

SANTORINI SOIL (BOÇLANA) & PUMICE STONE AND THEIR USE

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ABSTRACT

Pumice stone is a porous volcanic rock naturally formed through volcanic activities. During the Ottoman era, this material was known as Santorin soil & sand (Boçlana, pumice, or sponge stone). The Ottoman Empire utilized Santorin soil innovatively in civil engineering, particularly in port construction and the dry docks of naval shipyards. Historical records show that Santorin soil was imported three times (1796, 1827, and 1885) twice from Italy and once from Greece—to be used specifically at the dry docks of the Ottoman Imperial Shipyard (*Tersane-yi Amire*). Currently, archival evidence regarding the specific extraction sites of this material is largely missing. Today, pumice stone, once prominently used in Ottoman construction projects, has become industrialized and widely employed across multiple sectors. This article also explores how human life has adapted within the natural environment where Santorin soil originated. On Santorini Island, the original site of pumice discovery, residents historically carved homes directly into pumice formations. The islanders continue to cultivate vineyards for winemaking, leveraging the region's unique geography to create cellars. Furthermore, the article addresses whether pumice stone has been adequately utilized in Turkey given advancements in technology. The primary sources of this study include documents from the Presidency of State Archives, Ottoman Archive Division, along with relevant research publications. The article aims to comprehensively illustrate the discovery, usage, trade, taxation, transportation, and all archival aspects concerning Santorin soil during the Ottoman period. Additionally, it examines the evolution and adaptation of this resource from the Ottoman Empire into the Republican era of Türkiye.

Keywords: Ottoman Empire, Santorini Island, Santorin Soil & Sand (boçlana, pumice, Sponge stone), Trade And Construction, Technology.

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SANTORİN TOPRAĞI (BOÇLANA) & POMZA TAŞI VE KULLANIMI

ÖZET

Pomza taşı, doğal olarak volkanik aktiviteler sonucunda oluşan, gözenekli yapısıyla bilinen bir tür lav kayasıdır. Bu toprağa Osmanlı Santorin Toprağı & Kumu (Boçlana-pomza -sünger taşı) demektir. Osmanlı Devleti'nin inşaat sektöründe liman yapımı ve tersanedeki gemi inşa yerlerindeki havuzlarda Santorin toprağı ile mühendislik alanında yaratıcı çalışmalar oluşturduğu görülmektedir. Tersane-yi Amire 'deki havuzlar için ikisi İtalya'dan, diğeri Yunanistan olmak üzere üç defa (1796 – 1827 - 1885) toprak getirilmesi sağlanmıştır. Bugün bu taşın çıkarıldığı yerlerin birçoğu hakkında Osmanlı Arşivi'nde evrak yoktur. Osmanlı Devleti'nde inşaatta kullanılan bu madenin, bugün birçok alanda etkin bir şekilde endüstriyeleştigi görülmektedir. Makalede Santorin Toprağı'nın oluştuğu doğal çevrede insan hayatı nasıl şekillenmiştir sorusu da yanıtlanmak istenmiştir. Pomza Taşı'nın ilk keşfedildiği yer olan Santorin Adası'nda ada halkı bu topraklara oydukları evlerde yaşamlarını sürdürmektedir. Halk ada topraklarında yetiştirdikleri üzümlerden şarap imal etmekte, şaraplar için mahzen inşasında da bu coğrafyayı kullanmaktadır. Yine gelişen teknolojiyle birlikte Pomza Taşının ülkemizde yeteri kadar değerlendirilmesi yapılıyor mu ? sorusuna da cevap aranmıştır. Yazının temel malzemesi Cumhurbaşkanlığı Devlet Arşivleri Başkanlığı Osmanlı Arşivindeki evraklar ve araştırma eserleridir. Makalede Santorin Toprağı'nın Osmanlı Devleti'nde nasıl keşfedildiği, nerelerde kullanıldığı, alım ve satım işlemleri, vergilendirmesi ve nakli, vs. arşive yansıyan her türlü unsuru açıklanmaya çalışılmıştır. Bu şekilde madenin Osmanlı Devleti'nden Türkiye Cumhuriyeti'ne geçişte ne tür bir gelişim izlediği de verilmiştir.

Anahtar Kelimeler: Osmanlı Devleti, Santorin Adası, Santorin Toprağı & Kumu (Boçlana-Pomza –Sünger taşı), Ticaret ve İnşaat, Teknoloji.

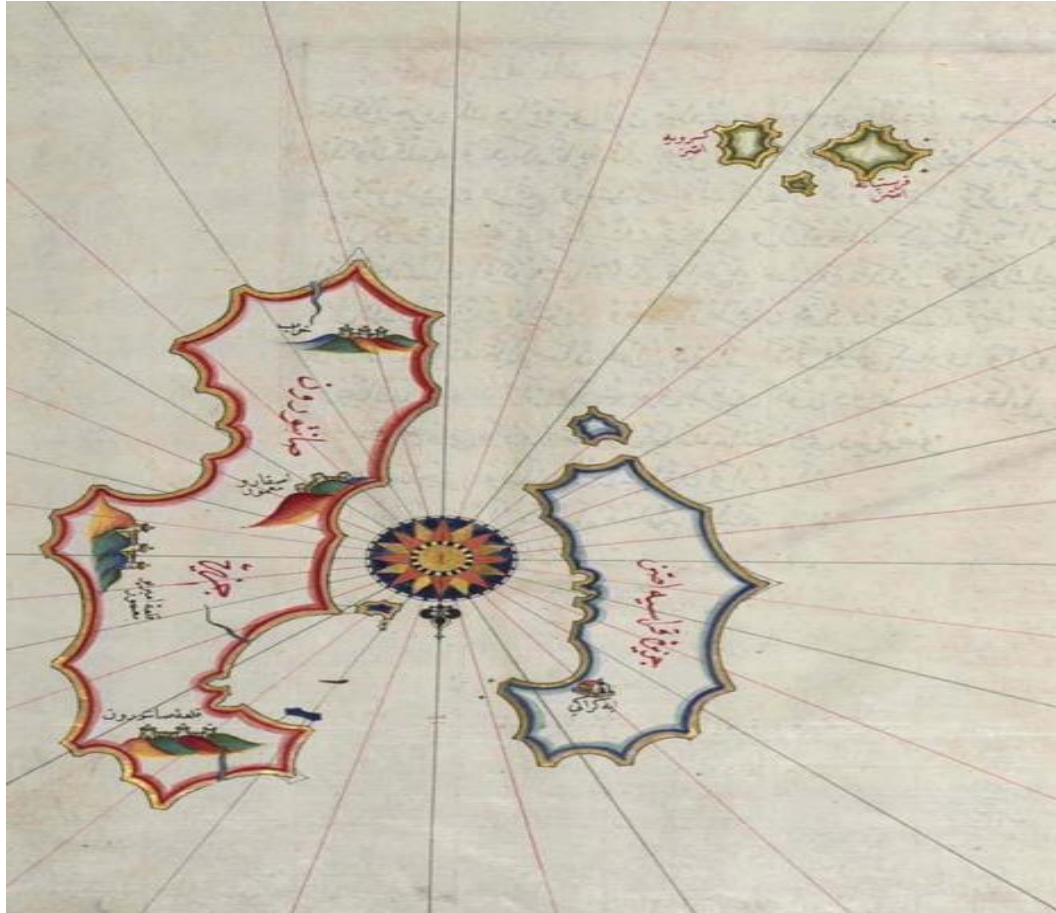
INTRODUCTION

The island of Santorini (Thera), located at the southernmost end of the Cyclades (Kiklad) Islands within the Eyalet of the Archipelago (*Cezayir-i Bahr-i Sefid Vilayeti*), is today known primarily for its tourism² and seismic activity. However, during the Ottoman period, it was a small island renowned for its pumice stone. Within the sanjaks and islands affiliated with this province, we also observe the use of various types of soil and earth materials for different purposes. The primary sources of this study are the Ottoman archival documents held by the Directorate of State Archives of the Presidency of the Republic of Türkiye, as well as travelogues and scholarly studies.

² For tourism activities on the island, see Kısa Ovalı - Tachir, 2016. Today, tourism is very important for the island. For the effects of tourist expenditures on the regional economy Şen, 2022, 97-112.

The pumice stone extracted from Santorini was utilized particularly in the construction of harbors and in shipyard. This construction material, referred to as “Santorin sand” or “Santorin stone,” was also known by the local name “Boç(c)lan.” The aim of this article is to comprehensively examine the use, transportation, and taxation of pumice stone within the Ottoman Empire. As mineral resources were integral not only to economic structures but also to the history of urban development and trade, this study seeks to highlight an often-overlooked aspect of the social and economic history of the Ottoman Empire .

The material referred to in archival documents as Santorin soil or Boçlana soil appears to be pumice, a type of volcanic stone also known as sponge stone. The terms “Santorin soil/sand” and “Boçlana soil/sand” are used interchangeably in Ottoman archival sources. This article focuses on the material extracted from the island of Santorini used as a building material throughout the centuries and examines its significance and utilization both in the Mediterranean world and within the Ottoman Empire. The high level of Ottoman engineering can be observed in the construction of harbors and dry docks, particularly those built at the Imperial Shipyard, where this material was employed.



Map 1: Piri Reis, Santorini Island, 1513. (Piri Reis, 1513, p. 344).

Santorini is an island located in the Aegean Sea and currently part of Greece (Balta, 2009, pp. 109–110). It is the second-largest island of Thera (Santurin/Sânturini/Sántorin), situated in the southernmost part of the Cyclades Islands (Kiklad) near the Greek mainland in the southern Aegean Sea. Volcanic eruptions and earthquakes have significantly altered the island's originally circular shape, breaking it into four smaller islands.³

Herodotus (c. 484–420 BCE), in his work *Histories*, provides the earliest known information about Santorini. Santorini, referred to as Thera, is recorded as one of the Phoenician colonies. It is mentioned that the inhabitants of Phoenician cities in the surrounding mountains were driven to the sea, and describes these peoples as fishermen, merchants, and colonizers (Sayce, 1883, pp. 30–40; Herodotus, 1991, pp. 147–156). Pliny the Elder (23/24–79 CE), in his writings, offers insights into the origin of the island's name and the geographical situation of the surrounding islands during his time. According to Herodotus, Santorini is located south of the island of Ios; it is of volcanic origin and covered with pumice stone. The island was colonized under the leadership of a Spartan named Iheras, by the Lacedaemonians and the Minyans from Lemnos.

Pliny notes that Thera (Santorini), Delos, and Rhodes rose significantly above sea level for a long period, while smaller islands were formed more recently. He lists Anapha and Avhiclx as lying beyond Melos; Nea between Lemnos and the Hellespont; Halone between Lechedos and Teos; and Thera and Therasia as part of the Cyclades. He also writes that in the fourth Olympiad, and again 130 years later, new islands emerged in the same region, including Hieria and others known as “Automate” (The Elder Pliny, 1855, pp. 118–323).⁴

According to Strabo of Amaseia (64 BCE – 24 CE), the island of Santorini (Theraphia) had a circumference of approximately thirty miles and was located about three miles from the island of Crete, specifically from the city of Candia (modern-day Heraklion). (*Géographie de Strabon*, 1873, p. 376)⁵.

Ottoman sailors and travelers also provided information about the island. In his *Kitāb-ı Bahriye*, Pîrî Reis refers to what he calls “Santirin,” describing it as an island abundant in “stones that do not sink in water” a clear reference to pumice stone (Pîrî Reis, 1513, Apk Archive, p. 344). In the 17th century, the renowned Ottoman traveler Evliya Çelebi visited the island during a time when its volcanic activity was still ongoing. According to Evliya Çelebi, the island had a circumference of twenty miles, featured a remarkable harbor, and possessed a small fortress. Without specifying a date, he records that the island had experienced a volcanic eruption.

³ For volcanic activities on the island, see Druitt, - Francaviglia, 1992; Eastwood- Pearce-Westgate-Perkins-Lamb, Roberts, 1999 ; Papastefanaki, 2018 .

⁴ The Olympics were organised for the Greek Gods. For the first Olympics, 776 BC is found in historical sources. It is almost certain that the first Olympics were organised only in the field of running. (Tekin-Tekin, 2014, 121-140).

⁵ The standard abbreviation is (mi). They are divided into two different lengths, the Statute mile and the Nautical mile. The length of a land mile is equal to 1,609.344 metres in metric terms. (Kallek, 2020, 53-54) .

During this three-month period, the mountains and rocks of the island were aflame, and stones as large as bathhouse domes had been scattered across the sea like mushrooms. When the traveler arrived on the island, he observed that it was still burning (Evliya Çelebi, 1935, p. 260).

In the last quarter of the 17th century, B. Randolph, an English nobleman engaged in maritime trade across the Eastern Mediterranean particularly among the Aegean island referred to the island as Saint Erino, Torino, or Santarini. He noted that finely woven cotton textiles produced on the island were exported to Crete, Zante⁶ (Zakynthos), and other destinations (Randolph, 1998, pp. 29–30).

French traveler who visited the island in the 17th century, Jean de Thévenot, provides detailed information about Santorini. He describes various groups living on the island, the most notable of which is the Caravan of Saint Nicholas, residing at a particular point on the island. He recounts that about eighteen years earlier, on a Sunday night, an extraordinary loud noise originating from the Port of Santorini was heard as far as the island of Chios. Initially, it was assumed that the noise had come from the Turkish fleets. However, no further sounds were heard, and it was later discovered that this noise was in fact caused by a fire at the bottom of the sea in the port of Santorini, which resulted in the release of a large amount of pumice stone. This sound, according to Thévenot, resembled the simultaneous firing of many cannons, producing a terrifying cracking and booming. The atmosphere subsequently filled with illness. Many people in the port of Santorini either died or rapidly lost their eyesight; those who fell ill recovered only after several days. The infection spread, and not only in that port, but also in places like Chios and Smyrna (Izmir), all silver item whether in the hands of dignitaries or in the pockets of ordinary people turned red. Priests in those regions told him that all of their chalices had also turned red. A few days later, the infection subsided, and the silver returned to its original color. The pumice stones released during this event covered the Archipelago Sea, and when certain winds blew, they filled the harbors. Even today, remnants of these stones can still be found scattered throughout the Mediterranean. Thévenot's account vividly captures not only the terrifying sound of the explosions but also the aftermath volcanic pumice dispersed across the sea and the spread of an unusual illness. (Jean de Thévenot, 1687, p. 107)

Foreign researchers and travelers have provided detailed information regarding the geography of the island. According to the French naturalist Tournefort, who documented Santorini in the early 17th century, the island was composed entirely of pumice stone, making its soil evidently barren and infertile. He notes that the island had a population of approximately 10,000 people and that the only references to the Turks were in relation to the collection of poll tax (*cizye*) and tithe (*aşar*) (Tournefort, 2013, vol. 1, p. 185). Later, in 1790, the French entomologist and naturalist Guillaume-Antoine Olivier visited the island and focused more on its social and economic structures.

⁶ It is an island of Greece in the Ionian Sea.

Although many of his observations repeated earlier accounts, Olivier provided detailed descriptions of the island's agricultural and animal husbandry practices, offering valuable insight into its economic life.

“One evening, before the festivities, we anchored at the small port of Saint Nicolo, located on the northern edge of Santorini. The distance from Cimolis to Santorini was said to be fifteen or a fixed ten fersahs⁷. Shortly after our arrival, we boarded a boat to Phira to wait for the Latin bishop, to whom we had brought letters from Naxos. Nothing was more frightening than the violent disturbances occurring in the interior regions of Thera, Therasia, and Aspronisi; and nothing more astonishing than the known accounts of a stream once flowing from the plain's base and the formation of the three islands. In some places, the Santorini plain, with an elevation of approximately one hundred meters, appeared like a steep mountain composed of various rocks and volcanic cliffs. Great difficulty was encountered in constructing a proper road from the plateau to Apanomeria and Phira. In every direction, the terrain extended so deeply and was so inaccessible that it was almost impossible to climb into the plain. In the following days, we explored the fourth section of the island, both from the hills and by land, as far as the point of Akrotiri. In this region and to the north, the hills were consistently high, steep along the road, and composed of various volcanic rocks that strongly resembled the Thole formation we had previously observed below Phira. The terrain stretched roughly from one hill to another across a protruding ridge, and everywhere, as we had seen in other locations, it was covered in eroded pumice stone with a thin layer of vegetal soil formed atop it. Mounts Saint Stephen and Saint Elias are the highest points on the island of Santorini. Although some areas are partially covered by the remains of a well-known fortress made of pumice stone, these mountains are believed to have remained unaffected by volcanic activity. They are composed entirely of limestone and contain rather poor-quality white marble. Father Richard recounts that during the time of a Jesuit priest, old men in Santorini had claimed to feel the heat in the middle of the meadow and therefore named the spot Micra Caimeni, meaning ‘Little Burned Island’ (...).” (Olivier, 1801, pp. 158–160 and 166)

With its perfectly circular shape and flattened summit, the mountain appears as a calotte rising gradually from its edges. Mounts St. Stephen and St. Elias may be located at one of its ends, possibly those covered with greenery and forest. The fact that this mountain is covered with vegetables has contributed to the beautification of the landscape. It also provided the island's inhabitants with firewood and perhaps even served as a plentiful source of water.

The amount of wine exported from Santorini each year is quite substantial: during a typical harvest season, it is estimated at around one million okka⁸.

⁷ Fersah is a road distance measure used in ancient times. 1 fersah is accepted as equivalent to 3 nautical miles, i.e. 5,570 km in maritime (Halaçoğlu, 1995, p. 412).

⁸ Okka is an old weight unit used in the Ottoman Empire, equal to 1282 grams and 400 dirhams. Although it varies, two values are given as 1259,2 gr. and 1281 gr. (Kallek, 2007, 338-339).

Consequently, a small quantity of brandy is also exported. Deprived of access to spring water, the local inhabitants are scarcely acquainted with any beverage other than wine. They begin drinking it as early as the age of four, and this habit is considered rather pleasant. During the intense heat we experienced, we too consumed it with enjoyment and without discomfort. Although Santorini's soil is extremely dry and far from fertile, the cotton plant and grapevine grow remarkably well on the island. The surface of the folio (arable land) consists of nothing more than a mixture of pumice stone, fragments of bafalte (volcanic slag), and vegetal soil formed from decayed vegetables and manure spread across the fields. Santorini cotton appears distinct from the herbaceous cotton cultivated in other regions; it grows like a shrub and lasts for fifteen to twenty years. It is pruned each year at ground level (Olivier, 1801, p. 168)

The soil is not suitable for wheat cultivation. Only a small amount of barley and some legumes are harvested. Fruit trees are quite rare: fig and almond trees are virtually the only ones grown. A few sheep, goats, and pigs are raised. Horses and mules are used for draught purposes, while oxen are employed for plowing the fields. In Santorini, no fuel is used other than the wood and charcoal brought from the coasts of Asia. In addition, the islanders travel to the High Islands and neighboring islands to collect these materials. The collection process takes place from the end of August/September (Fructidor) to October/November (Brumaire). A vine that is thus planted, pruned, and cut does not last as long as in our four provinces, yet it yields two to three times more grapes. In this way, cultivation is facilitated for those wishing to experiment in hot climates and in places like Santorini, where the soil is deep and exposed to plenty of sunlight. Other types of crops cultivated on the island are of minimal importance. Lentils gathered from Hiera and some neighboring islands to which the locals travel for harvesting hold a notable place in local agricultural activity. The land tax on Santorini is calculated at two para per okka of wine taxed. Each year, approximately 55,000 piaftres are paid in taxes during the visit of the Kapudan Pasha's fleet to the Archipelago. The land tax is supposed to be adjusted to the island's soil and should not exceed one-tenth of the produce. However, the voyvoda (local governor), who collects this tax from the port, has long practiced giving one-fifth of the income to private individuals. (Olivier, 1801, pp. 175–176 and 178).

The houses in the village of Pyrgos are partially carved into pumice stone and partially constructed on its exterior surface. They are positioned one above the other, following the contours of the sloping terrain. The elevated exterior section is flattened at the top, forming a kind of terrace made from a mixture of lime and pumice stone. Wine cellars are also carved into the land. They are spacious and exceptionally clean, excavated into a bed of white pumice stone that appears to cover the entire area. The dripping (drainage) section is shaped as an arch. Some wealthy individuals line the interior of these cellars with a type of cement, while others leave it uncoated demonstrating that such reinforcement is not strictly necessary. Although this filler is somewhat hard, the arch itself is highly flexible and can easily be repaired by removing any unreliable part.

The wines are arranged in two rows. Near the entrance of the cellar, they are placed in reasonably large containers made from a mixture of lime and pumice stone. These are cemented over glass and molded with a mortar that has passed through a cradle-like form. (Olivier, 1801, p. 177) .

The position of the Ottoman Empire on the island was primarily that of a tax-collecting authority. No precise information is provided regarding the size of the Muslim population. According to Olivier, who emphasized that the island's geological structure was composed largely of pumice stone, this feature had a direct impact on agricultural practices. The terrain made of pumice stone also influenced the architectural layout of houses and wine cellars, which were constructed either carved into or built upon this unique volcanic landscape.

Choiseul-Gouffier largely reiterates the information provided by earlier sources on various subjects.

Santorini (the island of Thera) has always been the setting for some of the most fascinating events. None of these islands appear to have originated directly from volcanic activity; rather, they may simply be high mountain formations, much like the other mountains that constitute the Archipelago. Some of these formations, in the earliest times, may have been completely submerged perhaps because the Black Sea, swollen by the influx of numerous rivers, was no longer able to contain its waters. These waters likely cleared a passage through what had been a barrier, opened by a powerful earthquake.

They would have entered through the Bosphorus and formed this part of the Mediterranean. As a result of events that could very well have occurred after that time, the sea level began to rise and new islands started to appear on the water's surface. The origins of the islands just mentioned are, in all probability, rooted in this very phenomenon. (Choiseul-Gouffier, 1782, p. 33).

Far from giving birth to the island of Thera, volcanic activity in fact destroyed a large portion of it. These fires, which have been burning since antiquity, have continued to strike terror throughout the region. The entire area now submerged between Santorini and Therafa (modern-day Aspronisi) was once part of the greater island Therafa itself included. A massive volcanic eruption engulfed and consumed all the landmass in between. As a result, the island of Thera took on a crescent shape, almost enclosed by Therafa on one side. Along the shores of this gulf, one can observe steep, blackened, and calcified cliffs—remnants of enormous volcanic furnaces and, so to speak, the inner walls of the crucible in which this cataclysm occurred. These coastlines, rising more than 300 feet above sea level, are composed of lava, pumice stone, and vitrified (glassified) granite. But above all, what deserves special mention is the astonishing depth of this chasm: its bottom has never been fully located or reached. How high today are the peaks of the mountains that form these new islands? And are the subterranean fires, powerful enough to heat such an immense body of water, still active? (Choiseul-Gouffier, 1782, p. 23).

Due to continuous volcanic eruptions, the physical structure of the island is constantly being disrupted and reshaped. Gouffier does not refrain from questioning when these volcanic activities might come to an end. According to him, the island's morphological formation is still ongoing. Composed of steep mountains, the island presents considerable challenges in terms of accessibility. While this topography offers a picturesque landscape, the terrain itself is uneven and difficult. Gouffier also emphasizes the economic importance of wine production on the island. However, he notes that there is little social harmony among the local population. Tensions between Catholics and Orthodox Christians are notably high, a situation from which the Muslim population appears to derive a certain satisfaction for their own interests.

Approximately eight thousand people live on the island of Santorini, among whom only around 700 to 800 are Catholics. The Greek and Roman (Orthodox and Catholic) religions are more opposed to one another due to mutual hatred than theological differences; like estranged brothers, they find new causes for hostility in the memory of their former unity. The Greeks, according to the account, are driven into a state of profound ignorance, having reduced nearly all their dogmas to extreme asceticism and a blind antipathy toward the Latins. In their effort to expand influence, they contest control over numerous small chapels scattered across the countryside chapels whose numbers nearly equal that of the local population. However, this hostility rarely escalates to the point of disturbing public order. Each side acts as a restraint on the other, and what prevails between them is more a rivalry of self-interest than of genuine zeal. This competition fosters a certain outward orderliness, consistent with the general belief that conduct influences people more effectively than reasoning in matters of morality and religion. To these causes, another perhaps even more powerful factor must be added: the attitude of the Muslims, who never allow a major dispute among Christians to end without inflicting ruin on both sides.

As we passed a portion of the island, we observed that the entire face opposite the volcano was quite fertile. Although the soil is covered with pumice stones, it still supports vineyards that produce abundant and excellent-quality wine. In addition, significant amounts of barley and cotton are cultivated in this area, though wheat remains scarce. To illustrate how most houses on the island particularly in the village of Nebrio are constructed, I documented a few excavated structures. In some places, the inhabitants have undoubtedly carved their homes directly into the rock, hoping to better protect themselves from the frequent earthquakes. There was little left for me to explore on Santorini, except for Mount Saint Stephen, located in the southeastern part of the island. This area consists of massive rock formations covered with a dense layer of small pumice stones, which makes access particularly difficult. The plain extending toward the mountain presents a very different landscape, densely planted with vines, olive trees, and pomegranate trees—a scene marked by striking fertility. The mountain itself is crowned with ruins that testify to the former presence and destruction of a once-magnificent city. (Choiseul-Gouffier, 1782, p. 36).

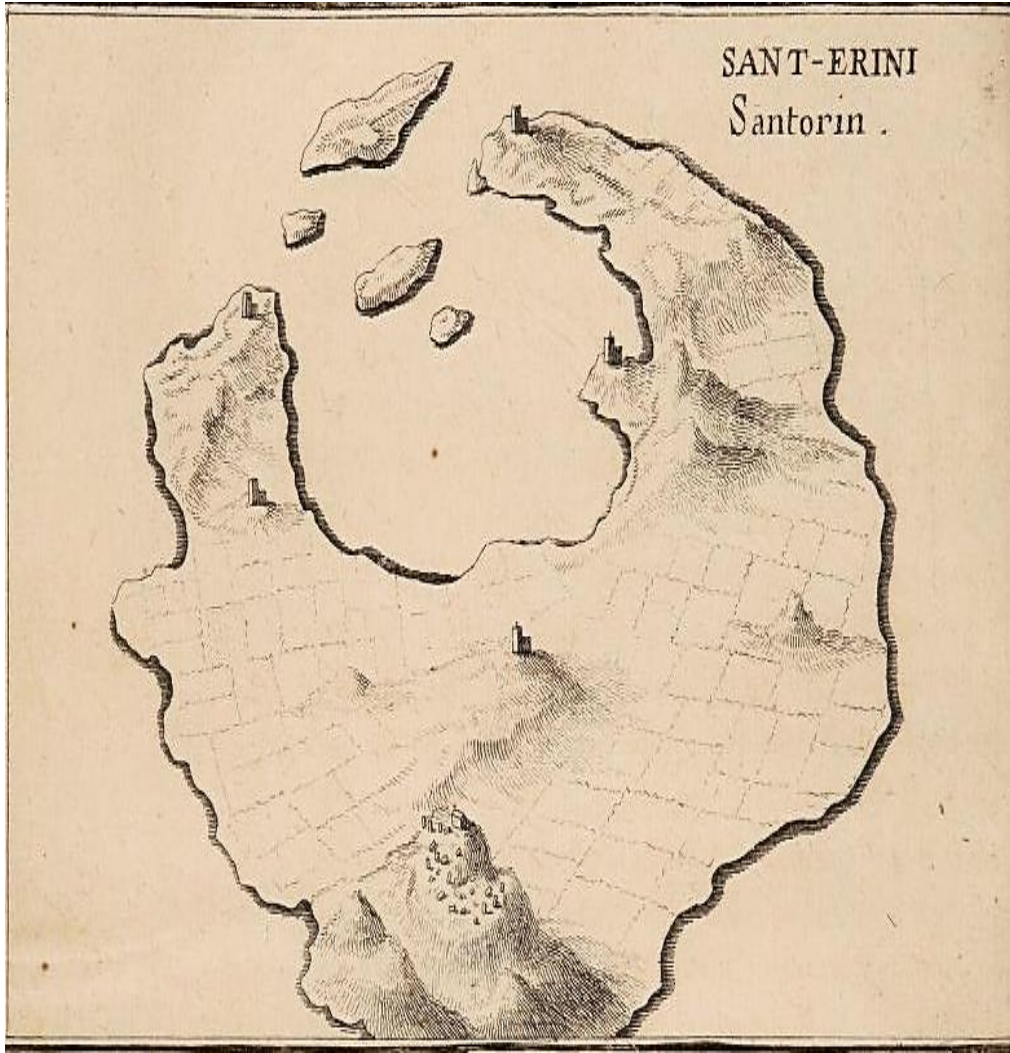


Figure: Santorini Island (Tournefort, 1717, p. 260)

The island's geography has directly influenced the shaping of its architectural structures and the formation of its ports. Saint Nicola and Pyrgos are among the notable settlements mentioned by the author in this context.

At the tip of Santorini, known as Apanomeria, lies the village of Saint Nicola, surrounded by immense rocks that appear torn apart, scorched, and calcified. A reef called Thera separates this area by a narrow and shallow channel where boats quietly anchor. This reef is actually a fragment of the Santorini landmass, having detached from it due to weakened foundations separated only at the upper surface.

This sea-exposed landscape offers a panoramic view of almost the entire coast of the Santorini Gulf. It vividly displays the fractured and calcined condition I previously described in relation to the rock formations. In the distance, one can see the point of Apanomeria and the village of Saint Nicola. At the center of the view stands the Castle of Scaro (Scaro Château), presenting a strikingly ominous silhouette. Slightly further down lays the village of Pyrgos, considered the most pleasant place to stay on the island. Below it, there is a small bay where boats can dock. However, if the wind rises, one might have to seek more comfortable anchorage near the Saint Nicola area. (Choiseul-Gouffier, 1782, pp. 21–37).

An examination of the sources reveals that the volcano on the island of Santorini erupted three times: in 776 BCE, and later in 1630 and 1866.⁹ During the 1866 eruption, a significant amount of feldspar and pumice stone was formed; moreover, newly emerged crater lakes, referred to as kamenis, were also mentioned (Fouqué, 1879, pp. XVI–XIX).

The sources describing the island, as well as the travelers who visited it, focus primarily on its landforms and geographical features. The natural landscape, shaped by volcanic activity, was utilized by the local population to serve their own needs. The soil, composed mainly of pumice stone, is not only suitable for certain types of agriculture, but also provides a malleable building material, making it ideal for construction.¹⁰ Due to the dominance of pumice, agricultural diversity on the island is limited. However, wine produced from the grapes grown on Santorini is particularly renowned. Stone-carved caves were also used effectively as wine cellars. Despite being one of the Cycladic Islands, there is relatively limited archival documentation available on Santorini. The existing Ottoman archival records mainly focus on the commercial value of the island's unique soil, which was highly sought after for centuries.

1. SANTORINI SOIL & SAND (BOÇLANA – PUMICE – SPONGE STONE)

Pumice is a type of volcanic rock that forms naturally as a result of volcanic activity and is known for its porous structure. The pores in pumice are generally not interconnected. These pores, ranging in size from visible to microscopic, are separated by glass-like partitions. Therefore, pumice is a lightweight rock that can float on water for extended periods and has high insulation properties (Güngör & Özkan, 2001, pp. 269–276). In agriculture, improving soil productivity is closely linked to soil porosity, which can be categorized into total porosity, aeration porosity (macro pores), and water retention porosity (micro pores). Macro pores (>100 microns in diameter) provide drainage and aeration, meso-pores (100–30 microns) facilitate water conductivity, while micro-pores (30–3 microns) retain water (Özün, 2018, p. 1473).

⁹ For the eruption in 1950: Yiğitbaşıoğlu, 2003.

¹⁰ For the architecture of the island: Akın, 2013.

Pumice is widely used in various sectors such as construction (e.g., bricks) (Aksay, Akar, Cöcen, & Onargan, 2009, pp. 32–42), automobile engines (Çolak, 2017, pp. 31–41), ceramics, textiles, agriculture, chemical filtration, water and wastewater treatment, and in air purification technologies for olive oil industry wastes, as well as in the abrasives sector¹¹ (Aksay, 2005, pp. 20–35). When pumice is used as aggregate in concrete, it reduces the load transmitted to the foundation and can result in up to 17% savings in construction steel (Varol, 2016, p. 34). Interestingly, despite its widespread applications, pumice is still underutilized in certain regions rich in this mineral. For example, in areas such as Van, pumice has not been fully employed in the construction sector (Elmastaş, Şahinalp, & Günel, 2009, pp. 457–468).

One of the most widespread uses of pumice is in the form of construction materials. Due to its lightweight nature and water-holding capacity, pumice has a significant positive effect when used in pumice blocks (*bims blocks*). Bims blocks are among the cheapest lightweight construction elements available in the market (Toklu, 2009, pp. 69–72). Owing to their porous and natural structure, bims blocks allow for “breathable” walls, creating healthy and odorless indoor environments. Therefore, issues such as condensation on walls or mold formation behind furniture, commonly observed with other materials, are not encountered in buildings constructed with bims blocks (Köse, 1997, p. 99).

The moisture present in pumice aggregates influences the friction between particles, thereby affecting their unit weight. The water absorption capacity, water absorption rate, and moisture content of porous aggregates are critical parameters determining the usability of the material, particularly in calculating bims block mixtures. Furthermore, factors such as the packing density of aggregate particles, the ratio of open and/or closed pores, and the degree of saturation directly influence the material’s water absorption capacity. These factors are typically defined based on the aggregate’s bulk density and specific gravity. Since the water retained in the pores of lightweight concrete negatively affects its mechanical and thermal properties, it is desirable for bims blocks to have minimal or no water absorption. For this reason, aggregates used in the production of bims blocks must have a low water absorption rate. The water absorption capacity of the porous aggregates that make up bims blocks depends on the pore ratio and the pore structure. The water absorption rate of aggregates can be expressed as a function of their bulk unit weight (Toklu, 2009, p. 44).

Pumice stone is also utilized in the production of Portland cement, which is one of the most important types of cement used today. The physical and chemical properties of perlite and pumice were first identified, and then cement samples were prepared by replacing reference cement with 5% and 10% of either perlite or pumice. The water requirement, setting time, volume expansion, and compressive strength values of these modified cements were subsequently determined.

¹¹ **Abrasives** are materials used to smooth and shape the surface of manufactured materials. These materials, which are the result of the combination of different chemicals, are especially preferred for honing marble, granite and tiles.

According to the results obtained, variations were observed in water demand, volume expansion, setting time, and compressive strength depending on the material characteristics and the substitution ratios (Pınarcı, 2024, p. 106).¹²

As can be observed, pumice has proven to be beneficial both as construction material particularly in bims blocks and in the production of Portland cement. However, its use in other industrial sectors remains mostly at the exploratory stage. While pumice has found limited application areas in the field of construction materials, studies are ongoing to determine its effectiveness in other industries. Currently, approximately 95.2% of pumice is utilized within the domestic market, with its primary usage being concentrated in the construction sector (Bitlis Province Pumice Processing Plant, Preliminary Feasibility Report, February 2021, p. 12).

2. EXTRACTION AREAS OF SANTORINI SOIL AND SAND (BOÇLANA – PUMICE - SPONGE STONE)

Turkey is exceptionally rich in volcanic mountains, and its crust hosts a wide spectrum of metallic and non-metallic mineral deposits.

A significant proportion of these resources originated from volcanic activity that has occurred throughout geological history. As magma ascends toward the upper layers of the lithosphere, its emplacement within the crust or eruption at the surface is followed by cooling and solidification, thereby generating volcanogenic ore bodies. Among the volcanogenic minerals of highest economic value are obsidian, perlite, ignimbrite and, most prominently, pumice (commonly referred to as “sponge stone”) (Elmastaş, 2012, pp. 197–206). The prevalence of Quaternary volcanic activity in eastern Anatolia—especially within the provinces of Van and Bitlis has resulted in the formation of numerous extensive pumice deposits. Despite the considerable number of scientific investigations devoted to the properties and modern uses of pumice, its exploitation and applications within the Ottoman Empire have yet to be systematically examined. The Eyalet of the Archipelago was rich in mineral resources. In a previous study, we have enumerated these minerals by sanjak and provided a detailed analysis of their characteristics and distribution (Baykara Taşkaya, 2023, pp. 344–362; Örenç, 2006; Çelik, Sarıışık & Gürcan, 2003, pp. 463–4749).¹³ In addition to the mineral wealth of the province, we have also examined the so-called earth pits (*toprak ocakları*) which were defined by the Ottoman Empire as non-mineral resources, including the Ermencelus Stone Quarry on the Island of Rhodes.

¹² Portland cement was also produced during the Ottoman Empire. According to documents in the Presidential State Archives of the Republic of Türkiye, Portland cement production began in Eskişehir as early as 1913. A document dated July 17, 1913 (12 Sha’ban 1331) addressed to the Ministry of Trade and Agriculture requested an amendment to the internal statute of the Eskişehir Artificial Portland Cements and Hydraulic Lime Ottoman Joint-Stock Company, aiming to increase the company’s capital to 120,000 Ottoman liras. An earlier document, dated June 3, 1913 (21 May 1329), had already been approved by the Council of State (*Şura-yı Devlet*) and the Council of Ministers (Meclis-i Vükela). It was subsequently ordered to be forwarded to the Imperial Council (*Divan-ı Hümayun*) Directorate for further action (BOA, BEO,4196-314652).

¹³ For the mines in the province, see Baykara Taşkaya, 2022, 729 - 778 and Taşkaya, 2022a: 17-39.

Among the significant districts of the province, the island of Lemnos, as well as Incirli Island and Kaşot (Çoban Island) affiliated with the Island of Rhodes, were known to contain mineral-rich soils. Lemnos, in particular, gained fame since antiquity for its unique healing soil known as *Tyn-ı Mahtûm*, which was believed to possess therapeutic properties (Demircan, 2012, pp. 281 and 291). For centuries, the Mediterranean world viewed this earth as a potential remedy even for incurable diseases. Another important type of soil was the sulfur-rich earth found on Incirli Island, which was administratively connected to the island of Kos. In 1857, a factory was established under the direct authority of the Imperial Arsenal to process sulfur extracted from this site. For a certain period, the sulfur mining operations were managed under foreign concessions. The processed sulfur soil was then distributed, with special permission from the state to nearby islands for use in viticulture. Although sulfurous soils were found on other islands within the province, the sulfur soil of Incirli Island proved to be particularly beneficial for vineyards (Baykara Taşkaya, 2022a, pp. 17–39).



Map 2: Santorini Island. (Olivier, 1801,p.159) .

Another soil type utilized within the province was the sulfur-rich soil of Liman Island. In a document dated October 18, 1858 (10 Rabi al-Awwal 1275), it is recorded that the governor of the province was requested by the Bey of Samos to supply 4,000 kantars of sulfurous soil from Liman Island, in order to save the island's vineyards from disease. Given the genuine agricultural need for this soil, the document indicates that such a request was to be fulfilled, and that the soil would be provided to the island of Samos for a number of years.¹⁴ Two years later, a renewed request for soil from Samos is documented.

In an imperial order dated December 28, 1860 (14 Jumada al-Thani 1277), the governor of the province was commanded to authorize the shipment of 10,000 kantars of soil to Samos. The document emphasizes that no obstruction should be made to the delivery of the soil (BOA, HR.MKT. 261/33; BOA, HR.MKT. 428/79). These records reflect the rich geological diversity of The Eyalet of the Archipelago. Just as the island of Lemnos was renowned for its healing earth (*Tıyn-ı Mahtûm*), other islands such as Incirli and Liman were known for their sulfurous soils used in agricultural fumigation and treatment. These various types of soil demonstrate the province's broad spectrum of mineral and therapeutic resources, serving both medical and agronomic purposes.

There is limited archival information regarding the extraction sites of pumice stone within the Ottoman Empire. Aside from the islands of Santorini and Kos, historical sources indicate that pumice referred to as sponge stone was also extracted in the district of Küçükçekmece and in the Kars region. Today, pumice occupies a significant place in Turkey's mineral potential. Various qualities of pumice suitable for different sectors are produced in deposits located primarily in the Central Anatolia Region (especially in Nevşehir and Kayseri), as well as in the Eastern Anatolia and Mediterranean regions (Tuncer & Özkan, 2001, pp. 269–276; Varol, 2016, pp. 27–34; Eroğlu & Şahiner, 2020, pp. 23–24). According to research conducted by the General Directorate of Mineral Research and Exploration (MTA), Turkey possesses approximately 2.6 billion cubic meters of pumice reserves. This figure represents nearly one-seventh of the world's total pumice reserves.

Table 1: Pumice Reserves in Turkey (Eroğlu - Şahiner, 2020,24).

City	Reserves (Tonne)
Nevşehir	1.069.115.572
Manisa	398.267.172
Kayseri	136.329.518
Osmaniye	110.172.625
İzmir	79.473.342
Konya	72.253.259

¹⁴ Kantar is 28,800 grams and its metric equivalent is 31,7808 kilograms (Kallek, 2001, 317-320).

Bitlis	40.570.132
Diyarbakır	39.744.197
Erzurum	37.665.019
Isparta	32.557.558
Van	30.553.860
Burdur	25.282.904
Iğdır	20.354.889
Mardin	19.800.149
Hatay	19.264.565
Ağrı	17.761.140
Elazığ	14.417.717
Kars	12.225.478
Aksaray	9.218.516
Ankara	2.658.576
Gaziantep	1.100.000
Niğde	752.468
Erzincan	550.747
Total	2.190.089.403

The regions where pumice stone is currently extracted are presented in the table below. Today, this mineral is mined in numerous provinces across Türkiye, and its areas of use have expanded significantly in recent years. Türkiye accounts for approximately 28% of global pumice exports, making it a leading exporter worldwide. Despite this, 95.2% of Türkiye's pumice production is consumed in the domestic market (Bitlis Province Pumice Processing Facility, Pre-Feasibility Report, February 2021, p. 12).

3. DISCOVERY OF SANTORINI EARTH & SAND (BOÇLANA-PUMICE-SPONGE STONE)

Our investigations into the Ottoman Empire have revealed various examples of soils used in construction. One of the earliest types we identified is a soil known as Geren. This particular type of earth was traditionally used in the construction of flat roofs. It is characterized by a color similar to that of the Morea (Peloponnese) region. Geren was extracted from an area near the village of Mumcular in the district of Bodrum, specifically from a location called Üçpınarlar. It had to be excavated from a depth of approximately 1–2 meters. When spread and moistened, Geren forms a crust-like surface that effectively creates a water-resistant layer. This property made it especially suitable for waterproofing purposes in traditional roof construction (Baykara, 2013, p. 156).

The use of Boçlana soil, as recorded in Ottoman archives, dates back to the year 1795. According to archival records, a request was made to collect soil samples from the island of Santorini. A document dated August 27, 1795 (11 Safar 1210) notes that two Ottoman Beyzades (*son of a Bey, a courtesy title borne by a son of a Bey Effendi*) were to travel to the islands of Santorini and Değirmenlik for the purpose of obtaining these soil samples. It was requested that their travel expenses, amounting to 1,200 kuruş, be covered. This expense was recorded in the Imperial Accounting Office (*Baş Muhasebe*) by New Revenues (*İrad-ı Cedit*) treasurer, and payment was requested from the Imperial Treasury (*Hazine-yi Amire*) (BOA, C..İKTS, 39/1934). Due to the lack of additional details in the document, it is not possible to determine the subsequent course of events regarding the use or outcome of the collected soil samples.

The first traces of how Santorini soil (Boçlana) was discovered can be found in Ottoman archival documents. According to a record dated March 4, 1798 (16 Ramadan 1212), it was proposed that two French physicians be granted a reward (*atiyye*) for their discovery of the Boçlana mineral on the island of Santorini. The matter is explained in a council protocol prepared by Deniab, a representative of the French Republic at the embassy in Istanbul. Two French doctors, named Burunir and Ulyubir, who were commissioned by the French Republic to travel to Istanbul, had learned from local merchants about a specific soil known as Boçlana. They were informed that certain individuals in Istanbul were interested in purchasing this soil, and they conveyed this information to Deniab. Upon presenting their case to Reşit Mustafa Efendi, the doctors were granted official permission to conduct research on state-owned land. To facilitate the collection of soil samples, a sergeant (*çavuş*) was assigned to assist them, and they were provided with travel expenses. A vessel from the Imperial Arsenal was dispatched. Interestingly, the ship first sailed toward the *Acemistan*¹⁵ region, anchoring near the shores of Damascus in a place called Tirdale. The French physicians also reported finding similar soil on several islands along the Black Sea coast. Although the doctors collected samples from multiple locations, they concluded that the original and most prominent source of Boçlana was indeed the island of Santorini, due to its proximity to the shore. They also noted that the soil found near Adalya (Antalya) shared similar qualities with the Santorini soil. After the completion of their mission, the physicians resumed their original medical duties. Sent to serve Mehmed Khan by the French Republic, they demonstrated their expertise in science and medicine during their stay. Their work was deemed valuable, and upon departing from Baghdad, they were presented with gifts by Vizier Süleyman Pasha. The use of Boçlana was found to be appropriate, yet the need for further research into its properties and applications was emphasized (BOA, HAT / 165 – 6911).

¹⁵ It refers to Persia

Following its initial investigation into the properties of Santorini soil the Ottoman state sought to determine whether this material was also used in construction practices in Greece. A translated document sent by the Ottoman chargé d'affaires in Athens, dated December 8, 1859, was addressed to the Ministry of Foreign Affairs (*Hariciye Nezareti*), in which the suitability of Santorini soil for use in construction was questioned. The translated memorandum emphasized that although the use of this soil in the construction of pools and various buildings may involve laborious processes, the report translated by Monsieur Edward, an engineer from the Layed Company provided technical insights on its properties. According to the Greek Minister of Foreign Affairs, Santorini soil was indeed used in building construction in Austrian territories (BOA, HR.SYS, 1722/17).

In a memorandum dated December 24, 1858 (29 Jumada al-Awwal 1276), the Ministry of Trade (*Ticaret Nezareti*) reported that a note from the Athens Embassy concerning the usability of Santorini soil in construction had been forwarded along with its supporting documents (BOA, HR.MKT. 319/52). Subsequently, in a letter dated March 26, 1860 (4 Ramadan 1276), the Ministry informed the Grand Admiral of the Ottoman Navy (*Kapudan Pasha*) that a letter from the Athens chargé d'affaires had been sent regarding the procurement of Santorini soil for use in the construction of a dockyard pool at the Imperial Arsenal (BOA, HR.MKT. 330/38). Approximately one month later, further instructions related to Santorini soil were relayed once again to the Kapudan Pasha. A letter received from the Athens Embassy was formally forwarded to the Sublime Porte (*Bab-ı Ali*) for final consideration (BOA, HR.MKT. 336/28).

The first recorded initiative to collect a sample of Boçlana soil dates back to 1795. Two years later, in 1797, the discovery of Santorini soil was made by two French physicians. Subsequently, the Ottoman Empire sought to determine whether the soil was suitable for building construction and formally consulted the Greek Government on the matter. In response, it was reported to the Ottoman authorities that this type of soil was also being used in construction works in Austria.

4. CONSTRUCTION ACTIVITIES

4.1. Port and Palace Construction

Santorini soil was notably used in the construction of ports within the Eyalet of the Archipelago. One of the materials employed in the construction of the quay at the port of Kos in 1859 was Boçlana (also referred to as Burslan) soil, which is the subject of our investigation. Although there is no archival information on how and from where this material was transported to the island, it is known that Boçlana,¹⁶ a type of water-resistant soil specially used for port construction, was brought to the island in baskets (*küfe*).

¹⁶ In the documents here it is given as Burslan soil.

During the port construction, various types of stones were used for paving, covering, and quay-facing purposes. Each type of stone had its own pricing, and the wages for the craftsmen responsible for laying these materials were recorded separately (Baykara Taşkaya, 2023, p. 2295).

On December 12, 1860 (28 Jumada al-Awwal 1277), Ata Bey, the governor (*mutasarrıf*)¹⁷ of the Eyalet of the Archipelago, requested that a sufficient quantity of the soil known as “Santorini sand” be sent from the island of Silyo (under the jurisdiction of Rhodes) for the construction of a port on the island of Samos. Authorization was granted for Miltiyadi Bey to transport the soil, and a permit was issued to facilitate this process (BOA, HR.MKT. 359/77-2).

In a subsequent document addressed to the Ministry of Finance (*Maliye Nezareti*), it was stated that the island from which the soil was to be extracted was not privately owned; therefore, a formal permit was deemed unnecessary. It was requested that the necessary administrative procedures be carried out accordingly (BOA, HR.MKT. 359/77-6).

The use of sponge stone in the construction of the Çırağan Palace is also documented in archival records. A document dated January 27, 1865 (29 Sha’ban 1281) reports the transportation costs of sponge stone brought from the Eskamra Pasture (*Eskamra Merası*) and stones from the Sorbo and Yusuf Ağa quarries in Şile for the construction of the palace (BOA, TS.MA.e, 1084/8). It is noted that the transport fee of 200 kuruş for the sponge stone delivered by the boat of Durmuş Reis was paid by the Imperial Arsenal. Despite detailed studies on the construction of the Çırağan Palace, which identify the origins of nearly all construction materials, no specific mention is found regarding sponge stone (Can, 1999, p. 22). While Santorini sand typically used in port construction was also requested for the construction of the palace, archival records do not specify for what purpose or in which part of the building the material was intended to be used. It is particularly noteworthy in these documents that the material is explicitly referred to as sponge stone, indicating a recognized nomenclature for this volcanic-origin material within official Ottoman terminology.

4.2. Boçlana Soil from Italy

The use of Boçlana soil was deemed essential for the repair and caulking of Ottoman Imperial Navy (*Donanma-yı Hümâyun*) galleons, as well as for the construction of large dry docks. This material was regularly procured for the shipyard basins constructed at the Imperial Navy. While the initial shipments of Boçlana soil originated from the islands of Santorini and Değirmenlik in 1796, it was later imported from Italy as well. In 1885, a subsequent procurement of soil was carried out from Ioannina (*Yanya*) in Greece. A document dated February 10, 1796 (1 Sha’ban 1210) details the excavation and inspection of the designated dry dock area by engineers at the Imperial Arsenal, noting the conditions of the wells, taxes on the wooden dock, and the wages of the laborers to be employed at the site.

¹⁷ For *mutasarrıf*, see (Örenç, 2020, V .31, 377-379).

It also records that Seyyid Çavuş, who had been dispatched to retrieve soil samples from Santorini and Değirmenlik, was granted a per diem (*harcırah*) of 150 kuruş. In total, it is documented that 6,000 kantars of Boçlana soil were brought in for use (BOA, C..BH.. 217/10103).

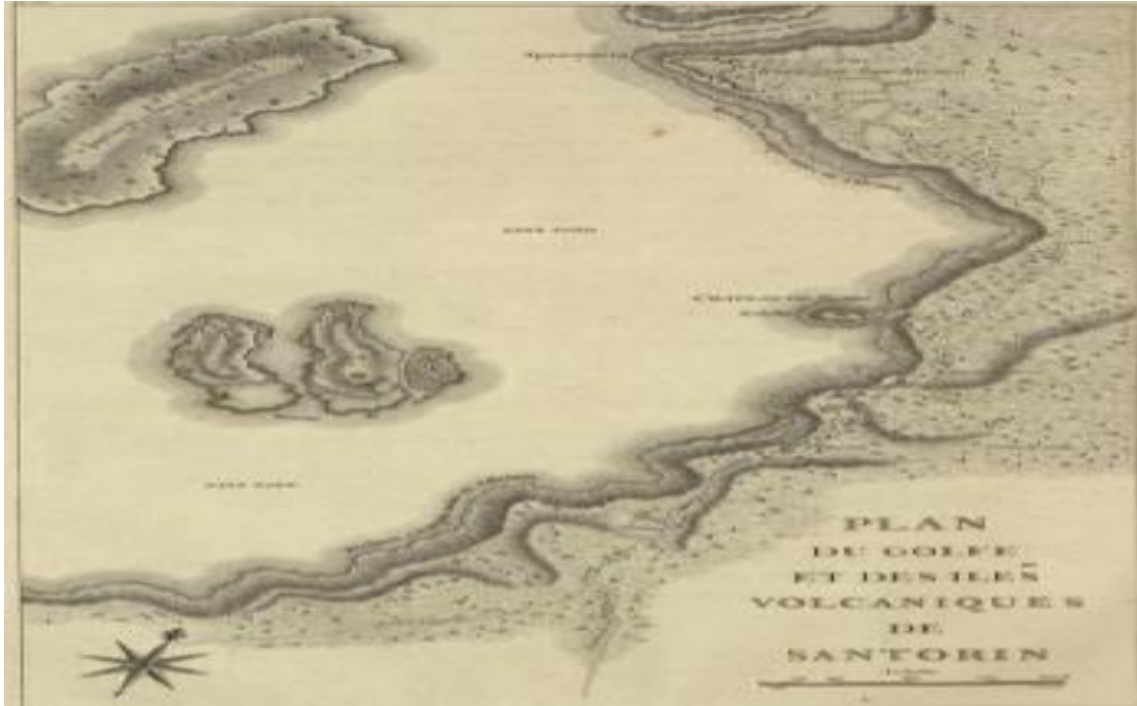
The procurement of Boçlana soil for the large dry dock under construction at the Imperial Arsenal was, at this stage, arranged from Italy. A document dated June 6, 1797 (10 Dhu al-Hijjah 1211) reports that the request to supply soil for the dry dock was conveyed through Costantino, the ambassador of the Kingdom of the Two Sicilies (Sicilyateyn), and his chief interpreter. The soil was to be procured from an Italian merchant named Salizani. It was agreed that approximately 30,000 kantars of Boçlana soil would be purchased and delivered from the region of Coyta Vekatom in Italy. The price was set at 77 para per kantar. A contract was signed, and the payment of 57,750 kuruş was arranged in two installments. The first installment of 37,500 kuruş was to be paid directly to the ambassador.

Salizani declared that the soil would be transported by four ships, and a total of 15,721 kantars had already been delivered. Additionally, a separate expense exceeding 7,000 kuruş was requested. In a revised calculation, a further 12,500 kuruş was required to complete the total payment of 50,000 kuruş. The situation was reported to the Grand Admiral, and it was confirmed that 3,000 kantars of the soil had cost 37,500 kuruş (BOA, C..BH.. 49/2320). In a follow-up document from the following month, it was stated that for the initially contracted 30,000 kantars, the agreed unit price was 77 para per kantar. For any additional quantities requested beyond the original agreement, a new rate of 40 para per kantar was applied. The sum of 56,000 kuruş had already been paid to the ambassador, and the receipt was forwarded to the Imperial Treasury (Baş Muhasebe). It was also noted that the contracted amount had been exceeded by 1,500 kantars. Whether additional soil would be required was to be determined by a Swedish engineer assigned to inspect the project. The translator, who later met with the Grand Admiral, clarified that since the additional soil exceeded the initial contract, it would be charged at the updated unit price (BOA, C..HR.. 57/2843).

According to the archival document dated August 13, 1797 (19 Safar 1212), a certificate (*ilmühaber*) was requested regarding the receipt from the Imperial Treasury for the payment made based on a promissory note recorded in the accounts. This payment concerned the 30,000 kantars of boçlana soil requested by Italy, for which a fee of 77 para per kantar had been paid to cover both the value of the soil and the cost of its transportation. Following the delivery of 30,000 kantars to the ship, it was reported that the remaining quantity was 1,533 kantars. It was stated that a sum of 56,000 kuruş had been delivered as payment for the remaining boçlana, and an additional 30,000 kuruş was still required. Therefore, it was requested that the value of the outstanding 1,533 kantars be paid to the relevant parties in order to complete the remaining payment. The total amount was calculated according to the division between the Imperial Treasury (*Mîrî Hümayun*) and the commander (*müşir*), and the amount was to be handed over to Salih Efendi, the Superintendent of the Dock Construction (*Havuz Bina Emîni*). According to previous records, it was noted that the boçlana soil delivered earlier by another merchant had been dispatched properly as required.

However, it was also noted that for the additional demand for soil, the price per kantar was proposed at 40 para. This proposed rate was rejected on the grounds that it was inconsistent with the contractual agreement, which specified a rate of 77 para per kantar for the initial 30,000 kantars. It was emphasized that any subsequent deliveries would be calculated at 40 para per kantar. Accordingly, it was requested that this payment be made to the translator, and that the treasurer (*defterdar*) also be informed of the matter. (BOA, AE.SSLM.III, 104 - 6272)

The archival record dated September 16, 1797 (13 Rabi al-Awwal 1211) reiterates the procurement of boçlana soil, which was required for the maintenance and caulking of the ships belonging to the Ottoman Imperial Navy, as well as for the operation of the large dock constructed for this purpose. Given that boçlana soil was known to be a special material found in Italy, an agreement had previously been concluded between the Sicilian ambassador and a merchant named Salizani for the transportation of 30,000 kantars of soil to Istanbul, at the rate of 77 para per kantar. As part of the arrangement, it was reaffirmed that a sum of 25,000 kuruş would be paid to the merchant, and that four ships would be designated to assist in the transportation process. The soil was expected to arrive in Istanbul imminently, and it was instructed that, upon arrival, it should be transferred to designated storage areas within the old naval shipyard. Additionally, it was reported that another ship was carrying approximately 20,000 kantars of boçlana soil. As stipulated in the contract, a further payment of 12,500 kuruş was to be made to the merchant's interpreter. It was requested that the required funds be disbursed by the Imperial Treasurer. (BOA, C..BH.. 27 – 1278)



Map 3: Santorini Volcano (Choiseul-Gouffier, 1782).

Another record concerning soil procurement reflected in the archival documents pertains to the payment for soil used in the old dry dock at the Imperial Shipyard. Pursuant to a imperial decree (*ferman*) dated November 30, 1825 (18 Rabi al-Thani 1241), addressed to the Superintendent of Construction (*Bina Emini*) Abdülhalim Efendi, it was ordered that the levy (*kharaj*) required for the registration of the transaction be paid by the Director of the Imperial Mint (*Darphane-i Âmire Nâzırı*). It was stated that a total of 42,757 kantars of boçlana soil would be used in the construction of the dock being built at the Imperial Shipyard. Payment of the remaining cost of the soil, which had been procured from various merchants at differing prices, was requested. Additionally, it was noted that approximately 3,000 kantars of extra soil would be needed for new construction sites. Regarding the old dry dock, it was recorded that the soil purchased by the Imperial Shipyard had been priced at 2 kuruş per kantar, totaling 6,000 kuruş, and this payment was to be made directly by the Imperial Shipyard. A record was also made in the Central Accounting Office for the payment to be issued from the construction account of the Imperial Mint (BOA, C..BH.. 44 - 2061). Another issue reflected in the archival records concerns the logistical difficulty of transporting soil and the practical solution of using cargo ships returning from supply missions to carry boçlana soil, thereby avoiding empty voyages. While the exact origin of the soil is not specified in the record, a document dated January 12, 1827 (18 Rabi al-Thani 1237), notes that a ship carrying ammunition and provisions to the Ottoman Navy near the Preveza region was instructed to bring back boçlana soil for the large dock at the Imperial Shipyard, rather than return empty. Following the delivery of its cargo, the commercial vessel dispatched by Sermet Mehmed Pasha was ordered to procure soil from the vicinity and transport it to the capital for use in the shipyard dock.

It was noted that a total of 50,000 kantars of soil would be required, and the transportation cost was calculated at 1 kuruş per kantar, amounting to 6,000 kuruş in total. It was also emphasized that this transportation fee would incorporate the cost of the return journey. The transaction was to be recorded by the central accounting office, and the required funds were to be paid from the Treasury of Ottoman Imperial Navy (*Tersâne-i Âmire Hazinesi*). (BOA, C.BH, 112 - 5421)¹⁸

It is evident from archival records that pumice stone was not only transported from the island of Santorini but also sourced from other regions within Greece. In this particular instance, the material is explicitly referred to as pumice stone in the documents. An official correspondence dated March 6, 1885 (19 Jumada al-Awwal 1302) was addressed to the Imperial Privy Council (*Mabeyn-i Hümayun*) through Hakkı Pasha, the Governor of Selanik (Salonika), informing him of the matter.

¹⁸ According to the archival record dated April 28, 1860 (7 Shawwal 1276), the requirement for soil in the construction of the new dock at the Imperial Shipyard was officially reported. The matter was conveyed in writing to the Grand Admiral. Additionally, it was noted that the Embassies in Paris and Naples should also be informed of the situation. (BOA, HR.MKT. 332 - 40) While the document clearly references the need for soil, it does not provide any information regarding the name, origin, or specific type of the soil to be procured.

According to a cipher telegram received by the Selanik Province, it was stated that 50 crates of pumice stone, brought from Vodina¹⁹, had been carefully packed and prepared for shipment. These materials were intended for use in constructing cascades to be installed over the royal pools, as per the request of the Sultan. Furthermore, an official document dated April 4, 1885 (23 March 1301) confirms that the necessary information concerning this shipment was also conveyed to the district governor of Yanya (*Ioannina*). (BOA, Y..PRK.MYD., 4/30-2 and 4/30).

Over the course of nearly a century, soil and stone materials were imported on three separate occasions for use in the docks of the Imperial Shipyard: twice from Italy (in 1796 and 1827), and once from Greece (in 1885).

5. THE TRADE AND TAXATION OF SANTORINI SOIL

Following its official recognition as a mineral resource, Santorini soil became subject to taxation. According to an archival record dated November 8, 1864 (8 Jumada al-Thani 1281), restrictions were imposed on the distribution of soil from the island of Santorini.

In a document addressed to the Registry Treasury (*Defter Emaneti*), it was noted that the island known for some time as İbrahim's Island, located near Kos and regarded as a tax-farming estate (*mülk malikâne*), was the subject of a property dispute. It was reported that residents of the neighboring Kalimya Island had begun constructing several buildings on this island. Allegedly, the construction involved the unauthorized use of Santorini soil. As a result, a memorandum was submitted by the Kos Council to the Supreme Judicial Council (*Meclis-i Vâlâ-yı Adliye*). Imperial Land Registry (*The Defter-i Hâkânî*) was instructed to take the necessary administrative actions. The government also mandated that no licenses be issued to individuals from Kalimya unless they paid the designated fee to the official dispatched to the island for inspection. Additionally, a report by the Kos Council was forwarded, requesting appropriate legal action to be taken against the individuals who had unlawfully intervened in the soil usage on İbrahim's Island. (BOA, MVL, 794 – 62; see also Genç, 2003, vol. 27, pp. 516–518)

The taxation of pumice stone also emerged as a noteworthy administrative matter in the Ottoman archival records. A memorandum prepared by the Imperial Accounting Office (*Divan-ı Muhasebat*) and sent to both the Ministry of Finance and the Supreme Council of Judicial Ordinance (*Meclis-i Vâlâ-yı Ahkâm-ı Adliye*) on August 25, 1867 (24 Rabi' al-Thani 1284), clarified legal ambiguities regarding the export of pumice stone by the residents of Uskumru village, located in the Küçükçekmece district. The memorandum explained that, similar to the taxation of millstones extracted in the Sanjak of Gallipoli, the villagers had no ownership rights over the pumice stones found on state-owned (*mîrî*) land and therefore could not claim a share in their export revenues as tenants or landholders.

¹⁹ Vodina (modern-day Edessa), located in the Macedonian region of northern Greece, is a historic city that today serves as the administrative center of the Pella nomos, one of the regional units (nomoi) of Aegean Macedonia in northern Greece. (Kiel, 2013, pp. 119–122)

It was emphasized that the stones belonged entirely to the state. Nevertheless, recognizing the benefit to the local population, it was proposed that pumice stones be distributed to the villagers, on the condition that they would be liable for the related fees and debts (*zimmət*) associated with the extraction and export processes. It was explicitly stated that, similar to millstones, the only applicable tax on pumice stone was the tithe (*öşür*)²⁰, rather than land tax (*temettü*) or tenancy fees.

This decision was reaffirmed in a subsequent document dated September 14, 1867 (15 Jumada al-Awwal 1284), again referencing the case of Uskumru village. Given that the land was under state ownership, the imposition of the tithe (*öşür*) was deemed appropriate in accordance with existing legal principles. The ruling was finalized with the transmission of the memorandum from the Supreme Council of Judicial Ordinance (BOA, MVL 1036–20; İ.MVL 577–25904)

Another archival record concerning pumice stone relates to its transportation and handling. For the construction of a pier in Bandırma, it was requested that Santorini soil be transported to a plot of land belonging to Ayşe Hanım, daughter of the late former Commander of the Gendarmerie, Mehmed Pasha. In a telegram dated September 29, 1871 (14 Rajab 1288), sent to the Mutasarrıflık of Karesi, it was emphasized that the stone should be examined by individuals knowledgeable in the matter. Following the examination, it was estimated that removing the soil would cost 3,000 kuruş. (BOA, ŞD. 1536/23-8) In a later correspondence dated November 27, 1872 (26 Ramadan 1289), also addressed to the Mutasarrıflık of Karesi, it was requested that the soil either be removed at a reasonable cost or, if determined to be usable, handed over to any potential interested party. The necessity of having an expert evaluate the suitability of the soil was again emphasized. Another proposed option was to dump the soil into the sea, although this was considered costly and thus the issue required closer administrative follow-up. (BOA, ŞD. 1536/23-5) A document dated March 29, 1872 (19 Muharram 1289), sent from the Mutasarrıflık to the Hüdavendigâr (also known as Bursa) Province, stated that removal of the soil from its location would cost between 2,000 and 3,000 kuruş. (BOA, ŞD. 1536/23-6; 1536/23-7) It was reported that the soil had been left unused for an extended period, and that the local administration had no use for it. Since the usability of the soil was uncertain, the correspondence from the province was referred to the Council of State.

²⁰ In general, taxes collected under the name *öşür* (tithe) were agricultural taxes, and their rates varied from one-fifth (hums) to one-tenth (*öşür*) of the harvest. These taxes were commonly levied in kind, particularly on cereals and legumes. Taxpayers were often obligated to surrender a portion of their produce—such as wheat, barley, and rye—to the authorities. In some cases—such as taxes on fibrous plants, fruits and vegetables, livestock (*âdet-i aġnâm*), beekeeping (*resm-i kovan*), and customs duties—taxpayers were granted the right to choose whether to pay in cash or in kind. Among all taxes, the largest share of revenue came from *öşür* and *sâlâriyye* (annual dues) levied on major grains. In addition to these, various specialized taxes were imposed depending on the crop or product. These included: Bahçe (garden tax) on orchards, Bostan on melons, watermelons, and cucumbers, Bağ on vineyards, Fevâkih on assorted fruits, Resm on early-season (*turfanda*) fruits and vegetables, Kovan on honey from beehives, Penbe on cotton, Harîr on silk cocoons, and Şıra resmi on molasses (*grape must*). (Tabakoğlu, 2007, pp. 100–103).

The Ministry of the Navy was also informed that the soil was no longer required by the Imperial Shipyard. As such, it was proposed that the soil be returned to the property owner, and that the outcome be submitted to the Interior Division of the Council of State (*Şûrâ-yı Devlet Dahiliye Dairesi*). In response to this process, the Ministry of the Navy issued a letter dated May 9, 1873 (11 Rabi al-Awwal 1290), responding to documents from Hüdavendigâr Province and the Council of State. The Interior Division resolved that the soil should be promptly and freely removed from the site for the needs of the Imperial Shipyard, and the necessary steps were to be taken without delay. (BOA, ŞD. 1536/23-2)

A significant customs-related incident concerning Santorini soil is reflected in Ottoman archival documents from 1906. On May 14, 1906, during a routine inspection at the customs office in Dedeğaç (*modern-day Alexandroupoli*), a dispute arose involving a Greek-flagged sailing vessel that had transported Santorini soil from Piraeus.

During the inspection, the Greek consul in Dedeğaç allegedly behaved in a verbally abusive and insulting manner toward Ottoman customs officers. It was recommended that the consul be formally reprimanded by his own legation. (BOA, HR.TH. 333/95) The issue stemmed from the imposition of double customs duties, which was deemed a violation of the terms set out in bilateral agreements between the Ottoman Empire and the Kingdom of Greece. In an official correspondence dated April 25, 1906 (12 April 1322), the Greek consulate in Dedeğaç explained that the extra tax was imposed because the vessel's captain failed to present the required manifest register (*manifesto defteri*), as stipulated by the trade conventions. Subsequent correspondence, dated May 23, 1906 (17 Mart 1322), clarified that Captain Fan Parli, who had delivered the shipment of Santorini soil, was asked to produce a manifest document per the existing agreement with Greece. However, it was reported that the loading port lacked the required register, which led to double taxation in accordance with Ottoman customs law. The Customs Administration (*Rüsumat Emaneti*) confirmed that all captains of ships arriving from Greece were required to carry such documentation, and that any failure would result in penalties. (BOA, HR.TH. 333/95-6) On April 12, the ship's broker Papaloto Nikola and the Greek consulate interpreter claimed they had later obtained the manifesto document and demanded the immediate return of the deposit paid. They threatened to file a complaint with the Customs Directorate if the funds were not refunded. The manifest dated April 15, 1904, the date of the vessel's departure, confirmed the cargo's loading location. The petition was transmitted to the authorities via the Greek embassy. Both the Customs Directorate in Edirne and the Ministry of Customs were notified and confirmed the communication via telegram. However, during a second complaint by the interpreter, his impolite and aggressive tone, made in the presence of Wilhelm, the German consul was noted and registered as a diplomatic grievance. A separate report from the Greek Consulate in Dedeğaç (April 25, 1906) reiterated that, under the Ottoman-Greek Consular Convention, any failure to present the required manifest documentation by the ship's captain should have resulted in no more than standard taxation. However, double duties were collected, prompting the consulate to demand both the immediate dispatch of the declaration to Piraeus and the reimbursement of the overpaid amount.

The Greek authorities formally protested the conduct of the Ottoman customs director, not only for refusing the refund, but also for the alleged discourteous behavior of the interpreter, which was characterized as offensive to a foreign government. In accordance with the terms of the consular agreement, the Greek side requested the return of the excess duties. (BOA, HR.TH. 333/95-4).

The final set of documents related to pumice stone within the scope of the early Republican period dates to the year 1922. According to a record dated November 21, 1922, a contract of sale was concluded between Ömer Lütfü, a merchant from Kars, and Fuad Bey, son of Mehmed Bey, Clerk (*Kançılar*) of the Gümrü Consulate (*Şehbenderlik*), for the trade of pumice stone. (Location: 571 / 36125 - 142627 - 266) (Document 1) However, this partnership agreement began to encounter difficulties within six months. Two additional documents, dated May 11, 1922 and August 28, 1922, were submitted by Ömer Efendi, President of the Kars Chamber of Commerce.

These documents detailed complaints regarding the misuse of the agreement by Mehmet Bey, particularly in connection with the transport and sale of pumice stone that had been dispatched to Tiflis. (Locations: 571 / 36125 - 142627 - 263 and 571 / 36125 - 142627 - 267) It was reported that Mehmet Bey had repeatedly sold pumice stone without informing his partner, and had even entered into additional partnerships with third parties, in violation of the original agreement. These actions led to serious disputes between the parties. The documents also mention that multiple unlawful acts had been uncovered as part of this business relationship. As a result, the Consul of Gümrü (*Gümrü Şehbenderi*) issued a decision to conduct the necessary investigation. However, due to the absence of further records, the outcome of this inquiry remains unknown.

No additional archival documents directly related to pumice or sponge stone could be identified. In the available records we were able to access; the material is sometimes referred to as “Santorini sand”, and at other times as “sponge stone”. We have attempted to examine and present these documents in detail, despite the inconsistent terminology used in the archival descriptions.

CONCLUSION

Although located in a strategically significant position within the Eyalet of Archipelago, the island of Santorini, situated among the Cyclades, did not constitute a major center of socio-economic activity. Like the other islands of the province, it was governed through a system of fixed (*maktu*) taxation imposed by the state. Archival evidence shows that various types of land within the province’s districts were used for different purposes. Santorini, in particular, witnessed three major volcanic eruptions, which played a formative role in shaping the island’s current geological structure. Among the island’s notable resources was a type of volcanic soil used in construction. This material was transported to the Ottoman mainland and utilized in significant public works projects, including port and dock constructions, as well as in prestigious architectural undertakings such as the Çırağan Palace.

The French government dispatched certain individuals to the island in order to study the geological composition of its soil. The Ottoman state itself had previously imported this material from Italy and Greece. The soil was notably used to cover the docks employed in shipbuilding within the Imperial Shipyard. As the commercial sale of the island's soil began, the issue of its taxation came to the forefront. Archival documents reveal the procedures followed in the transportation and shipment of Santorini sand. Based on practices applied to similar types of minerals and materials, it was deemed appropriate to levy and tithe on Santorini soil. Through this taxation model, the state began to generate revenue from the exploitation of this valuable resource.

Most of the documents related to pumice stone in the Ottoman archives are specifically centered on Santorini Island. There is a noticeable lack of records regarding other locations from which this material was extracted. Considering that the Ottoman state had begun granting concessions to foreign entities for the operation of mines from the early 19th century onward, it is not surprising that foreign governments sought privileges to exploit this resource.

Today, pumice is used extensively as a construction material, particularly in the production of bims blocks and Portland cement. While research has identified the potential for pumice to be used in other industrial sectors, these applications largely remain at the experimental or exploratory stage. Investigations into the effectiveness of pumice across various sectors are still ongoing. It is reported that approximately 95.2% of domestic pumice production is consumed in the local market, with its primary application being in the construction industry. In recent years, numerous studies have also been conducted on the social and economic structures of the islands within the Eyalet of Archipelago, where Santorini is located.

As an integral component of urban economic history, the mining sector and specifically the case of Santorini sand and stone (boçlana soil and pumice stone) has been examined in detail through archival records. This study has sought to explain the subject comprehensively within the specific context of Santorini Island, based on the various dimensions reflected in the Ottoman archives.

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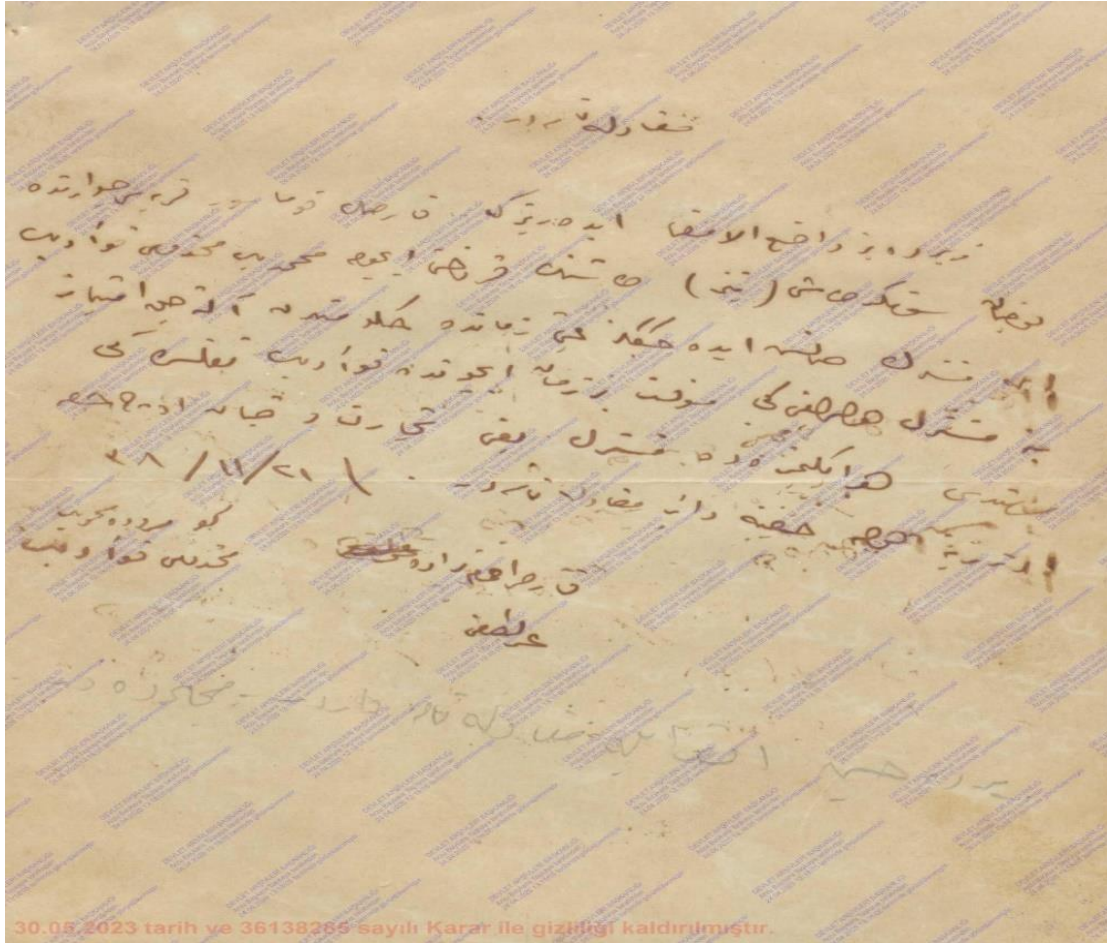
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ANNEX

Evrak 1: 1922 yılı Sünger Taşı Mukavelenamesi (Yer: 571 / 36125 - 142627 -266)



Mukavelenamedir

Zirde biz dahil olmağa ederiz ki Kars'ın Kamasur Karyesi civarında bulunan sünger taşı (tiz) taşının satışı için Mehmet Bey mahdumisi Fuad'ın müşterek satış edeceğimiz aynı zamanda müteadid alınacak imtiyaz yine müşterek olunacağı gibi mütevakkıf bir zaman için Kavaidin Tiflis'teki müşterisi her ikimizde müşterek yani ticaret ve hayat ettireceğine hakkında dair mukavelenamedir. Fi 21/ 11/ 38

Kars İmamzade Ömer Lütfi

Gümrüde Arab Mahdumu Fuad Bey

PICTURES

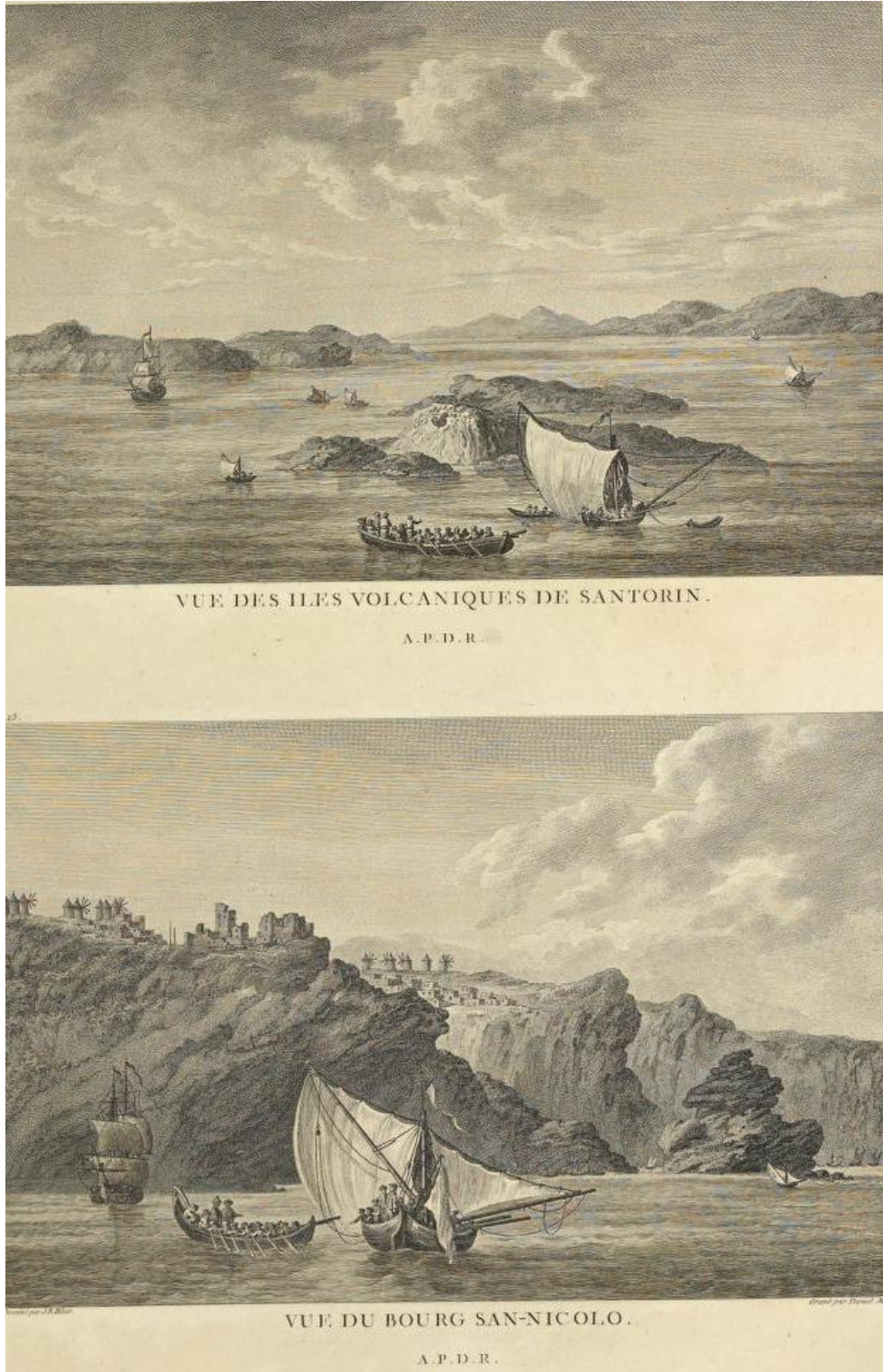
Picture 1: Gouffier, Shores of Santorini Island



Picture 2: Gouffier, Saint Etienne Mountain



Picture 3: Gouffier, Santorin Island Volcano and Saint Nicholas City



Picture 4: Gouffier, Women of Santorini – Nebrio City of Santorini

