, as well as two depictions of the projects' locations.

R: There is 1 session in this strand, containing:

- All consent forms from project participants
- 2 pdf files with explanatory & additional notes from the field:
  - File 2021SG05-R01- 0243(*Notes from the field Vol.1*) contains information and further oral testimonies that were gathered during the interviews conduction and the field visits around the different areas of the two countries.
  - File 2021SG05-R01-0244 (*Notes from the field Vol.2*) contains explanation and technical details regarding all stages of the traditional process and should be explored in combination with assets from strand L.
- This guide to the project and dataset; 2021SG05-R01-0245.
- A brief leaflet outlining the project; 2021SG05-R01-0246.
- A scientific paper on aspects of the project that was published in the Journal of the Buildings Lime Forum, vol.29, pages 49-57, 2024; 2021SG05-R01-0247.

6. Project outcomes

- It is to our knowledge the **first cross-border archive** created for the two countries and constitutes a valuable knowledge database for this artisanal practice of a past not so distant yet forgotten. We believe that it can contribute the most to setting the basis for further studies on traditional skills related with architecture, geology and natural resources management in the two countries and further in the Balkans.

- The **novel and multi-media methodology** followed for the development of the archive can be exemplary for similar material culture/architectural heritage documentation projects.

- The significance of **conducting research in marginal and cross-border communities**, such as the region between NW Greece and S Albania was proven enriching and revealing in diverse aspects; apart from the study of artisanal practices and cultural heritage skills, nuances of the modern history, aspects of immigration and social changes in both countries were revealed through the stories of people and architectural remnants; these aspects, are crucial for interpreting material cultures and their evolution in its temporalities, especially under the prism of a turbulent and ever-changing political and socioeconomic situation, as in the region of Balkans.

7. Credits

For the completion of the project and the development of the archive the following credits should be addressed:
Host institution: Boulouki-Itinerant workshop on traditional building techniques
Principal investigator, Archive curation: Ioanna Ntoutsi
Coordination of the fieldwork: Ioanna Ntoutsi (PI), Panos Kostoulas (Blk)
Photos-videos recording: Ioanna Ntoutsi, Faidon Moudopoulos-Athanasiou (project team member), Grigoris Koutropoulos (Blk), Panos Kostoulas (Blk)
Photos editing: Ioanna Ntoutsi
Videos production: Ioanna Ntoutsi
Drone operators: Faidon Moudopoulos-Athanasiou, Grigoris Koutropoulos
Architectural documentation/fieldwork: Anisa Lloja (project team member), Panos Kostoulas, Grigoris Koutropoulos, Athena Siafaka (Blk)
Architectural documentation/post-fieldwork: Anisa Lloja, Grigoris Koutropoulos
Pre-fieldwork bibliographic research/communication with informants: Ioanna Ntoutsi, Christoforos Theocharis (Blk), Anisa Lloja (project team member)
Transcription/translation: Ioanna Ntoutsi, Anisa Lloja, Aulon Harijaj (external collaborator), Eleni Spanou (Blk intern)
Map development: Faidon Moudopoulos-Athanasiou
Texts: Ioanna Ntoutsi
We are grateful to all local informants, masons and skilled labourers who consented to be interviewed or documented.
We, also, acknowledge the contribution of peers from the NGO Cultural Heritage without borders (CHwB) Albania, as well as many people form the communities we worked with, in both countries that assisted the project's completion in diverse ways.