



Marketing and Exploitation of Sillar Añashuayco - Arequipa

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Article History	Abstract
Received: 06 June 2023 Revised: 05 Sept 2023 Accepted: 22 Dec 2023	<p>The Sillar Route is located and developed in the ashlar quarries of Arequipa and is managed by the Ashlar Cutters Association. This research seeks to analyze the social determinants of the viability of sustainable tourism in the Cutters sector of the quarries of Arequipa. ashlar based on the opinion and perception of the quarry workers. The city of Arequipa was distinguished by UNESCO as a Cultural Heritage of Humanity in November 2000, in consideration of the buildings that make up the Cercado in its centuries-old neighborhoods, defined as a Monumental Zone and categorized as: religious monuments, military monuments, monuments civil-public and civil-domestic monuments. All of them share an element that, before the arrival of the conquerors, was already used in buildings built by Andean societies, ashlar. In this article we will see the main input of the buildings that have continued to be used for half a millennium, emerging as a fundamental element of the regional identity and the proposal to value the ashlar quarries, with a thematic tourist route that has been implemented.</p>
CC License CC-BY-NC-SA 4.0	<p>Keywords: Arequipa, tourism viability, sustainable tourism, tourism potential, quarries, ashlar, perception, heritage, quarries, ashlar, perception.</p>

1. Introduction

To enrich the environment that surrounds him, since his earthly dawn, man has required to remodel and tame nature (Bunge, 2013) according to his needs, using the elements available in his environment, such as digging into the earth's crust for agricultural activities, housing or mining, the latter to obtain copper, lead, silver, gold among other minerals, which became the right of ownership of the land (Serfati, 2013) and in the development of mining activity, which is complex, highly exposed, varied, with an impact on other economic sectors, hence it is a very profitable sector (Concha, 2017).

A good percentage of Arequipa locals and foreign tourists consider that ashlar is solidified volcanic lava, which is false, since geological studies determine that it is a volcanic tuff, which is very easy to work with by carving it with tools or rubbing it with rocks. This element is of utmost importance for the city of Arequipa, since most of it was built with ashlar and until now most homes and buildings use it to build walls and veneers.

The Andean man left testimony of his passage on the ashlar blocks, engraving symbols that represent stars, the sun, the moon, various scenes, snakes, camelids, felines and others. A beautiful example is the archaeological center of Pampa La Estrella, in the district of Uchumayo, a place where several petroglyphs were made on pink ashlar and in addition, there are some buildings identified by archaeologists as possible dairy farms, built with pink ashlar, their Authors who are members of the Wari society.

2. Materials And Methods

This research work was carried out to highlight the human group “The Sillar cutters”, who have been part of our cultural identity, since for generations they have been transmitting the ancestral technique of Sillar extraction, behind each of them there is a history, a cultural importance, since they are the ones who have worked for many years and until today, the material (Sillar) that distinguishes our city. The carrying out of this research is also considered so that the master stonemasons, due to their characteristics and conditions of their work areas and for their delightful and enriching ancestral knowledge, deserve to no longer be forgotten, they deserve special recognition from all those who contact us. We feel identified with Arequipa “Cultural Heritage of Humanity”, since thanks to them the Ruta del Sillar is a scene of living heritage.

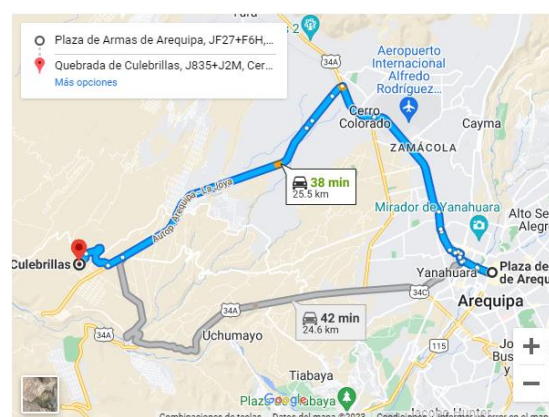
The Añashuayco Quarries are a natural tourist attraction located northwest of the city of Arequipa. They are also known as the “Sillar Quarries”. It is located in a ravine that extends for more than 18 kilometers. It is born at the foot of Chachani, one of the most important volcanoes of the famous White City, next to the Chili River as can be seen (figure 1).

Figure 1. The Añashuayco ravine is located in the Uchumayo district. The name “Canteras del Sillar” was given precisely because this is the main construction material used for many years for the churches, mansions and convents of Arequipa.



This tourist place originated more than three million years ago, approximately in the middle Pliocene era. Thanks to the intense activity of the large amounts of lava and volcanic gases that circulated in the area, the ravine was formed that today is visited by hundreds of tourists.

The first stop in Añashuayco is just 30 minutes from the city center in the **Cerro Colorado district**. The second stop, Quebrada de Culebrillas, is half an hour away from Añashuayco.



The ashlar is a stone carved on several of its faces, generally in the shape of a parallelepiped, and which is part of the ashlar works. Volcanic tuff or tuff is a type of light volcanic igneous rock, with a porous

consistency, formed by the accumulation of ash or other very small volcanic elements expelled from vents during a volcanic eruption. It is mainly formed by the deposition of ash and lapilli during pyroclastic eruptions. Its cooling rate is faster than in the case of intrusive rocks such as granite and with a lower concentration of crystals. Not to be confused with calcareous tuff or pumice.

Types of ashlar.

There are different types of ashlars that are described below:

Compact white tuff: Rock of rhyolitic composition, whose coloration includes tones ranging from gray to white and in the upper levels the yellowish white or cream coloration predominates. Macroscopically, it has a fairly compact massive appearance, porous, permeable and resistant to erosion, with a hypocrySTALLINE aphanitic matrix, with fragments of quartz, feldspar, potassium, sheets of biotite and fragments of pumice, forming a heterogeneous aggregate, but with a uniform appearance. Microscopically, it presents the following minerals in its composition: Plagioclase, sanidine, quartz, biotite and glass chips.

Moderately compact white tuff: It is mainly characterized by presenting columnar disjunction offering few and irregular joints such as can be seen in the cuts from the Arequipa-Yura quarry, where this joint has a certain displacement. Its characteristics are similar to white tuff, except that it is less consolidated and resistant to erosion, its color is generally due to the greater presence of potassium feldspars such as sanidine and orthose. They constitute drainages forming almost vertical cliffs that contrast with the poorly consolidated tuff. This rock is found lying on the white tuff, its mineralogical composition is given by the presence of vitreous fragments, small amount of quartz, pumice, abundant biotite in small sheets and inclusions of sub-rounded fragments of andesites.

Loose pink tuff: This tuff lies in some areas on moderately compacted white tuff and other times on pink, compact tuff, as its name indicates, it is characterized by its light pink color, physically it has an almost loose appearance, inclusions of sub-rounded fragments of andesites. Mineralogically, it has a chemical composition similar to compact pink tuff, with the difference that the minerals have been disintegrated or altered due to weathering. The reddish hue of this smell is given by the hematite, which is present in the corners of the grains as tiny spots, causing the glass to acquire a reddish gray color.

Geomorphological Formation

The episodes of geomorphological structural deformation of large proportions, which occurred in different periods of the tectonic history of the Andes from the late Cretaceous to the upper Eocene, 55 million years ago, defined the formation of imposing volcanic edifices such as Chachani, Pichu Pichu and Misti. Peruvian and foreign researchers, among whom Williams Jenks stands out with his crucial work from 1948, have studied ignimbrite in the geology of the Arequipa sheet.

One of the conclusions that has been reached is that a series of violent explosions that occurred at the Chachani volcano produced clouds or volcanic tuff of white, gray and salmon tones (Vargas 1970), of high temperature, which as they settled formed the glacia. of ignimbrite commonly known as ashlar 2.5 million years ago, and created an area of 8000 hectares, with a variable depth of around 150 meters, made up mainly of white and salmon-colored ignimbrite in the upper layer.

The formation of the glacia modified the route of the Chili River to its current location. The glacia was modified and formed the main ravines, due to rains and landslides, until its subsequent transformation into an artificial landscape of quarries (Figure 2).



Figures 2. When the Ashlar Glacia was formed, the original route of the Chili River was modified, until it followed the current contour of the La Calera hills.

The quarries of Añashuayco have been in operation for approximately one hundred years, and the artisanal method of extracting the stone has not changed from generation to generation. Five hundred cutters work in strategic places in the quarry called workshops, selected for the quality of the cliffs. There is no defined time or specific property; Each workshop is cared for and operated by the stonemason, who can change location according to his experience and dedication (Figure 3).



Figures 3. When the Ashlar Glasis was formed, the original route of the Chili River was modified, until it followed the current contour of the La Calera hills.

Saddle Production

The extraction process begins with the cutting of large blocks of rock that fall from the top of the cliff. The rock falls to the workshop, where the stonemason proceeds to cut smaller sections that allow it to finally reach the commercial size of an ashlar. Throughout the process, the tools used are the bar, jump ropes, chisels and chisels, which are manufactured by hand. The stonemason produces a "task" of two hundred blocks of ashlar, in a time that depends mainly on experience: the most expert can carve them in ten to fifteen days. The completed task is sold to distributors, who go down to the workshops to pick it up in trucks (Figure 4).



Figure 4. A Task consists of carving 200 blocks of ashlar, which are transported from the quarry to material distributors in the city.

Although the stonemasons work in an artisanal and informal way, they have recently managed to establish the Añashuayco Ashlar Cutters Association, with the support of a non-governmental organization, the Center for Research, Education and Development (CIED). This has allowed them a greater presence in the face of various problems; The main one is to confront the population of land invasions that consolidate every year very close to the edge of the quarry (Figure 5).



Figure 5. The main problem that stonemasons currently have are conflicts with new populations, which build very close to the edge of their workshops.

Ashlar Lithology

Geological studies have called the ashlar “Arequipa Airport Ignimbrite” because this rock is found in almost the entire depression of Arequipa, on which most of the city is built, and most of the quarries are located near the Rodríguez Ballón airport. In geology, the term Ignimbrite is used to describe a pyroclastic density current deposit (pyroclastic flow) that contains abundant pumice fragments of different sizes, ash, crystals, rock fragments torn from the conduit and the soil that are expelled to high temperatures during volcanic eruptions very explosions. At the time of placement, this material is very hot, and when it cools it can solidify, forming a rock. At the time of its emplacement, ignimbrite can reach distances of tens or hundreds of kilometers from its source. (Figure 6)

Figure 6: geological formation of the ashlar as “Arequipa Airport Ignimbrite”



Source: Ingemmet.

The Arequipa Airport Ignimbrite or “sillar” was formed 1.65 million years ago, due to very violent explosive eruptions generated by a volcano that was there before the Chachani and Misti volcanoes existed. These explosive eruptions generated two units that can be clearly distinguished: the well-solidified white ignimbrite that can be seen in the ravines, forming vertical walls, and the less compact pink (salmon) colored ignimbrite that is found above the white unit. The eruption of a large amount of magma (18 km³) would have generated the formation of a caldera (topographic depression resulting from the collapse of the roof of the magma chamber) in the area.

Approximately 1 million years ago, this caldera was covered by the eruptions that began to build the Chachani Volcanic Complex. Later, 112 thousand years ago, the Misti volcano began to form, which also built its volcanic edifice through several eruptions that accumulated lava deposits, pyroclastic flows, etc., until reaching the conical shape that can be seen in the present. On the other hand, the lahars and huacos also covered the ignimbrite in the lower parts; However, over time the water undermined these layers, forming the Añashuayco, Culebrillas, Chullo and other streams that descend from the volcanoes and cross different areas of the city. The Ignimbrita Airport of Arequipa or “sillar” can be found in an area that exceeds 600 km², in areas where the districts of Yura, Cerro Colorado, Cayma, Yanahuara, Alto Selva Alegre, Sachaca and Uchumayo.

Ashlar properties

Physical properties

- ✓ Texture: The texture of ashlar is porous and absorbs liquids and saline solutions without losing its cohesion.
- ✓ Presence of earthy fracture
- ✓ It resists the action of heat, without melting at more than 500 degrees Celsius.
- ✓ Color: White, pink and cream.
- ✓ Absorption: Absorption tests have been carried out according to ASTM C-127-59 standards, reaching an average value of 30.88.
- ✓ Specific weight of masses: Average value of 1.65
- ✓ Specific gravity of surface mass: Average value of 1.65
- ✓ Apparent specific gravity: Average value of 2.05
- ✓ Porosity: From the previous data it can be deduced that ashlar is a very porous material,
- ✓ so if you use it in construction you have to wet it first before using it,
- ✓ Bad conductor of temperature: Therefore it preserves the temperature of the homes
- ✓ in a pleasant way, since the ashlar acts as a regulator (thermostat) either
- ✓ retaining heat or gently radiating it.
- ✓ Permeable: Due to its porosity.
- ✓ Penetration speed: Water is 5.40 ml/minute

Chemical properties

- ✓ Color: yellowish gray, light gray, white, orange, grayish, pale red.
- ✓ Gloss: Opaque.
- ✓ Specific weight: 1.26.
- ✓ Absorption percentage: 30.5%.
- ✓ Average capillarity: 33.80%.
- ✓ High porosity and permeability.
- ✓ Tensile strength.
- ✓ Friction resistance.
- ✓ Compressive strength: 94.50 Kg/cm² (dry state), 85.80 kg/cm² (dry state).
- ✓ wet).

3. Results and Discussion

It is in this section where the research results are presented as a result of the application of the questionnaire to the workers of the ashlar quarries, sector, cutters, and the interview guide to the main authorities and figures related to the quarries, the same ones who measure the social determinants of the viability of sustainable tourism in these quarries.

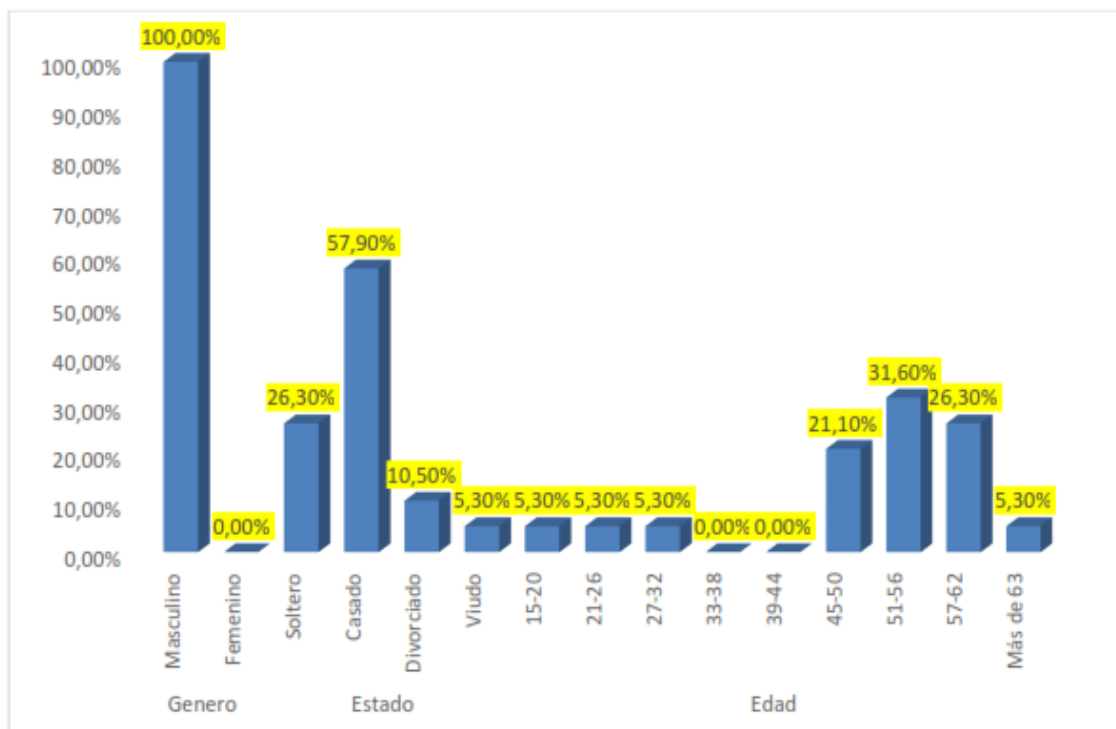
The questionnaire was applied to the 19 workers of the Cortadores association, those who currently work there.

TABLE N°1

Género, estado civil y edad de los cortadores de sillar encuestados

		fi	%
Género	Masculino	19	100,0%
	Femenino	0	0,0%
Estado	Soltero	5	26,3%
	Casado	11	57,9%
	Divorciado	2	10,5%
	Viudo	1	5,3%
Edad	15-20	1	5,3%
	21-26	1	5,3%
	27-32	1	5,3%
	33-38	0	0,0%
	39-44	0	0,0%
	45-50	4	21,1%
	51-56	6	31,6%
	57-62	5	26,3%
	Más de 63	1	5,3%

Figure 7. Gender, marital status and age of the ashlar cutters surveyed



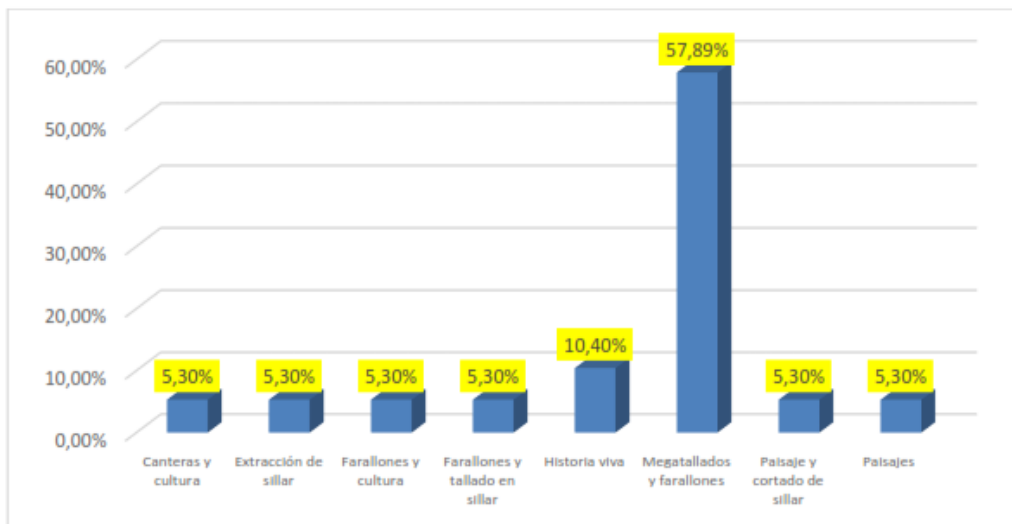
Interpretation 1

When analyzing the results of the question: Do tourists come to the ashlar quarries? It is observed that 84.2% state that the arrival percentage is high, while 15.8% indicate that tourists arrive regularly. All the cutters report that since the implementation of the Sillar Tourist Route the influx of tourists and visitors has increased considerably, currently the majority of those who consider that the daily tourist flow they receive is high are those who are in the most accessible areas of the quarry, that is, along the roads that are closest to the entrance or the workshops that are located in the areas whose arrival routes are less rugged; The other percentage that indicates that the influx of tourists is regular is found in less accessible areas, and far from the main roads delimited along the Cortadores de las canteras sector.

Table 2. Do tourists come to the ashlar quarries?

High	16	84.2%
Low	0	0.05%
Regular	3	15.8%
They don't arrive	0	0.0%

Figure 8. Do tourists come to the ashlar quarries?



Interpretation 2

When analyzing the results of the question: What are the main resources or tourist attractions for which quarries are visited? it is observed that 57.9% state that the main resources are the carved megas and the natural cliffs, while 10.4% point out that it is the living history and culture that is appreciated in the area. Most of the cutter’s report that the main tourist potential of the quarries is the landscape offered by the group of cliffs of the quarries, from which the ashlar has been extracted for decades; In addition, tourists also seek to live the experience of seeing them carving an ashlar, due to their skill in making precise calculations and being able to make even cuts, giving the peculiar shape to this volcanic tuff stone. For this reason, the masters also allow them to participate and invite them to try to make cuts with their tools (combo and chisel), providing a more complete experience.

4. Conclusion

Ashlar, since pre-Hispanic times, was used as an element for buildings and with Hispanic and mestizo architecture it gains enormous importance by becoming the emblematic reference of all the buildings of the White City, and above all as an element that is part of the Arequipa identity. of the population. The quarries of the Añashuayco and Culebrillas ravine, due to the management of the CIED institution before the Ministry of Culture, gain importance and so much value that the activities developed by the quarrymen have been patrimonized by our nation, the entire area in the future will be protected and It will be outlined as the Sillar Theme Park.

The Sillar Route is a new and unique tourist product proposal that in the coming years will gain relevance according to the flow of local, national and foreign tourists who visit the Arequipa quarries, unique in the world. Thanks to the implementation of the thematic route, the stonemasons have been trained in good practices with tourists, guiding workshops and safety in their work of extracting the ashlar blocks. Despite being a non-metallic mineral, we normally think that they do not generate pollution, however, we can see how the exploitation of ashlar is affecting the nearby rivers, and the city, its environmental impact during its extraction makes us understand that we are not highly trained for responsible exploitation in small mining such as quarries.

The commercialization of ashlar is a bit archaic, or conventional, we have not observed ways where there is innovation or equipment that can accelerate both the production processes and improve the marketability of said mineral, either with transportation or hauling, even within the same production and not exposing workers too much.

The local perception of the workers and managers of the ashlar quarries regarding the tourist potential of the area is good, since it has been generating employment, facilitating the creation of businesses and allowing the culture, customs and traditions to be revalued, resulting in greater sales of products in the place, since they consider that it is a beautiful place and can provide the option of carrying out various tourist activities; In addition, there is the promotion and dissemination of the district as a tourist place by local authorities; who have been involving the population in the development of tourism activity, providing them with training and initiating the participation of women in said activities.

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