PUMICE INDUSTRIAL SITES IN LIPARI

Valorization project in the framework of UNESCO Geopark

POLITECNICO DI MILANO
School of Architecture Urban Planning Construction Engineering
Laurea Magistrale in Architettura - Progettazione Architettonica
Architectural Design
A.A. 2017/18

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ACCESSIBILITY AND TOURISM

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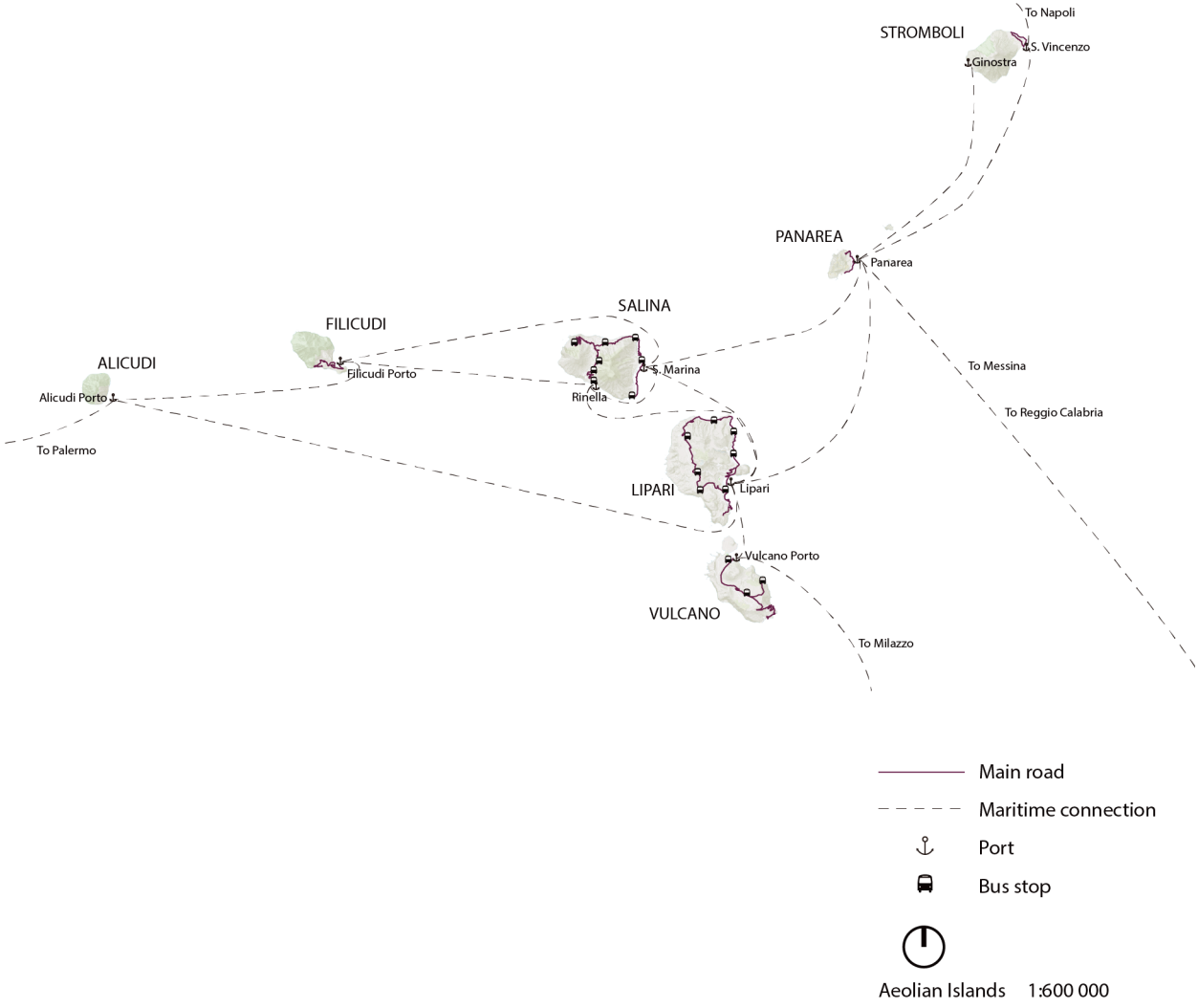
ACCESSIBILITY OF LIPARI ISLAND

Aeolian Islands in southern Italy

Aeolian Islands are in the Tyrrhenian Sea north of Sicily.

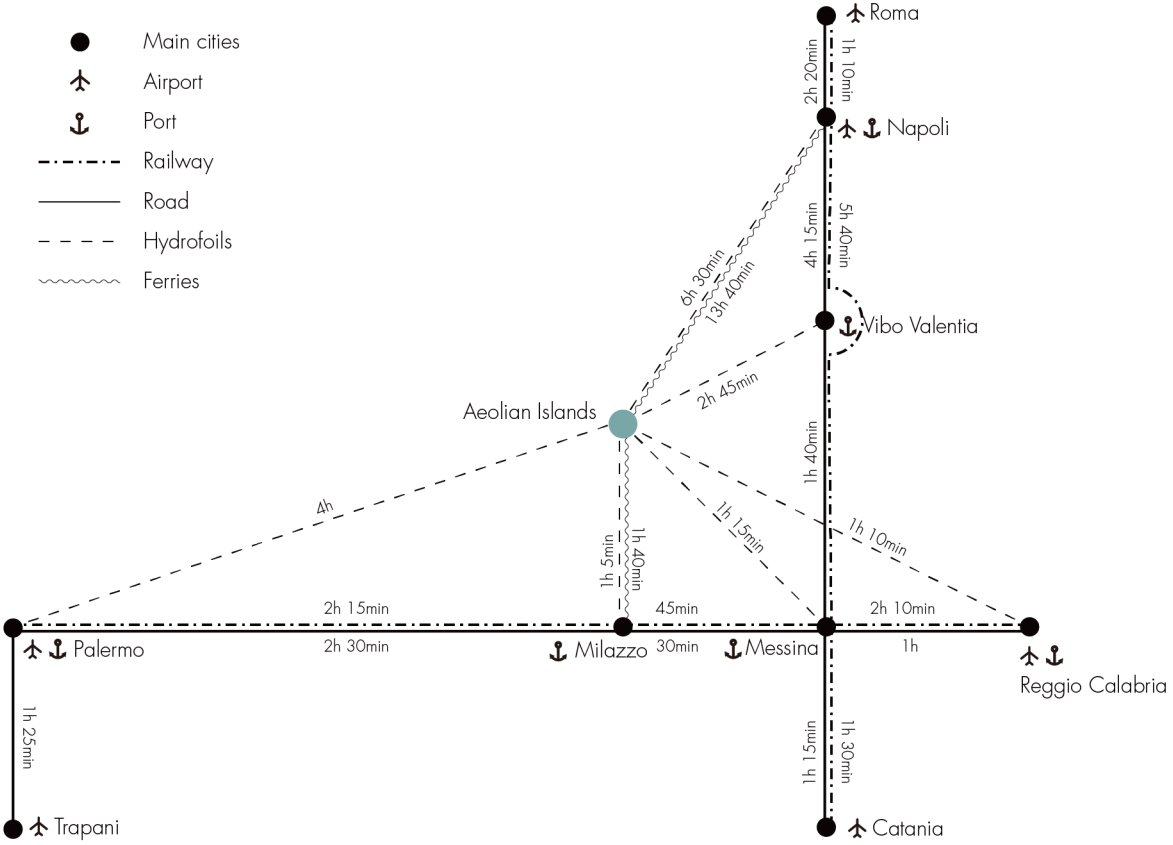
Lipari in Aeolian Islands

Aeolian Islands mainly consist of seven islands and Lipari is the largest island.



Maritime connections with mainland Italy

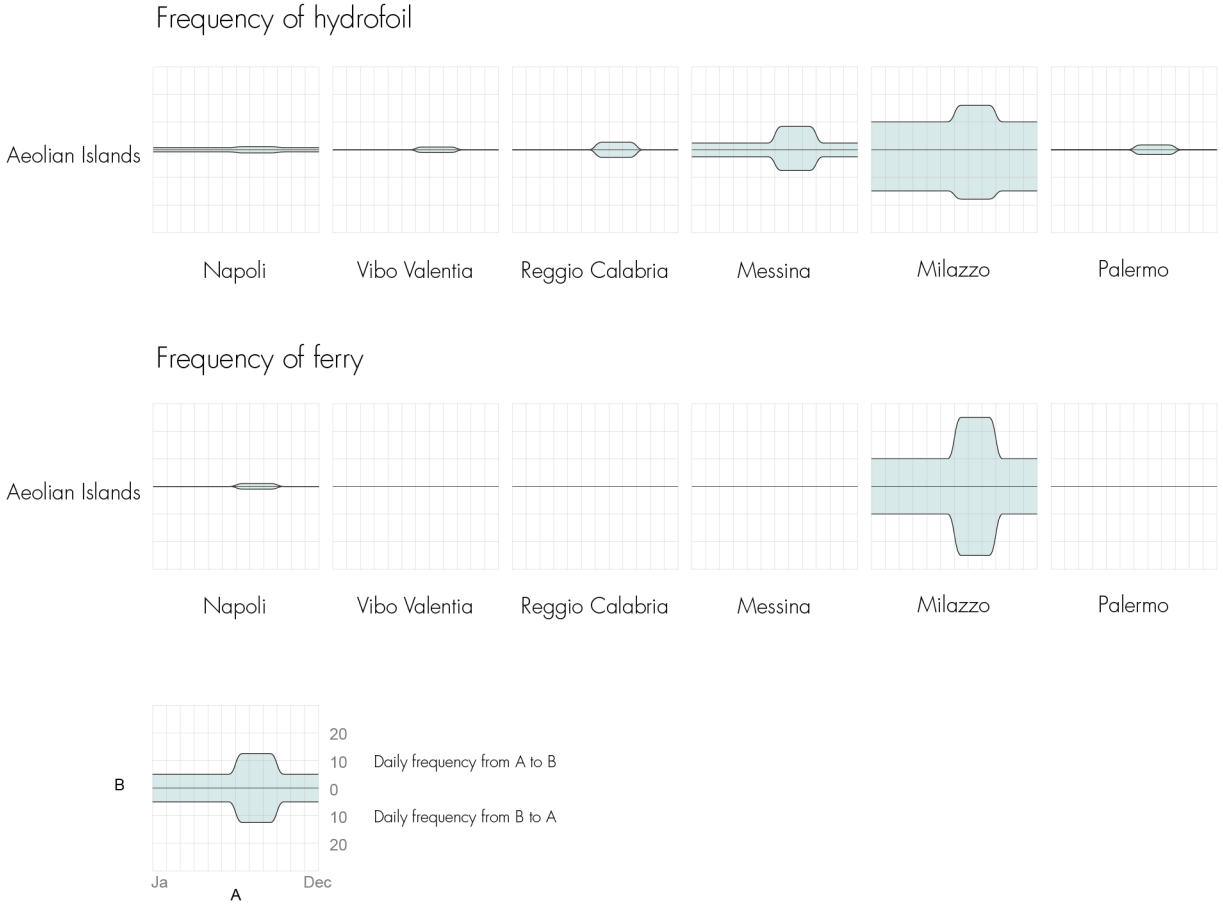
Aeolian Islands are accessible from some major cities in Sicily Island (Palermo, Milazzo, Messina) and in peninsula (Napoli, Vibo Valentia, Reggio Calabria) by maritime connection. Each city is also connected by road and railway with each other.



Frequency of hydrofoil and ferry

Milazzo is the most favorable choice to reach Aeolian Islands among those cities, with the shortest distance and the most frequent maritime connection.

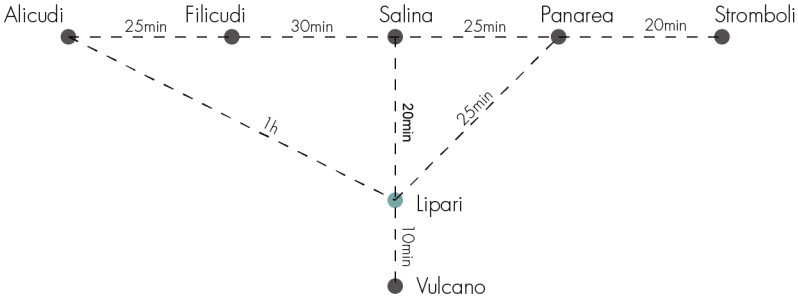
Milazzo and Napoli are the only two cities where there are ferries to Aeolian Islands, which makes it possible to transport vehiclesto the destination.



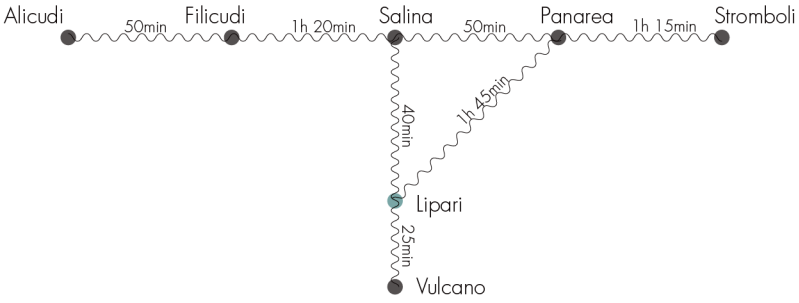
Maritime connections in Aeolian Islands

Each islands in Aeolian Islands can be reached from another by hydrofoil or ferry, while Lipari, Vulcano and Salina have the most frequent connection. Generally, the maritime connection is more frequent in summer than in winter.

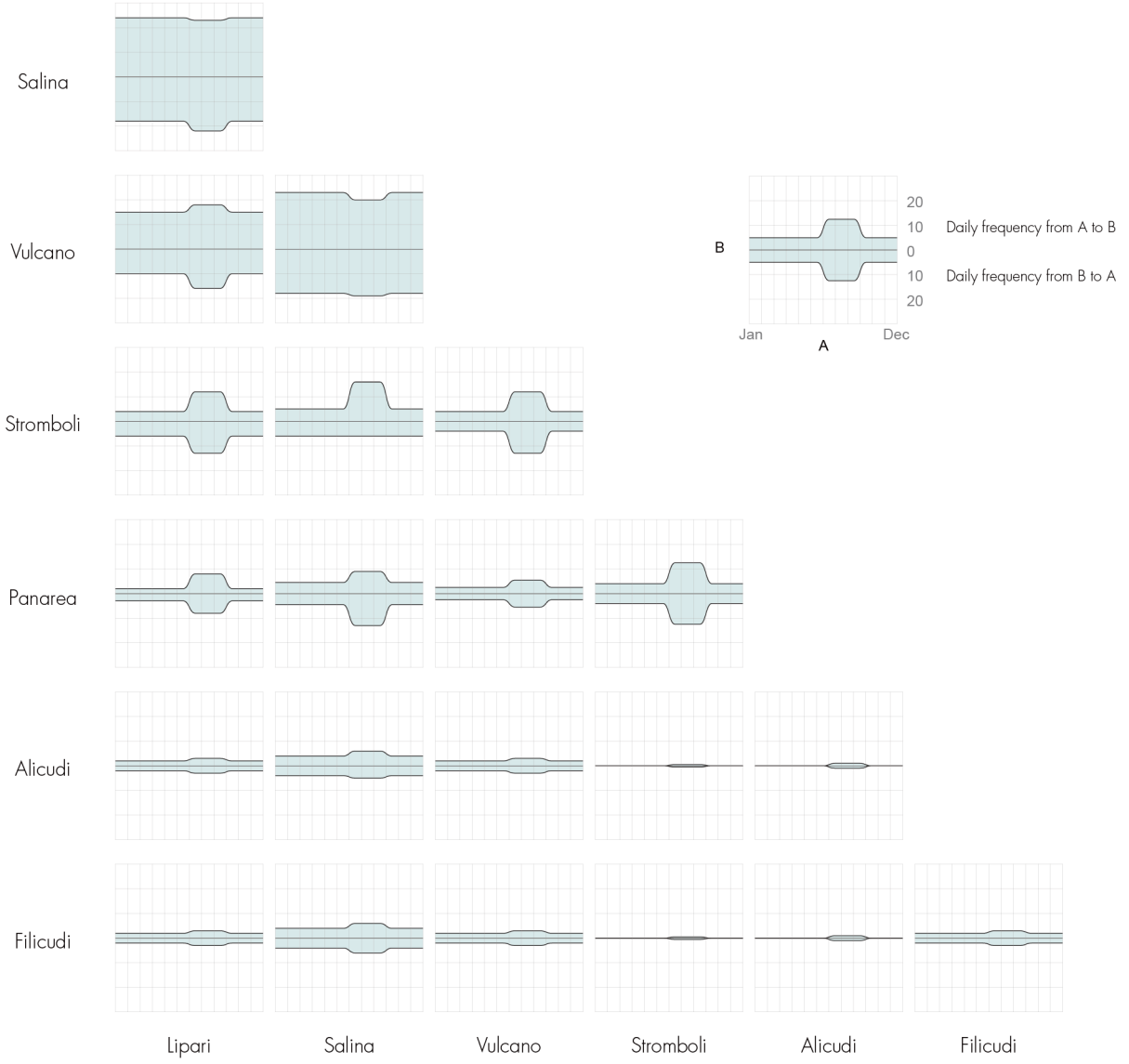
Connection by hydrofoil



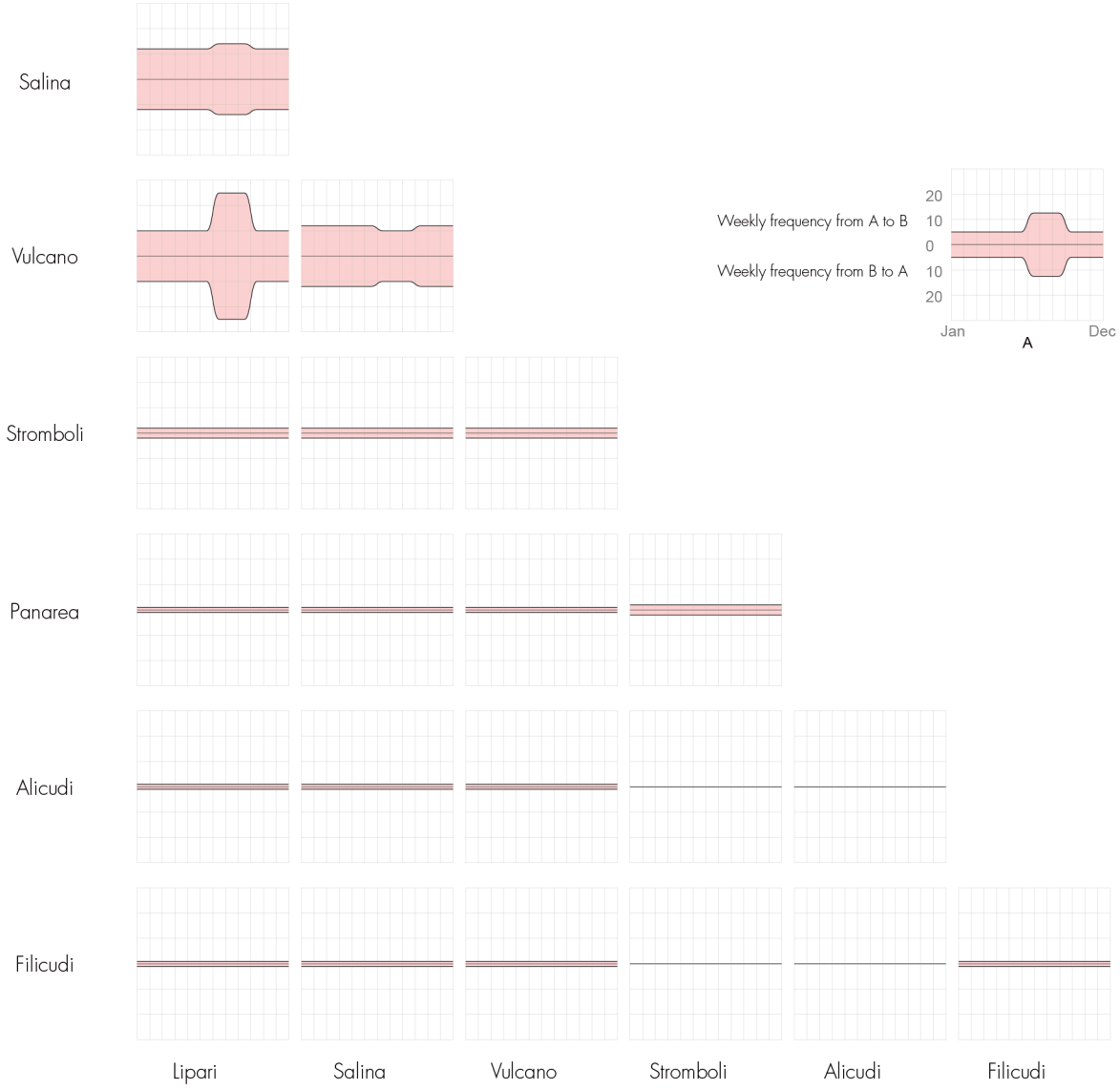
Connection by ferry



Frequency of hydrofoil



Frequency of ferry



TOURISM FACILITIES

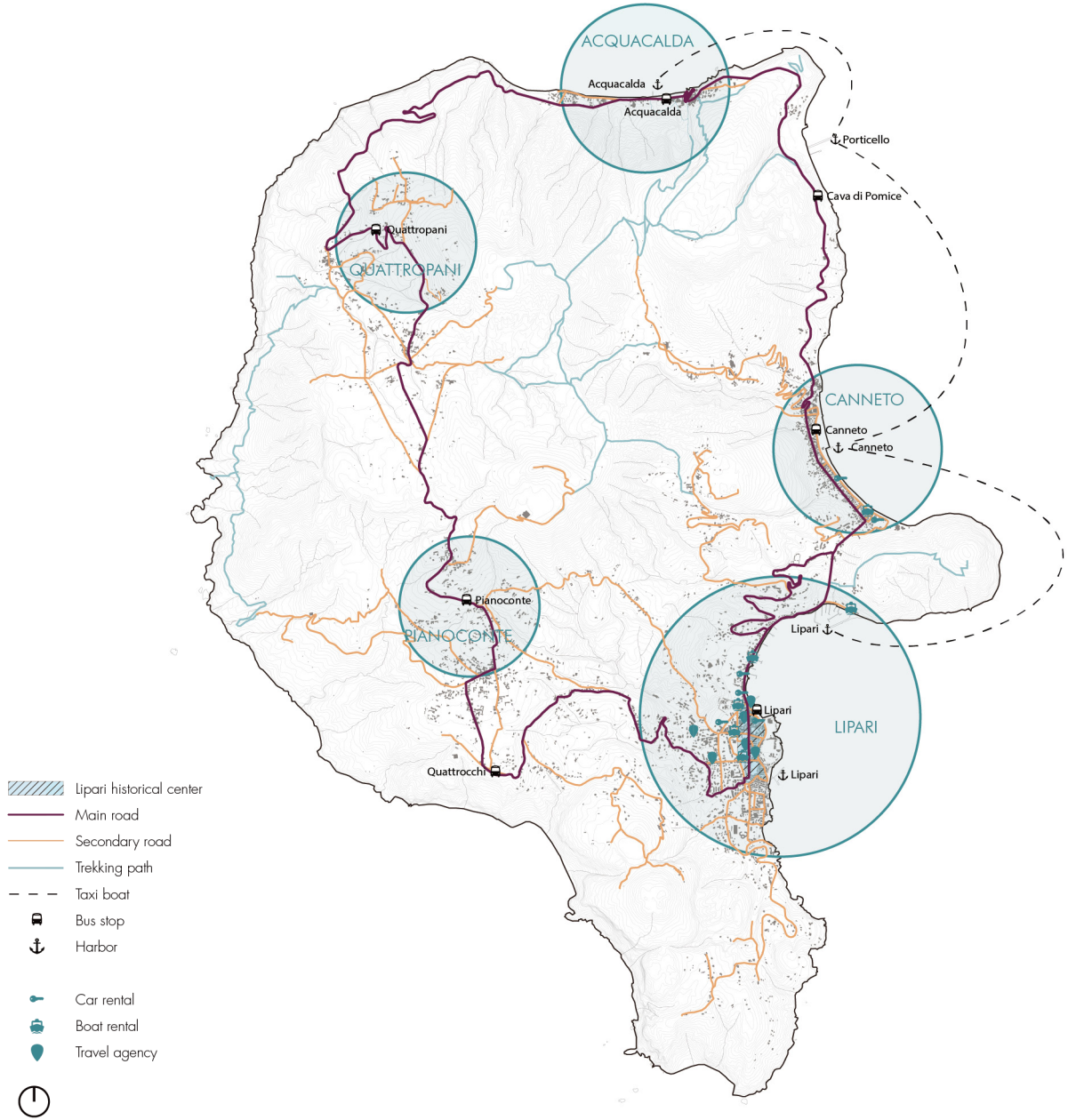
Tourism facilities and Lipari one-day trip suggestion

Besides the main town, there are four main villages: Canneto, Acquacalda, Quattropani and Pianoconte. There is a main road around the whole island connecting each town and a bus line by which people can reach some important places in the island.

"Taxi boat" is available in Lipari, which provides another choice for people to reach other places in Lipari Island by boat. There are main four harbors in Lipari Island (Lipari, Canneto, Porticello and Acquacalda).

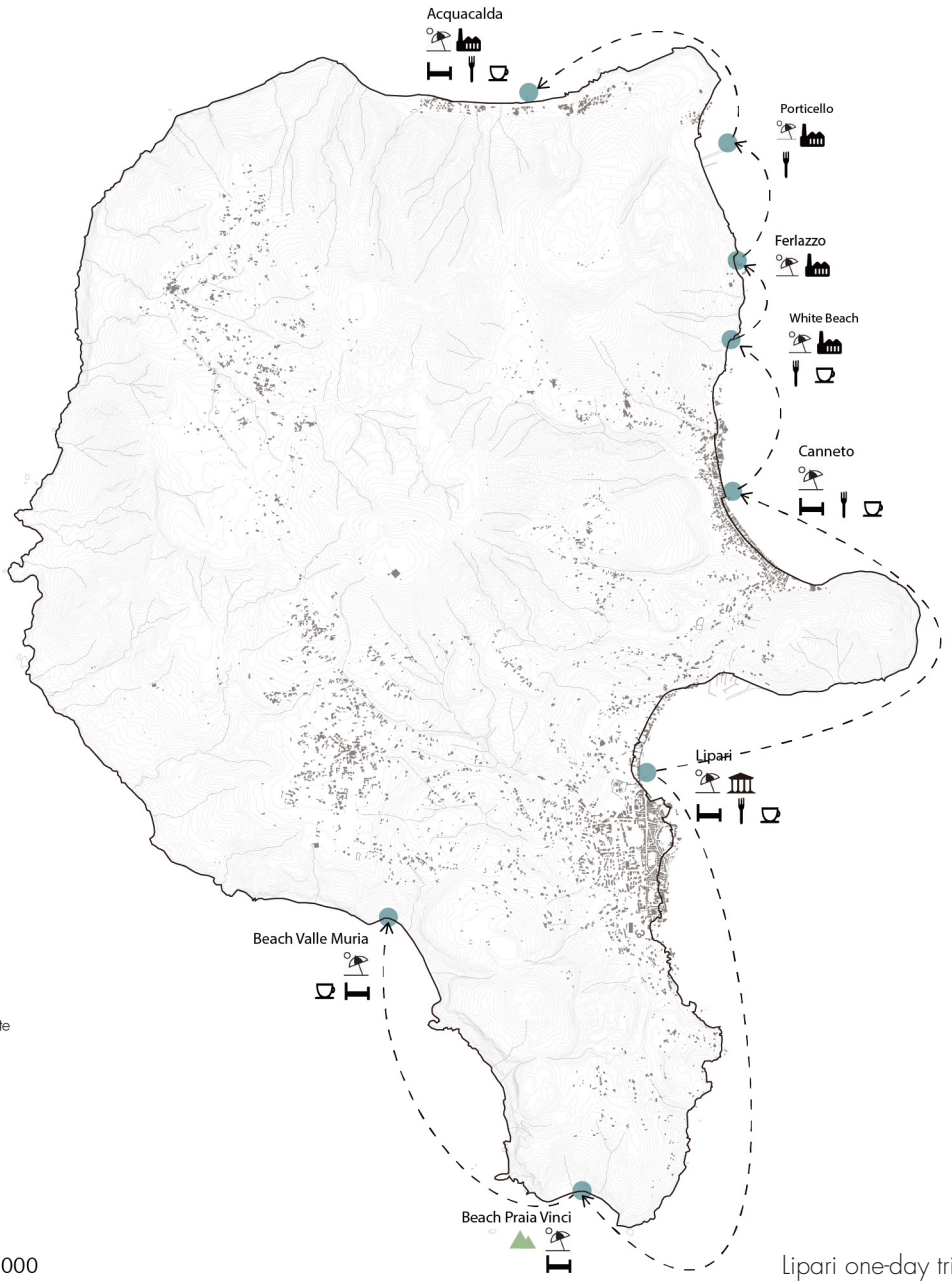
Lipari is the main town in the island and it has the most travel agencies and rentals (both car and boat), while there are also a few in the town of Canneto.

For a one-day boat trip in Lipari Island, there are two possible choices. One is to head north to see the pumice quarries and beaches, another is to go to Beach Praia Vinci, the southmost of the island.



Scale 1:60 000

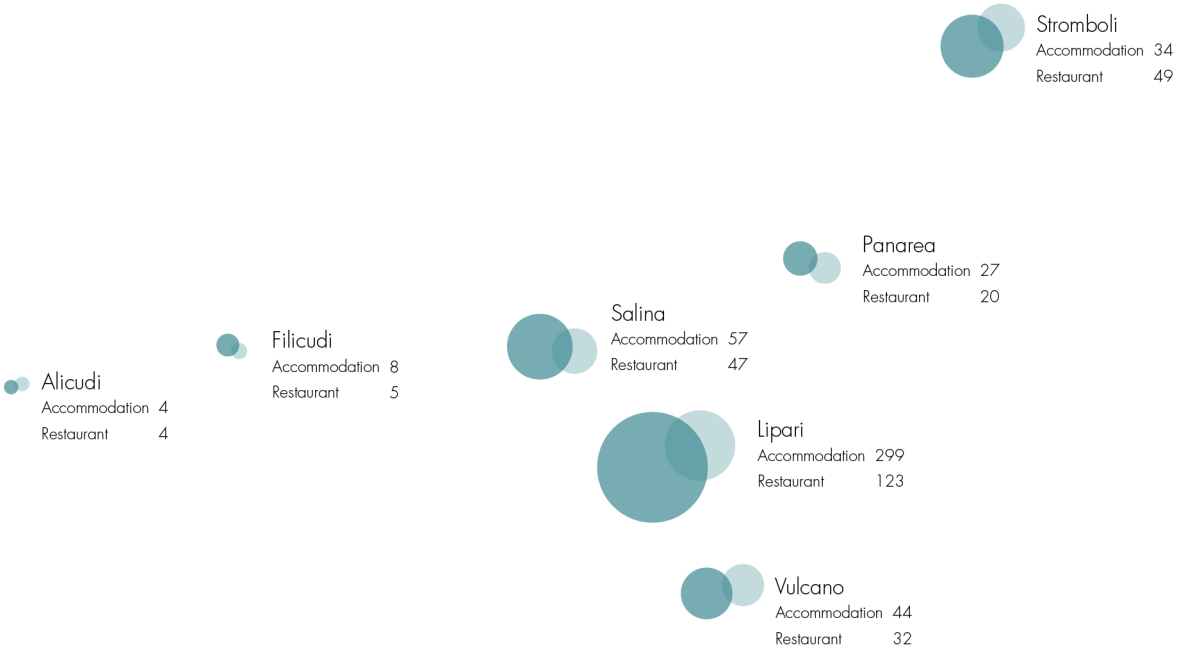
Tourism facilities



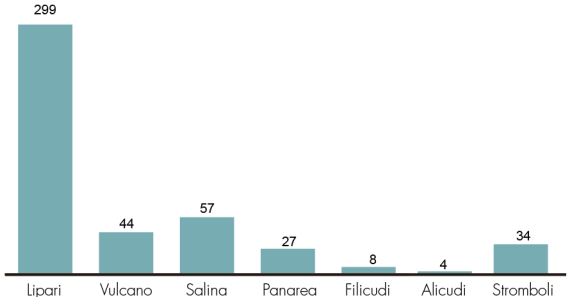
Lipari one-day trip suggestion

Distribution of accommodations and restaurants in Aeolian Islands

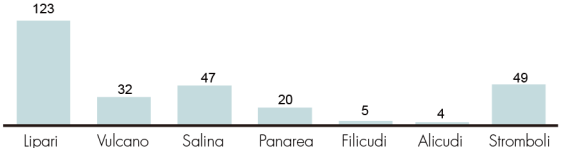
As the biggest island, Lipari has the most accommodations (299) and restaurants (123). Besides, there are few accommodations and restaurant in Filicudi and Alicui, with respectively only 8 and 5 accommodation, and 4 restaurants for each, which may cause possible difficulty for people's staying there.



Distribution of accommodations in Aeolian Islands

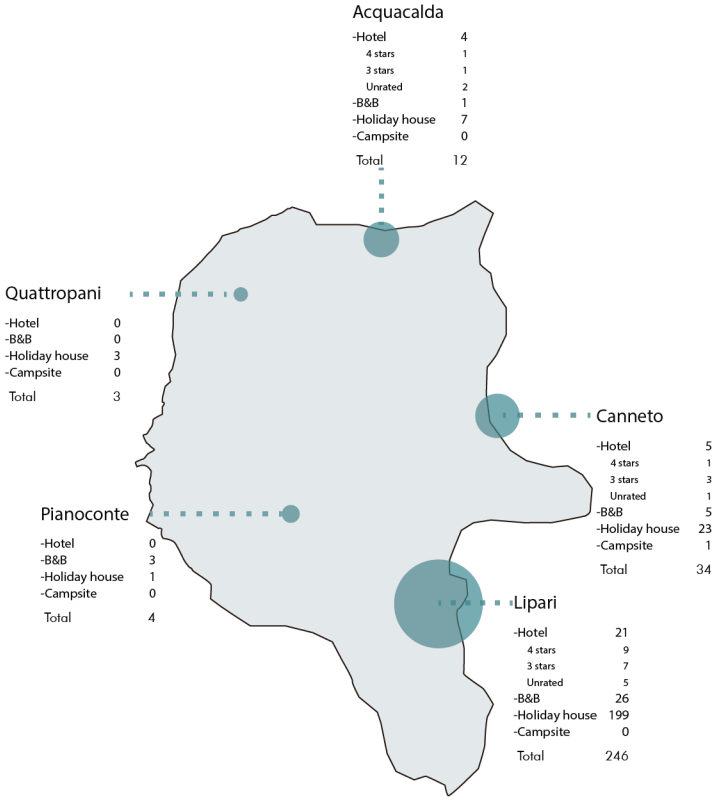


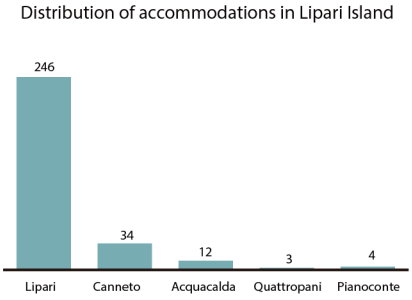
Distribution of restaurants and bars in Aeolian Islands



Distribution of accommodations in Lipari Island

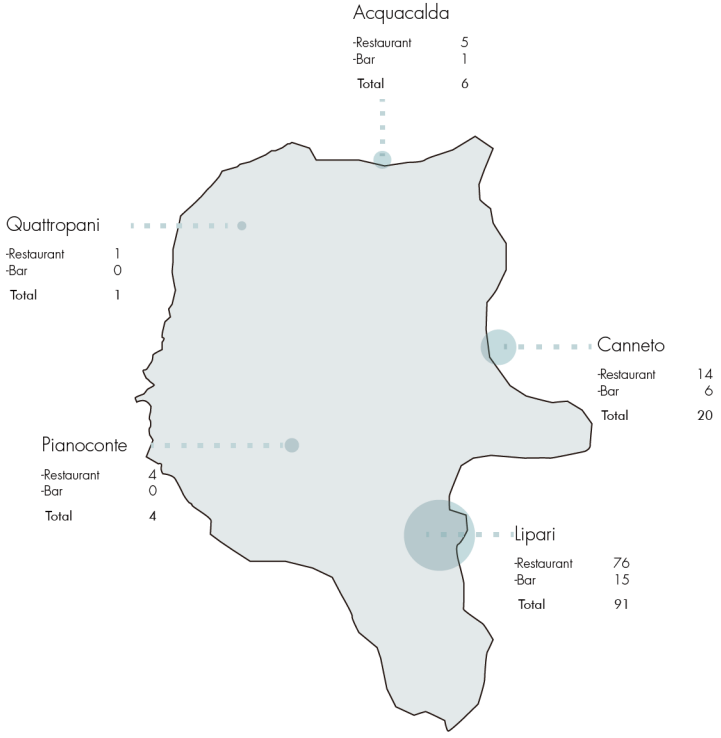
From the distribution of accommodation, restaurant and bar, we can see that it is much easier to find accommodation in the main town Lipari, with 246 out of 299 in the whole island.

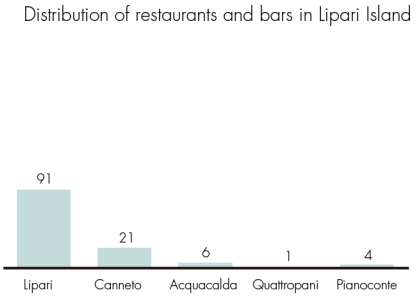




Distribution of restaurants and bars in Lipari Island

The same as the ditribution of accommodations, Lipari has the most restaurants and bars compared with any other place in the whole island.





SYSTEM OF THE PATHS.....

History of the Roads in Lipari

Aeolian islands are the islands system which are composed by 7 islands. Lipari is the largest of this system. The history of the island is coming from Neolithic Ages but one of the official settlements and circulation roads were demonstrated in historical map of the year 1802. It shows that town center of Lipari is the first settlement of the island. Since it has a marine, the marine is the main access point of the island from the sea so the town developed as the first. Also, the map of the year 1802 proves that one of the other first settlement is Pianoconte. The map demonstrades primitive version of the path between Pianoconte and Lipari. The connection between Pianoconte and Lipari was improved during the time and 66 years later, new settlements were came to exist. In addition to them, district of Quattropani and Canneto were arisen in 1868. New various paths were developed around these towns. In 1955, the main improvement in the island is on the north direction. Acquacalda and its connection paths were built during these years. Also the city center of Lipari was enlarged. In 30 years, island connection was improved in a good way and there is a direct circle round path which passes through Acquacalda, Punta del Legno Nero, Quattropani, Pianoconte, Lipari, Canneto and Porticello.

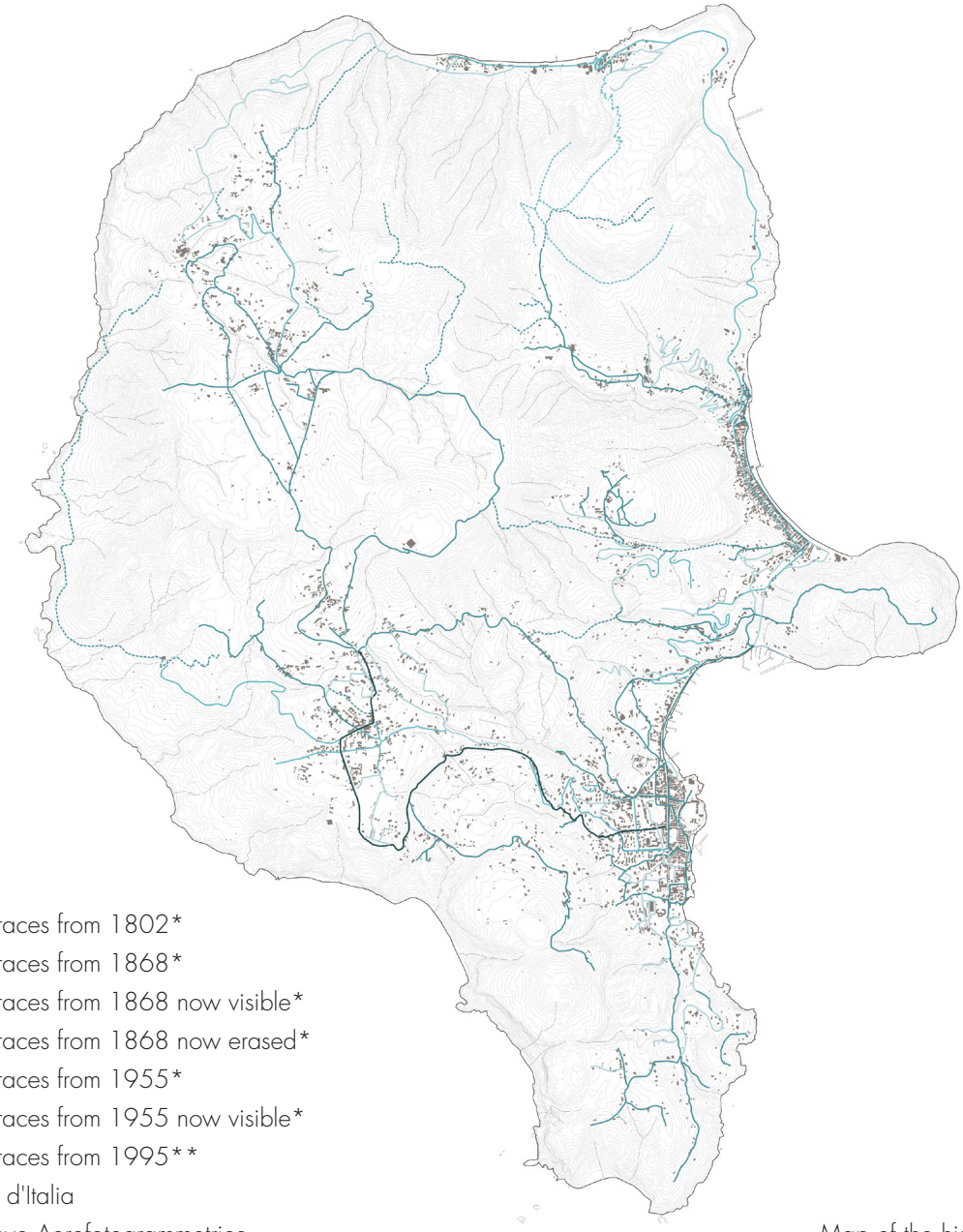
Development of the Roads

Lipari Island Map
1802

Lipari Island Map
1868

Lipari Island Map
1965

Lipari Island Map
1995



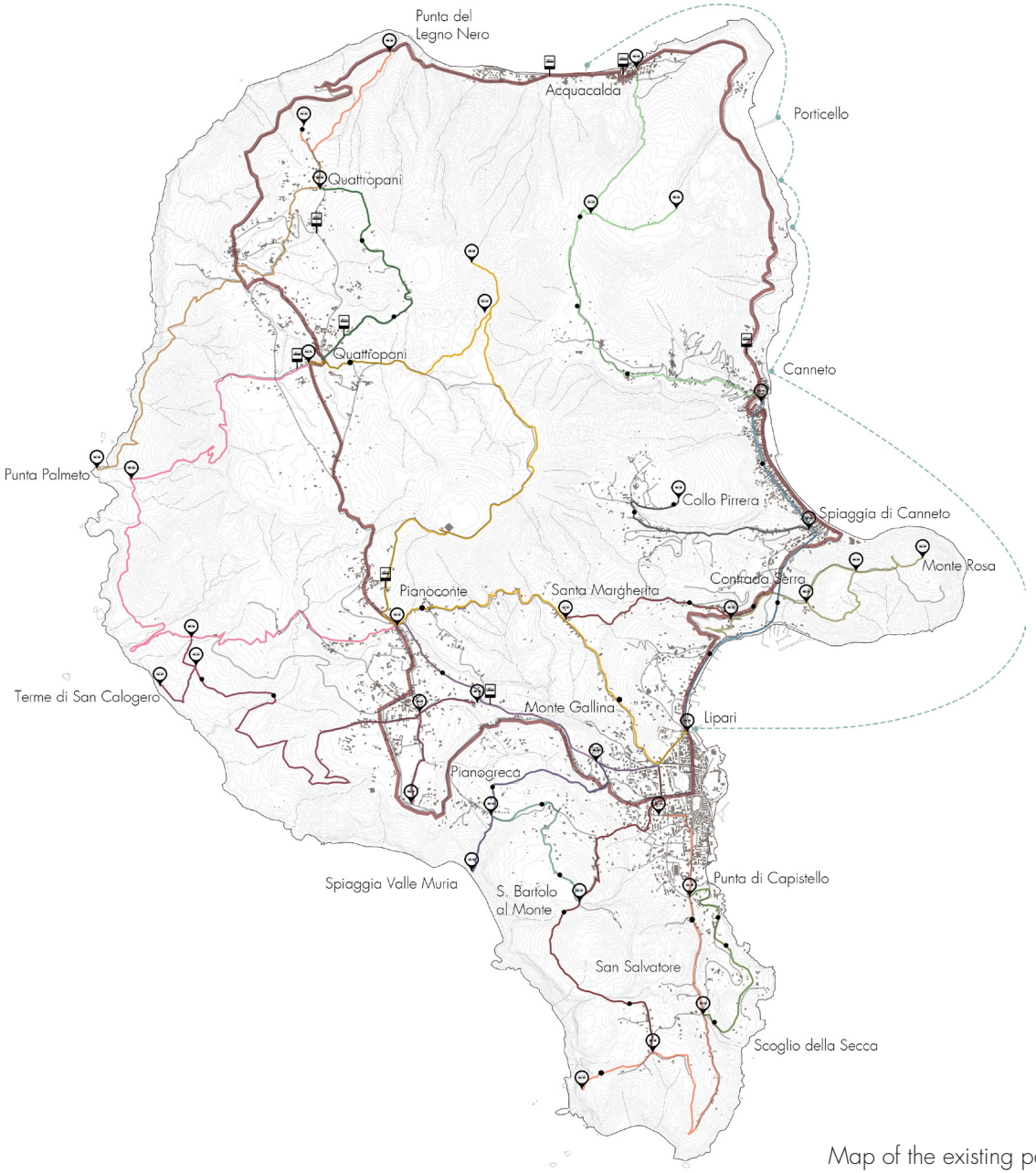
Map of the historical path

Existing Roads and Paths in Lipari

Today in Lipari, trekking paths are more actively in use instead of car, bus and motorbike roads. They serves different possibilities to enjoy the island in different levels. Because of its natural form, the volcanic island has lots of hills with a different height and various points of view towards other islands around. Rather than the magnificant nature of the island, there are also historically important buildings which you can find through some of the paths.

To improve turistic activities in the island, the municipality and some private tourism agencies are offering different trekking routes. These routes have changing difficulties, purposes and different view possibilities. In the island, there are also public bus stops but because of the narrow roads it is useful to travel by private shuttles to reach the paths. It is a small island that people can pass by using different routes such as from the pumice quarry to sea or from the base of black obsidian to an area with kaolin. In one place, it is possible to see a small town texture but in another you can see an abondoned ruins of an old factory. In addition to its geological morphology, there are also unique nature of the volcanic island. By taking some of the paths, you can walk through the vine yards and in the higher points you can see the contrast of the green with the beautiful blue of the sea.

The whole island is surrounded by geological settings with the integration of different town centers. For trekking paths, people can choose whether taking the path only itself or making a combination among them. All paths have different duration from 32 minutes to 3 hours 58 minutes and also different difficulties according to the slope or the type of the ground. According to those factors, people can choose what they want to see and which chalange level that they want.



Map of the existing path

Route	Location	Distance	Go	Back
	1. Quattropani - Lipari	10.9 km	3h 20m	3h 58m
	2. Monte Gallina - San Salvatore	5.1 km	1h 38m	1h 23m
	3. Lipari - San Salvatore	4.1 km	1h 16m	1h 27m
	4. Punta di Capistello - Scoglio della Secca	3.0 km	1h 06m	1h 01m
	5. S. Bartolo al Monte - Pianogreca	1.6 km	37m	32m
	6. Canneto - Lipari	3.9 km	54m	56m
	7. Spiaggia Valle Muria - Monte Gallina	2.6 km	1h 03m	59m
	8. Pianoconte - Lipari	2.8 km	51m	1h 05m
	9. Monte Gallina - Terme di San Calogero	8.9 km	2h 24m	2h 46m
	10. Pianoconte - Quattropani	8.1 km	2h 18m	2h 27m
	11. Quattropani- Quattropani	2.8 km	52m	46m
	12. Quattropani - Punto del Legno Nero	2.0 km	53m	39m
	13. Quattropani - Punta Palmeto	5.5 km	1h 46m	2h 1m
	14. Canneto - Acquacalda	5.1 km	2h 15m	2h 45m
	15. Spiaggia di Canneto - Collo Pirrera	2.5 km	54m	40m
	16. Santa Margherita - Contrada Serra	1.7 km	25m	35m
	17. Monte Rosa - Lipari	3.8 km	1h 02m	43m
	Car & Motorbike (Main Road)			
	Taxi Boat			
	Private Bus			
	Public Bus			
	Location of the Photograph			



1. Quattropani - Lipari

It is one of the main branches of the island which connects some small towns through its path. Most of the part is covered with asphalt. In some parts it is passing through the mountain part with a pumice road. It has a landscape view on the sides of a narrow road.


2. Monte Gallina - San Salvatore

It is a way through the observatory house of Lipari. It is on a hill in the southeast part of the island. During the trip on the asphalt road, there is a sea view on one side. In the highest point, it is possible to see the Island Vulcano.


3. Lipari - San Salvatore

It is another branch of the roads coming from the center of Lipari to the south part of the island, through the nature. It connects the small settlement of San Salvatore to the center. It turns into narrow country road when its passing through the landscape.



4. Punta di Capistello - Scoglio della Secca

It is a small road that connects some private houses with a great view of sea. There is a possibility to see the center of Lipari in a higher position from the south. The asphalt road is on the cliff and has an alignment with the coast.


5. S. Bartolo al Monte - Pianogreca

It is a small connection road between two settlements. It locates in a high level and because of that there is a view of the center from the top. Asphalt road passes through some small houses and green landscape.



6. Canneto - Lipari

This road connects Lipari center to Canetto which is the second largest settlement of the island. It is an asphalt road which passes through the mountain with a tunnel. Inside of the Canetto, it passes through small buildings of the town as a narrow street. It is an important path to reach the public facilities in the town and also to see some churches and museums in downtown.

7. Spiaggia Valle Muria - Monte Gallina

It is a narrow connection road from Monte Gallina to the large beach on the south-west part of the island. It is a narrow asphalt road through the trees and fields.

8. Pianoconte - Lipari

It is a secondary road to connect the village Pianoconte and main center of Lipari. It is passing through yards and green areas.

9. Monte Gallina - Terme di San Calogero

It is another rural asphalt road which works as a landscape path to enjoy the western site of the island. It leads to natural water sources and beautiful nature views. This asphalt road connects the small town with the main car road.

10. Pianoconte - Quattropani

This path connects Pianoconte to Quattropani passing over the west cost of the island; it is a narrow path just partially paved and almost totally deep in the green hills, out of the built areas.

11. Quattropani - Quattropani Chiesa Vecchia

This road connects two different sides of the village Quattropani. It is a narrow asphalt road passes through some houses and fields. It is a great landscape path which has a western sea view from the top. It leads to the road of the old church.

12. Quattropani - Punta del Legno Nero

This road connects the village Quattropani and the main road passing through a coastal village Porticello. It is a concrete road passes through a historic church. It is a path serves both historic and landscape views and places. It has a view to the island of Salina.


13. Quattropani - Punta Palmeto

This path brings till the panoramic point of Punta Palmeto, where is posible to see the near island of Salina. It is almost totally out of the built areas and pass along the western cost of Lipari Island.


14. Canneto - Acquacalda

It is another narrow road from the town Canneto to the main crater of the island. At the beginning, it starts as an asphalt road and in the second half continues as a country road. It passes through vine yards and small villages. On the top, one of the branches goes through an old bee farm which locates in the crater. At the edge, there is a direct view to the largest quarry of the island. In the other branch of the road, it is possible to take the trekking path which leads to the village Acquacalda. It is just a narrow trekking path passing through trees and bushes. During the trip, it is possible to see Acquacalda in a higher position.


15. Spiaggia di Canneto - Collo Pirrera

It is a short connection road between the town of Canetto and upper side of the mountain. Through out the road it is possible to see some historic buildings. At the end of the path, the asphalt road turns into stone paved narrow road which leads to a panoramic point.

16. Santa Margherita - Contrada Serra

It is an asphalt connection road between the Santa Margharita village and the main road which is circulating the whole island. It gives an opportunity to have a view of landscape and Lipari center view from an upper level.

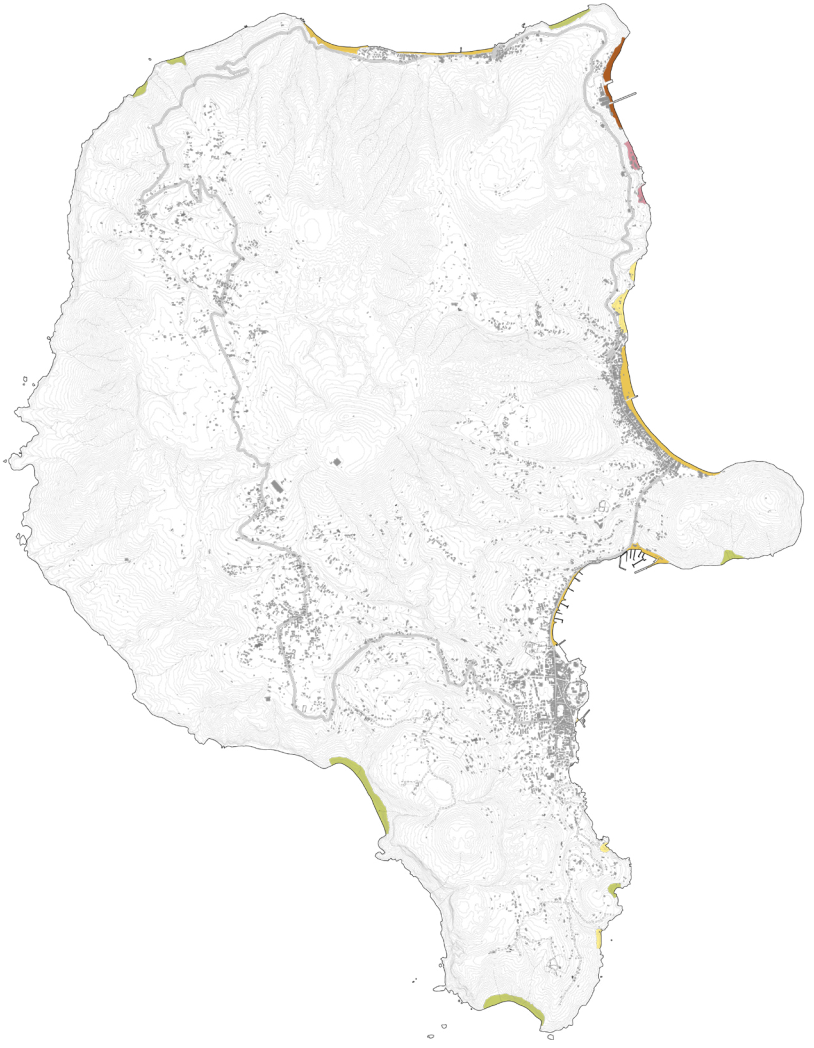
17. Monte Rosa - Lipari

Monte Rosa is the arm shaped extrusion of the island towards the east. It is a hill which has a small church on top. The location has a great view of panaroma with a large angle. It is a nice trekking path through the green and the blue of the sea at the back which serves a view to both Lipari center and Canneto downtown.

BEACH ACCESSIBILITY ANALYSIS.....

Beach Accessibility Analysis

Beaches on Lipari Island can be classified as three types (touristic/public beaches, industrial beaches and undeveloped beaches) by their function. The first two types of beaches are distributed around the main loop road which connects the whole island. While the type undeveloped beaches do not have paths linked with the main road.



Main Road

Path Way

Touristic/Public Beach
Easy/Direct Accessibility

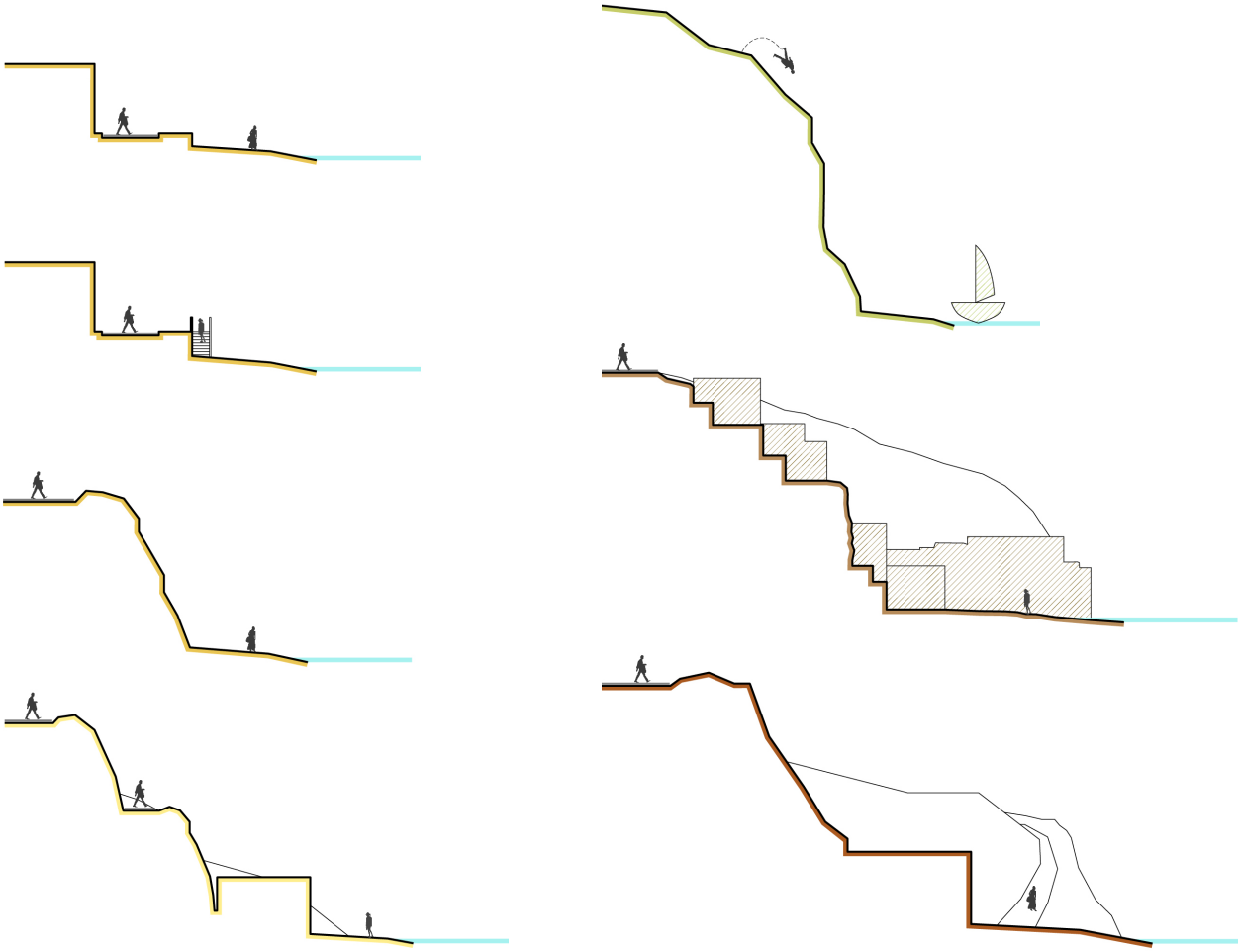
Touristic/Public Beach
Accessible by Long Stairs/
Ramps

Industrial Beach
Easy to access

Industrial Beach
Difficult to Access/Cross
Buildings

Undevelopped Beach
Hard to Access

As to aspect of accessibility, touristic/public beaches near Lipari town, Canneto and Acquacalda have the less height differences with the main road (less than 5m) and can be reached directly or easily. To enter other touristic beaches or industrial beaches, visitors need to pass a serious of buildings or structures and sometimes the entrance needs the permission of the owners. The height differences between these two types of beaches are generally large so visitors need to pass long stairs or ramps. The accessibility to undeveloped beaches is hard for there barely have artificial path connecting to the main road.



Schematic beach sections

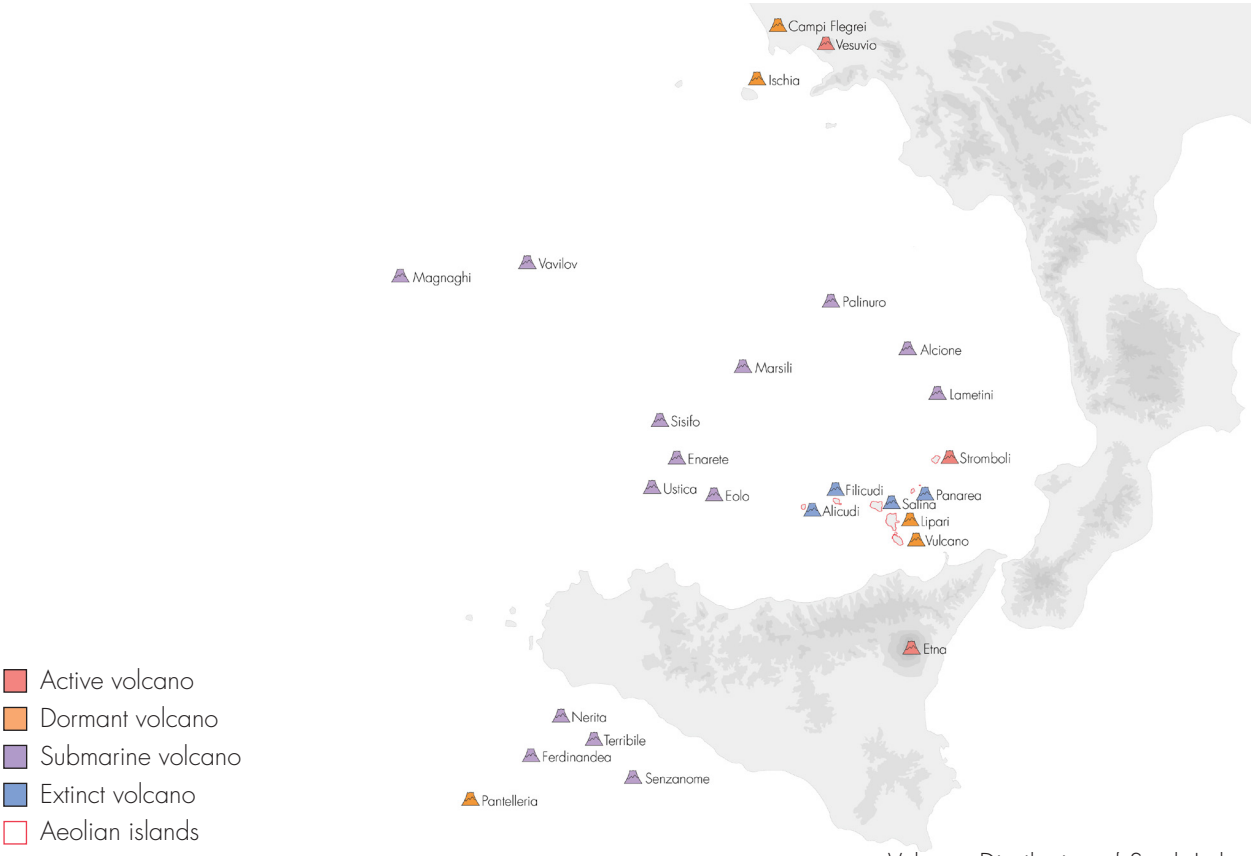
LANDSCAPE AND PROTECTION

Volcanology and geomorphology
Vegetation analysis of Lipari island
Territorial sections analysis

VOLCANOLOGY AND GEOMORPHOLOGY

Volcanoes in South Italy

The Italy volcanism owes its origin to a wide ranging geological process, involving the entire Mediterranean area and linked with the Euroasiatic and African tectonic plates converging together.
This process, begun 10 million years ago, at the same time as the mountain ranges of the Apennine chain were being built up, is due to the African plate sliding underneath the Euroasiatic one with subsequent formation of areas characterized by volcanism. It is in fact in these areas, inside the earth, where the conditions are created to form magmas and to propel them up towards the surface.
The international scientific community has adopted various criteria to classify Italian volcanoes, we have the Activity Status dividing them into extinct, dormant and active.



Volcano Distribution of South Italy

Classification of Volcanoes in Italy

· Extinct volcanoes

Volcanoes which last erupted over 10,000 years ago are defined as extinct. These include the Amiata, Vulsini, Cimini, Vico, Sabatini, Pontine Islands, Roccamonfina and Vulture volcanoes.

· Dormant volcanoes

Whereas dormant volcanoes have erupted during the last 10,000 years but are currently in a period of dormancy. According to a more exacting definition, volcanoes with a current period of dormancy shorter than the longest period of dormancy registered previously are considered dormant. Here we have: Colli Albani, Phlegraen Fields, Ischia, Vesuvius, Salina, Lipari, Vulcano, Ferdinandea Island and Pantelleria. Amongst these, Vesuvius, Vulcano and Phlegraen Fields, have a very low eruptive frequency and their conduits are now obstructed. Not all the dormant volcanoes present the same risk level, both for the hazard of expected phenomena as well as for the differing extent of population under exposure. Furthermore some have a secondary vulcanism phenomena (degassing from the ground, fumaroles, etc.) which may well cause situations of risk.

· Active volcanoes

Finally, volcanoes having erupted over the last few years are defined as active. These are Etna and Stromboli that frequently erupt and represent a reduced hazard at short term due to their open conduit activity.

· Submarine volcanoes

Volcanic activity in Italy is also concentrated in the underwater areas of the Tyrrhenian Sea and Canale di Sicilia. Several submarine volcanoes are still active, others, now extinct, represent true and proper submarine mountains. Apart from the better known Marsili, Vavilov and Magnaghi volcanoes, the submarine Palinuro, Glauco, Eolo, Sisifo, Enarete volcanoes as well as the volcanic areas in the Canale di Sicilia should also be mentioned.

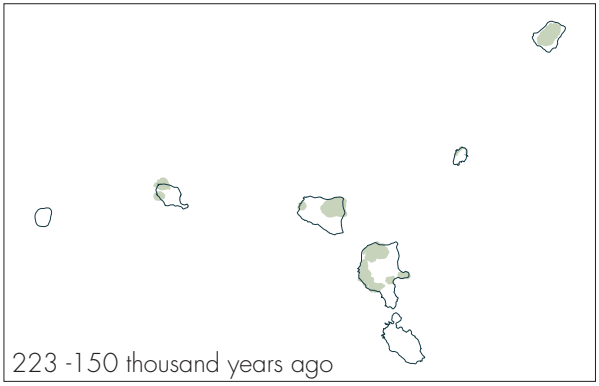
Aeolian Islands

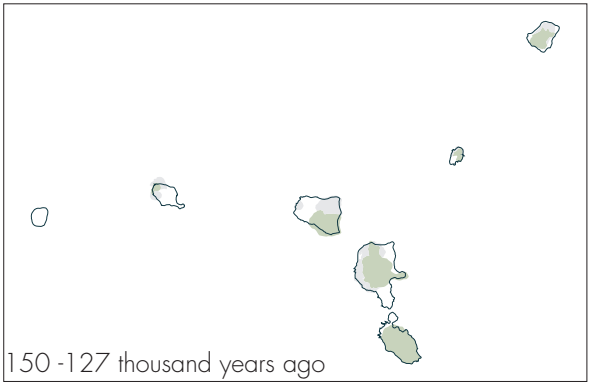
The Aeolian Islands are a volcanic archipelago in the Tyrrhenian Sea north of Sicily.
The origin of the Aeolian Islands is due to movement of the Earth's crust as a result of plate tectonics. The African continental shelf is in constant movement towards Europe. The resulting collision has created a volcanic area with ruptures in the Earth's crust with consequent eruptions of lava.
Geologically the archipelago is defined as a volcanic arc. The seven Aeolian Islands are only the emerged part of impressive volcanic structures that form the almost semi-circular Aeolian volcanic arch. This complex geological structure, about 200km long, includes, in addition to the islands, also five completely submarine volcanoes: Eolo, Enarete and Sisifo to the west of Alicudi and Lametini and Alcione to the north of Stromboli.

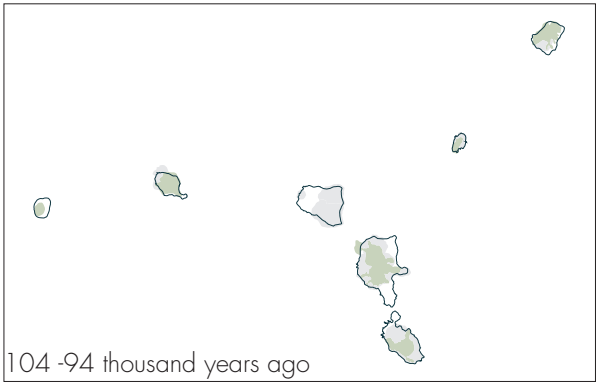
Map of Aeolian Islands

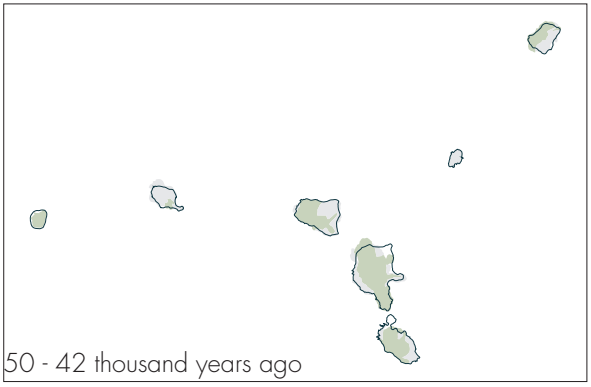
Evolution of Aeolian Islands

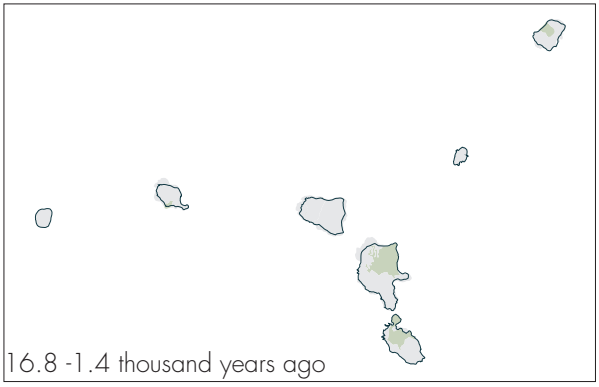
The present shape of the Aeolian Islands is the result of volcanic activity over a period of 260,000 years. The volcanic activity of steaming fumaroles and thermal waters are on most of the islands. The volcanic activity has also left the islands with very fertile soil that is conducive to the growth of natural flora.











present boundary volcano products pre-exist volcano product

Evolution of Lipari Island

Lipari, the largest island of the archipelago, is the emerged portion of a large volcanic apparatus, about 1600 m high which, starting from a depth of about 1000m below sea level reaches 602meters above sea level (Monte Chirica located in the north island).

The oldest rocks outcropping on the island are aged 223,000 years, the younger ones date back to the 6th century AD (Monte Pilato and Forgia Vecchia). This last phase, particularly recent, emphasizes that from a volcanological point of view, Lipari must still be considered an active volcano. Currently the only evidence of volcanic activity is represented by fumaroles (between Timpone Pataso and Timpone Ospedale) and thermal springs (Terme di San Calogero and Bagno Secco). The fumarolic activity is responsible for the formation of the kaolin quarries that are located in the western part of the island.

The island of Lipari, like all the Aeolian Islands, is the result of a complex series of volcanic eruptions that have occurred over the millennia.

Map of Lipari Island

Eruptive Epoch 1

Old volcanoes

267 thousand years ago

The oldest exposed Paleo-Lipari products are lava flows and pyroclastic products with minor scoriae that built up a number of centers mostly localized along the west coast of Lipari (Pietrovito, Timpone Carrubbo, M.Mazzacaruso) and very subordinately in the central sector (Timpone Croci).

These centers are named 'old volcanoes'. Their activity was of central-type and was generally characterized by an initial hydromagmatic explosive phase, followed by the emission of strombolian scoriae and lava flows.

Eruptive Epoch 1

Eruptive Epoch 2

Western volcanoes

267 - 88 thousand years ago

Renewal of volcanism during Epoch 2 followed a major period of volcanic inactivity that is recorded in the widespread angular unconformity. The activities occurred from a number of volcanic centers located along the west coast of Lipari, namely the 'western volcanoes'. They were both of central-type (M. Mazzacaruso, Timpone Carrubbo and Chiesa Vecchia) and fissural-type (M. Chirica, Fuori del Pertuso and Timpone Ospedale), and are mostly distributed along north–south alignments.

Eruptive Epoch 2

Eruptive Epoch 3

M. Chirica, intermediate portion

150 thousand years ago

M. Chirica renewed its activity during Epoch 3 after a period of quiescence recorded in the unconformity la exposed along the valleys that cut the northern flank of the edifice.

This activity produced a thick volcanic succession (V.ne di Bezzotti Formation) that built up the intermediate (main) portion of the M. Chirica edifice.

Eruptive Epoch 3

Eruptive Epoch 4

M. S.Angelo (lower portion) and Monterosa

119 - 114 thousand years ago

The M. S.Angelo stratocone and the Monterosa centers were active during Epoch 4.

This led to a significant shift of the vent localization towards the central and eastern sectors of Lipari.

Eruptive Epoch 4

Eruptive Epoch 5

M. S.Angelo, intermediate portion

105 thousand years ago

The M. S.Angelo activity renewed during Epoch 5 after a major inactive period and was recorded in the unconformity.

This activity produced widespread high-K CA andesite (to dacite) hydromagmatic pyroclastic products and lava flows that overall constructed the intermediate and main portion of the M. S.Angelo stratocone.

Eruptive Epoch 5

Eruptive Epoch 6

M. S.Angelo (upper portion) and M. Chirica

92 - 81 thousand years ago

Epoch 6 was characterized by renewed activity of M. S.Angelo and M. Chirica, with no substantial changes of eruption types and chemical composition of erupted products (high-K CA andesites) with respect to the previous activities.

Eruptive Epoch 6

Eruptive Epoch 7

Southern dome-field, lower portion

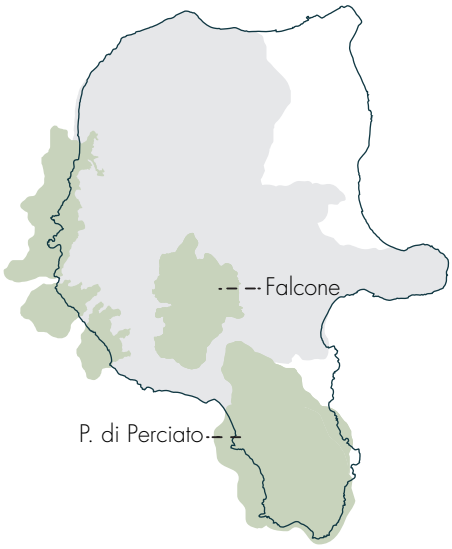
43 - 40 thousand years ago)

Renewal of volcanism occurred from vents located in the southern sector of Lipari, and resulted in the remarkable onset of rhyolite magmatism.

Epoch 7 was characterized by two distinct eruptions following a recurrent eruptive scenario with initial explosive phases and late effusion of endogenous lava domes.

The oldest products exposed in the southern sector of Lipari are the remnants of two lava domes cropping out along the coastal cliff of Scogliera sotto il Monte (P. del Perciato Formation), including the isolated rocks of le Formiche, Pietralunga and Pietra Menalda. Renewed activity during Epoch 7 resulted in the Falcone Formation products. The initial explosive phases were driven by magmatic fragmentation mechanisms and produced a thick succession of whitish pumiceous lapilli-tuffs that is widespread in the southern-central part of Lipari.

Eruptive Epoch 7



Eruptive Epoch 8

Southern dome-field, upper portion

27 - 20 thousand years ago

Renewal of rhyolitic volcanism in southern Lipari occurred during Epoch 8 following an eruptive scenario similar to the previous activities.The reknown M. Guardia pumiceous products and various domes were erupted, and constructed the upper portion of the southern dome-field of Lipari. Epoch 8 is arranged into two distinct sequences of eruptions, subdivided by a minor period of inactivity.

The early activities of Epoch 8 were those of the M. Guardia subplinian eruption, which is known as one of the most powerful in the Aeolian archipelago. The activity renewed with emission of some rhyolite endogenous lava domes of Castello, V.ne Canneto dentro and Capo Rosso.

Eruptive Epoch 9

North-eastern dome-field

8.7 thousand years ago

Epoch 9 activity followed a period of quiescence that is recorded in a sharp erosional unconformity cutting the Castello, V.ne Canneto dentro and Capo Rosso domes. The activity ranged from 8.7 thousand years ago to medieval ages and produced successive pumiceous successions and viscous obsidian-rich lava coulees that constructed a dome-field in the north-eastern sector of Lipari.

Eruptive Epoch 8

Eruptive Epoch 9

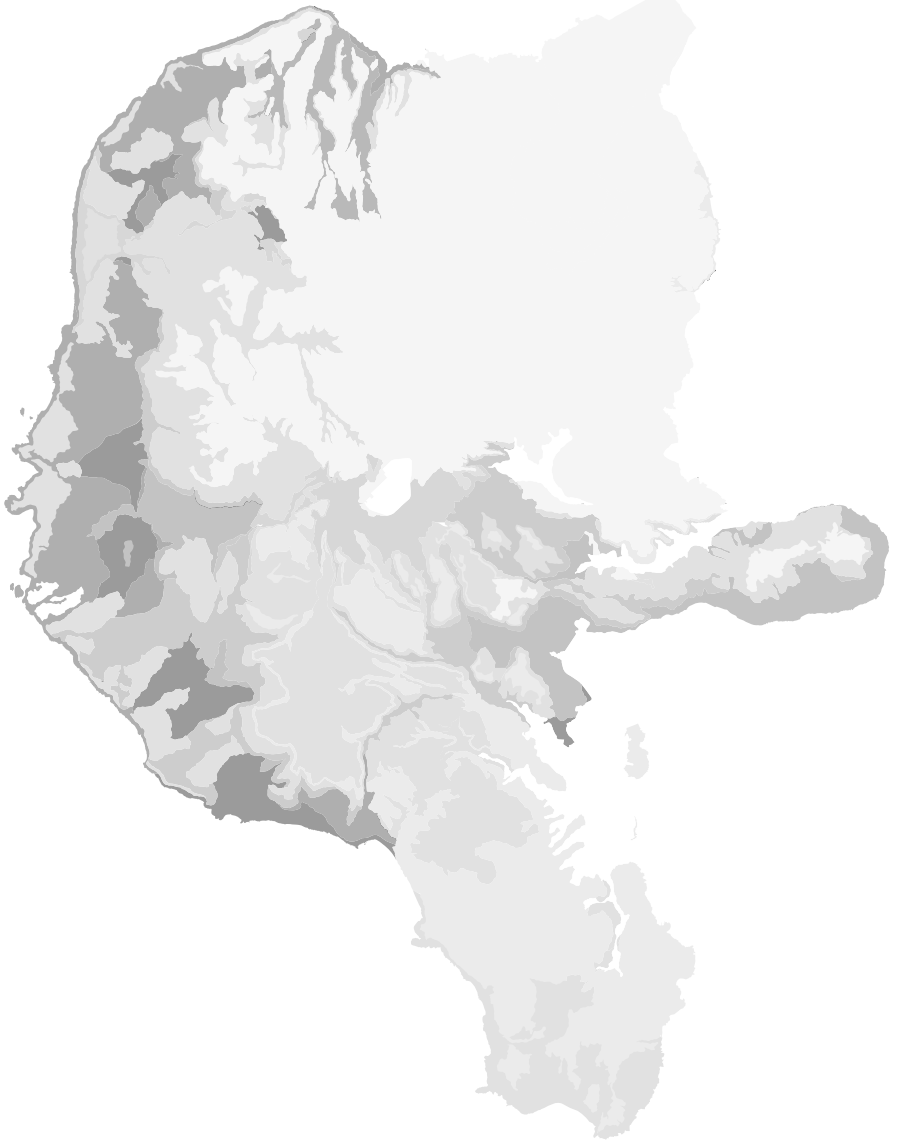
Introduction of Geomorphology of Lipari

The Lipari volcanic complex, situated in the central Aeolian sector, was constructed between c. 267 ka and medieval ages by various lava flows, scoriaceous deposits, lava domes (coulees) and pyroclastic products related to hydromagnetic and strombolian activities. The eruptive history of Lipari is described by nine Epochs of activity interrupted by dormant periods, volcano-tectonic phases and episodes of terrace formation during the Last Interglacial. Several partially overlapping volcanic edifices were active through time, mostly under control of the NNW–SSE and north–south (minor east–west) regional tectonic trends. The latest eruptive events of M. Pilato and Rocche Rosse occurred from AD 776 to 1220.

A number of volcano-tectonic collapse structures, namely vc1–vc4 in stratigraphic order, are recognized on Lipari by means of sub-vertical escarpments with curved geometries. These collapse rims are invariably marked by the high-angle discordance relationships between the pre-collapse and collapse-filling volcanic products.

From the geomorphology of Lipari that we can see there are four main volcanos mainly distributing from the north to south in the middle of the Lipari Island.

Evolution of Lipari Island



ERUPTIVE EPOCH OF VOLCANIC

- eruptive epoch 1
  267 thousand years old
- eruptive epoch 2
  267-188 thousand years old
- eruptive epoch 3
  150 thousand years old
- eruptive epoch 4
  119-114 thousand years old
- eruptive epoch 5
  105 thousand years old
- eruptive epoch 6
  92-81 thousand years old
- eruptive epoch 7
  43-40 thousand years old
- eruptive epoch 8
  27-20 thousand years old
- eruptive epoch 9
  8-7years old
- eruptive epoch 0

Eruptive epoch 1: A new geological map of Lipari, illustrating the large variety of lava flows, domes and coulees and pyroclastic units produced by a spectrum of hydromagnetic, strombolian to subplinian and effusive activities, has been produced.

Eruptive epoch 2: A reconstruction of the eruptive history of Lipari between c. 267 ka and medieval ages (AD 776–1220) through nine successive Epochs of activity and related eruptions, developed under control of the major regional tectonic trends (North–South, NNW–SSE and subordinately East–West) and interrupted by recurrent quiescence periods and volcano-tectonic collapses, has been described.

Eruptive epoch 3: The volcanic activity is characterized by progressive west–east and south–north shifts of the eruptive vents through time together with a progressive chemical change of erupted products from early CA basaltic andesites to latest rhyolites.

Eruptive epoch 4: The most intense subplinian explosive phases of activity involving rhyolitic magmas are recognized during the latest stages of development of Lipari in southern (M. Guardia) and north-eastern Lipari (Vallone del Gabellotto, M. Pilato). They produce widespread pumiceous successions that play a fundamental role for correlations across the whole of Lipari and among distant islands of the Aeolian archipelago.

Eruptive epoch 5: Based on the regional correlation of marine terrace deposits and tephra layers, the unconformity-bounded units allow the volcanic succession of Lipari to be placed within a regional stratigraphic framework defined for the entire Aeolian archipelago.

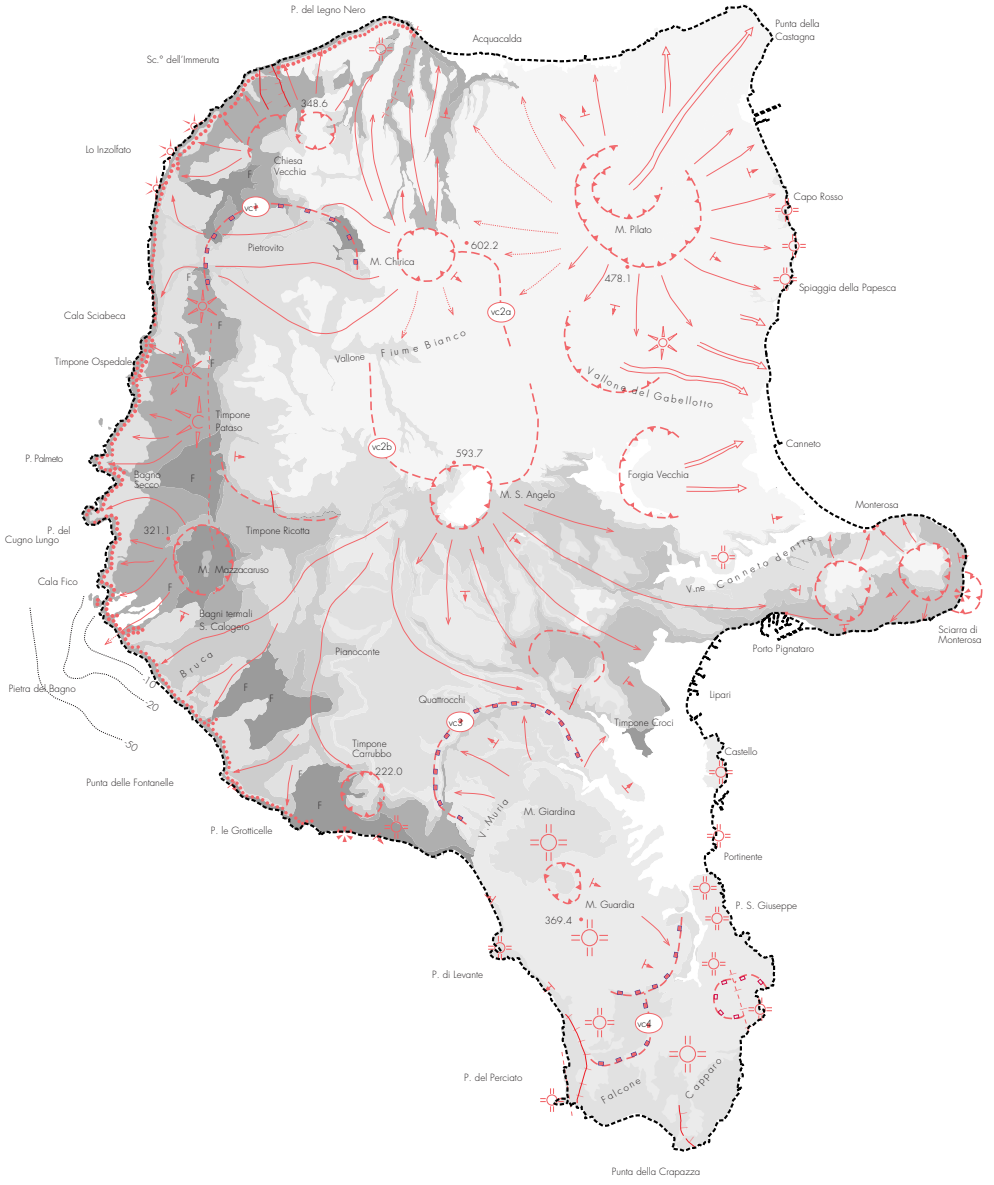
Eruptive epoch 6: The volcano-tectonic collapses which occurred through the history of Lipari are assumed to be caldera-type structures derived from the emptying of shallow magma reservoirs in a structural pattern dominated by the influence of the NNW–SSE-trending Tindari–Letojanni fault system on the whole Lipari–Volcano.

Eruptive epoch 7: A full geochemical dataset is provided for the Lipari products displaying a wide spectrum of magma compositions, varying from CA and high-K basaltic andesites to rhyolites, with a notable gap in the dacites field and a steep increase of K2O content through time.

Eruptive epoch 8: A model for the magmatic evolution of Lipari is proposed with the occurrence of different mantle-derived magmas mostly differentiated through AFC processes and magma mixing, with a variable contribution of the crust through time in the frame of a polybaric plumbing system.

Eruptive epoch 9: The genesis of cordierite-rich lavas at c. 105 ka is explained as the result of the mixing which occurred between mafic magmas and crustal anatectic melts at intermediate crustal levels, with the crustal anatexis processes assumed to have influenced the rheology of the crust and to have caused the volcano-stratigraphic gap that preceded the latest rhyolitic activities.

Geomorphological Elements



VOLCANIC FORMS

- crater rim
- feeder dyke
- lava dome
- spatter cone
- eccentric spatter cone
- main lava flow
- coulee
- direction of dispersion of pyroclastic deposits
- bedding attitude

STRUCTURAL FEATURES

- volcano tectonic collapse rim
- chronology of collapses (vc1)
- pit crater collapse
- uncertain collapse rim
- a) normal facult b) tectonic lineament

OTHER SYMBOLS

- marine terrace deposits
- recent continental sediments
- recent continental sedimentsmain hydrotermalized
- depth contour line

Collapse vc1 has a large sub-rounded rim in the area of Quattropani–Pietrovito, northern Lipari, and affects the remnants of the Pietrovito volcanic edifice active during the early stages of development of Lipari. The collapse depression is almost entirely filled by younger volcanic products, which makes it difficult to reconstruct precisely the geometry and chronology of collapse vc1. A possible hypothesis is that the vc1 collapse rim is the northern part of a wider north–south-elongated volcano-tectonic structure extended along the western sector of Lipari from Pietrovito to the area of Timpone Ricotta where an undefined morphotectonic depression is recognized.

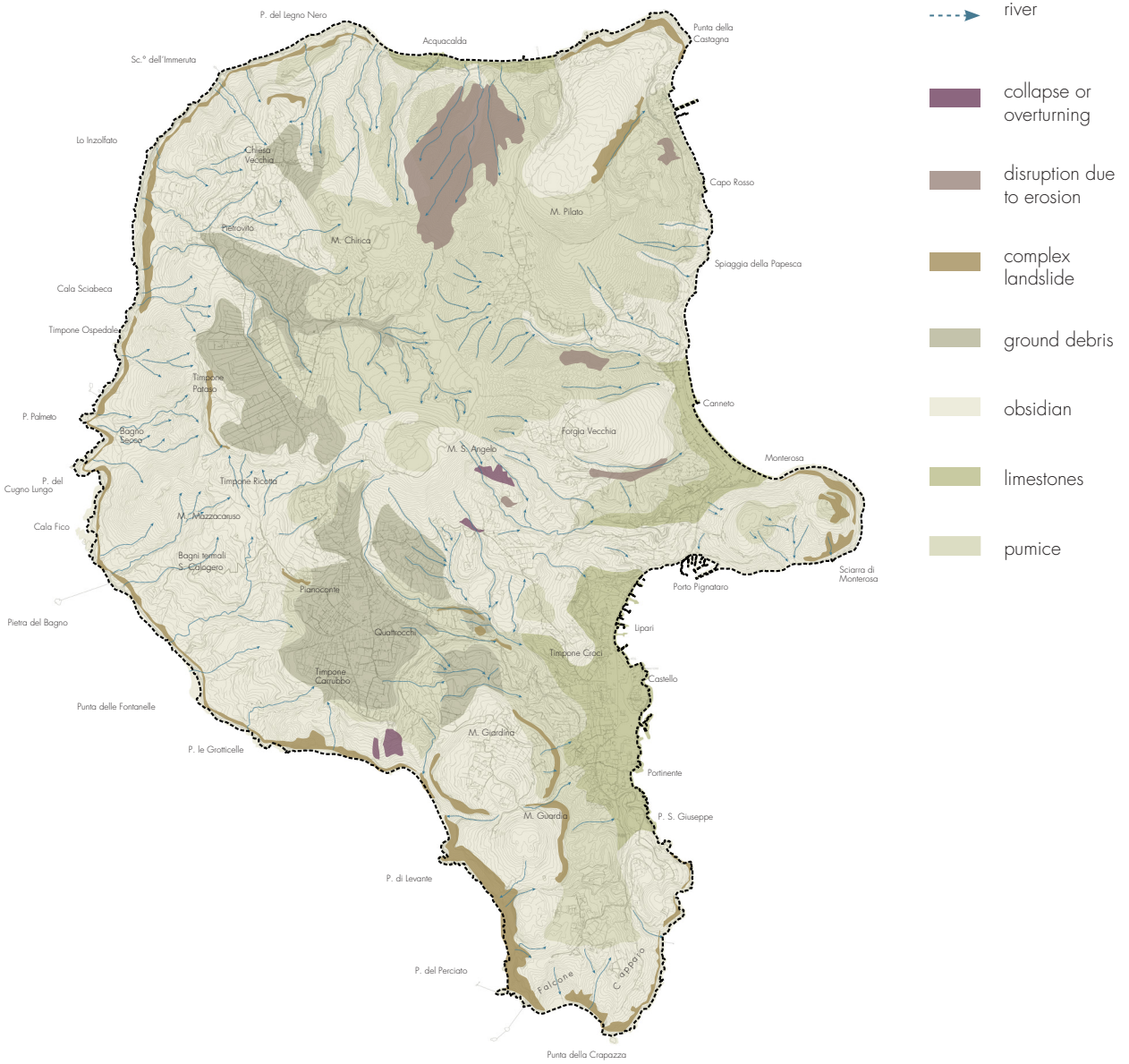
The vc2 collapse is recognized in the central sector of Lipari by means of an elliptical, north–south-elongated morphological depression bounded by clear embayment observed on the northern flank of M. S.Angelo (vc2a) and the southern flank of M. Chirica (vc2b). This collapse is completely sealed under thick younger volcanic successions and is not directly exposed to the surface. The oldest products that filled the collapse depression are the so-called 'leaf-bearing' pyroclastic succession of M. S.Angelo (c. 105 ka) and the latest M. Chirica lava flows (92–81 ka). Accordingly, we assume that collapse vc2 cut the early M. S.Angelo pyroclastic products (Timpone Ricotta and Timpone del Corvo formations, c. 114 ka), and probably developed during the time interval between c. 114 ka and 105–81 ka. However, the morpho-structural evidence of collapse vc2 is not visible.

Collapse vc3 is represented by a horseshoe-shaped scar exposed near Quattrocchi that cuts the southern flank of the M. S.Angelo edifice after its complete development, thus being younger than 92–81 ka. This collapse corresponds to the caldera II by Pichler (1980). The vc3 collapse is assumed to be the northern morpho-structural border that delimits the large dome-field in the southern sector of Lipari. A couple of nested sub-rounded escarpments are observed in the southern sector of Lipari, near Falcone-Capistello.

They represent the field evidence for collapse vc4 developed during the growth of the southern rhyolitic dome-field of Lipari. In particular, collapse vc4 cuts the Falcone domes (43–40 ka) and is unconformably covered by the M. Guardia pyroclastic products and filled by the M. Guardia and M. Giardina domes (27–24 ka). We have not recognized any crucial field evidence for the large sector collapse assumed by Favalli et al. (2005) to affect the northern fiank of M. Chirica. The products exposed in this sector of Lipari in fact reveal a primary periclinal bedding attitude with no traces of collapse truncation, except for the traces of a rectilinear NE–SW normal fault near P. del Legno Nero.

The interpretation and origin of the volcano-tectonic collapses recognized on Lipari are discussed in the section "Summary and discussion".

Geomorphological Analysis



GROUND-WATER DEBRIS

Groundwater debris is debris that roll on the sides of the mountains which accumulate at the foot of rocky walls or steep slopes.

OBSIDIAN

Obsidian is a naturally occurring volcanic glass formed as an extrusive igneous rock.

Obsidian is produced when felsic lava extruded from a volcano cools rapidly with minimal crystal growth. It is commonly found within the margins of rhyolitic lava flows known as obsidian flows, where the chemical composition (high silica content) induces a high degree of viscosity and polymerization of the lava. The inhibition of atomic diffusion through this highly viscous and polymerized lava explains the lack of crystal growth. Obsidian is hard and brittle and therefore fractures with very sharp edges. In the past it was used to manufacture cutting and piercing tools and it has been used experimentally as surgical scalpel blades.

LIMESTONES

Limestone is a sedimentary rock, composed mainly of skeletal fragments of marine organisms such as coral, forams and molluscs. Its major materials are the minerals calcite and aragonite, which are different crystal forms of calcium carbonate (CaCO3).

Limestone has numerous uses: as a building material, an essential component of concrete (Portland cement), as aggregate for the base of roads, as white pigment or filler in products such as toothpaste or paints, as a chemical feedstock for the production of lime, as a soil conditioner, or as a popular decorative addition to rock gardens.

PUMICE

The volcanoes in the north-eastern part of the is-land of Lipari have spewed out immense masses of pumice in successive eruptions, the export of which was one of the main economic resources of the island for centuries until 2007 when the mining and processing ceased. In the modern age pumice is used in cosmetics and in industrial washing (stone wash). In construction is used to lighten the concrete and as acoustic and thermal insulation, both as a powder and in blocks or panels. It also has other uses mainly related to its absorbent and abrasive properties such as absorbing and filtering industrial oils and cleaning surfaces in general.

Introduction of Volcano Products

Eruptions and volcanic phenomena followed one another along the millennia and their diversified nature produced different phenomena: from the creation of pumice stone, so light that it floats on the water, to lava flows that produced the obsidian stone, a black and cutting glass that was used by ancient populations to produce sharp utensils.
Lipari in particular became rich thanks to the export of obsidians all over the Mediterranean Sea. Around the 2500 B.C., with the metal age, the market of obsidian lost its importance, but due to its favourable location Lipari did not suffer much from this. Around the bronze age and the beginning of the iron age Lipari was invaded by populations coming from Italy (Subappennine culture), which were later on chased away by other populations of the Italic peninsula, whose artefacts suggest they belonged to the 'Villanovian' civilization.

A great number of raw materials, such as pumice, obsidian, pumice, flint, clay, kaolin, alum, sulphur, were produced because of Lipari volcano, which could be sold in the market.

Main Volcano Products: Pumice

Pumice, called pumicite in its powdered or dust form, is a volcanic rock that consists of highly vesicular rough textured volcanic glass, which may or may not contain crystals. Pumice is therefore an explosive magmatic rock, very light be-cause of its high porosity and, therefore, it is the only rock that floats on water. The pumice thrown into the air covered more than a quarter the surface of the island, forming deposits hundreds of metres thick around the crater. Prehistoric people collected the pumice washed up on the beaches by the sea and used it as a grinding stone to smooth and refine arrows or bone awls.

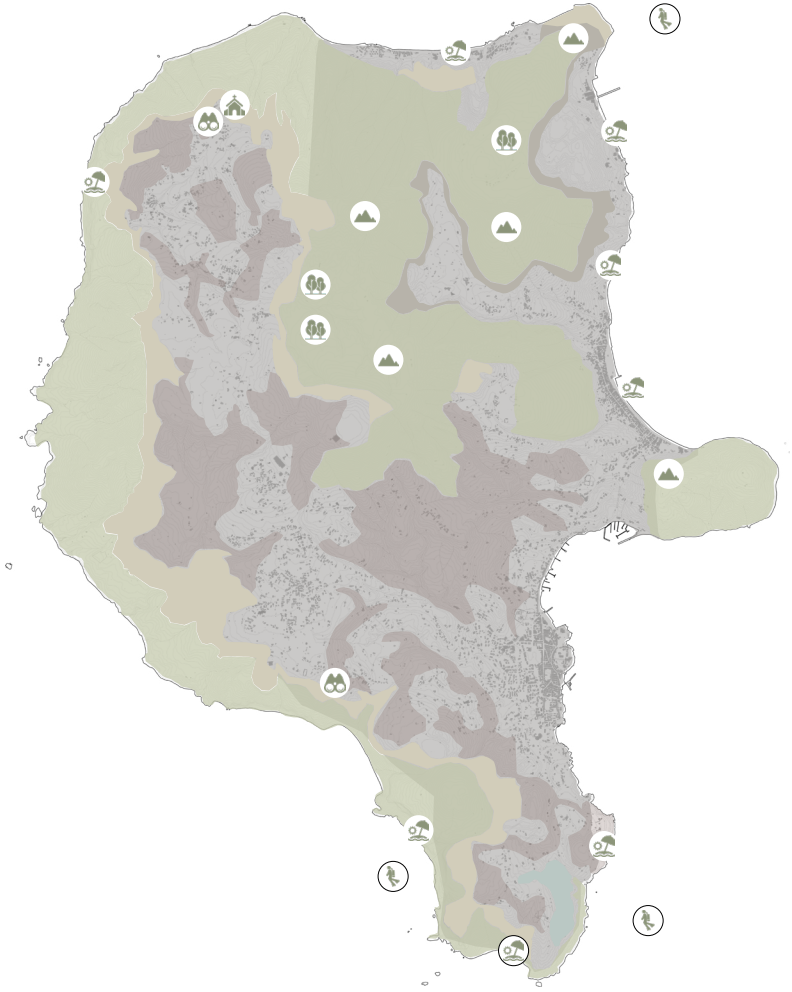
Main Volcano Products: Obdidian

Obsidian is a natural glass that originates when a magma of special, very viscous, composition escapes from a volcano and solidifies quickly.
A quarry workshop of the Neolithic age in which the obsidian was extracted and processed to reduce it to blades or nuclei that were more easily transportable, was sectioned with the edge of the Canneto-Lami road. Another similar field was dissected by the cut of the Canneto Acquacalda road in the district Papesca. In the archaeological layer rich with blocks, cores, splinters and blades of ob-sidian, a fragment of Neolithic pottery in the style of Diana was also found.

VEGETATION ANALYSIS OF LIPARI ISLAND

Natural preservation area analysis

After multiple land area being preserved by government, there are currently three types of preservation area in Lipari, known as primary and secondary preservation area. We also tried to mark the non-preservation and urban area to indicate current situation. In order to notify the relevant forests, beaches and buildings to show the distribution of attractions.



Diving Area

Beach

Relevant Forest

Relevant Church

View Point

Relevant Mountain

Primary Natural Preservation Area

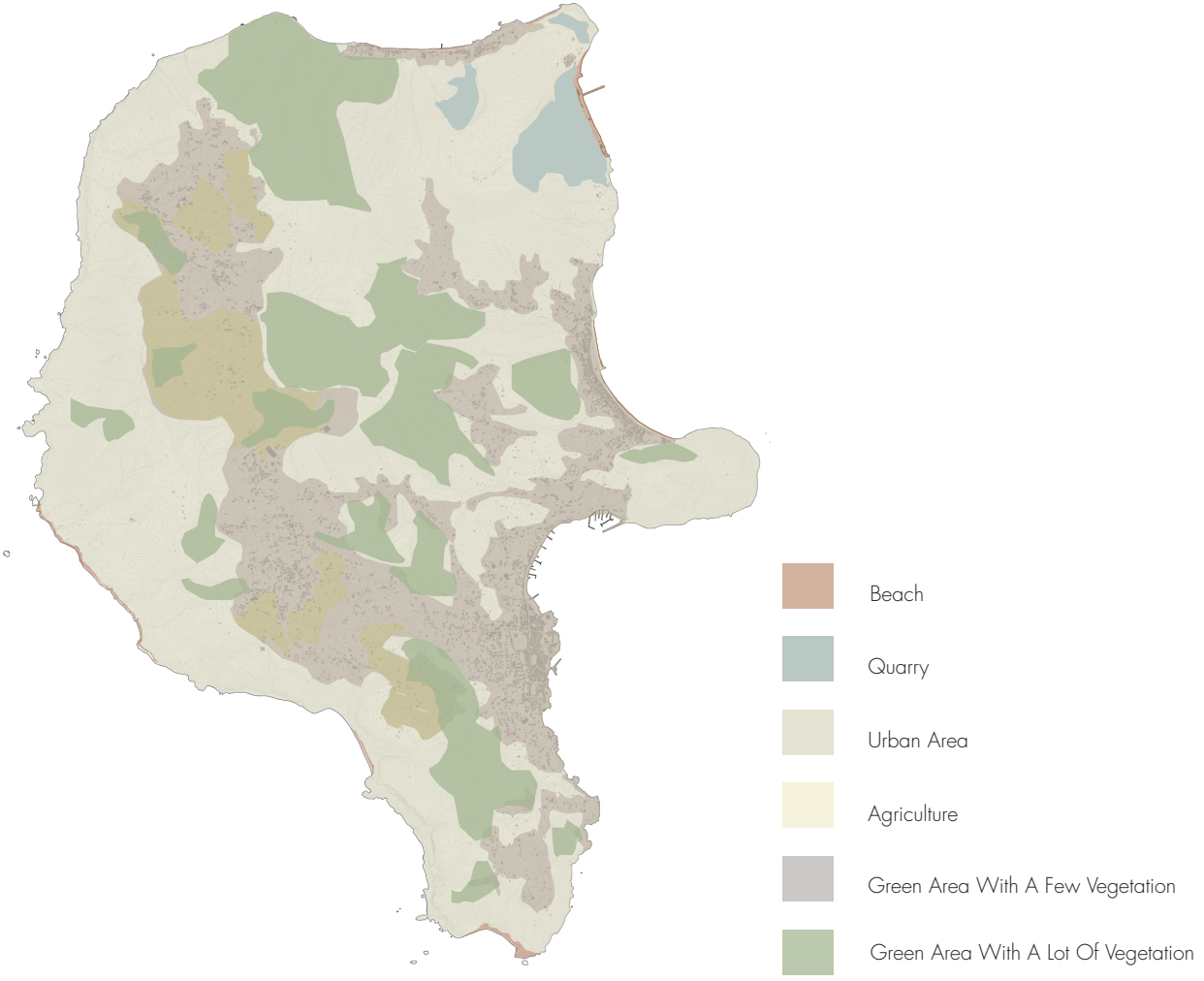
Secondary Natural Preservation Area

Non-Preservation Area

Urban Area

Landform analysis

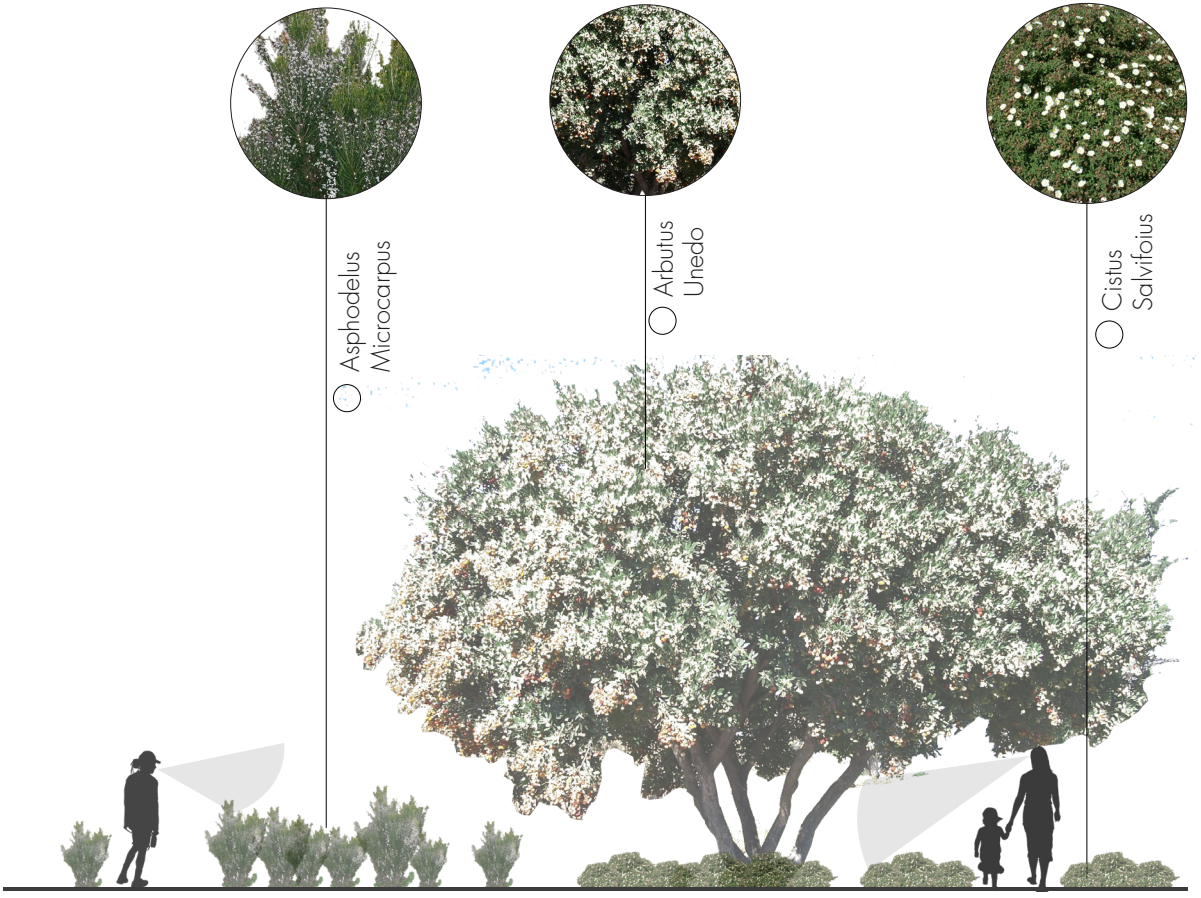
There are mainly 6 types of landform in Lipari, which are beach, quarry, urban area, agriculture and green area with a few or a lot vegetation. From the diagram, it can be approximately figured out that the green area with a few vegetation occupied most land area about 60%. Moreover, green area with a lot vegetation follows behind with about 15%.



Vegetation analysis

As the previous analysis, it is obvious to see there are a lot of vegetation on the island and according to our reference 8 species of vegetation cover most of the green area, which are Asphodelus Microcarpus, Arbutus Unedo, Cistus Salvifoius, Erica Aborea, Fraxinus Ornus, Teline Monspessulana and Quercus Rotundifolia. Marking out the area where these vegetation grows on the preservation diagram, Erica Aborea is the most frequently seen species among all.

In order to have a clear indication about the dimension of these vegetation, putting them on the diagram with figures can clearly shows the dimension and visual relationship between human and the plant.

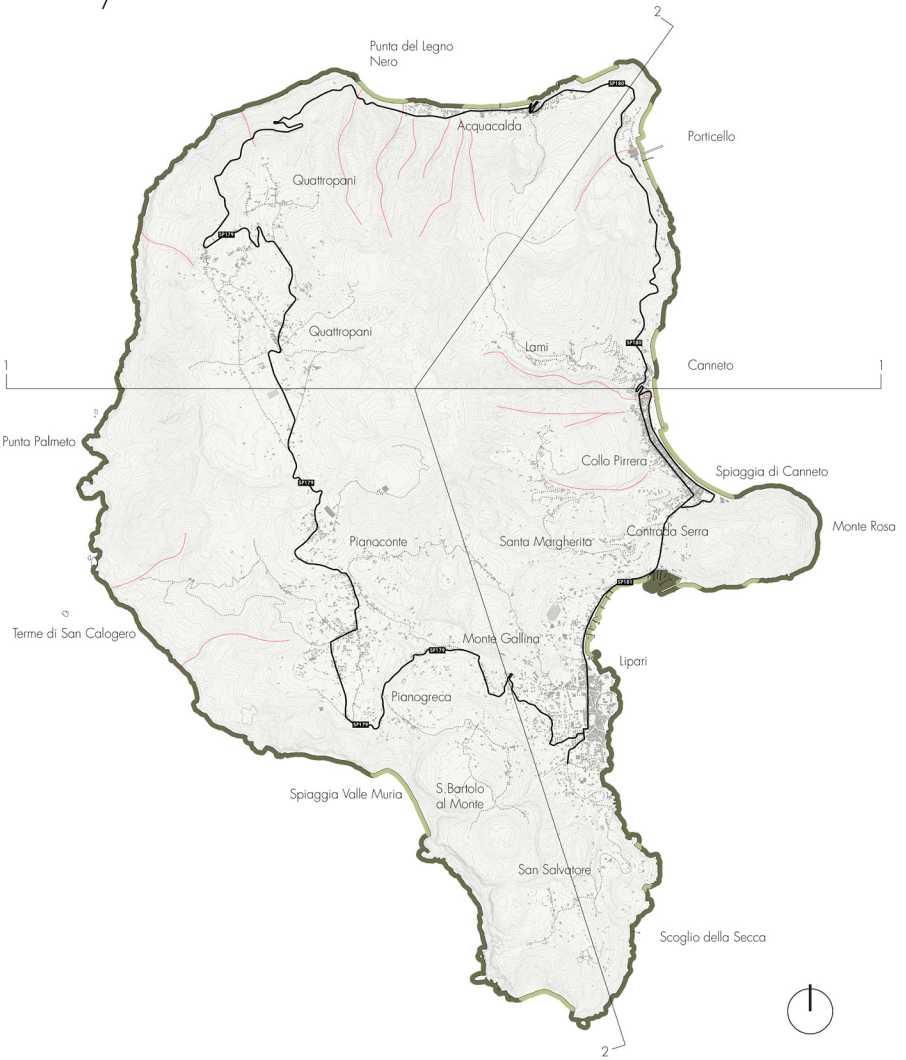



④ Erica Aborea
⑤ Fraxinus Ornus
⑥ Genista Radiata


Teline Monspessulana
Quercus Rotundifolia

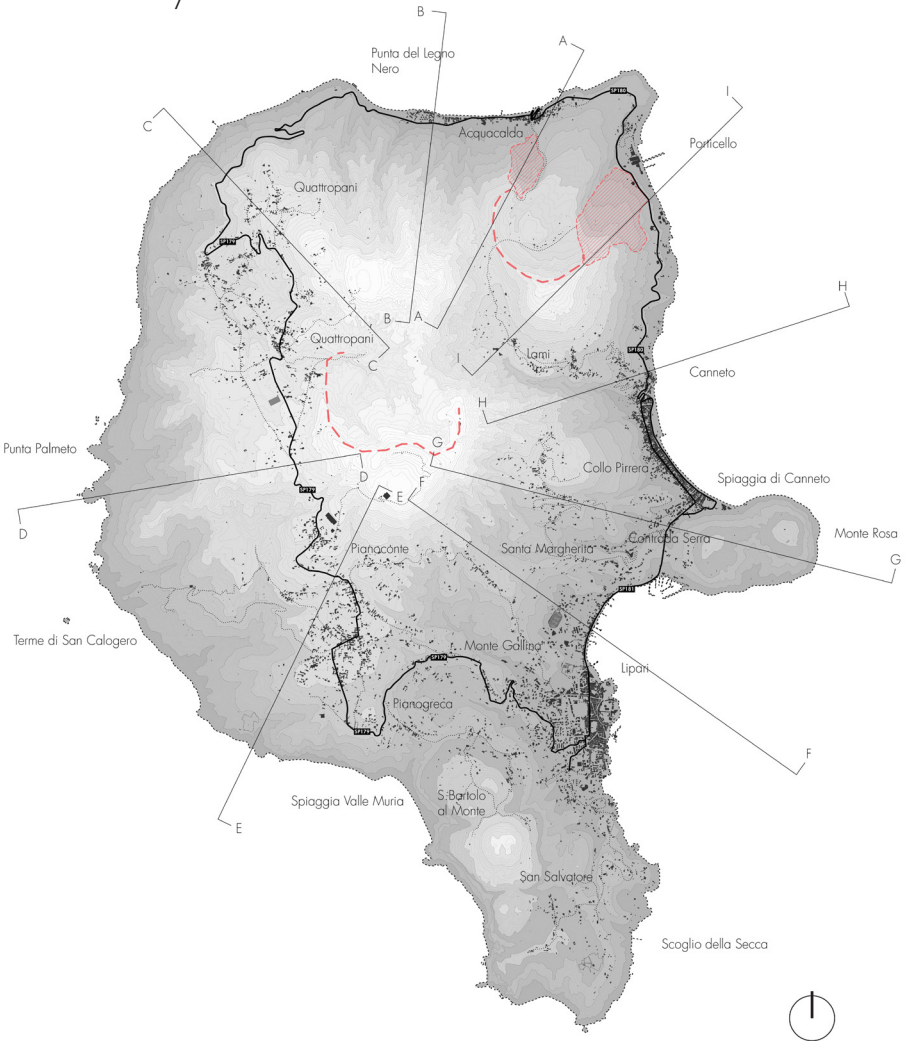
TERRITORIAL SECTION ANALYSIS

Waterfront Analysis



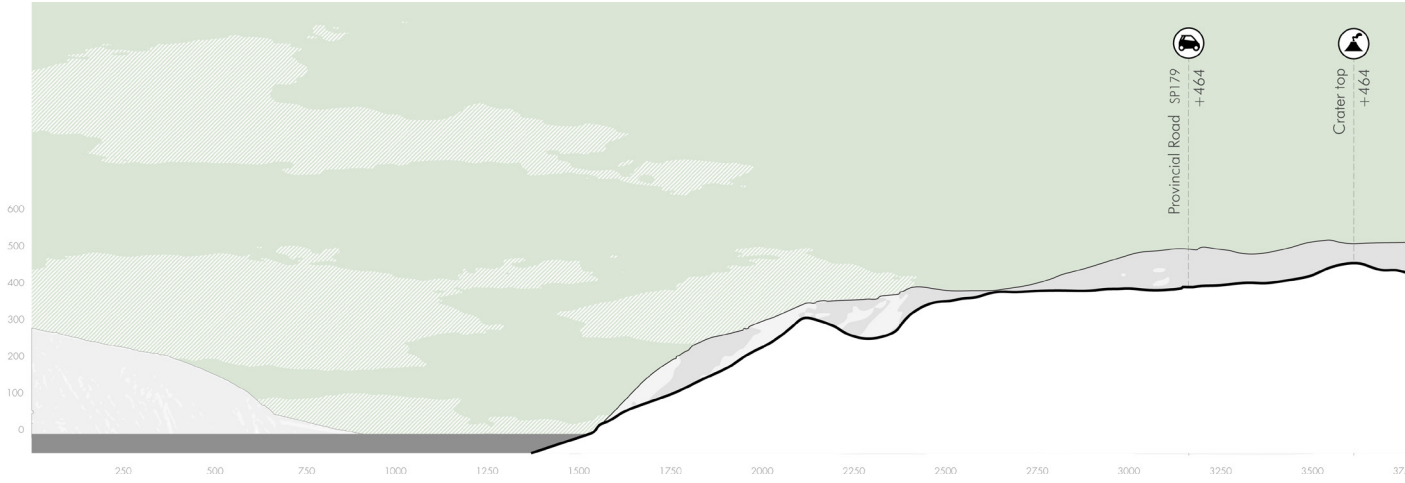
In general, the waterfront of Lipari island has two typical type: the cliff and the beach. From the map we can easily find that the eastern part of the island has more resource of beach, and cliffs are more common in the western part. That is one of the reason that there is more towns and villages located along the eastern coast but only a few of them in the western area

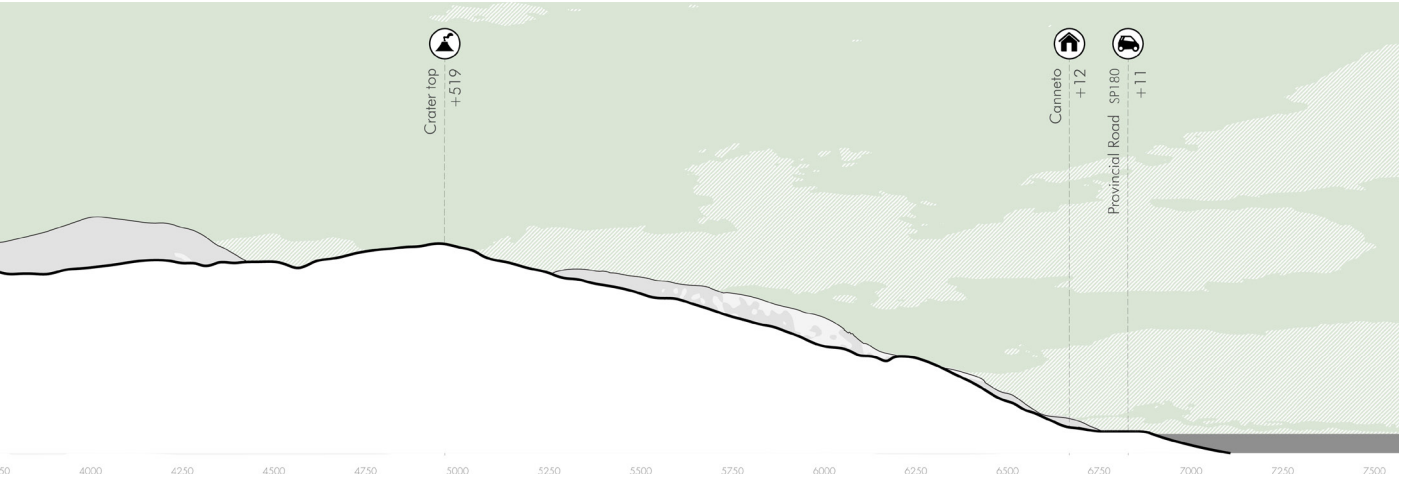
Terrain Section Analysis



The highest point of Lipari island is at the center, where is also an edge of a crater. The maxium altitude is over 500m, which means the average gradient is quite large in this island. Because of the volcano eruption, the north-eastern part of the island is relativly flatten then its southwestern part.

Cross section 1:20000

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+519
Canneto
+12
Provincial Road SP180
+11
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4500
4750
5000
5250
5500
5750
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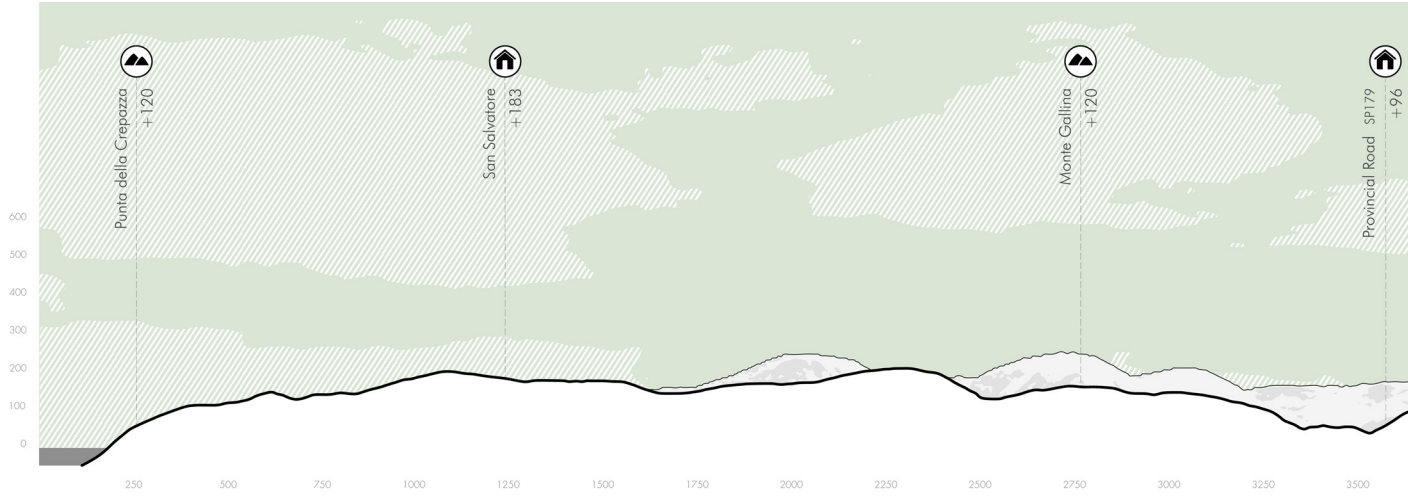
6250
6500
6750
7000
7250
7500

SECTION 1 -1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+120
San Salvatore
+183
Monte Gallina
+120
Provincial Road SP179
+96
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500
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500
750
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1500
1750
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3250
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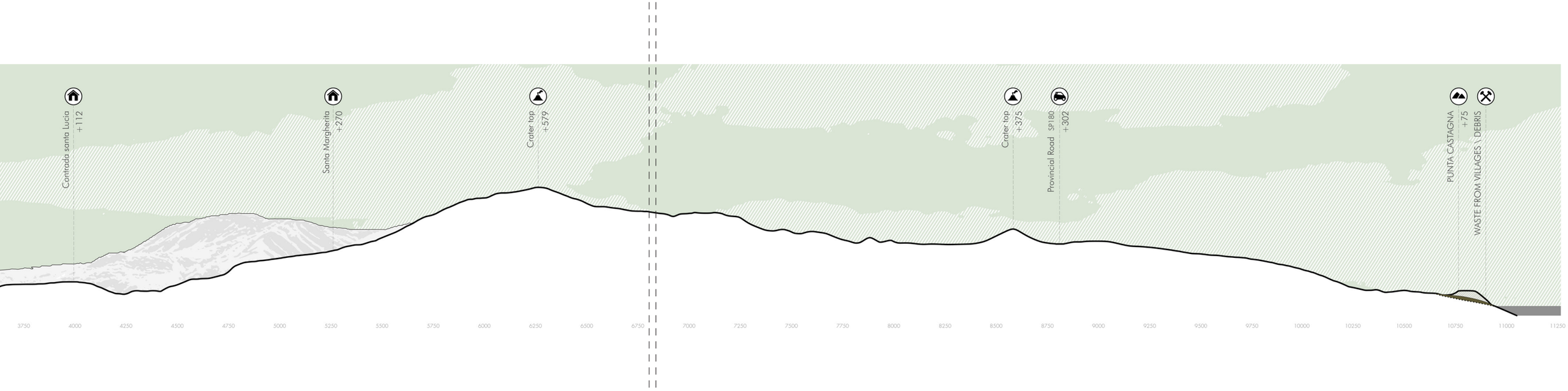
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Santa Margherita
+270
Crater top
+579
Crater top
+375
Provincial Road SP180
+302
PUNTA CASTAGNA
+75
WASTE FROM VILLAGES \ DEBRIS
3750
4000
4250
4500
4750
5000
5250
5500
5750
6000
6250
6500
6750
7000
7250
7500
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8000
8250
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9500
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10000
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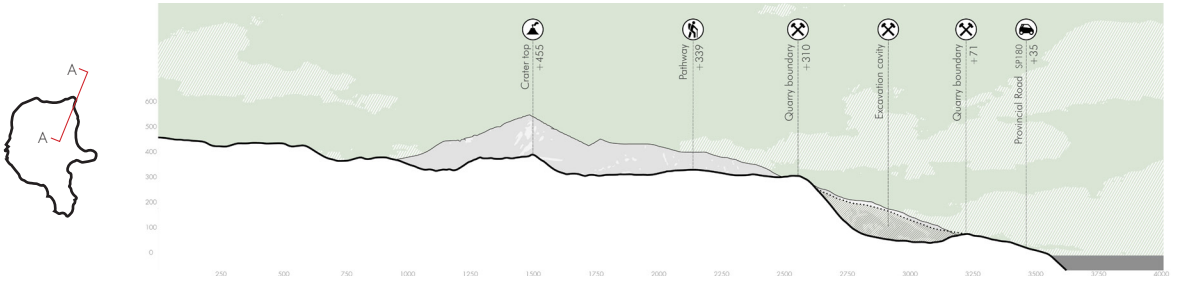
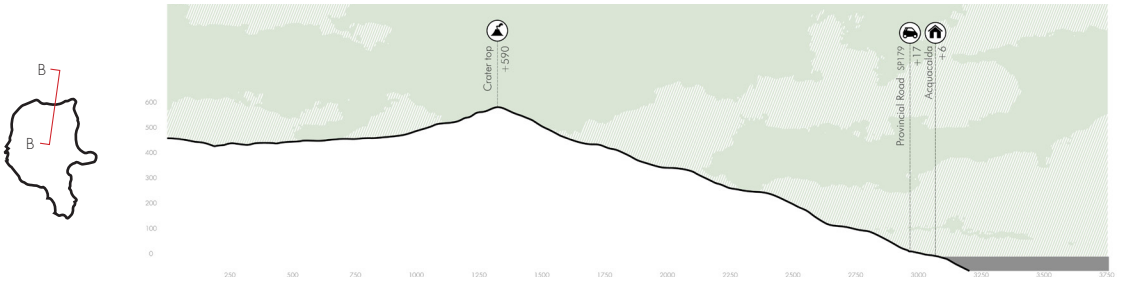
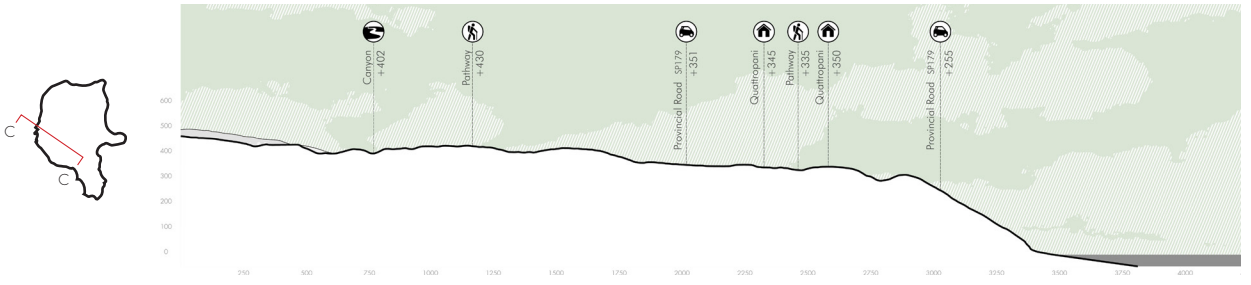
10500
10750
11000
11250

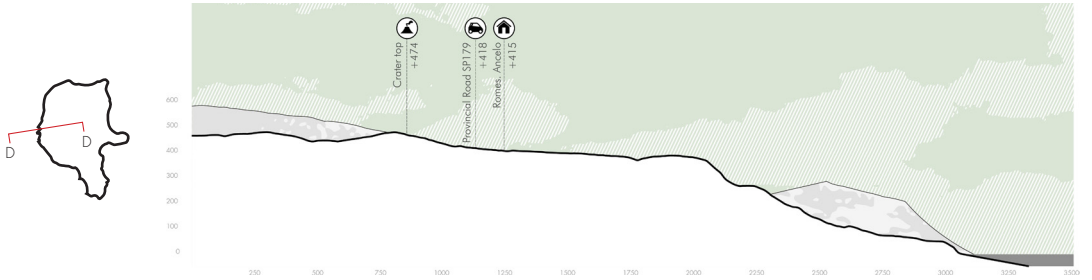
SECTION 2 -2

Partical section 1:30000








D
D
Crater top
+474
Provincial Road SP179
+418
Romes, Ancelo
+415
600
500
400
300
200
100
0
250
500
750
1000
1250
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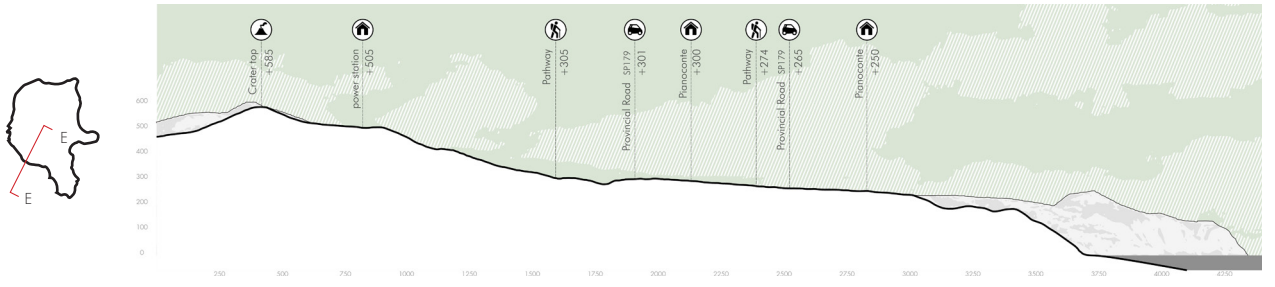
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power station
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Pianoconte
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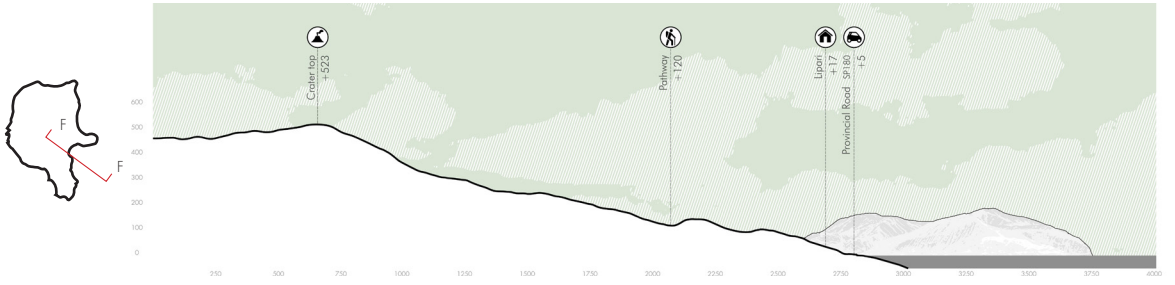
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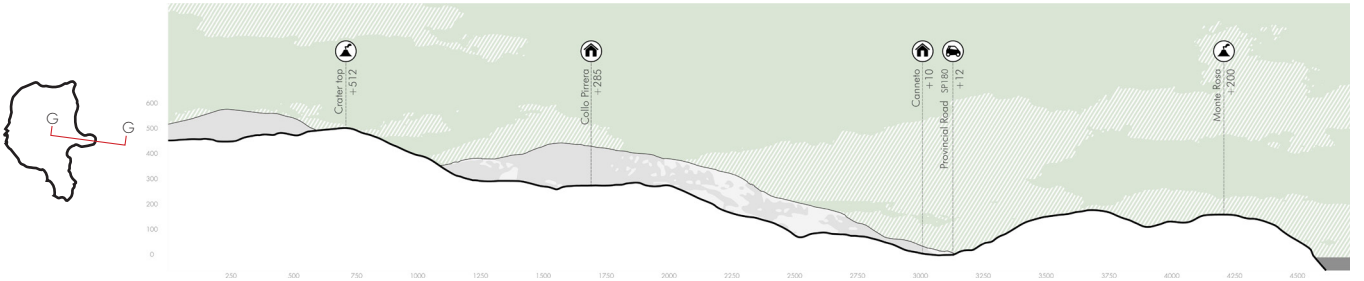
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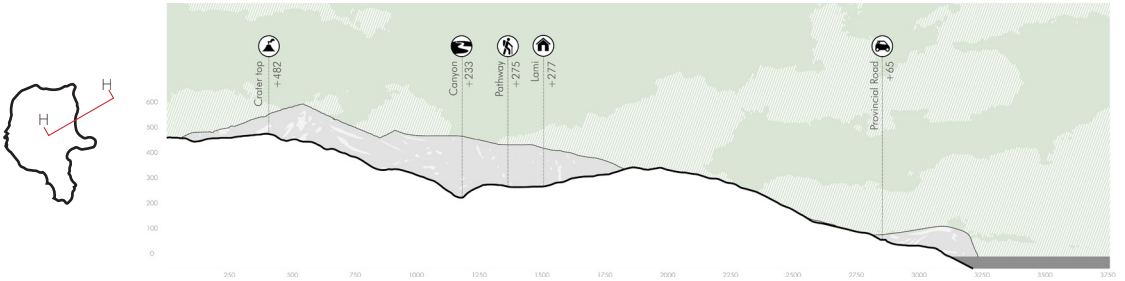
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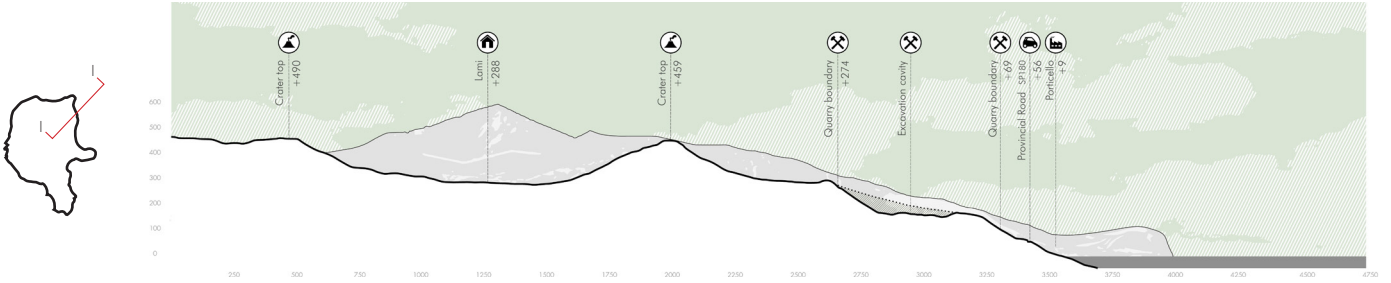
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Lami
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Crater top
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Quarry boundary
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Excavation cavity
Quarry boundary
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Provincial Road SP180
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Particello
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HISTORICAL ANALYSIS

Mining and archaeological sites
Pumice production process
Identity card pumice facories

Introduction to the History

The focus here is on an industrial artifact that, although not included in the category of monumental works, is marked by historical and architectural values typical of the place, Sicily and Lipari in particular.
The architectural complexes created for the processing of pumice stone form, together, a sector of the building tradition, thus acquiring the value of a historical document.
These assets are testimonies not only of a historical-productive period of the island but also of a way of building directly related to the techniques used for the construction of buildings of greatest value in the cities of Palermo, Messina and other Sicilians.
The factories of Lipari have been designed and raised, for economic reasons, with native and poor materials, showing (in their original form) a compositional idea, a logic of volumetric aggregation dictated both by functional reasons and by logistic ones, having been conceived to be erected in a portion of the coast where the proximity between the sea and the mountains is very restricted, but a necessary condition for productive purposes.
Precisely for these reasons they can be considered examples of industrial archeology worthy of retlief.

MINING AND ARCHAEOLOGICAL MINING SITES

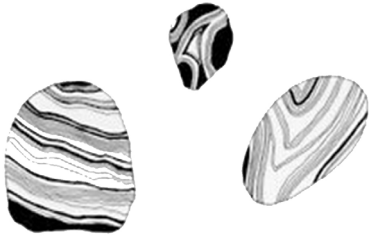
Geology and Mining Activities

Geology and archeology are two major components that build the character of the Aeolian islands, because the relationship between man and the territory was intrinsic and intense and the lives of the people were completely dependent on the surroundings.
Since ancient times they were frequented for the strategic geographical position, the mild climate and the precious resources of the volcanic soil and the presence of certain types of rocks that the world had never seen before, the islands came to be frequented and chosen over the centuries by people of culture around the world. Starting from the Neolithic Age, various communities that had migrated to the island of Lipari sustained their livelihood by the mining and exportation of the volcanological and geological findings in the Aeolian Islands.
The archipelago of the Aeolian Islands was a call for landings and stabilization of the various communities and thanks to the "mining" importance that this territory has had.

Following are the list of the most important rocks and minerals found and extracted in the island of Lipari.

Obsidian

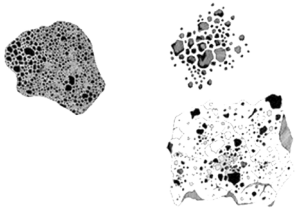
Obsidian is a natural glass that originates when the magma of particular composition, very viscous, escapes from a volcano and solidifies rapidly. The obsidian lava produced by the crater of the Monte Pilato, and used by man during the Neolithic period, since the end of VI millennium BC, dates back to about 9000 years ago. Scholars have considered that the Obsidian flows during the Neolithic era, are partially buried by the enormous pumice mantle of the last eruption, that occurred in the seventh century AD. In the Aeolian Islands, obsidian is present only in the north-eastern part of Lipari, in the pumice region, with which it is closely connected. A quarry workshop of the Neolithic age in which the obsidian was extracted and processed to reduce it to blades or cores more easily transportable, has been sectioned with the cutting of the Canneto-Lami road. Another similar deposit was formed by the cutting of the Canneto-Acquacalda road in the district Papesca.
Obsidian, was an important raw material, much appreciated by prehistoric man, which was actively sought and used to manufacture work tools. In Italy, the presence of obsidian is linked to one particular geographical position, in fact the deposits are only found on islands: Lipari, Palmarola, Pantelleria, Sardinia (Monte Arci). Obsidian artefacts of Lipari are found in many location, both inside and outside Italy. This is why obsidian represents a document of the first major commercial movement recognizable in prehistory of the Mediterranean.
However, with the spread of cheaper and stronger metals, the request for obsidian progressively decreased until it disappeared almost completely around 1500 B.C. In Greek and Roman ages, it was still sometimes used as a semi-precious material for luxury items.



Obsidian in Lipari.
Caitlin Foster, Stones, 2010.

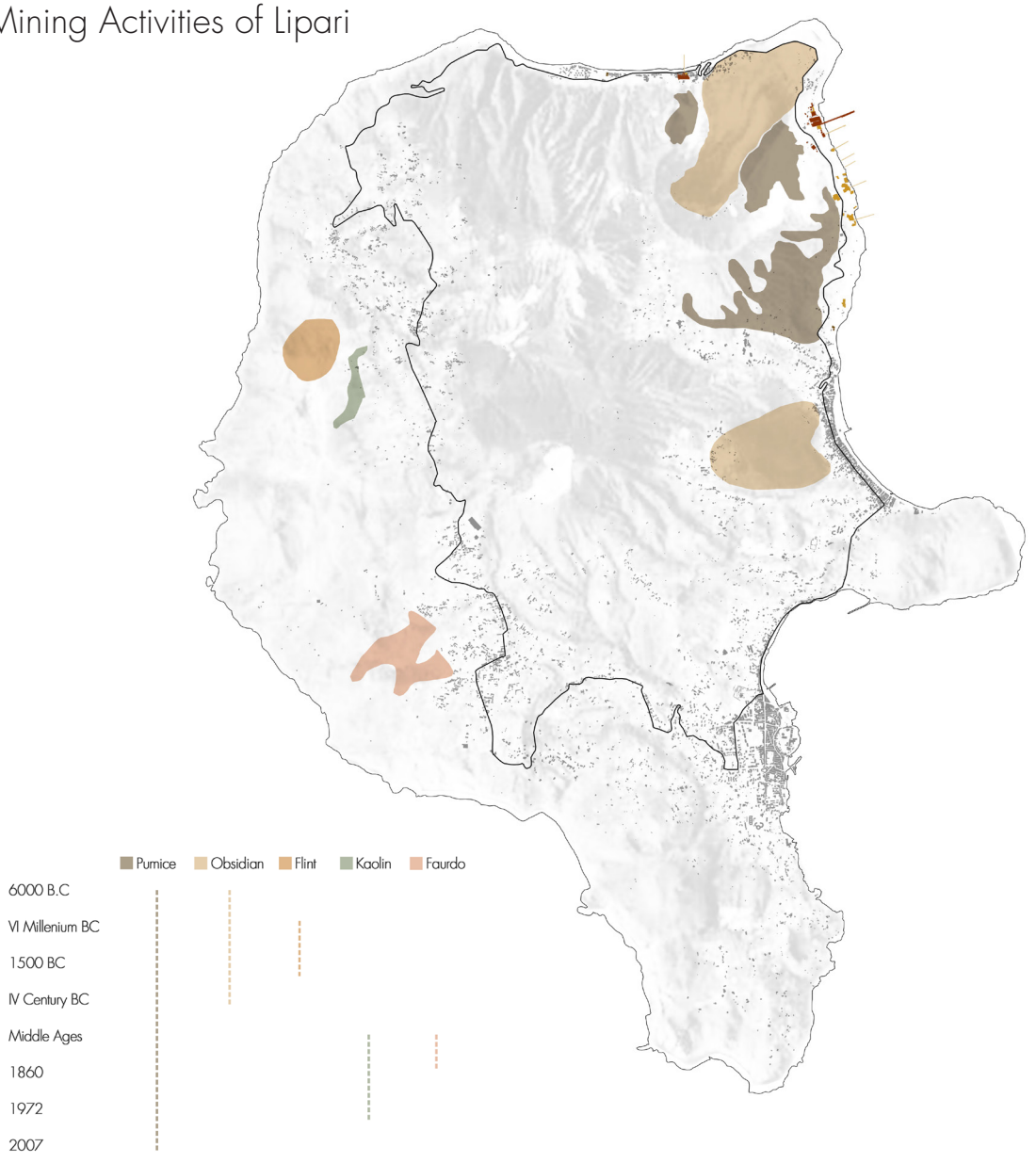
Pumice

The volcanoes of the north-eastern part of the island of Lipari have erupted followed by eruption of enormous amounts of pumice magma, whose exportation has constituted for centuries one of the main economic resources of the island up until 2007 when the extraction and processing activities ceased. The last eruption, dated to the seventh century AD, from the crater of Monte Pilato, ended with the obsidian flows of the Rocche Rosse and the Forge Vecchia and gave this part of the island its current appearance modified by the quarry. Pumice launched in the air overcoated a quarter of the island's surface, forming around the crater, deposits the thickness of hundreds of meters. Away from the crater, carried by the wind, we can find a thin layer of very fine powder that has spread on the whole island, and is also traceable in the nearby islands of Vulcano and Panarea. Pumice is therefore an explosive magmatic rock, which is very light due to its high porosity therefore it is the only rock that floats water. Prehistoric men have collected pumice taken from sea on the beaches and have used it as an abrasive stone to polish and to sharpen the arrows or the bone awls. In Greek and Roman times, pumice has had countless uses as an abrasive for the processing of marble and metals. In particular, it has been used to sharpen instruments of all kinds including awls and styles of bone to write with. It has been used for building as a component of the mortar, for lightening of the vaults, or in cosmetics for cleaning of the teeth and to smooth the skin, and also in the medicine for the care of wounds and ulcers. This is exactly why the pumice was widely exported in enormous quantitis, and led to the development of the islands economy.



Pumice Quarry in Porticello, Lipari.
Caitlin Foster, Stones, 2010.

Mining Activities of Lipari



Pumice Quarry in Acquacalda, Lipari.

History and Archeology

In the eyes of ancient authors, the Aeolian Islands appeared as a land strong and magical, home to the god Aeolus, as his home. From Homer to the Romans, to the nineteenth-century travelers, thoughts and words were dedicated to these islands for history and legends. Since ancient times they were frequented for the strategic geographical position, the mild climate and the precious resources of the volcanic soil. The islands came to be frequented and chosen over centuries by people of varying cultures around the world. Thanks to these traces left over time it has been possible to study and deepen the development of the islands, especially in Lipari, starting from the arrival of the first inhabitants of the Middle Neolithic, around 4000 BC. These people, who probably came from Sicily, were attracted by the fertile soil and by the presence of obsidian, the black volcanic rock emitted together with the white pumice from the craters on the northern side of the island.

"L'isola di Lipari è di piccole dimensioni, abbastanza fertile ma, soprattutto, possiede quei prodotti che rendono lussuosa la vita degli uomini: fornisce ai suoi abitanti pesci di ogni tipo in gran quantità e quei frutti in grado di offrire straordinario diletto a chi ne goda." [1]
"The island of Lipari is small in size, quite fertile but, above all, possesses those products that make men's lives luxurious: provide the inhabitants with all kinds of fish in large quantities and those fruits can offer extraordinary pleasure for those who enjoy it."

If we try to break down each period in the history of Lipari chronologically, we find that civilization initially began in the north western parts of the island and gradually the important core shifted to places around the Castello in the town of Lipari.
4000 B.C. - Arrival of the first inhabitants, Middle Neolithic Age.
2000 B.C. to 1000 B.C. - Migration of people of different origins. Mycenaean build S.Calogero, a thermal bath near the western coast.
1000 B.C. - Violent foreign invasions. Escape of inhabitants from the island.
580 B.C. - Greek colonisation with Castello as the main centre and Acropolis.
3rd century B.C. - Conquest by the Roman Empire. Settlements were converted to small provincial towns, subject to political and military control.
1060 A.D.- Normans reached a few portions of the island and repopulation began.

1544 A.D. - The castle falls into the hands of the pirate Barbarrossa, after which high walls of the defense fortifications, which are found even today, are re-built by the Spanish.
19th century A.D. - Enlargement of the town of Lipari and formation of roads that connect the main settlements in the island.
1919 A.D. to 1929 A.D. - The island falls under fascist control, with the portions of Castello serving as a Fascist confinement camp.
1950 A.D. - Postmodern era. Tourism begins to flourish and so does the industrialization and over-mining of Pumice quarries. The Castle of Lipari is converted into the headquarters of the Aeolian Regional Archaeological Museum in 1954.

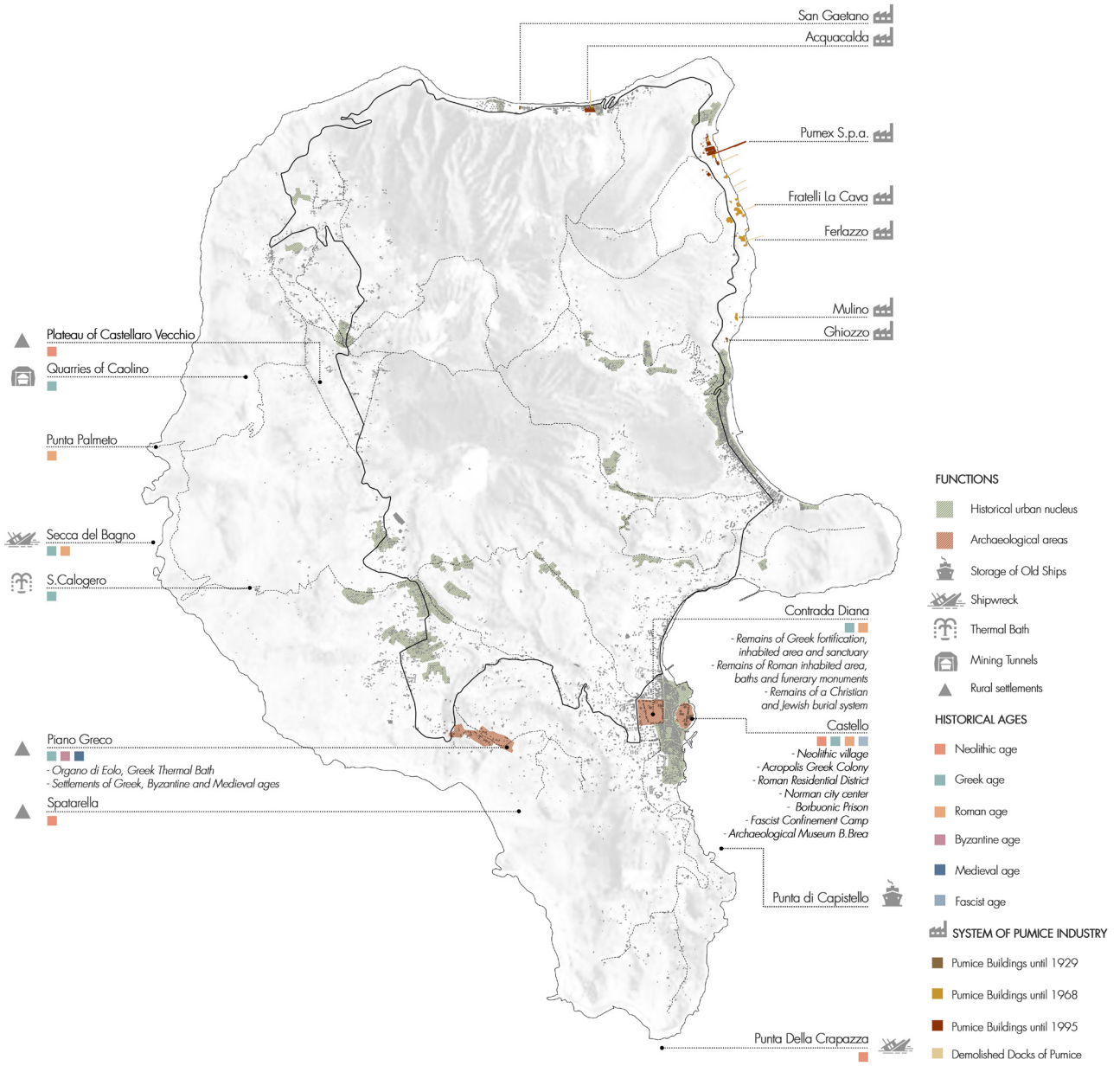
In particular, in the Island of Lipari, the first findings are found in the area of Castellaro Vecchio near Quattropani, dating back to the 4th millennium BC. The position of this village on the plateau, in one of the most fertile areas of the island, more favorable for agriculture and for pastoralism than for navigation and trade, perhaps reveals that in these early populations that the attachment to traditions was still strong on the island. So far, no trace of this age has been discovered in the island of Lipari.
The Castle of Lipari is a boulder of isolated rhyolite that extends into the sea with steep walls forming two small coves suitable for a harbor shelter: Marina Lunga, to the north and Marina Corta, to the south. It is a true natural fortress and for this reason it was the headquarters of the population from the late Neolithic and Bronze Age and was later the Acropolis of the Greek, Roman and medieval cities. In the very first period of the Bronze Age, when the demand for obsidian was decreasing gradually, the opportunity for the dawn of a new settlement in Piano Conte emerged. Unlike the town of Lipari, Pianoconte was an emerging example of an urban civilization which balanced both defense and use and production of natural resources like water and food.
The localites with older foundations are therefore identified in the southwest part of the island. In course of time, many such small villages emerged, and they were considered independent from each other due to the lack of transport routes; until the beginning of the 19th century, when the construction of a road became necessary. Road section (currently the SP 180) called the "Strada Vecchia" that connects the town of Lipari with Pianoconte as it unites the typically hilly area with the most important port on the island. A new connection was laid between Lipari and Canneto in the 14th century, while only in the 19th century, the north and north-western part of the island, which had temporary mud roads, began to have proper vehicular access. It then became extremely convenient to set up factories and quarries for the extraction of pumice.

If the town of Porticello was almost entirely an industrial area, the district of Acquacalda hosted services for a small community: some elementary school classes, a small one post office, inns for travelers and the church of S. Gaetano, around to which the first residents settled. It had its greatest housing development around the 1950's when the stretch was completed with a connecting road to Canneto.
The northern part of the island of Lipari therefore grew in close relationship with the development of the pumice industries and the realization of the provincial road, representing a real driveway for the whole island that was only completed around 1970.

Notes

[1] Diodoro Siculo, Bibliotheca historica - V, 10.

Historical Developement of Lipari



PUMICE PRODUCTION PROCESS.....

Historical Pumice Production Process Analysis

Aeolian Islands

The Aeolian Islands are a volcanic archipelago in the Tyrrhenian Sea north of Sicily, named after the demigod of the winds Aeolus.

The islands' inhabitants are known as Aeolians (Italian: Eoliani). The Aeolian Islands are a popular tourist destination in the summer and attract up to 200,000 visitors annually.

The largest and richest island is Lipari and the islands are sometimes referred to as the Lipari Islands or Lipari group. The other islands include Vulcano, Salina, Stromboli, Filicudi, Alicudi, Panarea and Basiluzzo.

Lipari Island

The mountainous group which rises on the island of Lipari consists of Monte Pelato or Campo Bianco and Monte Chirica, 603 meters high.

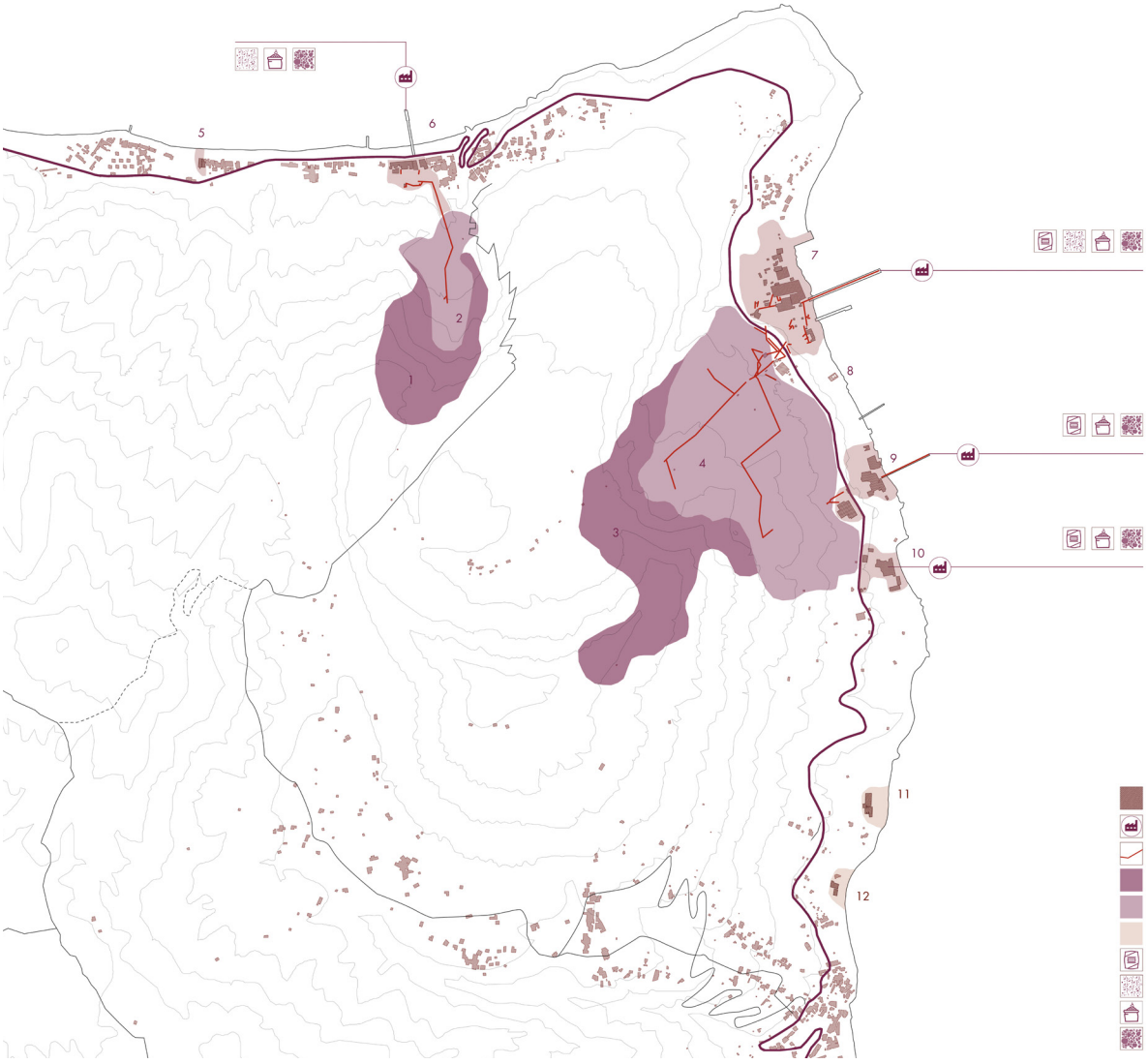
The white color on the island is given by the pumice stone, on which there is no vegetation. It is a real mineral wealth for that area, and an Italian monopoly.

Those islands all have volcanic origin and very abundant deposits of pumice to the eruptions, which is nothing but the volcanic glass made spongy by gas bubbles that penetrated it while it was melted by reducing it to foam.

Pumice

Pumice is therefore a volcanic stone, very porous, light, in greenish gray color, rough to touch and shiny, made of aluminum, soda and potassium silicate. This stone in Lipari was already known in Roman times.

Mining And Pumice Production Places



Pumice Production in Lipari

Pumice is used for various industrial uses, that is to polish the marble and lithographic stones: it is consumed in the factories of cars, buttons, perfumery items such as powder and toothpaste and polishing metals, household objects and floors . This wide use has naturally made more and more increase of the production that is disposed almost entirely abroad.

In fact, the pumice produced in the island of Lipari in 1920, which reached 34,150 tons, 24,734 were exported for a value of L. 8,656,900. The rest remained in Canneto, a fraction of Lipari, causing a crisis of overlap that is still affected.

More than half of pumice that year was exported to the United States of America. Before the war a strong customer was also Germany; after it has diminished the importation, because it tries to buy abroad as little as possible and because it found a way to artificially manufacture it with a sand concoction from the Rhine river. It was Germany that established the landing of its vapors in Canneto di Lipari, followed from other shipping companies, while, until not many years ago, the pumice was brought to the Italian ports of the Continent and recharged for foreign countries.

The production had grown considerably over the years, with the exception of the war years, and in fact in 1910 it was 25,221 tons, that is almost 90,000 tons less than the production of 1920.

The export was made in sacks or trunks, crude or marinated, that is, the pezzame or pumice scrap and is marinated by them to protect the national work and to be sure of the quality.

Elsewhere it is mainly pumice powder, the lapillus which is the pumice debris, which is not the powder of the ground pezzame, but the poorer material mixed with obsidian and earthy elements that can be said to cover the whole Lipari reservoir.

Beyond the two qualities mentioned, we have the bastardoni which are pieces of pumice as big as a man's head, the Alexandrine, pieces of pumice reduced in parallelepipeds that also serve for construction material and other qualities that it seems useless to enumerate, also because they are easily to be confused with each other.

Historical Pumice Production Process - Digging by Different Way

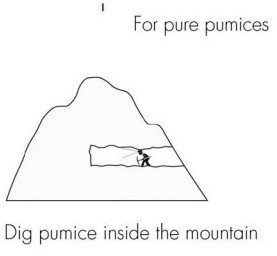
Diagram with historical condition

It is Interesting to see how people dig this product. The pumice quarries were of two qualities: the subterranean ones that were mainly located high up on the mountain, and those in the open air were on the coast.

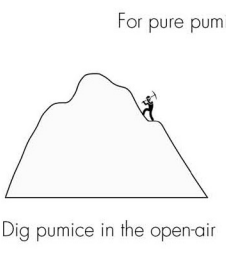
In the former, the pumice was cut in pieces, most chosen and expensive. In the latter, the production called lapillo powder, the easiest to obtain and had the best market.

A 1920 statistics from the Inspectorate of Mines calculated 63 open-air quarries and 74 underground quarries with about 500 workers. These were all open quarries in the municipal property to which were added those of individuals who are a little more than one sixth.

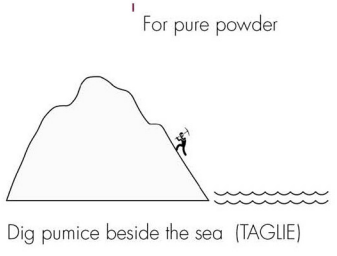
However, the most active ones were open air quarries because of the great request of the lapillo which represented two thirds of the production of 1920.



Dig pumice inside the mountain



Dig pumice in the open-air



Dig pumice beside the sea (TAGLIE)

Historical Pumice Production 1 - From Subterranean Quarries

historical condition

The subterranean quarries were opened with a pickaxe by a few workers, who managed to make underground walkways of over two hundred meters in the heart of the mountain where one passes at a time bent between the crumbly and very yielding ground. Every now and then you could see a few pieces of compact pumice of greater purity and value that is isolated from the debris and brought out.

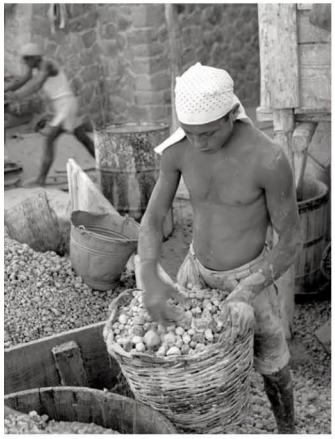
As is well understood, this was a dangerous and unhealthy work due to the dust it raises and the lack of armor in the tunnels, but the difficulties of rational exploitation were to be found in the fact that these quarries are communal, that is, all. In Lipari, the peasant went to pumice, as if he were going to the wood to make firewood, that was when he had time and the market required it.

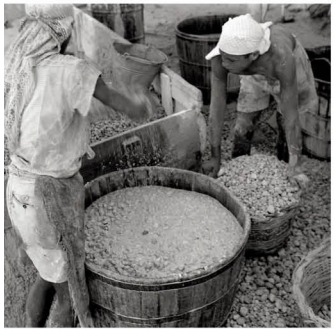
Historical Pumice Production 2 - Open Air Quarries on the Mountain

historical condition

The excavation proceeded differently in open-air quarries from underground ones, but it was everywhere primitive, rudimentary and in vain if we would look for modern mining systems in it.

From the high mountain where the quarries open, the pieces of pumice extracted were taken to the sea in bags or coffees (cufine) on the shoulders for a journey of at least three quarters of an hour of steep paths, while a simple cableway would avoid all this fatigue.





Historical Pumice Production 3 - Open Air Quarries by the Sea

historical condition

The quarryers had the concession, marked the land had to be exploited with poles and then they started scratching it by letting go all these pumice and soil dust.

In the descent the first selection was already taking place, because the steep slope isolated the pumice pebbles; the other selection was made by putting these pumice debris into the buratto and the resulting product was then dried in the sun.

The pumice grains that the buratto separated were then collected and ground in the mills. The lapillo for truth could also be found on the top of the mountain but it was not convenient because you have to take it to the sea and its modest price did not compensate for the effort.

The process was therefore very simple and the only expense that the quarryman had was that of the buratto when he went to buy one, he immediately started to extract the lapilli.

The drying of this powder was also done with combustion driers, but it was mainly made by spreading it in the sun, as above a threshing floor; and since the island has only very short stretches of beach, in whose locality the town had sprung up for this reason, it follows that the lapillus, like in Canneto, was set to dry in front of the houses and when the wind rises, the country was all wrapped up in a blizzard of white unhealthy dust that gave a painful tribute to tuberculosis.

Diagram of 3 Different Historical Pumice Productions Process

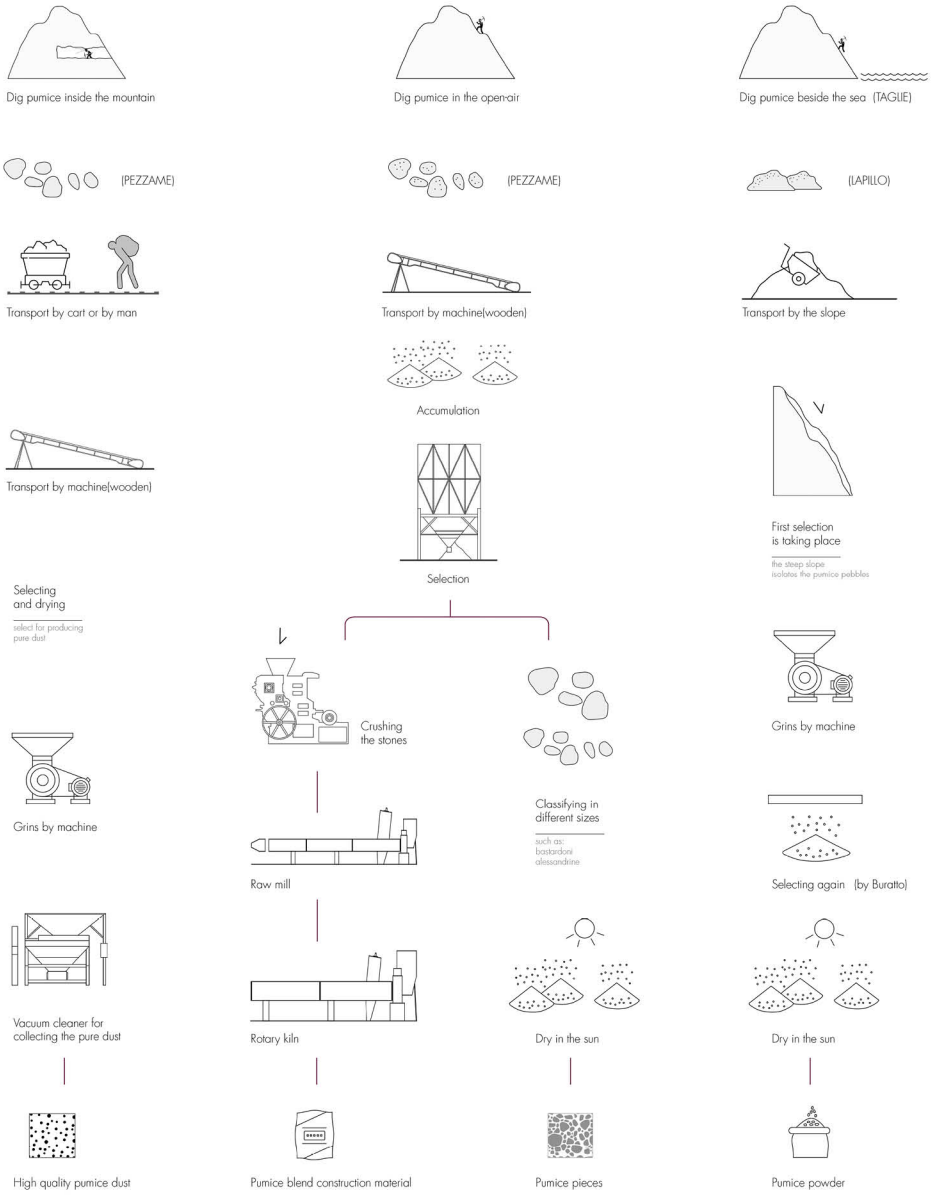


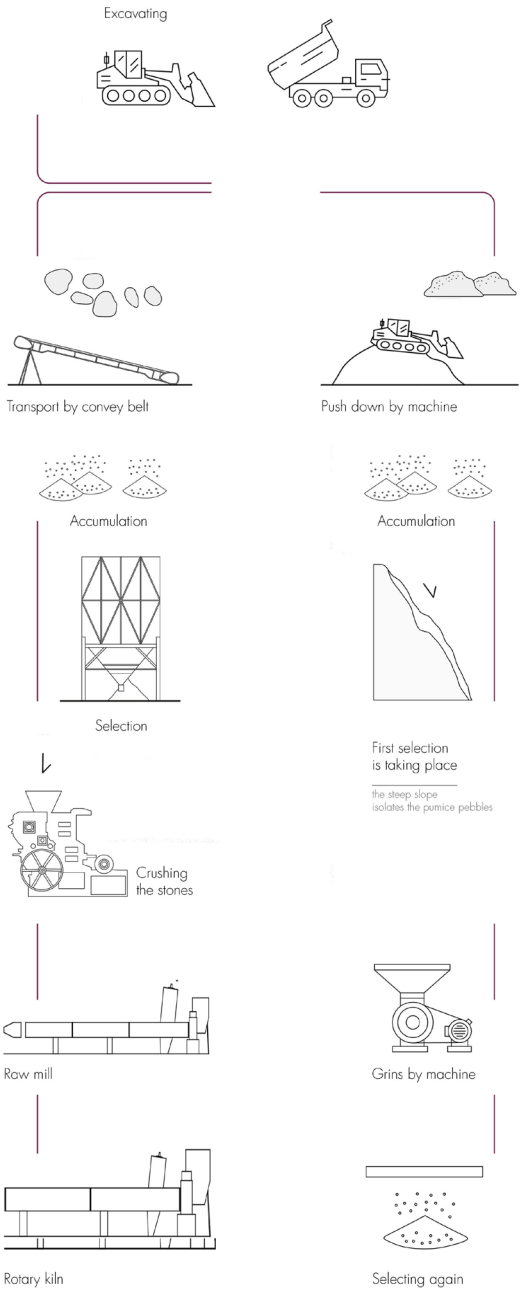
Diagram of 3 Different Historical Pumice Productions Process

it is noted that there were different systems for digging pumice and these systems correspond to different products. On one side the pumice in pieces, on the other the dust not free from other materials. The first reached in 1920, the golden year of pumice, the average price of 75 pounds every kilogram, the lapillo of 1.25 lire!

The latter, just for the cheap, had for years a great demand and replaced those concoctions of ash, sand that were used to clean the cutlery and floors, while the pumice in pieces had to suffer some year a strong stagnation even for large purchases made the previous year. Hence there was a struggle between the mountain quarrymen and those of the sea, demanding the former that the latter should not get rid of the lapillo, to force buyers to turn to the most expensive and purest goods.

It was from these mountain quarries that pumice had sprung up in pieces that was brought and sold in Canneto of Lipari.
It is in Canneto that converge industrialists and traders who bought the goods directly from the excavators.

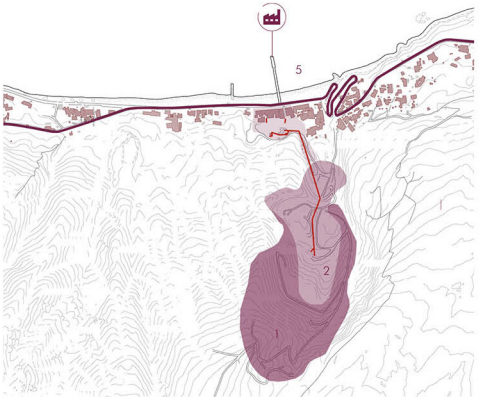
Package, Storage and Shipping of the Pumice Production


Excavating
Transport by convey belt
Push down by machine
Accumulation
Accumulation
Selection
First selection
is taking place
the steep slope
isolates the pumice pebbles
Crushing
the stones
Raw mill
Grins by machine
Rotary kiln
Selecting again

Pumice Production - Modern Production Process

The Smaller Quarry - Site Acquacalda - Quarry to the North

Existing and historical condition

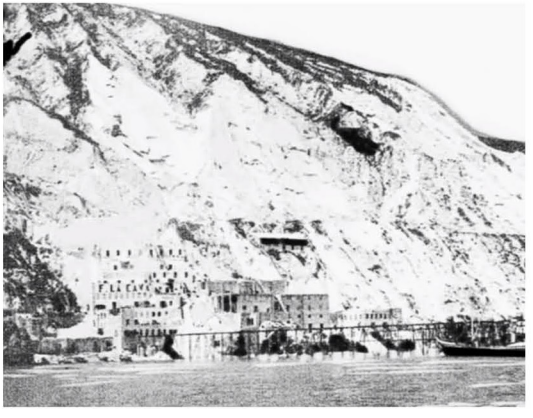


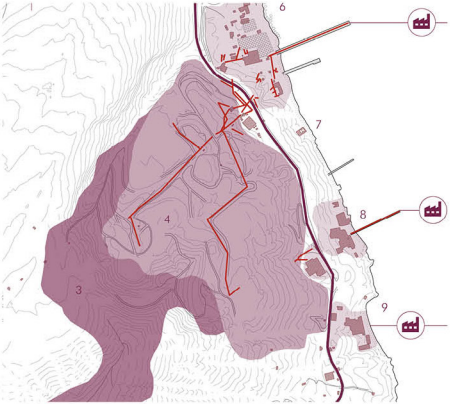
The Smaller Quarry - Site Acquacalda - Accumulation of Waste

Existing condition

The Bigger Quarry - Site Porticello - Quarry to the East

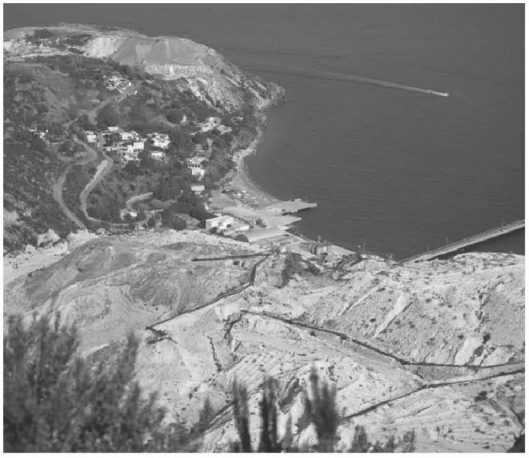
Existing and historical condition

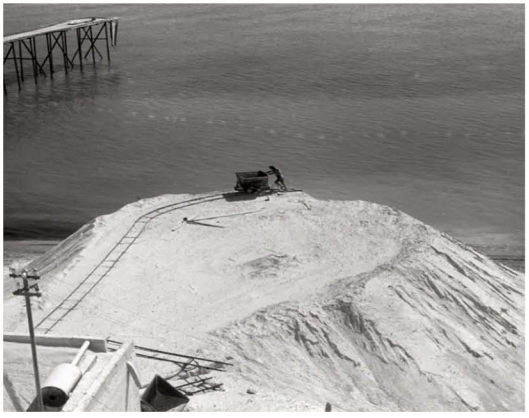


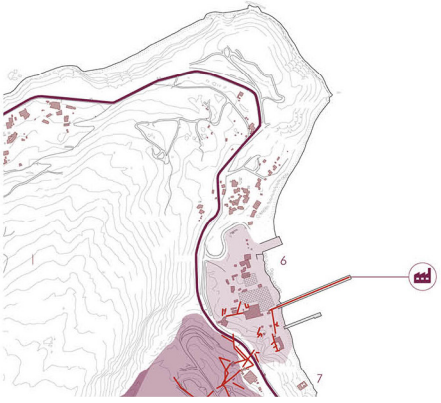


The Bigger Quarry - Site Porticello - Accumulation of Waste

Existing and historical condition







Factory in Site Acquacalda - Italpomice Factory

Existing and historical condition

Producted from end of 19th Century to 2001

A German factory in Acquacalda, they equipped according to modern industrial systems with special machines, has found a way, with vacuum cleaners, to collect pumice dust from the air, made the industry healthier and collected a product of the highest quality, which was the impalpable pumice.

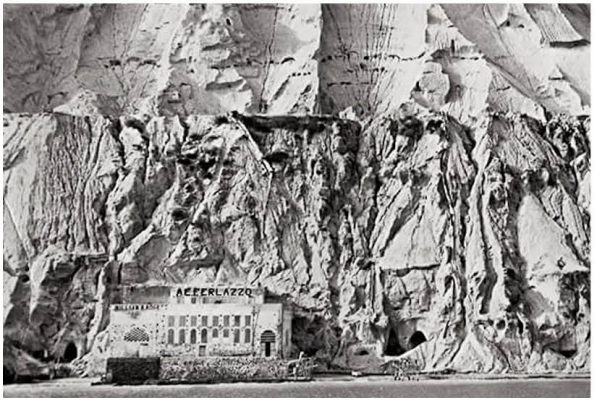
Factory in Site Porticello - Italpomice Factory

Existing and historical condition

Producted from around 1958 to 2007

Factory 2 in Site Porticello - Havana Factory

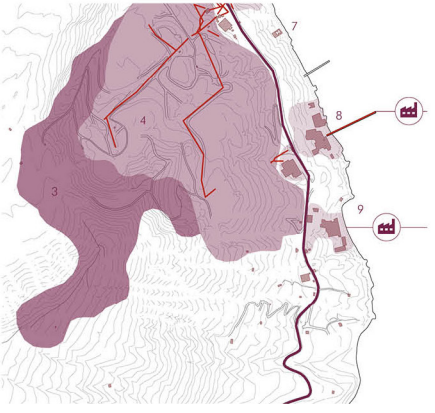
Existing and historical condition



Factory in Site Pietra Liscia - Cava di Sopra/Sotto Factory

Existing and historical condition

Producted from around 1950 to 1960



Factory in Site Capo Rosso - TH Ferlazzo Factory

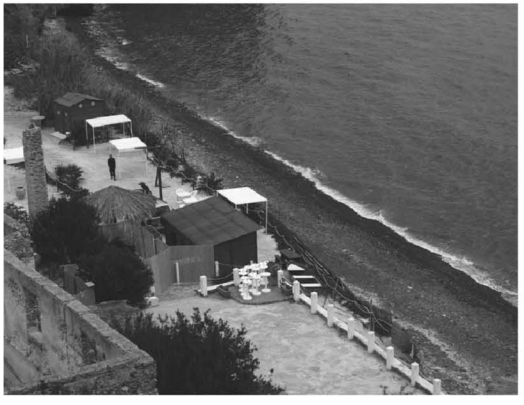
Existing and historical condition

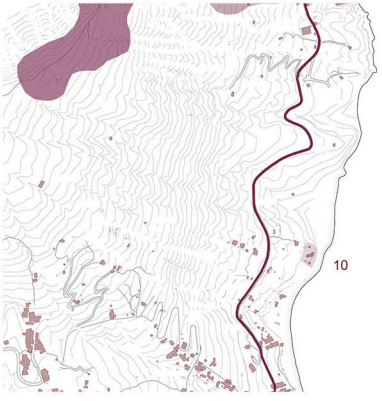
Producted from around 1930 to 1950

Factory in Site White Beach - Mulino Factory

Existing condition

Producted from end of 19th Century to around 1930





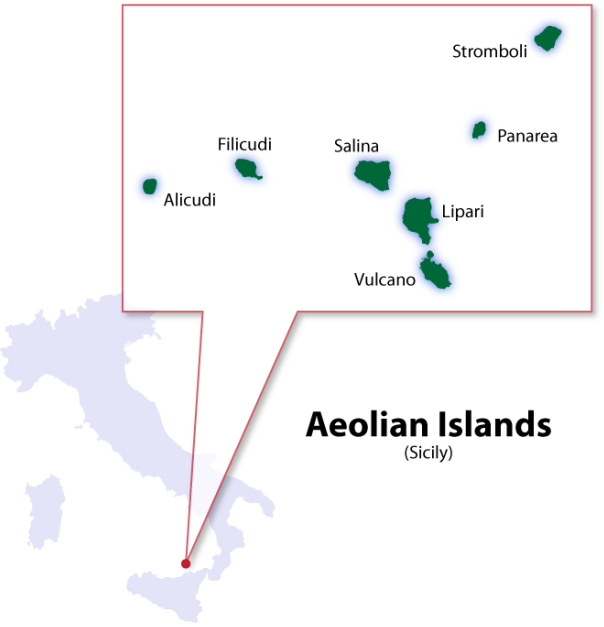
IDENTITY CARD PUMICE FACTORIES.....

History of built settlements in Aeolian islands

The habitability of the seven Aeolian Islands are rather different, Lipari, Vulcano, Salina, Stromboli, Filicudi, Alicudi and Panarea, are located in the North East of Sicily and represent an extraordinary testimony of the birth and evolution of volcanic islands. each of the islands are having different populations and bulit settlements according to their natural and geological artibuties.

Despite the volcanic activity still underway, or even thanks to it, the Aeolian Islands are fascinating islands, a natural environment rich in flora and fauna with wonderful beaches, coves, caves, inlets, stacks, and with a great variety and wealth of funds marine.

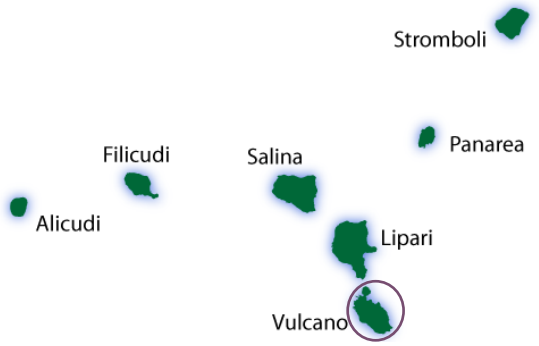
The first human settlements in Lipari and Salina are linked to volcanism, dating back to some centuries before 4000 BC, for the research and use of obsidian, the volcanic glass due to the cooling of the lava. This trade brought extraordinary prosperity to the islands and formed duwellings and small comunities around the mines.



7 Aeolian islands

Vulcano

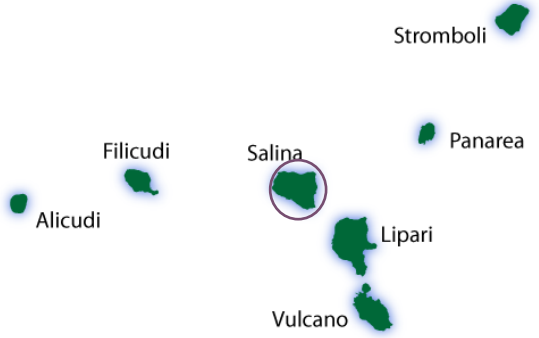
the third largest island in the archipelago after Lipari and Salina , remained uninhabited due to the strong volcanic activity. Only after the last major eruption, in 1888, the Great Crater ceased to be active and some farmers were able to settle and live on the island. Currently the volcanic activity is limited to fumarolic emissions, present almost everywhere. vulcano island is famous for its mud baths.

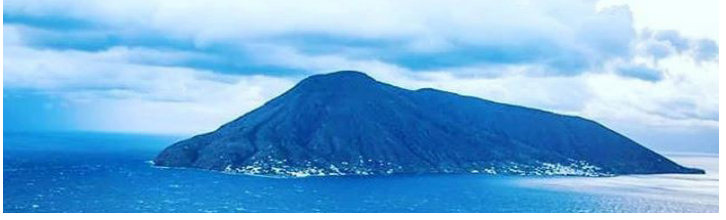


Vulcano Island

Salina

Salina is positioned in northern angle of lipari. The Aeolian Islands are the visible part of the submerged mountainous group that follows a linear development of about 87 km, from the most northerly point (the island of Stromboli) to the westernmost point (the island of Alicudi), and which extends deep towards the west with other submerged slands.

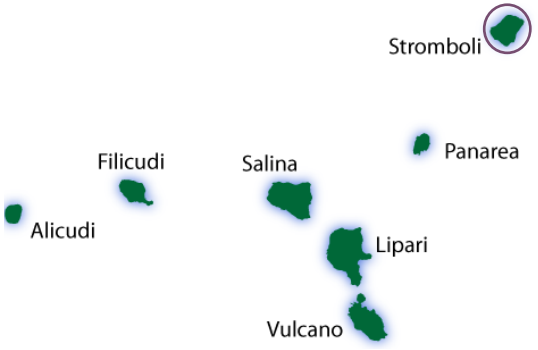




Salina Island

Stromboli

It is note worthy that the first island invisitor attraction is stromboli, due to it's live and ongoing volcanic activities . The island's population is currently about 500. the duwellers are mostly in tourism activities and giving accomodation or services to visitors.in non touristic seasons, a portion of the village population,leave stromboli to other seasonal jobs in neighboring islands. multiple white molding buildings at the foot hill form a one big colonized comunity of housings, motels and service buildings.



Stromboli Island

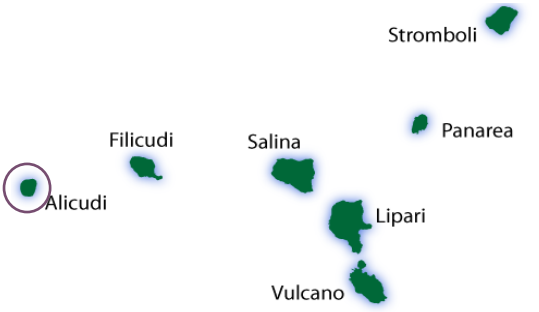
Filicudi

Filicudi is one of eight islands that make up the Aeolian archipelago, situated 30–50 km northeast of the island of Sicily, southern Italy. It is a frazione of the comune of Lipari.

Filicudi Island

Alicudi

Alicudi is the westernmost of the even islands the island is about 40 km west of Lipari, has a total area of 5.2 km², and is roughly circular and has a low density built area at it's less sloped foothill .The island is inhabited only on the east side, which slopes in a less harsh way towards the sea.

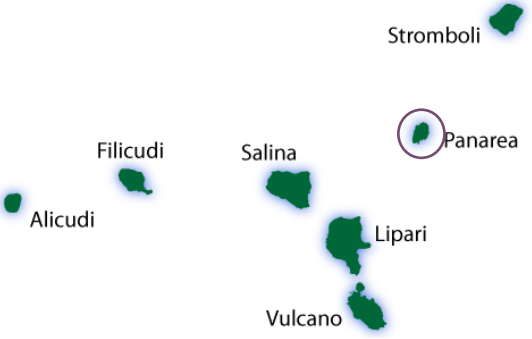




Alicudi Island

Panarea

The archaeological evidences of construction are dating back to Mycenaean inhabitants (~ 1200 BCE);
In modern times, Panarea has become a fashionable vacation spot .most residences admit only temporary occupancy, and the few year-round homes available are highly expensive and difficult to obtain. as like alicudi and salina ,most of the buildings in the island

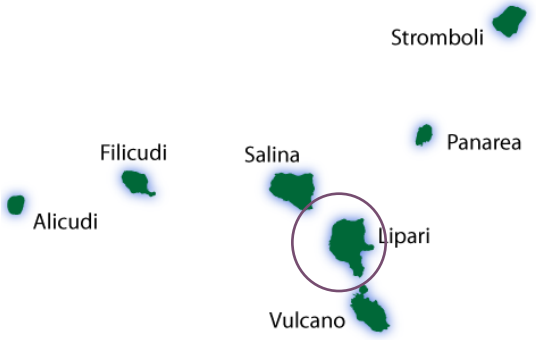




Panarea Island

Lipari

Lipari is the largest of the Aeolian Islands in the Tyrrhenian Sea off the northern coast of Sicily, southern Italy; it is also the name of the island's main town and comune, which is administratively part of the Metropolitan City of Messina. Lipari buildings are mostly built in 18 and 19 centuries, by means of industrial and manufacture of pumice and each site were added gradually and on an extension basis for the pumice manufacturing factories and it's different service buildings.



Lipari Island

A GENERAL OVERVIEW OF LIPARI SITES

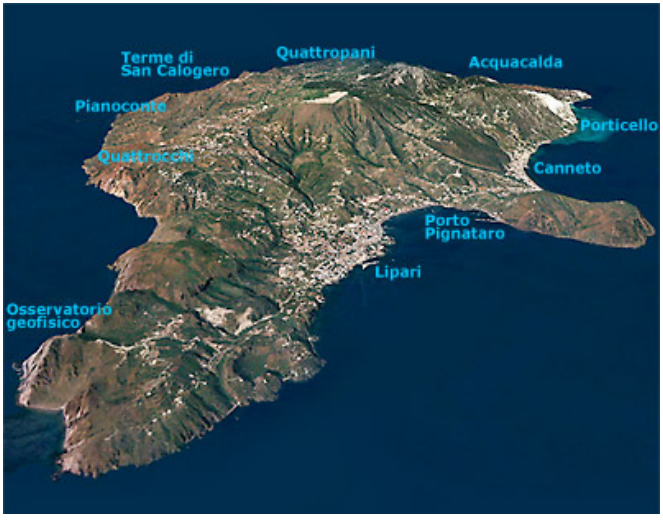
Starting with the visit when arrived firstly in Lipari,the very first thing to appericiate is size and urbanization of the center.

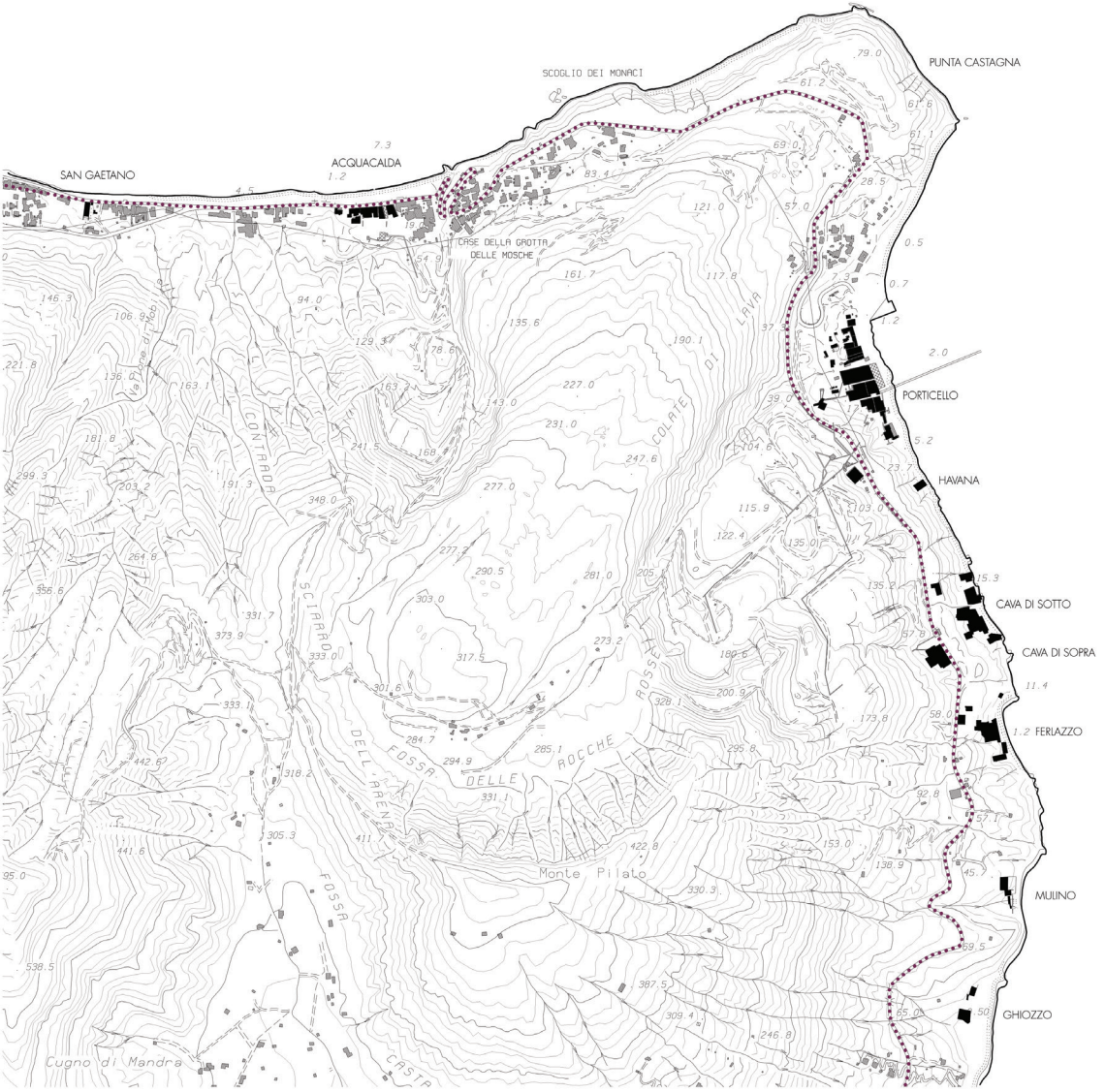
About 4 km from Lipari meets Canneto, located in a cove bordered to the south east from Mount Pilatus. From Canneto, along the road that leads to the church of Pirrera, you can reach Old Forge, the Fortresses Red and White Field, famous for the first two obsidian flows and pumice the expanses of the 'last. Continuing along the road that leads to Acquacalda you reach Porticello, dominated by white pumice deposits.

The White Beach, one of the most beautiful of Lipari, is so named for the color of the seabed, due to the sediments of pumice deposited in the sea over the years. The continuous variation of geological situations are real in Punta Castagna, formed by 'obsidian become a promontory: this is one of the most picturesque corners of the coastal journey. Rounding Punta Castagna appears Acquacalda.Passing through the village you can see the white expanse of the pumice deposits, with characteristic piers that stretch out into the sea (for transport of pumice on cargo ships) where there is a beach dominated by pumice quarries.

From here begins the climb up the mountain to the village of Quattropani, situated on a promontory just in front of the 'island of Salina. Still stands on a plateau planted with vines, the village of Pianoconte with its white houses. At about a quarter of an 'hour from Pianoconte, there are the Terme di S. Calogero, built in 1867 and known right from 'ancient times for their therapeutic virtues, attest to the presence of a Roman grotto, which dates back to about 3,500 years ago, and the "Tholos" of Mycenaean civilization, brought to light during the work restoration.

From here you can admire the picturesque coves with high coasts, the 'beautiful view of the Faraglioni and the background of the ' island of Vulcano. Again to return to the main road, continuing to Lipari, an interesting detour is the path that winds through the vineyards of Monte Guardia. On top of the mountain is the 'International Geophysical Observatory.




SCOGLIO DEI MONACI
PUNTA CASTAGNA
SAN GAETANO
ACQUACALDA
CASE DELLA GROTTA DELLE MOSCHE
PORTICELLO
HAVANA
CAVA DI SOTTO
CAVA DI SOPRA
FERIAZZO
MULINO
GHIOZZO
COLATE DI LAVA
CONTRADA
SCIARRO
FOSSA DELL'ARENA
ROCCHE ROSSE
Monte Pilato
Cugno di Mandra

IMPORTANCE OF ID CARD STUDY

Since there are siming similarities between shapes and materials of some Lipary sites, and are mostly built in simple volumes only to persue quick or in some cases temporal functions, they may be mistaken by each other at the first look. especialy the ones in the hillfoot (like Ferlazzo & Cava di sotto) and other visually pairing sites. the location of the sites and positions witch they hold in relation to the quaries, help understand some clues about the process of excavations and the geological transformations that the quaries and the whole mountain has experienced through that period.

this section of the analysis is aiming to point out the most important and noticeable features of each building in lipari's north-east quarter and clarify the differences and finally to give an abbreviated and quick introduction to the sites in the and make each, visually familiar and distinguishable.

ID CARD

introduction: i n the ID card , data is inserted as the following order:

1- location of the site along the coastal line and more generally in the northern half of the island .

2- an iconic figure of each site as a remembrance signature.

3- A paragraph including a specific definition and some numeric data for measurement means, both in point of view of size and age. this paragraph hold in the following data:

- 3.1- the built area
- 3.2- volume
- 3.3- height from sea

4- A picture taken from front (from the sea view towards lipari mountain)

5- Site plan of the built area and the environment around it (sea,hills,roads,..)

6- A cross-section showing the position of site along the connecting line of mountain and sea).

the factor of "height from sea level" is visible in this document and is an important factor in each site's former use and a quick factor for distinguishment.

7- charts:

7.1- pie chart: as a comparison of each site's area and volume to the total areas.

7.2-Area chart: this chart is the illustrative form of the area and volume numeric data .it's a quickway to see whether the site is spread minly horizontally or vertically.

8- And finally the timeline witch refers to the years in service and in some sites the abandonement year.

- All drawings (siteplan,section and elevation) are shown are in the same scale of 1:1000 , for helping a better comparison in size.

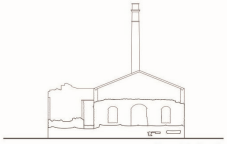
-the charts are done according to area and volume factors, witch are also pointed out in the descriptive paragraphs of each site. these charts can help differenciate between the shape orders and morphology of developements. the sites with higher numbers in volume are mostly the ones having a multi level and staircase developement, rather than the flat ones beside the sea shore (sites like Ferlazzo and Porticello are good compareables in this topic). the volume is also instantly noticeable , from the sea view.

-Building age of each site and more over different built parts of a single site may differ. surveys and photoes from different time periods, show this gradual developement and spread of the industrial buildings beside the excavation mines and also shipping ports. however structural analyses and decayed materials show that fact additionally.

SAN GAETANO

PRODUCTIVE TIME

End of 19th Century | 1930 | 1950 | 1956 | 1958 | 1960 | 2001 | 2007

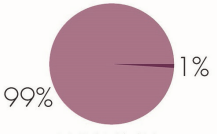


1:500

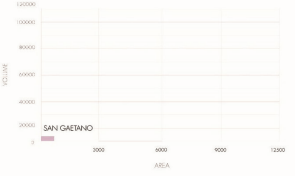
San Gaetano
Other Factories

Built Area : 528 m2
Volume : 3324 m3
Height from sea: 0 - 5.2 m

AREA

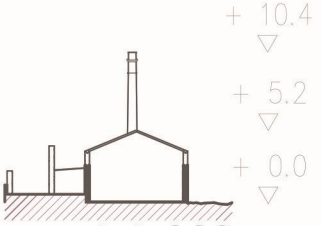


VOLUME



Being built in1930's on a flat shore ,sangaetano is the smallest among sites,with a 2% Area and 1% volume. ICONS: red brick chimney / collapsed Gable roof

1:1 000



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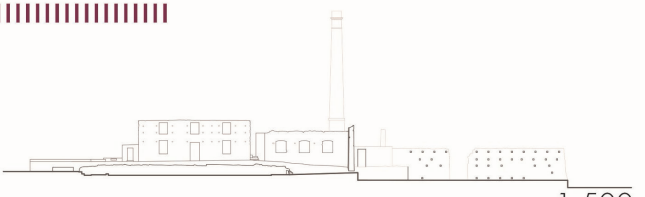
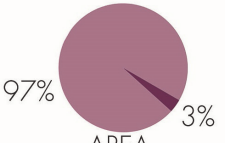
MULINO

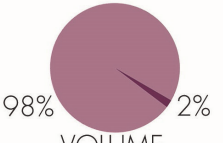
PRODUCTIVE TIME
End of 19th Century 1930 1950 1956 1958 1960 2001 2007

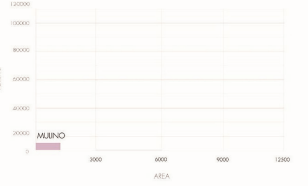


Mulino
Other Factories

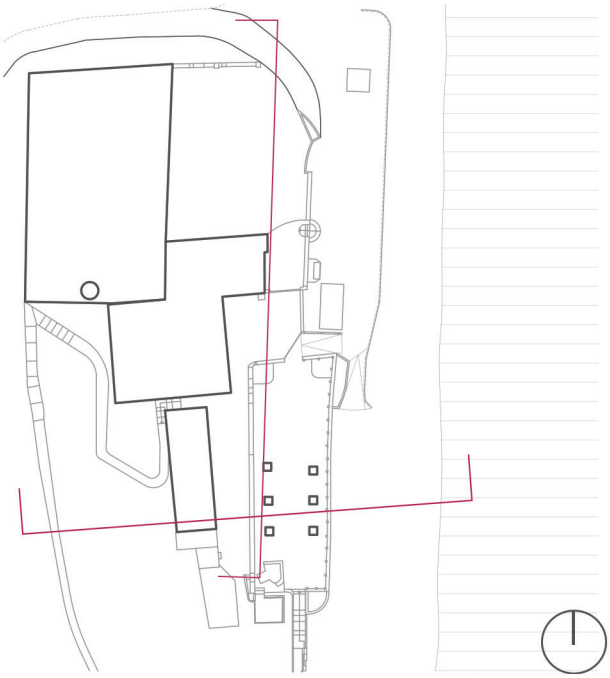
Built Area : 1085 m2
Volume : 6404 m3
Height from sea: 0 - 9.5 m

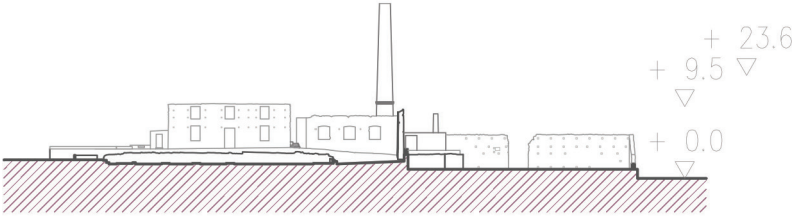


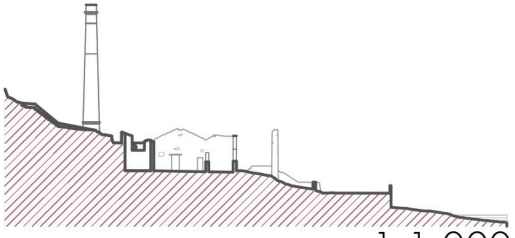




Also bulit in 1930's ,mulino is the second small site after san gaetano with 3% of total sites area. and 1% of volume
ICONS: white brick chimney







1:1 000

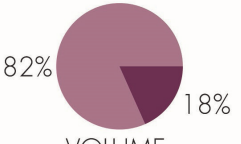
GHIOZZO

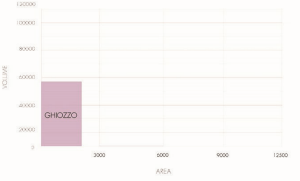
PRODUCTIVE TIME
End of 19th Century 1930 1950 1956 1958 1960 2001 2007

1:500

Ghiozzo
Other Factories

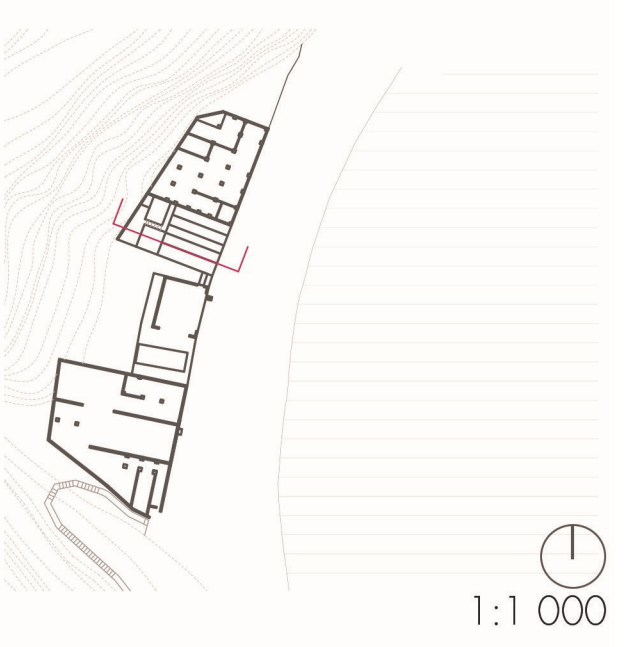
Built Area : 1885 m2
Volume : 59605 m3
Height from sea: 0 - 8.6 m





Having a white sand beach like mulino, ghiozzo is the closest site to center canneto. and was abandoned since 1950's. it has 6% area and 8% volume.

ICONS: collapsed Gable roof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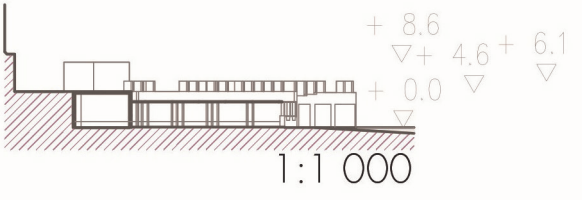
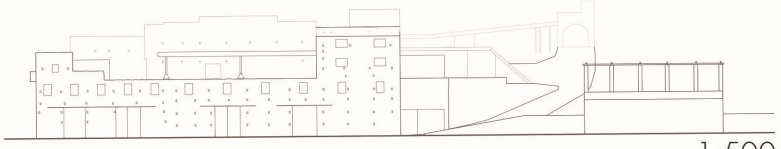

+ 8.6
+ 4.6
+ 6.1
+ 0.0
1:1 000

CAVA DI SOPRA

PRODUCTIVE TIME
End of 19th Century 1930 1950 1956 1958 1960 2001 2007



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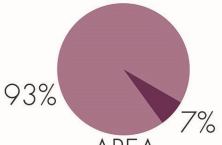
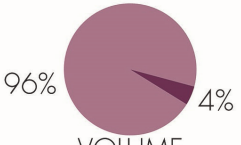
Cava di Sopra
Other Factories

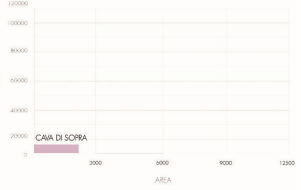
Built Area : 2168 m2
Volume : 15176 m3
Height from sea: 60 - 75 m



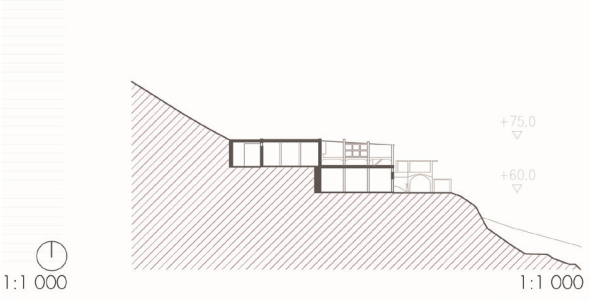
AREA



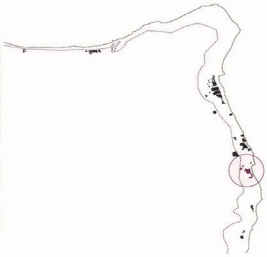
VOLUME



this rather newer site was built in 1950's, and is the only site with a direct access to the main rode. with 7% area and 5% volume
ICONS: industrial railings


+75.0
+60.0
1:1 000
1:1 000

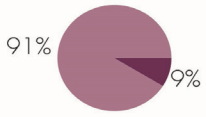
FERLAZZO



PRODUCTIVE TIME
End of 19th Century 1930 1950 1956 1958 1960 2001 2007

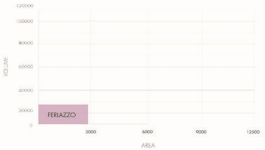
Ferlazzo
Other Factories

Built Area : 2853 m2
Volume : 27108 m3
Height from sea: 0 - 77.5 m

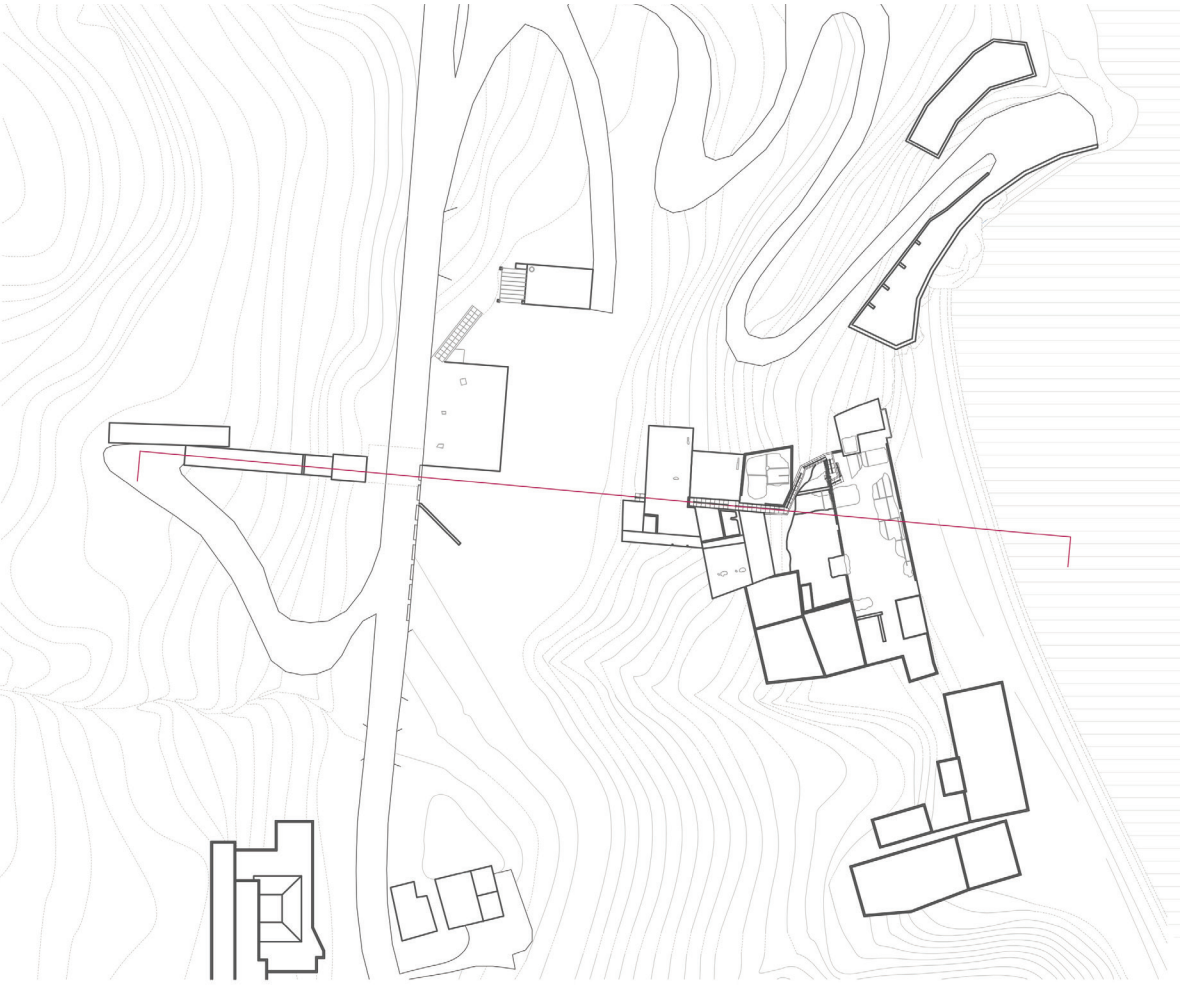


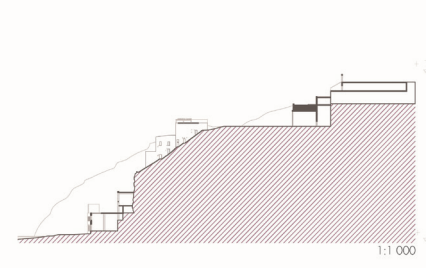
AREA

VOLUME



Similar shape with cava di sotto,but smaller and built 20 years earlier.with 9%area & 8%volume
ICONS: stepping facade/ narrow shore

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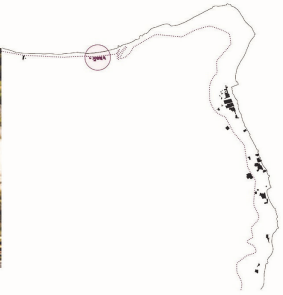
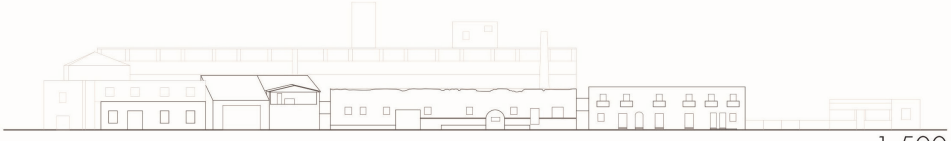
ACQUACALDA



PRODUCTIVE TIME
End of 19th Century 1930 1950 1956 1958 1960 2001 2007



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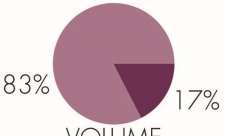
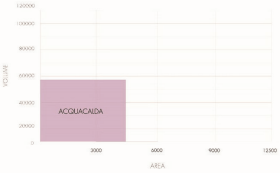
Acquacalda
Other Factories

Built Area : 4439 m2
Volume : 56794 m3
Height from sea: 2.5-12.5 m

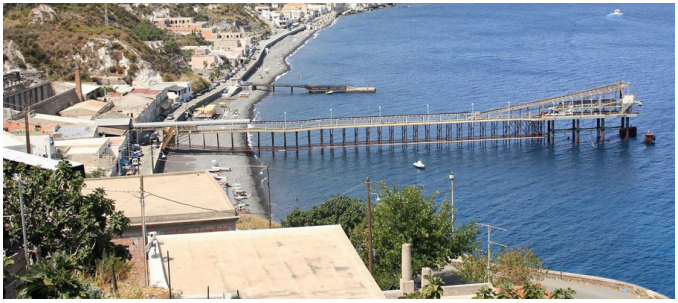
AREA

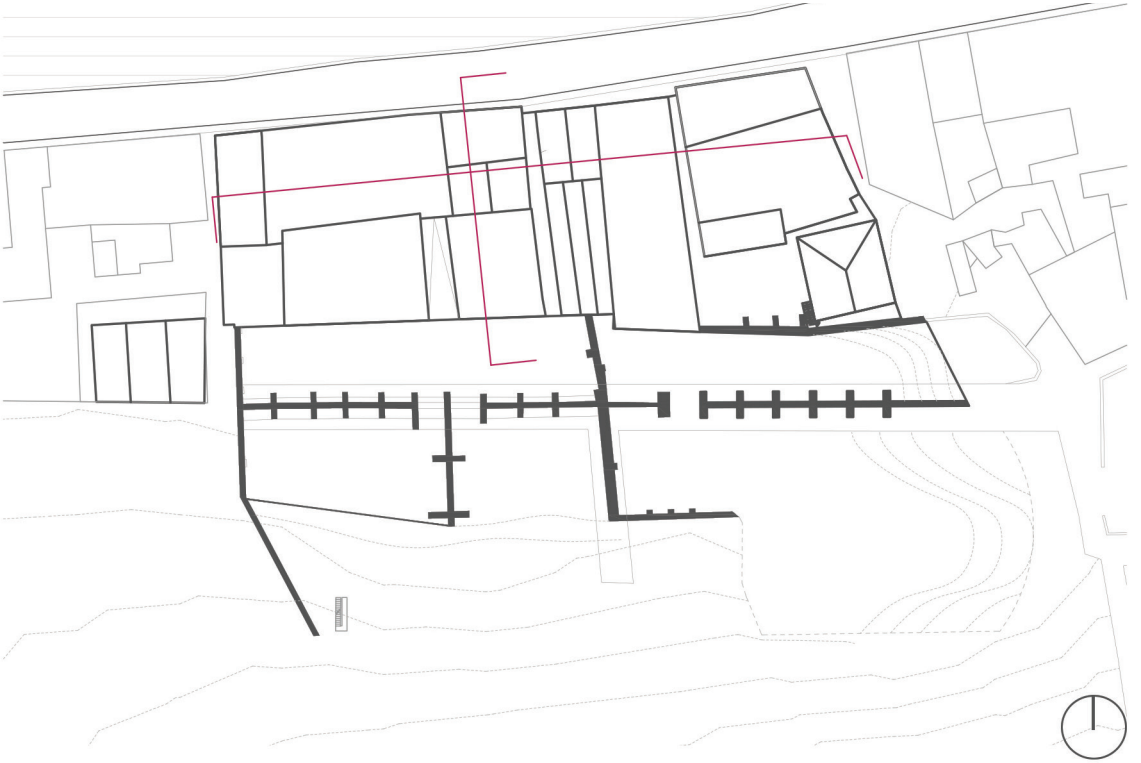


VOLUME



Built by the main rode in early 90's, aquacalda worked till 2001
Has 14% area and 17% volume of the total,and is built 2.5 meters above the shore evel.
ICONS: red brick chimney / long old facade by the main rode





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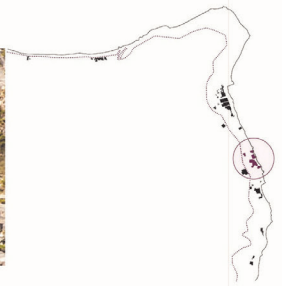
CAVA DI SOTTO

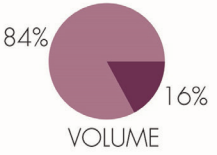


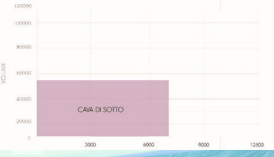
PRODUCTIVE TIME
End of 19th Century 1930 1950 1956 1958 1960 2001 2007

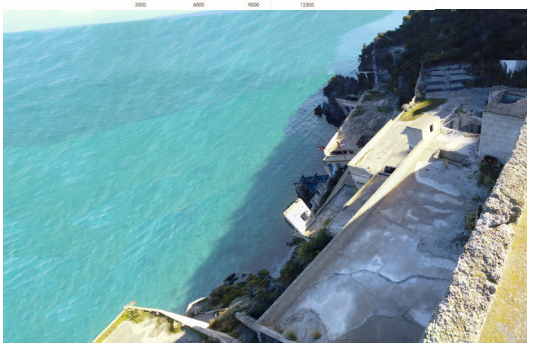
1:500

Cava di Sotto
Other Factories

Built Area : 6836 m2
Volume : 55594 m3
Height from sea: 0 - 50 m

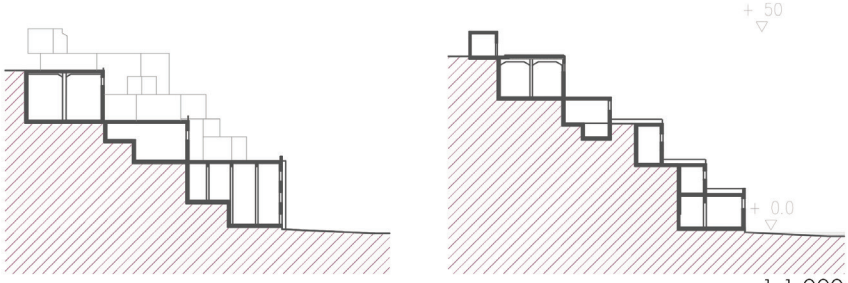






Similar age with cava di sotto,but a much higher volume (17%) in multiple levels and a 21% area.
ICONS: stepping facade/ narrow shore

1:1 000



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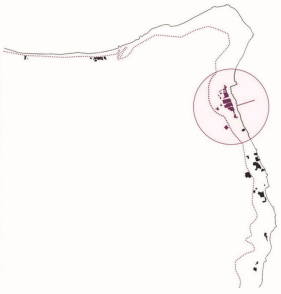
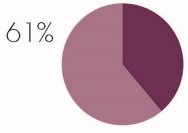
PORTICELLO



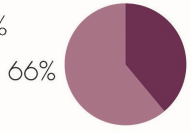
PRODUCTIVE TIME
End of 19th Century 1930 1950 1956 1958 1960 2001 2007

Porticello
Other Factories

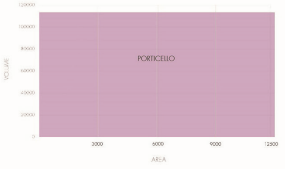
Built Area : 12626 m2
Volume : 113543 m3
Height from sea: 0 - 38 m



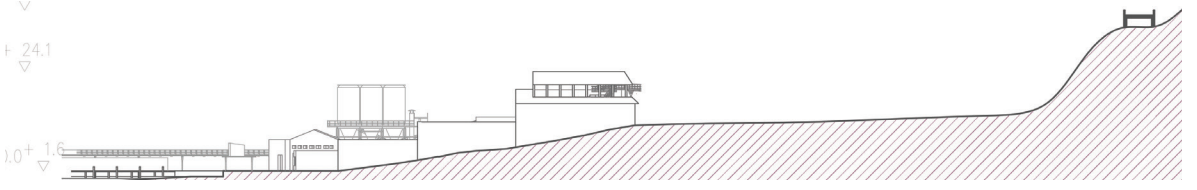
AREA



VOLUME



The biggest site both in area and volume point of view (39%).with numerous railings and machinery, abandoned since 1930's. ICONS: shipping deck/industrial machinery/extensive site

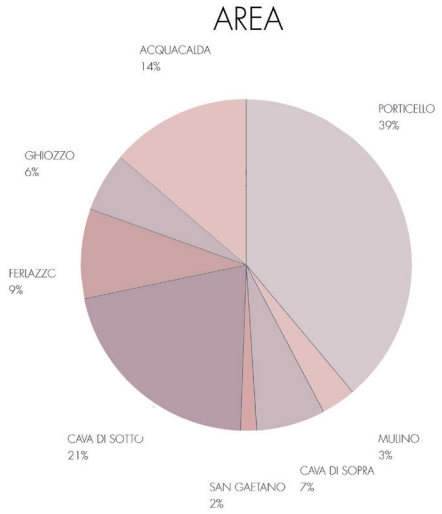

+ 24.1
+ 1.6

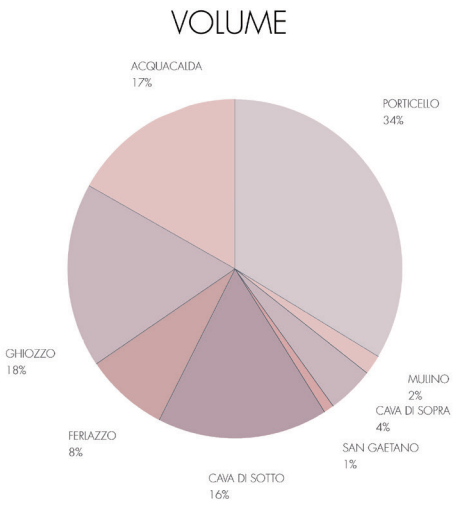
AREA AND VOLUME COMPARATIVE DIAGRAMS

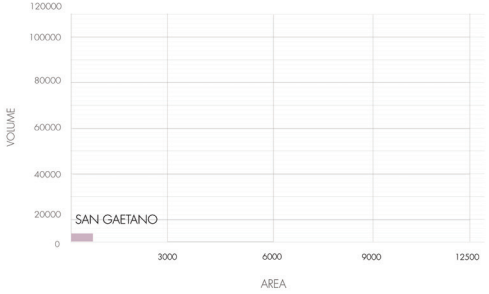
Having a closer look to the area graphs, it's noticeable that loipari buildings are constructed in different variation of capacities. for the matter of comparison, two different diagrams are illustrated. the pie chart,shown below is a comulative graph, showing each site's share in the total are or volumes.in other words the total chart (100%) is representative of sums of all site areas.and the same for the volume pie chart.

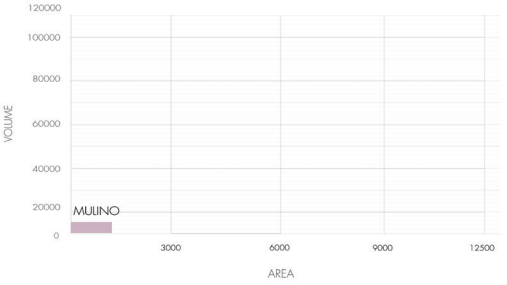
The second comparative diagram, is more of a comparison between area and volume of each site individually.

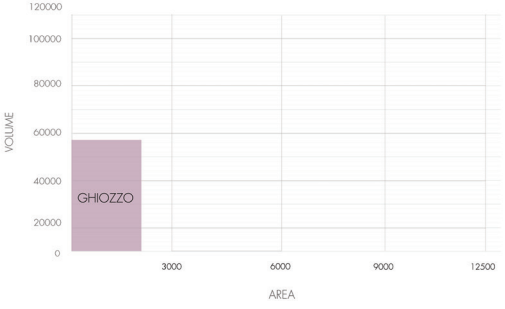
in this diagram the horizontal axis, is representative of each site's area in square meter. and is marked each 3000 meters. and the vertical axis is showing the volume, and is marked each 20000 cube meters. looking at the colored squares, it is possible to undrestand the proportion of each site,and it's kind of spread.

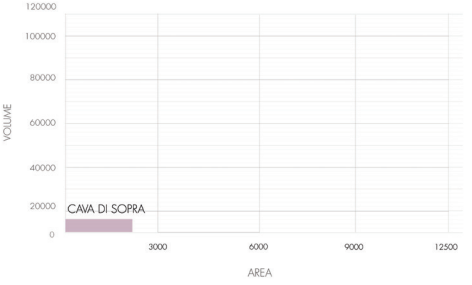





120000
100000
80000
60000
40000
20000
0
VOLUME
SAN GAETANO
3000
6000
9000
12500
AREA


120000
100000
80000
60000
40000
20000
0
VOLUME
MULINO
3000
6000
9000
12500
AREA


120000
100000
80000
60000
40000
20000
0
VOLUME
GHIOZZO
3000
6000
9000
12500
AREA


120000
100000
80000
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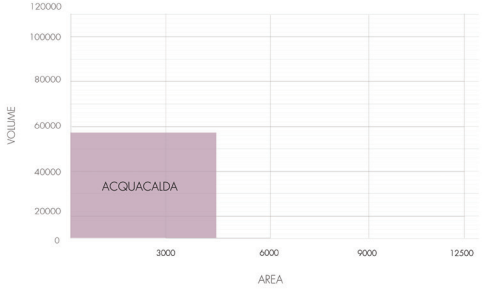
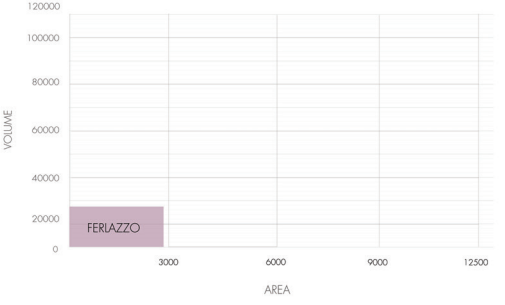
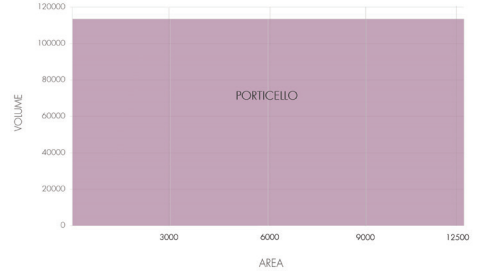
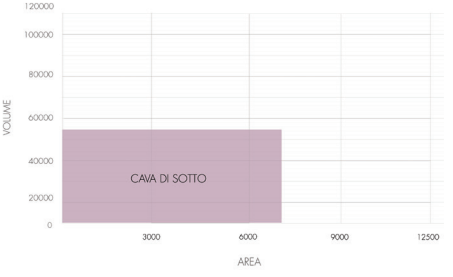
20000
0
VOLUME
CAVA DI SOPRA
3000
6000
9000
12500
AREA


120000
100000
80000
60000
40000
20000
0
VOLUME
ACQUACALDA
3000
6000
9000
12500
AREA


120000
100000
80000
60000
40000
20000
0
VOLUME
FERLAZZO
3000
6000
9000
12500
AREA


120000
100000
80000
60000
40000
20000
0
VOLUME
PORTICELLO
3000
6000
9000
12500
AREA


120000
100000
80000
60000
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0
VOLUME
CAVA DI SOTTO
3000
6000
9000
12500
AREA

GEOSITES

UNESCO World Heritage Site
Geoparks and geomining parks

UNESCO WORLD HERITAGE SITE

Aeolian Island Heritage Site of UNESCO

World Heritage Nomination

The nomination of the archipelago, to be recognized as a World Heritage site was done around 6 years before the inscription, and was based on the island's values:

- The volcanologic value: the volcanic landforms, that represent classic features in the continuing study of volcanology world-wide, provide a set of volcanic features and phenomena. Since at least the 18th Century, the islands had provided "two of the types of eruptions (Vulcanian and Strombolian) to volcanology and geology textbooks and so have featured prominently in the education of all geoscientists for over 200 years" and continue to provide a "rich field for volcanology studies, as significant on-going processes in the development of landforms".

- The archeological value: for its exceptional testimony to the continuity of life in the Aeolian Islands, from the Middle Neolithic era to today; for perfect state of conservation of stratigraphies that scientifically date an important part of the prehistory, protohistory and ancient history of the Mediterranean Sea; and for the Lipari Acropolis.

- The ethno-anthropological value: for the anthropogenic cultural landscape which was formed with the centuries and which is joined to us as a practically untouched testimony of the millennial activity of the man such as the isolation of the islands, the use of obsidian as a resource for the fabrication of tools, the particularity of the slopes of the volcanic cones that produced terrains, where stone terraces were built, and the different agricultural, urban and architectonic typologies found on the isalnds.

Inscription and IUCN suggestions

The original nomination comprised the islands in their entirety, including cultural properties. After the evaluation from the 1999 Bureau meeting, the Bureau requested the State Party to exclude the human use areas, and asked to propose a more sharply defined boundary for the nature reserves and buffer zones. These areas were defined as: Zone A (nature reserves), which are the areas of greatest scientific importance

and Zone B areas, as being surrounding natural areas or buffer zone, and the Zone C areas, the ones that are not included in the nomination, but are considered as predominantly human modified landscape buffer zones to Zones A and B areas.

Cultural properties, mainly buildings were also nominated, but after being evaluated separately by ICOMOS (International Council of Monuments and Sites), the recommendation was that the site did not meet the cultural World Heritage criteria.

The Aeolian islands were inscribed in the UNESCO Heritage List in December 2000, under the Criterion (i): Earth's History and Geological Feature, based on the merit that "the Aeolian Islands being an outstanding record of volcanic island building and destruction, the ongoing volcanic phenomenon, and the influence that volcanism has had on the culture and peoples of these islands. Moreover, their activity and influence is in evidence today, with the active volcano of Stromboli and the continuing threat of Vulcan (and Vulcanello). The seven islands are in a volcanic arc or archipelago, much like the Hawaiian Islands. They offer in a relatively small geographic space a model on a small scale of the story of volcanoes. They are well studied and monitored and have international significance in the study of volcanology".

The islands currently correspond to the criteria (viii) (to be outstanding examples representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features), as the criterias names where changed in 2004.

Other activities suggested by the IUCN, to help develop the heritage significance of the area were:

- development of museum facilities, including support of the current museum project. It is noted that, except for the excellent museum displays in the town of Lipari, there is currently limited interpretation on site or near site and it is recommended that more attention be given to this aspect;

- inclusion of professional geological input in published books and maps, and for the planning of tourist trips, and also for the education and training of tourist guides, and general publicity about the volcanic heritage of the Islands;

- development of a regular series of on-site conferences to build up information for the use of visitors to this area;

- development of a volcanic trail

- urged the State Party to expedite formal legal protection for the nominated area and to develop an integrated management plan for the area to ensure effective management of World Heritage values, along with the creation of Geopark.

Aeolian Islands Management Plan PTP (Piano Territoriale Paesistico)

The admission of the Aeolian Island in the "World Heritage List" represented a great opportunity for all the island to promote the preservation and valorisation strategy and to promote the uniqueness of the island around the world.

In all the islands, it is important the strong relation that exist between structural landscape, history of the population and protection and requalification strategy of the islands; in particular, the volcanic origin of the island and the volcanic product strongly affected the life and economy of the island, from prehistoric period untill nowadays.

That's why the "Piano Territoriale Paesistico" is a fundamental instrument draft to defend and valorize the landscape and cultural identity of the territories. Moreover, the plan establishes all the limits in the intervention and usage of the lands with the aim to prevent singular interventions that don't take in consideration the eco-development of the entire system.

The PTP mainly aims to protect the landscape, the natural heritage and the cultural-historical heritage, and search to valorize them thanks to the definition of conservation, transformation and utilization of minimum condition and rules. The plan specific goals are:

- Scientifically identify the category of the cultural territorial landscape heritage;

- Organize that category according to their structural and perceptual relevance and divide them into three-dimensional cultural territorial goods and surface cultural territorial goods;
-
- Localize on the territory the heritages and their systems;

- Ensure the safety of all the cultural territorial goods as cultural resource in relation with the compatible dynamic of the transformation processes;

- Preserve the macrostructural identity and dignity of the territory; defend the essential and intrinsic characteristic of elements, areas, system, and significant sign of cultural, environmental and landscape interest;

- Give constitutional support to all the norms and to their management with the creation of procedure coherent with the Italian Constitution and with a successful explanation of the scientific motivation to the option;

- Guarantee high quality to the natural and built environment, and their collective usage;

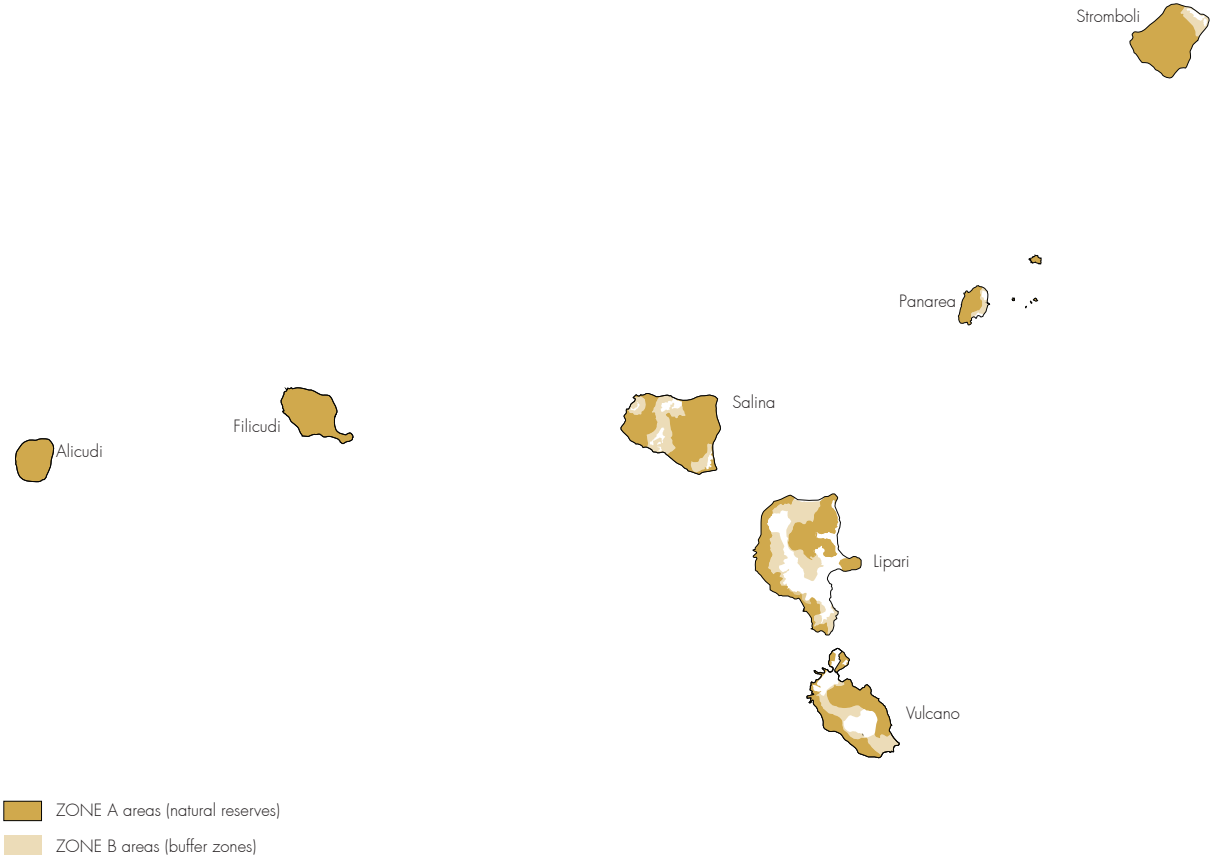
- Identify and classify artefact and all the operation that had decreased in the years the environmental value of the territory;

- Locate and indicate all the actions and measures necessary to:
  - remove the artefact and stop the anthropic activities incompatible with the preservation and valorisation of the sites
  - make compatible the environment detractor not compatible under an aesthetic-perceptual aspect;

- Identify the critical elements and define the landscape compatibility inside the creation process of the general planning instrument.

The PTP also defines the intervention typology compatible with the different type of land and heritage, and here explained:

- Scientific research and monitoring;
- Civil protection intervention;
- Cultural, educational, formative and informative activities;
- Agricultural, wooden and pastoral traditional activities;
- Eco-hydraulic forestry operation;
- Agri-touristic activities;
- Camping;
- Public equipped park without vertical development structures;
- Recovery of the historical pedestrian path;
- Building restoration for public functions;



GEOPARKS AND GEOMINING PARKS

Geosites: Geoparks and Geomining parks

Geosites

Geosites are elements, areas or places of geological interest of significant value and important witnesses of Earth's history.

Since 1995, with the support of UNESCO, numerous projects and working groups have been born on a world scale dedicated to the study and the enhancement of the geological heritage:

- Working Group on Global Geosites of the International Union of Geological Sciences;
- Geomorphological Sites of the International Association of Geomorphologist;
- ProGEO program;

In Italy the collection of information about italian geosites is carried out at the national level by the Department of Defense of Nature (ISPRA - Istituto Superiore per la Ricerca e la Protezione Ambientale).
The project "National Inventory Geosite", launched in 2002, aims to create at national level an inventory of geosites in order to develop a useful tool the geological knowledge of the territory and for the environmental protection. At the moment the inventory includes about 3000 geosites surveyed in the country.

Moreover, the Department of Geological Service of ISPRA collaborates with UNESCO on Geoparks projects and has also developed plans for Geomining parks in Italy.

Geoparks

The protection and enhancement of geological heritage at national and international level is a fundamental factor in the context of broader policies for planning and management of natural resources. Several are the acts and measures that have been adopted to protect the most important areas from the geological point of view.

The strategy of Geoparks adopted by UNESCO - launched in 2000 under the European Geoparks Network (EGN) and consolidated in 2004 with the establishment of the Global Geoparks Network (GGN) - perfectly interprets the policies for the conservation and enhancement of geological heritage and integrates them in the context of more complex actions, aimed at the protection of environmental resources and sustainable

development at the local level.

An internationally recognized Geopark is a territory that has a particular geological heritage and a sustainable development strategy. It must have well-defined boundaries and sufficient extension to allow an effective economic development of the district. Moreover, it must include a number of geological sites of special importance in terms of scientific quality, rarity, aesthetic relevance or educational value.

Most of the sites in the territory of a Geopark must belong to the geological heritage, but their interest can also be archaeological, naturalistic, historical or cultural, they have to be linked in a network and have to benefit of measures for the protection and management. An area identified as a Geopark must be administered by well-defined structures that are able to reinforce their protection, their valorisation and their sustainable development policies. Furthermore, it must have an active role in the economic development of its territory and must make a positive impact on the living conditions of its citizens and on the environment.

EGN - European Geoparks Network and GGN - Global Geoparks Network

After a first launch of the "Geoparks" program operated by UNESCO in 1998, it was necessary to wait for the year 2000 for the real activation of the first Geoparks in Europe. In fact, during the 2000's, four protected areas of four different European countries (the Petrified Forest of Lesvos Island in Greece, the Geological Reserve of Haute Provence in France, the Vulkaneifel Geopark in Germany and the Maestrazgo Cultural Park in Spain) constituted the European Geoparks Network.

These four territories were presenting a geological and geomorphological heritage of particular scientific, informative, didactic and esthetic importance, which established a combined work to identify new strategies for sustainable development based on projects aimed at enhancing the geological heritage.

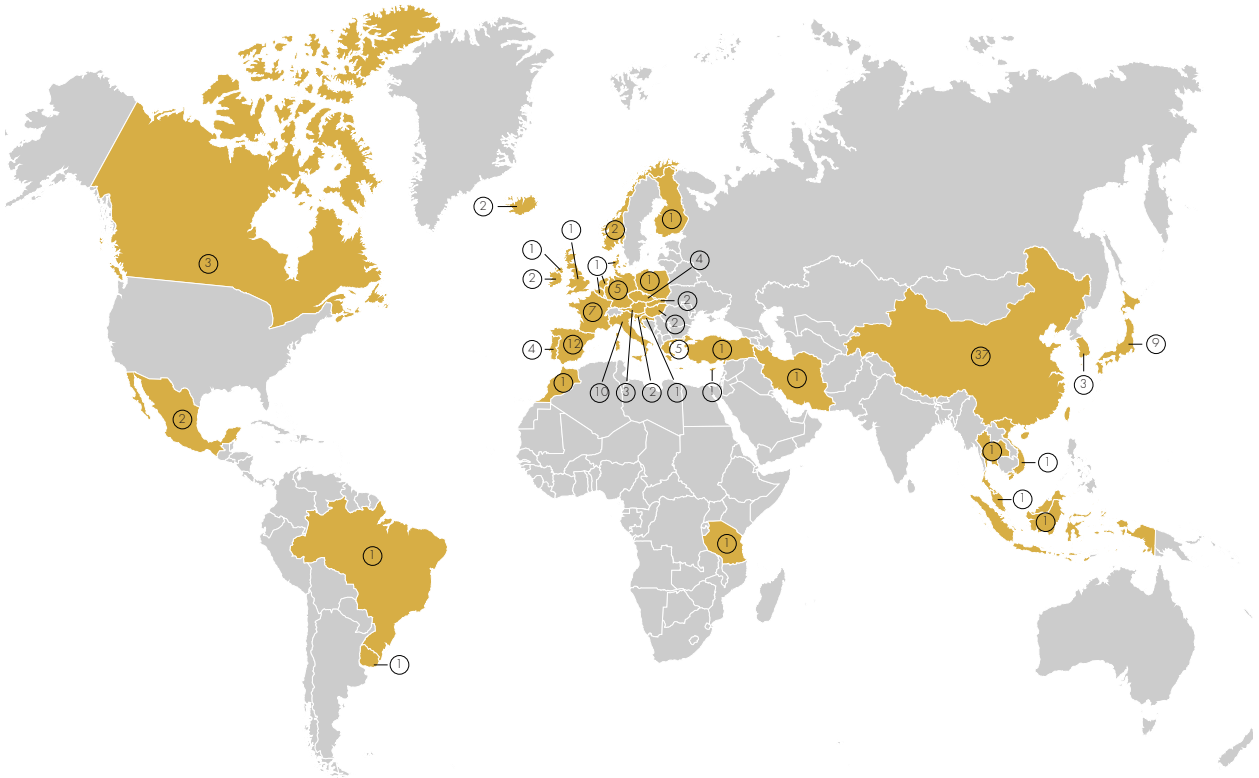
From the initial collaboration between these four territories, many initiatives that have promoted geotourism have emerged and have developed interesting experiences in the field of environmental education, training and scientific research in the various disciplines of Earth Sciences, catalyzing the interest of a rising number of territories characterized by an important geological heritage.

Some years after the institution of the European Network of Geoparks, in February 2004, a group of international experts of UNESCO in Paris discussed and agreed the establishment of the Global Network of Geoparks, officialized during the First International UNESCO Conference about Geoparks, held in Beijing, China in June 2004.

This network pursues three priority objectives:
1. The protection of the environment
2. The promotion of educational activities on earth sciences
3. The promotion of local sustainable economic development

On April 17 2018, the UNESCO Plenary Assembly, representing 195 States, on the occasion of the 38th General Conference held in Paris, approved the new "International Geosciences and Geoparks Program" (IGGP) establishing a new category of UNESCO sites: the UNESCO World Geoparks (UNESCO Global Geoparks). At the moment the list includes 140 international Geoparks, organized through different regional networks:

- 73 territories refers to the European Geoparks Network: Austria (3), Cyprus (1), Croatia (1), Denmark (1), Finland (1), France (7), Wales (2), Germany (5), Greece (5), England (1), Northern Ireland (1), Italy (10), Iceland (2), Norway (2), Netherlands (1), Poland (1), Portugal (4), Czech Republic (1), Republic of Ireland (2), Slovak Republic (1), Romania (1), Scotland (2), Slovenia (2), Spain (12), Turkey (1), Hungary (2) and Belgium (1);
- 58 territories refers to the Asia – Pacific Geoparks Network: China (37); Japan (9), South Korea (3), Malaysia (1), Indonesia (4), Iran (1),Thailand (1) and Vietnam (2);
- 2 territories refers to the Latin American Geoparks Network: Brasil (1) and Uruguay(1);
- 5 territories refers to the North American Geoparks Network: Messico (2) and Canada (3);
- 2 territories in Africa: Marocco (1) and Tanzania (1).



Unesco Global Geoparks in the World

How to obtain the Geopark status:

The application for an aspiring UNESCO Geopark, comprises several steps and must comply with the UNESCO criteria. The candidate must first submit an expression of interest to UNESCO, via official channels. Later, it must present a dossier with supporting material demonstrating that the park has been functioning as a "de facto Global Geopark" for at least one year. The candidate must have discussed and exchanged information with other UNESCO Global Geoparks, participated in international or regional Geopark meetings, conferences or courses. The site must have a "geological heritage of international value" and should be "managed by a body having legal existence recognized under national legislation that has a comprehensive management plan, covering governance, development, communication, protection, infrastructure, finance, and partnership issue". The number of active applications is limited to two per Member State. The UNESCO Secretariat assigns two evaluators to start a field evaluation. Subsequently, the application will be review alongside the evaluation, and recommendations on the applications will be made by the UNESCO Global Geopark Council. The final decision is expedited by the Executive Board of UNESCO. Every four years, a revalidation process should be made, where the UNESCO Global Geopark under review must submit a progress report, a self-evaluation, a progress form, and two evaluators will make a field mission to revalidate the quality of the site.

In addition, for a site to be considered a Geopark it:

Must contain geology of international significance (evaluated by scientist professionals).

Must be living, working landscapes where science and local communities engage in a mutually beneficial way.

Must encourage awareness of the story of the planet as read in the rocks, landscape and geological ongoing processes.

Must promote links between geological heritage and all other aspects of the area's natural and cultural heritage, demonstrating that geodiversity is the foundation of all ecosystems and the basis of human interaction with landscape.

Must contribute to achieving UNESCO's objectives by promoting geology and science

Have international cooperation between areas with geological heritage of international value, local community support, promotion of heritage and sustainable development of the area
Must be single, unified geographical areas where sites and landscapes of international geological significance are managed with a holistic concept of protection, education, research and sustainable development.
Must have clearly defined borders, be of adequate size to fulfil its functions and contain geological heritage of international significance as independently verified by scientific professionals.

Should use the heritage, in connection with all other aspects of that area's natural and cultural heritage to:

- promote awareness of key issues facing society in the context of the dynamic planet we all live on;

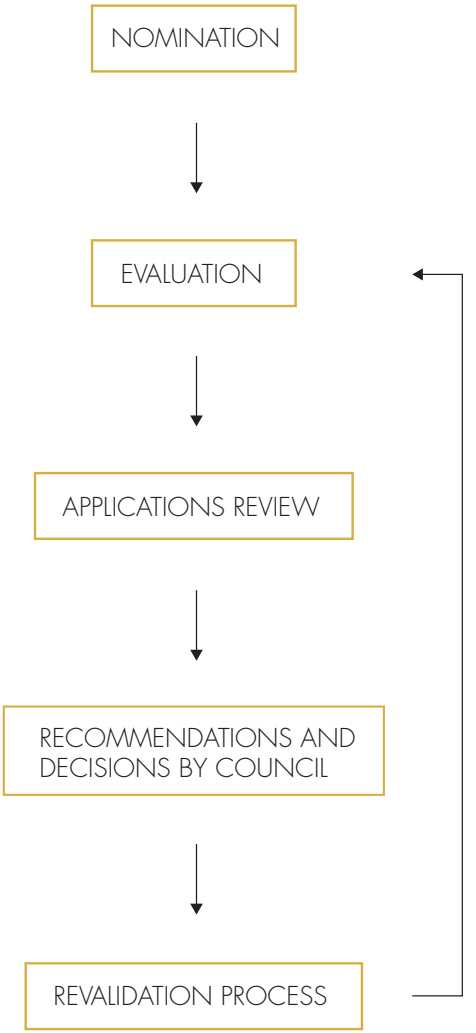
- Increase the knowledge and understanding of: geo-processes, geo-hazards, climate change, the need for sustainable use of Earth's natural resources, the evolution of life and the empowerment of indigenous peoples.

Should be areas with a management body having a legal existence recognized under national legislation.
If overlapping with another UNESCO designated site, the request must be clearly justified and evidence must be provided for how UNESCO Global Geopark status will add value by being both independently branded and in synergy with the other designations.

Should actively involve local communities and indigenous people as key stakeholders in the Geopark. A co-management plan, in partnership with local communities, needs to be drafted and implemented, to provide for the social and economic needs of local populations, protects the landscape in which they live in and conserve their cultural identity. Local and indigenous knowledge, practice and management systems should be included, alongside science, in the planning and management of the area.

Must share their experience and advise to undertake joint projects within the GGN, and must respect local and national laws relating to the protection of geological heritage.

APPLICATION PROCEDURE



CRITERIAS FOR UNESCO GLOBAL GEOPARK

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Italian geoparks

Italy is well represented in the international panorama with 10 Geoparks recognized by the European Network and Global Network under the auspices of UNESCO.

1. Madonie Geopark
2. Rocca di Cerere Geopark
3. Beigua Geopark
4. Geological Mining Park of Sardinia
5. Adamello-Brenta Geopark
6. Cilento and Vallo di Diano Geopark
7. Tuscan Mining Geopark
8. Apuan Alps Geopark
9. Sesia-Val Grande Geopark
10. Pollino Geopark

Italian UNESCO geoparks

Geomining Parks

The project, starting from the main experiences in the national Italian field, aims to highlight the peculiarities of the mining heritage, the difficulties encountered in its management and to propose the necessary regulatory adjustments to the parliamentary bodies, to ensure the use of mining sites for cultural, educational and tourist purposes. This initiative gained strenght with the the cessation of almost all mining activities where public and private initiatives were undertaken, which aimed at safeguarding and enhancing the mines. This happened in the absence of a precise national framework, without a precise cultural characterization of the valorised patrimony, without normative references and with scarce financial resources. Thanks to these meritorious initiatives, however, the complete dispersion of a significant historical heritage was avoided, which today, has been rightly included among the goods protected by the "Code of Cultural Heritage and Landscape". However, the mines still don't have a precise location, because of their influence not only in the cultural field, but also on the environmental and landscape one.

The Department of Nature Protection of the Agency for Environmental Protection, within the activities and studies in the field of the protection and enhancement of monuments and sites of geological interest, has concluded an agreement with the Federculture Association with the aim of:

- Define criterias and methods for the preservation of mining sites;

- Highlight the main technical and regulatory issues to ensure the enjoyment of the mining sites for tourism, cultural and educational activities;

- Analyse the forms of management and exploitation of mining sites with the aim of providing replicable models in the various national level.

The results of the Convention was published in the book: "Guidelines for the management and use of Geo-mining sites and parks" which was presented during the conference "Parks & Geomining Geoparks: experiences of management and development of the area ", held in Rome, at the headquarters of ISPRA, the 20 November 2008.

What is a geomining park?

For all its activities, man draws to nature, over-exploiting the resources of the Earth. Minerals and rocks have been very useful to human life, and ingenious techniques have been developed to extract them.

A mining park is an area that has been subjected to extraction of minerals or other geological materials from the earth (mine).

The extraction of other useful materials resulted in a transformation of the landscape, changing both the appearance of the mining area (mine or quarry) and all the surrounding areas where the initial processing of the resources took place. Often, the activities of towns and villages have been centered on mining.

The mining parks were created with the intention of recovering these areas and give them back to the community, enhancing their cultural and environmental value.

In resultance of this important role that the geo-mining sites have played over the centuries, recent legislation on Cultural Heritage (Code of Cultural Heritage and Landscape, DL January 22, 2004, 42 of Art. 10 paragraph 4) now includes them among the cultural heritage to be protected, whenever they show historical and ethno-anthropological features.

Moreover, the same law recognizes as Landscape Assets "homogeneous parts of the territory whose features are derived from nature, human history or by their mutual interrelationships". In the Italian territory, there are several areas showing these features, where mining ceased completely or partially. Some of these areas, following bureaucratic procedures, obtained specific recognition, becoming eco-museums parks and mining villages.

Unlike national parks that protect ecosystems and species, geo-mining parks, perhaps the least known type of park, do not require spatial continuity to pursue their goals of protection. They often consist of multiple sites (mines,quarries, processing industries, museums) that can be even several kilometers far away one from the other, but they are recognized as part of the same production system and help therefore to rebuild the history of human activities and the complex geomorphological structure of the territory.

Italian geomining parks according to ISPRA

A. Ecomuseo delle Miniere e della Valle Germanasca - Scopriminiera
B. Villaggio Minerario di Formignano
C. Museo Storico Minerario di Perticara - Sulphur
D. Parco dello Zolfo delle Marche
E. I Parchi della Val di Cornia
F. Parco Tecnologico e Archeologico delle Colline Metallifere Grossetane
G. Parco Minerario dell'Isola d'Elba
H. Parco Geominerario Storico e Ambientale della Sardegna

Italian ISPRA geominingparks

Geo and Geoming Geoparks study cases

In our goal to better understand how Geoparks and Geomining Parks work, we choose two Italian parks as study cases. The first one, The Parco Geominerario Storico e Ambientale della Sardegna, was chosen for being the first declared UNESCO Geopark and having a peculiar territorial organization. The second one is the Tuscany Mining Park – Geoparco delle Colline Metallifere, interesting by its former mining activities.

Sardinia - Parco Geominerario Storico e Ambientale della Sardegna

In November 1997 the proposal for the inclusion of this site in the UNESCO sites was presented by Sardinia Autonomus Region and Sardinian Mining Autority.

UNESCO's General Assembly accepted the proposal in 1998 and declared the Geomining Historic and Environmental Park of Sardinia as "the first Park in the Geosite - Geopark World Network". Many reasons contributed to this recognition, like its particular geological-paleontological and mineralogic elements, its biologic rarities and endemics, its forest and wets zone populations, the variety and importance of its spectacular natural landscapes in the morphology of its coasts, internal mountains, underground cavities and archaeological, all situated in the middle of the western basin of the Mediterranean. Mining activities have modelled the landscape for several years, and the ancient culture of the mining populations created a particular atmosphere. You can find evrywhere evident marks of industrial archaeology, in underground worlds and in contact with the Sardinian nature. Charming working class villages, extraction pits, thousand of kilometres of galleries, industrial systems, old railway stations, important records and the memory of generations of miners turn this Park into a new large cultural deposit to be discovered.

Geology

Sardinia is largely formed by rocks of the Palaeozoic era or, to be more precise, the Cambric and Silurian eras. The Cambric lands are located in Inglesiente and Sulcis, and contain diverse sedimentary rocks, metamorphosis belonging to three distinct series: an arenacea formation at its base, on the surface a complexity of clay scissions and an interpolation of chalkstone and dolomites. There are also zinc and silver lead deposits (in the territory of Iglesias). In general Sardinia Island offers a concentration of different metals and minerals, interesting especially for industrial uses.
The stratigraphic successions of Sardinia preserved in an extraordinary way are the evidence of geological

events, from the moment where Sardinia joins the bottom edge of the European plate and when it is separated from it during the Oligocene-Miocene, as a result of the opening of the western Mediterranean sea (rifting phase and subsequent counter-clockwise rotation of the Sardinian-Corsican microplate). The geological history of Sardinia is therefore part of the geological history of western Europe and is totally different from the one of the Italian peninsula. In the course of time, dynamic, physical and chemical processes led to the accumulation of several mineral deposits of different types and origins. They have been known for thousands of years, and from the abundant archaeological mining evidence we can reconstruct their history.

Archeology

At the beginning of 60's there was a forced reorganization in the mining areas in Sardinia. A strong recession hit this industrial sector, and private investiments abandoned mining enterpises in all the districts. The Italian Government and Autonomous Region of Sardinia were forced to provide a heavy economical intervention in these areas.

In a territory rich in many resources, the closure of mining left a heritage of landscapes, infrastructures, equipment, facilities, documents and archives, but it also left human values, professional skills and know hows, that are the roots of cultural identity for many generations, and must be respected, protected and passed on.

Areas

In order to protect and valorise its heritage, the Geological and Mining Park of Sardinia was divided in 8 distinct Areas on a total of 3,770 square kilometres.

Each Area is both peculiar and original in specific varieties of the geological deposits, in their mineralogical characteristics, in the history of mining activity and in the mining techniques.

A particular attention is devoted to historical and archaeological aspects strictly related to mining.

The 8 Areas contain an extraordinary heritage of mining archaeology, that added to the naturalistic and archaeological elements of value make the "Geological and Mining Park of Sardinia" unique in the world.

The 8 Areas are:

- Monte Arci

Located in the middle-west area of the island, it is the first mining area of Sardinia. The main material present in the territory is the obsidian, a volcanic stone born of the eruptions of the Monte Arci;

- Orani Guzzurra Sos Enttos

Subdivided in two areas, the first one is the territory around Orani commune and the second one includes the mining and naturalistic sites of Lula commune. Orani area is important from a geomineral point of view due to the presence of talc, granite and marble. Guzurra-Sos Enattos is known for its metallic deposit of lead, zinc and silver;

- Fontana Raminosa

Is located in the middle of the island and its geomineral importance comes from the presence of a huge copper mine that had a crucial role in the history of metallurgic industry of Sardinia. This area is also characterised by the presence of virgin woods, mouflon and Golden eagle;

- Argentiera Nurra Gallura

This area is also subdivided in two: the first one includes the land from the Nurra till Capo Caccia and Alghero (north-west part of the island) and its important for its metallic deposits of lead, zinc, silver and iron become now examples of industrial archaeology. The second area is dislocated in different spots in the north-east side of the island where granite mines can be found;

- Sarrabus-Gerrei

Located in the southeast side of the island, is the second biggest area of the park, important for its dimensions, variety and importance of the mining activities. The main metals extracted in this area were lead, antimony and silver;

- Sulcis

Is the biggest area of the park and it's located in the south-west part of the island. This area is important not only for tits metallic mines of Narcao area, but also for the important presence of carbon in Serbariu area. The site also owns an interesting environmental and naturalistic heritage;

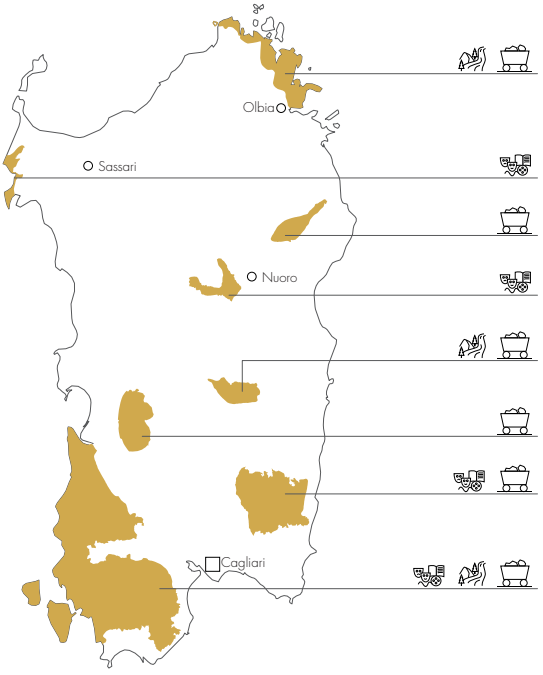
- Iglesiente

Situated in the south-west side of the island, its most important mines are in the so called "anello metallifero dell'Iglesiente" where lead, zinc, silver deposit are located inside the carbon deposit, which are the oldest Italian stone deposits;

- Guspinese

One of the most important areas, thanks to its history and mineral heritage. All the production, technological, social and technological activities of the mineral industry signed the territory and the culture of the area, and represent nowadays a huge heritage under preservation and valorisation.

Sardinia Autonomous Region and Sardinian Mining Authority has been contributing to the creation of the Geomineral Historic and Environmental Park of Sardinia since the end of 80's, with the strong idea that not only the most relevant mining areas should be included in the Park, but also less significant mining structures should be part of this project.
It was also the contribution from passionated citizens and interested scientists, organized in a civil association, that pushed the project ahead.



Mining sites

Geomorphological/naturalistic interest sites

Cultural heritage

Tuscany - Geoparco delle Colline Metallifere

The Tuscan Mining Park - Parco delle Colline Metallifere Grossetane - is located in the north of the Grosseto province, in Tuscany, central Italy, and overlaps with one of Italy's most important mining districts, the Colline Metallifere, famous for the extraction of precious minerals such as copper, alum, pyrite, mixed sulphides, lignite, amongst others. The area of the park is 1.087 km2, with a low human presence, a population of 53.549 people and a density of 49.3 people/km2, and covers seven different municipalities.

Geological heritage

In October 2010, the Tuscan Mining Geopark was recognized as Geopark from UNESCO, forming part of the European Network of Geoparks, and the Global Geopark Network of UNESCO. The mineral heritage results significant in relationship with the presence of numerous mineral deposits whose exploitation has profoundly characterized its landscape. The geological features of the Park area are the outcome of a complex and long geological evolution, mainly in the formation of the Apennine chain, characterized by different sedimentation and paleo geographical areas: the Ligurian domain, who was "an oceanic basin formed by ultrafemic rocks, covered by a sedimentary succession deposited in a deep marine environment"; the Subligurian and Tuscany domains, that were "epicontinental settings constitutes by a metamorphic basement underlying a sedimentary coverage"[1].

Mining activity mainly occurred during the medieval period and in the 19-20th century. At the end of the 20th century the last mines shut down. The area of the Colline Metallifere was exploited to produce lead, zinc, copper, silver, iron, pyrite, alum and lignite, besides geothermal and hydrothermal activities. The high environmental value of these areas has been recognized by acts of the Tuscany Region which has established two sites of community importance (S.I.C.), a site of national importance (S.I.N.), nine sites of regional importance (S.I.R.), and a special protection area, in compliance with specific directives Community. The Geopark also includes 3 reserves managed by the Corpo Forestale dello Stato for animal population purposes, and 3 natural reserves managed by the Province of Grosseto.

The Park is characterized by "hilly slopes with frequent outcrops of limestones, and red clayey soils deriving from the action of external agents of limestones"[1]. Several particular phenomena are also present in the site, such as: karst formations, a geothermal phenomenon, thermal springs, and the large-scale mining and ore-processing areas. The characteristic of the heritage are mainly the evidences of geological, mining, and

metallurgical activities, occurred in this area for about three millennia. The park is therefore focused on mining and metallurgical abandoned sites. A Masterplan of the Park was created therefore, as an effort to create a census of the technological and archeological heritage, to document its historical, cultural and environmental value, and has identified strategies regarding the recovery, preservation, management and development of the archeological, geological and industrial goods.

Touristic Opportunities

The territory of the Park is located in areas characterized by different economic activities, among which the tourist activity stands out, especially the seaside area, concentrated in the summer months. The cultural tourism is also present, with the cities of art (Massa Marittima), and the agricultural tourism is widespread throughout the hilly hinterland with a high-quality standard. The territory is also touched by economic activities related to the world of wine, olive groves, agriculture and breeding, characterized by typical products in many cases of excellence (salume di cinta senese, honey, olive oil, high-quality wine). From the 90's, a will to diversify the touristic offer towards a more sustainable kind was made clear. Starting from this period, after the demission of mining businesses, the first projects for the recovery of Park assets were born, with the creation of the Environmental Education Laboratory at Gavorrano and the creation of a trekking trail network covering almost all the territory of the Park. These poles offered the communities the possibility of cultural growth, awareness and memory recovery, that was being lost. With this, a process of deseasonalization started, with the possibility of frequenting these places in moments different from the summer.

The UNESCO Geopark project

According to UNESCO, the Tuscan Global Geopark is inspired by the concept of sustainability that pays attention to the environmental, economic, social and cultural issues of the territory. It employs environmental guides that follow annual specialized training. LEA-La Finoria International Center for ESD is the UNESCO Global Geoparkís operational partner who works with schools coming from all over Europe. A team of very well-trained educators offers about 70 different learner paths suitable for different ages from three years up to adults. Most of the events are based on learning, by doing activities and cooperative learning methodologies. In 2014 the UNESCO Global Geopark received the European Charter for Sustainable Tourism Certification and it is deeply committed by its active involvement of various stakeholders in implementing its sustainable development strategy.

The project consists of one or two reception points at each municipality, called the Gates to the Park. The

mission of these gates is to promote the knowledge of the world of mining, of its geological heritage, of the landscape heritage, of the history of mining, and of the identity of the area of the Colline Metallifere. These gates are of various types, such as Information Centers, Documentation Centers, Libraries, Museums, Parks, and offer also various services like information about the sites, the services and the activities they offer, museum routes, guided tours, animation activities, workshops and educational activities, hosting displays, exhibitions and events, and sale of informative and educational material.

Gavorrano Gate:

1) Gavorrano Naturalistic Mining ParkFollonica Gateway
2) Infopoint Centro de DocumentaciÛn David Manni

Follonica Gate:

1) Iron and cast Iron Museum

Massa Marittima Gate:

1) Mine Museum
2) Archeological Museum Infopoint
3) Museum of History and Art of Mines

Monterotondo Marittimo Gate:

1) Gate of the Mining Park of Monterotondo Marittimo Antico Frantoio
2) Door of the Park of Le Biancane

Montieri Gate:

1) Gate of the Montieri Archeominerary Park
2) Info point Montieri Information Office
3) Info point Gabellino

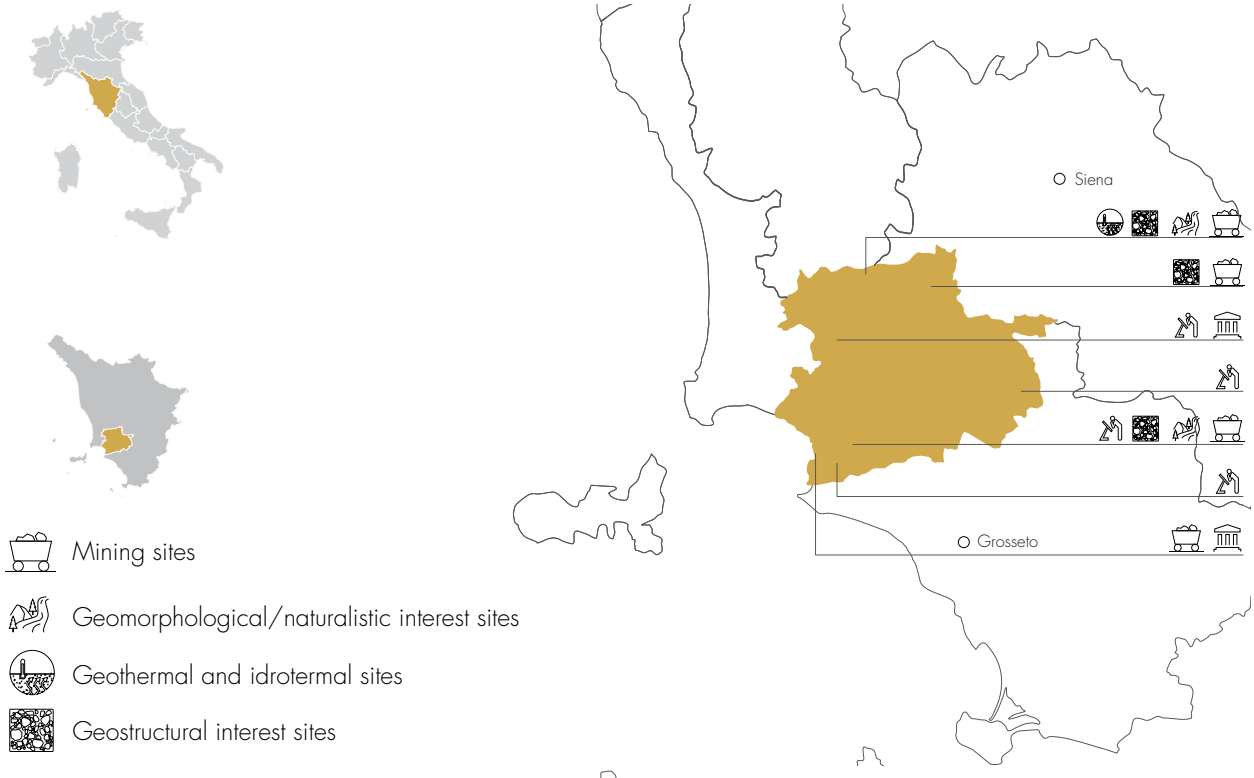
Roccastrada Gate:

1) Ribolla Park Civic Center

Scarlino Gate:
1) Info point Scarlino

Management of the Park
The Park is a consortium managed by a Committee, in which are represented all the Public Administrations involved: Ministry of Environment, Ministry of Heritage and Culture, Tuscan Region, Province of Grosseto, Comunity Montana delle Colline Metallifere and the seven municipalities. The local government is in charge to manage the sites and goods of the Park, and carry on all the initiatives regarding conservation, protection and revalorization of the territory.

[1] TUSCAN MINING PARK - ITALY, www.europeangeoparks.org, http://www.europeangeoparks.org/?page_id=648



Geoparco delle Colline Metallifere

Aeolian Islands matching characteristics of a geopark

The significant important geological and naturalistic value of the Aeolian Islands earned them, in 2000, the inlcusion by UNESCO to the "World Heritage List". The archipelago, formed by seven volcanic islands (Lipari, Vulcano, Salina, Stromboli, Filicudi, Alicudi and Panarea), is a submarine relief system whose origin dates back to about one million years ago. Precisely because of its peculiar terrestrial and marine ecological characteristics, for its fascinating geological history and for its significant naturalistic value, the Aeolian archipelago is the object of study of scholars from all over the world. The islands are studied since the eighteenth century in particular because they are affected by the phenomena of volcanism and unique hydrodynamism in the Tyrrhenian Sea, which continue today to enrich the field of volcanological studies.

Lipari

The island of Lipari is the largest of the archipelago and also the most populated. Like all the others, it has volcanic nature too; during its geomorphological evolution (over a million and five hundred years) twelve volcanoes have intervened to shape its morphology and still today there are thermal phenomena typical of the volcanic areas. The areas of greatest interest from the geological point of view are those of Monte Chirica, Monte Sant'Angelo and Monte Pilato but many others are very interesting from a naturalistic point of view such as those of Monte Guardia and Giardina, Monterosa, Timpone Carubbo, Punta Castagna and Secca del Bagno.

As for the archaeological heritage, the island of Lipari is the richest of the Aeolian archipelago as a center of trade for the precious obsidian since very remote times. The island is one of the main points of reference for the study of the succession of civilizations in the Mediterranean basin. The peculiar geographical position of the archipelago and the fact that, over the centuries, the islands have known the visit of many peoples (from the Siculi to the Greeks, from the Romans to the Normans and the Aragonese), have allowed to create a real Aeolian Archaeological Park. The Archaeological Park of Lipari is located in Contrada Diana and of particular importance are the collections kept at the Aeolian Archaeological Museum L. B. Brea. Other important archeological sites can be found along the island, such as Rocca Riolitica of the Castel, Piano Greca, San Calogero Thermes, Punta Palmetto, Castellario Vecchio and other across the coast such as the Submarine Archeological area of Bagno, Punta Crapazzo and Punta di Capistello.

All the Aeolian islands are rich in mineral deposits but unlike the others, the island of Lipari is the only one that over the centuries has been exploited as a mining site, mainly pumice stone. It therefore presents a wealth of sites linked to industrial archeology, which are concentrated in the north-eastern part of the

island, at the foot of the largest pumice deposits. The presence of pumice stone, in fact, was the natural resource that affected the history of the archipelago, especially in the last two hundred years. Thanks to the industrialization and marketing of the product, Lipari became famous throughout Europe and the world, untill the point, when some foreign companies, at the end of the seventheenth century, invested in the construction of the first pumice processing plants. These are the companies of Barthe and Aeolian Society.

The north coast of the island was significantly marked during the early 1900s. With the industrial development it was necessary to build a road connecting Quattropani to Acquacalda (the small inhabited settlements in the area) and resulted in the first establishments of the pumice: the factory of the village of San Gaetano (Acquacalda) and the one of Papisca. In the 50s, on the east coast of the island there were several piers for the transport of pumice owned by the companies D'Ambra, Restuccia & Co, Eolpomice, Coperativa San Cristoforo, Agglopomice, La Cava and Ferlazzo. In 1958, Pumex S.p.a. was founded and absorbed some of the minor companies located in the area of Porticello.
Until 2007, mining activities continued unabated. The development of new technologies and the introduction of mechanical excavators meant that the rhythms of pumice stone extraction substantially increased, thus leaving a chasm in the mountain. Since the year 2000, with the inclusion of the Aeolian Islands in the UNESCO World Heritage List, a request for shutting the mining activities in the Island of Lipari was made, as it represented a menace for the Site. Nowadays, there are no more exploitation of pumice in the island.

Alicudi

The island of Alicudi is the wildest and most untouched of the archipelago, which makes it very attractive from a naturalistic point of view. The areas of greatest interest are the ones of the Volcano, Montagnola, Filo dell'Arpa and Scoglio Jalera.

Filicudi

The island of Filicudi is characterized by the presence of three now extinguished eruptive cones: Fossa delle Felci, Montagnola and Torione. The island is characterized by numerous paths that offer magnificent views both on the hinterland and the sea, and form a rich coast with terraces and caves such as those of Maccatore, S. Bartolomeo, Perciato and Bue Marino.
It seems that the island has been inhabited since the Neolithic period, being rich in archaeological remains such as the village of Filo Braccio or the Archaeological Submarine area of Capo Graziano (Bronze Age settlement). A series of objects and testimonies found in the remains are now kept at the branch of the Lipari Museum in Filicudi.

Panarea

The island of Panarea is the smallest of the Aeolian archipelago even if, together with its islets and its neighboring rocks - Basiluzzo, Spinazzola, Lisca Bianca, Dattilo, Bottaro, Lisca Nera and Formiche - it presents a unique landscape. From the geological point of view the island is the oldest of the Aeolian Islands. The natural heritage of the island offers a great variety of peaks such as Punta di Corvo, the highest one, Punta Cardosi, Castello, Punta Falcone and Punta del Tribunale.
The island hosts a submarine archaeological site between Capo Milazzese and the island of Basiluzzo as well as the findings of a Bronze Age village in the area of Punta Milazzese and another branch of the museum L. B. Brea of Lipari.

Salina

The island of Salina is the second biggest in terms of populations and dimensions, and is also the greenest of the whole archipelago. The island, in ancient times, was called 'Didyme' (twins), because it consists of two hills, Fossa delle Felci (the highest peak in the whole archipelago) and Monte dei Porri. Other interesting naturalistic sites are Monte Rivi, Pizzo di Corvo, Punta Marcello, Punta Lingua, Punta delle Tre Pietre and Secca del Capo. Some remains of a prehistoric village can also been found in the island.

Vulcano

The island is of considerable geomorphological and naturalistic interest due to its volcanic structure, which is still in continuous fumarolic activity. It consists of four volcanoes: Vulcanello, Gran Cratere (Fossa Grande), Monte Saraceno and Monte Aria. The island is rich in sulfur and alum, thanks to which, together with the volcanic activity, it is possible to exploit the natural mud and the thermal waters of great curative value.

Stromboli

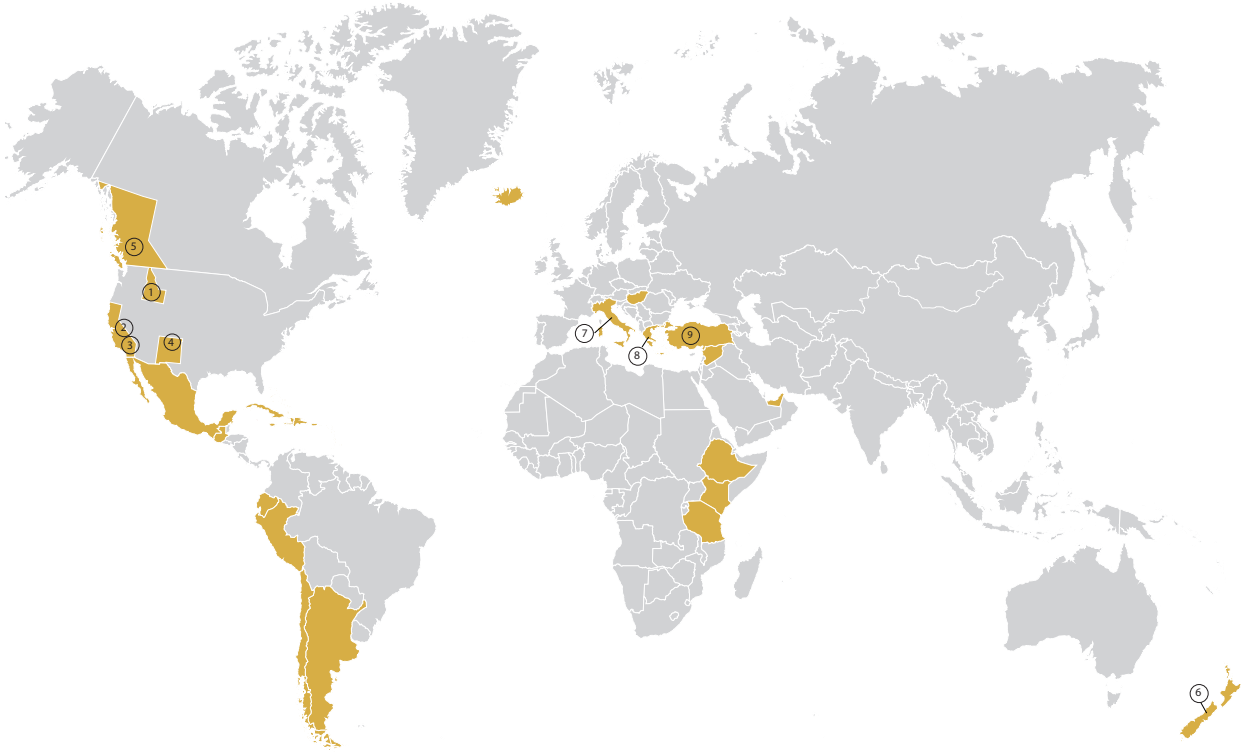
Stromboli is the last to have emerged from the sea immediately after Strombolicchio, a small volcano about a mile away. Hikers and curious, passionate naturalists, scientists and vulcanologists are in fact competing to visit one of the few volcanic areas of the Mediterranean in activity for at least two thousand years. The island is characterized by the overlapping of more volcanoes, in the center stands the highest peak, the Serra Vancori, and further north the crater Cima, which is still active. The products of small eruptions rush down the Sciara di Fuoco.
Also in Stromboli there are remains of an ancient Bronze Age village in the village of San Vincenzo.

Proposal for the Pumice Geomining Park of Lipari from the municipality

Pumice has an extremely wide distribution across the Earth's surface. It is frequently found in deposits discovered in the deepest portions of the ocean floor and is a common occurrence in abyssal red clay.
The abundant oceanic deposits of pumice can be explained by submarine volcanic eruptions, as well as the distribution of floating pumice by sea winds and currents.
Pumice mining has a lower impact on the environment than other rocks and minerals. Extracting pumice usually involves surface mining procedures, where the top soil layer is simply removed to get to the deposits, and the soil is stored for later reclamation of the mining site following the cessation of operations.

Afghanistan, Indonesia, Japan, and (the Eastern half of) Russia are Asian countries with significantly large reserves of pumice. In Europe, Italy, Turkey, Greece, Hungary, and Iceland have large deposits of pumice.
The U.S.A., Canada, and Mexico in North America have pumice reserves, as do a number of the Caribbean Islands. A few African (Kenya, Ethiopia, Tanzania) and South American countries Peru, Argentina, Ecuador, Chile also have deposits of pumice to their respective names. In general, today the top five leading pumice producers are Spain, Greece, Turkey, and Chile; pumice is also mined extensively in the United States, with Oregon, Nevada, Idaho, Arizona, California, New Mexico and Kansas as producers of the rock in the country.

Italy was the older and largest producer of pumice in the world, mining and working the pumice on site and exporting it all over the world, reaching the goal of 1400 tons of pumice produced in one year. It was the first supplier of pumice in Europe.
Because of its relevance in the mining and production of the Pumice that modified considerably the territory, the landscape and the life on the island, the Comune of Lipari draw up the proposal for the Pumice Geomining Park of Lipari.



Pumice presence in the world

Proposal for the new park

Since September 2014, it has been formed a technical commission from the municipality administration that had the aim of examine the Island of Lipari to write down a proposal for the valorisation of the island and especially of the old mining area and its industries.

In this new organization and development plan, all the areas of interest weren't designed as individual infrastructures anymore; they were designed as elements composing a complex environmental system with the goal of reducing the strong impact that the anthropization had on the ecosystem.

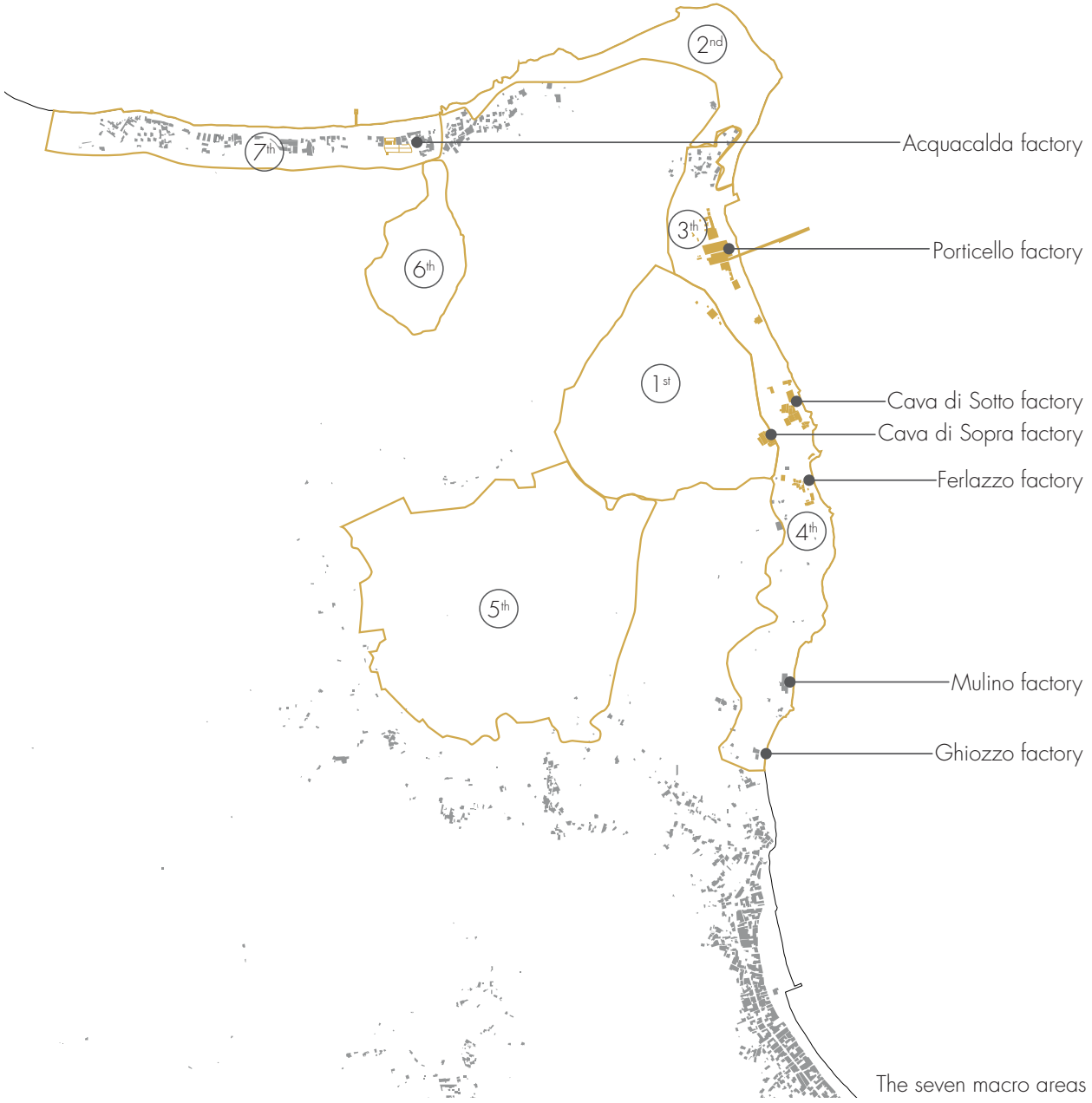
This complex environmental system of areas can be considered as an "Ecological Network",a place where the protection and preservation of the heritage meets the controlled economic and social development; the concept of "Ecological Network" made a step forward in the conservation policy, moving from the conservation of single areas to the conservation of the entire structure and ecosystem present in a territory.

From a deep analysis of the area, the island has been divided in seven macro areas of interest:

1st macro area:	Cava di Porticello zone
2nd macro area:	Punta Castagna zone
3rd macro area:	Pumex society factory zone (Porticello factory)
4th macro area:	Old abandoned factories
5th macro area:	Fossa delle rocche rosse and Lami-Malopasso zone
6th macro area:	Acquacalda quarry
7th macro area:	Acquacalda village and Italpomice factory zone

First macro area: Cava di Porticello zone

Creation of the geomineral park according to Unesco plan, with the function of fulcrum of the new Porticello Acquacalda system, expanding the path and intervention areas also to Fossa delle Rocche Rosse and Lami-Malopasso to connecting them to cava di Acquacalda area. Before working on the area it's necesary to make it safe and work on the enviromental recovery with the aim of a naturalistic usage.


2nd
7th
Acquacalda factory
3th
Porticello factory
6th
1st
Cava di Sotto factory
Cava di Sopra factory
Ferlazzo factory
4th
5th
Mulino factory
Ghiozzo factory
The seven macro areas

Creation of a visitor centre (and annexed structures for food and other services) inside the existing factory to illustrate the history of the working process of the pumice.
Creation of the industrial archaeology museum where there be exposed the old machinery used to work and treat the pumice and an exposition of the final products of this process.

- Beach club
- Talasso-therapy center
- Parking, cycling track

Second macro area: Punta Castagna zone

Decontamination and restoration of the entire promontory, reducing in that way the possibility of environmental risk and protecting the natural heritage.

Third and Fourth macro areas: Reuse of the dismissed buildings

This area is composed by some dismissed buildings beside the shore used to work the pumice and produce of pumice product.
As well as the UNESCO plan established, they must be conserved as industrial archaeology, preserving their structures and architectures and valorising them, but they should also be reused for cultural activities and for beach facilities preserving their identities.

Some possibile use are:

- Branch of the University of Geology and Volcanology
- Volcanology museum of Eolie island
- National Park of Eolie island headquarter
- Research center according to UNESCO plan
- Natural Research centre with the aim of promotion of educational activities for school and family; Multilanguage info point
- Education area according to UNESCO Plans (secondary school specializing in tourism and language)
- Training courses about sustainable tourism
- Sea School: ecology, sail boat, environment, tourist fishing courses

Fifth macro area: Fossa delle rocche rosse and Lami-Malopasso zone

Restoration of the existing buildings inside the crater with the aim of recalling the agricultural culture related to a volcanic landscape.
Support the launch of small farms creating an agricultural area available for both inhabitant and tourist where teach the traditional cultivation; creation of a botanical garden representing Eolie island.

Sixth and seventh macro areas: Italpomice factory zone and Acquacalda zone

Secure the north-west side of Pilato mount and define the area of excavation of Italpomice society with the aim to use it as a cultural/ludical space or as a natural theatre connected for the new infrastructure system.

- Beach club
- Talasso-therapy center
- Parking, cycling track

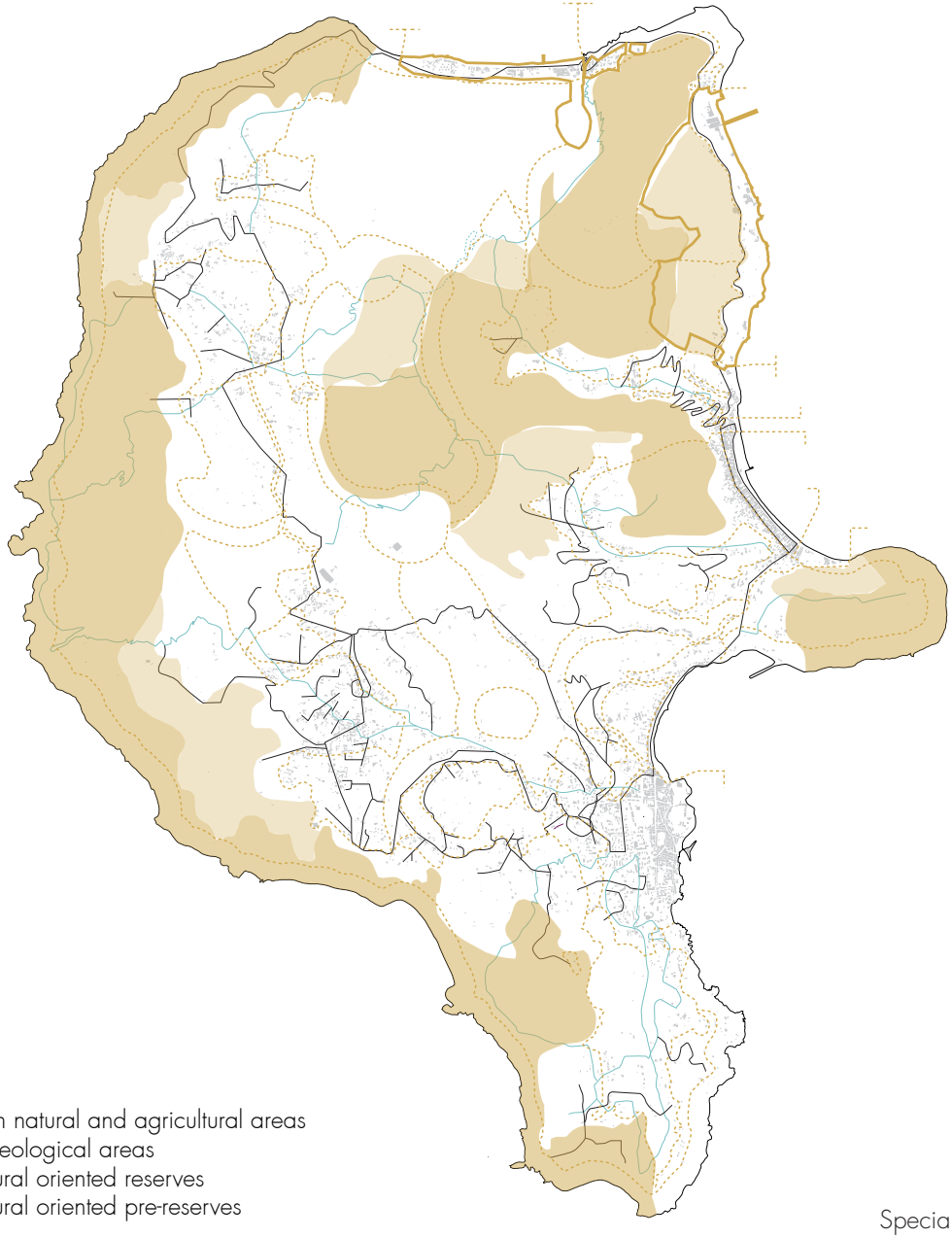
Fifth macro area: Fossa delle rocche rosse and Lami-Malopasso zone

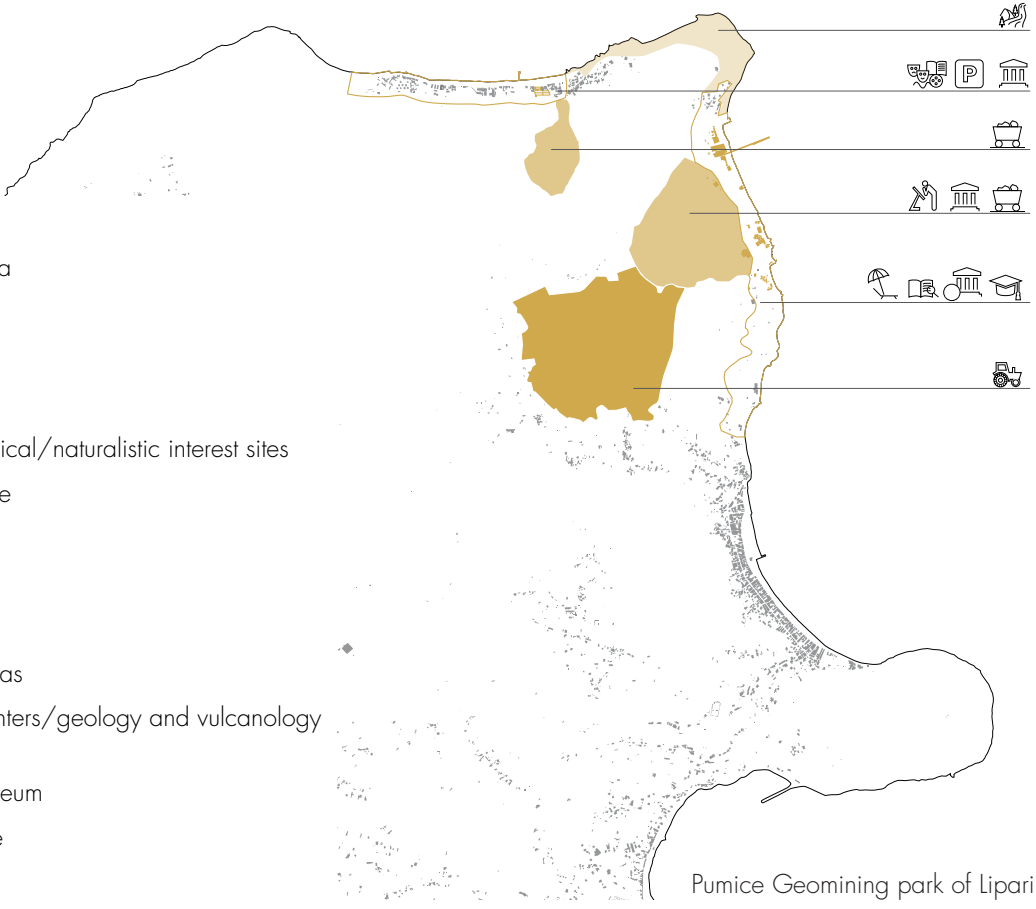
Restoration of the existing buildings inside the crater with the aim of recalling the agricultural culture related to a volcanic landscape.Support the launch of small farms creating an agricultural area available for both inhabitant and tourist where the traditional cultivation will be teached; creation of a botanical garden representing the Aeolian Isalands

Sixth and seventh macro areas: Italpomice factory zone and Acquacalda zone

Secure the north-west side of Pilato mount and define the area of excavation of Italpomice society with the aim of use it as a cultural/ludical space or as a natural theatre connected to the new infrastructure system.

- Creation of an environment educational center according to UNESCO plans
- Creation of the Pumice museum in Acquacalda inside the old pumice farm
- Parking areas, cycling tracks and pedestrian path to reach the Est side


Main natural and agricultural areas
Archeological areas
Natural oriented reserves
Natural oriented pre-reserves



- Quarries
- Agricultural area
- Landfill
- Built area
- Mining sites
- Geomorphological/naturalistic interest sites
- Cultural heritage
- Parking areas
- Museums
- Visitor center
- Agricoltural areas
- Educational centers/geology and vulcanology universities
- Vulcanlogy museum
- Research centre
- Beach facilities

Pumice Geomining park of Lipari

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