

Report on the natural landscapes of Greece that require protection. Description of various natural landscapes

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Introduction

The present paper has been written as an IGME report in 1983. It aimed to draw the attention of the State Authorities to a number of natural landscapes of Greece as well as to some other areas of special beauty or scientific importance, so that they are of interest for their protection and conservation.

The showing off and presentation of all of the sites has resulted from the great experience of the IGME scientists, obtained through hard field work during the last 30 years.

At this stage, several landscapes or various locations are outlined or simply described, without a deeper analysis or special study. This is because IGME has never been asked so far (with the exception of the Acropolis Hill), to conduct such a study.

It should, therefore, be made known that IGME is at the disposal of any body (service) to assist with the elaboration of a special study, in order that appropriate measures might be taken for the protection and preservation of any natural landscape or monument that requires protection.

For better presentation and description of the places to be protected, these areas have been classified as geological and geomorphological units and not in relation to the locality. Under this procedure, a general view of each unit, concerning the whole Hellenic territory is given.

Local Authorities would play a very important role for the protection of the landscapes being worthy of protection, since they can determine and decide for new locations or areas required to be given special attention.

We shouldn't avoid to underline that a number of "tourist amateur collectors" visit certain areas of our country with the purpose of

collecting minerals or fossils in order to bring them abroad. However, we are not in a position to know whether the collected samples are brought on market.

We simply mention here that the protection of landscapes in other European countries is covered by law, and no intervention is allowed without the approval of the competent Authorities.

1. Volcanoes

1.1. Methana Volcano (Peninsula of Methana)

It is a recent volcano. The last explosion took place during the historical years (273 B.C.)

It is necessary to put under protection the dome of Kammeno Vouno (Burnt Mountain) (western part) and the locations where thermal water flows out (northern and eastern parts).

1.2. Milos Island

The island of Milos as well as the complex of the islands surrounding it, is almost entirely of volcanic origin of Upper Pliocene age. NE of the island, andesitic lavas occur, in the form of columnar fractures, being extremely spectacular (columnar hexagonal prisms).

1.3. Thera islands

The volcano of Thera is a recent one. Its caldera occurs into the sea, limited among the islands of Thera, Thirassia and Aspronisi. The islands of Palea Kameni, Nea Kameni and Mikri Kameni formed by lavas, during the volcano explosions, occur within the caldera. The caldera area as well as the entire landscape, require to

be protected and preserved, since the volcanic deposits are loose (unconsolidated) at their greatest part. Recently the site has been included in the World Geological Heritage List.

1.4. Nisyros Island

Nisyros is an entirely volcanic island with a large pseudocaldera of a subrecent up to recent volcano. Presently only fumarole activity is observed. The bottom of this pseudocaldera is found at a level of about 500 meters. The fumarole area, that is the central area of the volcanic pseudocaldera, requires to be protected. The area is extremely spectacular during the cold months, when the vapours are condensed and give the impression of an active volcano.

1.5. Oxyolithos volcano

It is a spectacular volcanic cone close to Oxyolithos village of Euboea. Any kind of activity (intervention) in this formation, would destroy the cone morphology (symmetry, relief, balance).

2. Sites of geomorphological interest

2.1. Meteora area

Besides the archaeological and religious interest, this area also presents important geomorphological interest. Spain is another European country, hosting such formations (conglomerates Montserrat), close to Barcelona. Only two of three similar areas exist in the rest of the world.

The area of Meteora calls for a detailed geotechnical study in scale 1:2000, so that eventual collapse caused by erosion to be prevented.

2.2. Glacier drifts

Glacier deposits are rare in our country. Whereas these deposits, in the northern parts of Europe are extended down to the sea level, in the Mediterranean area they are observed only at high altitudes (more than 1000 m, in the Hellenic Peninsula).

These areas occur in the Tymphi (Gamela) Mountain, appearing at a relatively large extent, eastwards of the Scannello village and ENE of Papigon village, where they form some lakes named Drakolimnes. These area must be protected against the catastrophe caused by the removal of materials or the construction of technical works such as forester activities or even the construction of artificial lakes used for animal watering.

2.3. Mineral occurrences in the island of Serifos

In Serifos, there occur both ancient smeltings and rare minerals. A compact lievritic - ilvaitic scarn appears in the area north of Mega Livadi village. It is a rare paragenesis with lievritic crystals being unique in the whole world.

In the area WNW of Mia village slag remnants (totally 6) are observed.

Finally, scarn, as well as ancient and modern mines are found in the Chalara area SE of Koutalas village.

3. Palaeontological sites

3.1. Area of Pikermi

Vertebrate bones were identified near the Pikermi village for the first time, 120 years ago. During following successive excavations more than 50 species, mainly mammals were determined.

From geological point of view, the area is considered to be very important since the Pontian Stage was introduced into international dictionaries as "Pikermi Stage". Excavations are prohibited by law since 1932. Recently, the area has been included in the World Geological Heritage List.

This area should be fenced and managed in such a way as to serve as an open-air Museum. The geology-palaeontology laboratory of the Athens University is aware of the aspect and it is responsible for the area excavations.

3.2. The petrified forest of Lesvos

This well known picturesque petrified forest covers a large extent, north of the Porto Sigrí village. Recently it has been included in the World Geological Heritage List. A detailed geological mapping as well as certain works are necessary for the discovery of petrified trees, so that the "structure" of the forest, the volcano explosion and the volcanic ejecta that covered it to be identified, as much as possible. Its touristic development requires technical works and installations to be constructed following the discovery of the forest.

3.3. Theokafta of Argolida

It is a unique occurrence of ammonites in Greece, and among the very few ones appearing in Europe. It occurs near the Epidavros Asklipio, where the ammonite-bearing limestones of Middle-Upper Triassic age (Hallstatt facies) occur. Several Greek and foreign scientists who

had studied these deposits, have determined more than 30 species.

This deposits as well as these fossils are in danger to be exploited by the peasants, the foreign and the local tourists.

4. Mining

4.1. Lavreotiki

The area of Lavrio is world-known for its ancient mines and installations for the silver-bearing galenite processing. The whole area as well as the existing installations are being destroyed at the name of various reasons.

The mining galleries, shafts and metallurgical installations cover a large extent of the area. IGME could, at request, carry out detailed mapping and suggest ways for their protection and maintenance.

4.2. Ancient mines of Cyclades

Ancient mines are found in various Cycladic islands. Some foreign scientists in cooperation with the Archaeological Service have recently started to make investigations.

4.3. Pangaion Area

Pangaion is well known for its mines of gold bearing veins of iron-pyrite, silver-bearing galenite etc. Besides that, ancient dolly tubs exist in Mousthenis area. Based on the works of IGME, galleries and several other mining works have been localized.

4.4. Old Kavala area

North of Kavala City and specifically in the area of old Kavala, a great number of 1.2-1.6 m high ancient mine galleries, exists.

It is most probable that the extracted MnO_2 was used as black colour for the painting of potteries. The galleries being well preserved, efforts should be made for their detailed study and preservation.

4.5. Area of Lefki

Close to the village of Lefki (Kavala), there is an ancient cavernous gallery, where silver-bearing lead was apparently extracted. This gallery occurring within marble, runs the danger to be affected by the construction of a new quarry in the proximity.

4.6. Koupanada — ancient mine of Thassos

This is a huge ancient mine with a total length of the typical (1.40-1.60 m high) galleries about 4 km. The General Direction of Mines at the Ministry of Industry should be provided with a topographic map of this mine.

5. Caves and Karstic Phenomena

5.1. Seamills of Argostoli

This karstic event is unique in the world. The sea there flows continuously into the sink hole formed in the Cretaceous limestones occurring a few meters far from the sea.

Presently, this phenomenon can be explained only if we accept that the sea water swap away by the karst waters, coming down from near Sami (eastern coast). This karstic drain pipe should be protected from both human activities and the obstructive materials (rubbish, pitchstones, plastics, etc.) brought in from land and sea. All these materials can block out the underground pipes.

5.2. Pyrgos — Dyrou — Glyfada cave of Mani

The Pyrgos — Dyrou — Glyfada cave of Mani is among the most picturesque in the world. Being over 3 km long, its hall is filled with brackish water. Presently is easily accessible through land. A protective zone up to a distance of 200 m, from the cave axis should be built up; any installation of quarries or rock blasting on the zone should be prohibited by law. Besides, sewages of waste materials must not be allowed to flow into this area.

5.3. Alepotrypa cave of Dyros

Situated close to the former, this cave has been developed touristically. There is plenty of literature for this cave, since it has archeological-prehistoric importance. The whole area between the caves and the coast should be protected.

5.4. Cave of Limnes at Kastria Achaia

Including 13 lakes, this cave is found in the Kastria village of Helmos Kato — Klitoria. Its interior and exterior call for protection against human activities.

5.5. Koutouki cave of Attica

Occurring close to Paeania, this cave is very well known, since it has been developed touristical.

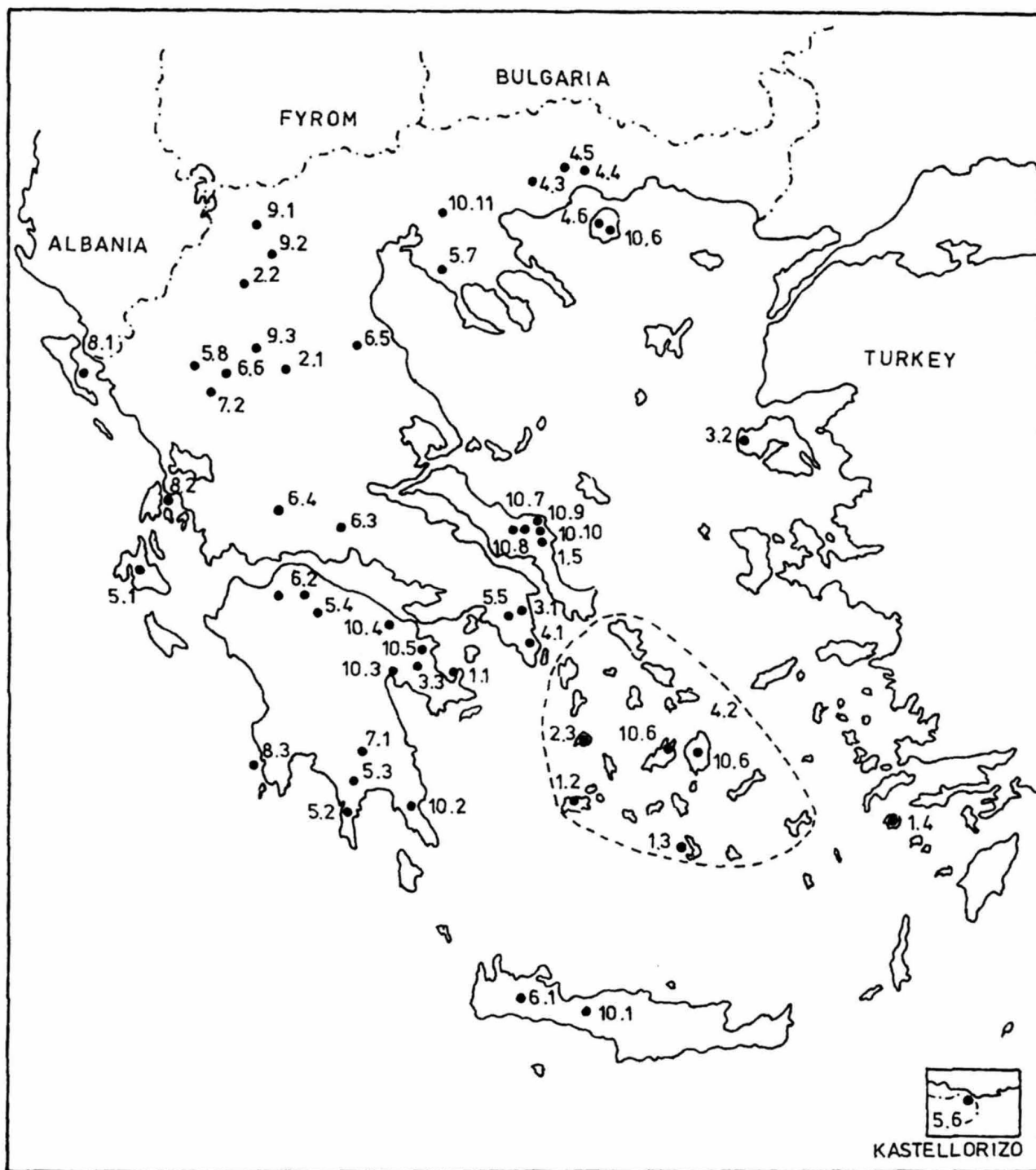


Fig. 1. Sketch for the position of the natural landscapes in Greece that require protection

It requires to be protected against the danger deriving from quarries and human activities.

5.6. Parasta Trypa (Kastellorizo)

Situated close to the Nioti cape of the island, it has its mouth at the sea surface. It is similar to the Italian Kapri cave. Many foreign tourists (mainly French) visit it every year.

This cave should be protected against human activities and mostly against submarine danger,

which can alter its morphology and generally the natural and biological balance.

5.7. Petralona cave of Chalkidiki

In this cave, occurring at a small distance from the Petralona village of Chalkidiki, the most ancient skull known up to now, in the European territory (260 000 years) was found; it belongs to the transitive type from the "tight" man to "wise" one. The cave requires to be protected

against human activities inside it, including excavations by unskilled people, quarry installation, water supply works above the cave etc. Consultations with geologists are necessary for any work carried out near the cave.

5.8. Perama cave of Ioannina

It is extended on the Coritsa Hill near the Perama village. It has been touristically developed, since it is richly ornamented with lithoids. The whole hill will be protected.

Information concerning the caves can be obtained from the Speleological Society, where more than 6 000 caves have been registered all over the country. The caves listed in this report are those of special beauty and importance. Certainly, there are many others which still remain undeveloped and require protection.

No doubt, the danger threatening this karstic phenomena derives from the explosions carried out either above them or at a great depth.

6. Gorges

6.1. Samaria Gorge of Chania

This gorge is so well known that there is no need to describe it here. What is necessary is a detailed mapping covering recent fractures, fissures and erosions of its sides and slopes; besides that, we underline the danger caused by rock detachments.

6.2. Vouraikos Gorge

This spectacular gorge of Northern Peloponnese has extended entirely within the Pliocene soft formations. It is suffering very often landslides and collapse of its sides. A detailed geotechnical study is necessary for its protection, mainly against erosion resulting from these catastrophic phenomena.

6.3. Reka gorge

This Gorge is formed within the mass of the bauxite bearing-mount of Giona; it is a typical example of limestone karstic erosion. Since the large bauxite exploitations carried out on the sides of this beautiful gorge are causing deformation of the landscape, it is absolutely necessary for the State to take the following measures:

a. The mine owners should be obliged to fill in the fractures and scars formed during the bauxite extraction, by repositioning the debris and by smoothing the gorge sides as much as possible.

b. Each restored area should be reforested immediately, because debris are eroded more quickly and more intensely than the compact limestones.

6.4. Klissoura Gorge of Aetolikon

At earlier geological ages, this gorge may have served as the bed of an affluent of Acheloos. Before the gravel removal from the gorge bed, Klissoura was the most beautiful gorge in our country. Natural morphology is getting more and more destroyed. Therefore, a geological reconnaissance should be carried out with the aim to find out the stability of both sides and the hazards caused by the detached limestone blocks.

Moreover, the removal of gravel should be prohibited, while forestal trees should be planted locally for the area protection against the limestone blocks collapsed from the gorge sides.

6.5. Valley of Tempi

This well known valley calls for a detailed geotechnical study carried out on its southern sides, in order that the National Road will be secured.

Since the cohesion of marbles has been disturbed because of the various works and rock blast, the rocks are in danger to be detached and to fall down.

It is also necessary for the Pinios bed to be protected against the outside floating materials which may cause diversion of the river current as well as erosion of the left sides.

6.6. Vicos Gorge

This spectacular gorge does not require special protection. However, since it is not easily accessible, it is advisable that a study for the opening of a path to be conducted. In this case, it is necessary for the path to be protected from the fall of rocks or blocks of limestones.

7. Ridges

7.1. Ridge of Langadas-Taygetos

It is the most extensive spectacular magnificent and wooded ridge in our country, with special geomorphology. Basically, this area should be protected against fires. Soil denudation impacts would cause disastrous erosion since the rocks forming the ridge are mainly schists. Moreover, a thorough study is necessary for the selection of the area for the installation of quarries in order

that the disturbance at the route of Sparti-Kalamata to be avoided.

7.2. Petra Ridge of Epirus

This ridge is extended mainly between Aeroraphi and Xerovouni, to the right bank of Arachthos and southwards of Kalafarytikos River; from the Melissourgi village to the East, and from Kallenji to the West. This ridge should be protected, principally against fires and gravel removal of great extent.

8. Islands

8.1. Pontikonissi

This very well known islet of Kerkyra suffers danger to be affected by the technical works carried out around it into the sea. The static balance between the rocks forming the island and the sediments occurring in the bottom surrounding it, is in danger to be disturbed.

8.2. Madouri (in the island of Valaoritis)

The necessity for its protection is absolutely justified. What is dangerous is the disturbance possibly caused to static balance of the bottom sediments surrounding it. If need be, submarine works should be constructed close to the island and at a distance shorter than 50 meters, provided a study is carried out first.

8.3. Sfaktiria-Navarino

Stactiria as well as the bay of Navarino are closely connected with the history of our country, since the very ancient years. Towards the southern end of Sfaktiria, there is a bridge formed by karstic erosion. Tsamados navigated his warship "Ares" under this bridge during the Hellenic Revolution. The phenomena of the formation of a natural seawater spring still exists.

These natural monuments run only the danger to be destroyed by human activities.

9. Waterfalls

Besides their spectacle, waterfalls play an important role for the area surrounding them.

In a way, they form the "microclimate" of the waterfall area. Despite the intense relief of our country, very few waterfalls exist rather due to geological conditions (of rocks, tectonics, morphology etc.). Listing below the main waterfalls existing in Greece, we hope that the

state will take the necessary measures to protect the regime and the run off basin, feeding these water falls.

9.1. Edessa Waterfalls

This well known waterfall runs the danger caused by human activities on the area of the waterfalls as well as the area feeding it. Any activity close to waterfalls should be carried out on the advice of a geologist, since the travertine rocks behave in a particular mechanical way.

9.2. Waterfalls of Arapitsa-Naoussa

The waterfalls of Arapitsa consist of a waterfall complex being of rare beauty. The whole area, however, should be protected against human activities, so that the disturbance of the geomorphological conditions and natural balance to be avoided.

9.3. Tjoumerka waterfall

This waterfall being the highest in our country, occurs near the Kataraktis village of the Athamanika mountains. The only danger threatening this waterfall derives from human activities or the blocking of the run-off basin issue, feeding it with water.

10. Other interesting areas

Besides the above mentioned, there is plenty of natural landscapes requiring to be protected. Several of them are known, while others are not. For this purpose, IGME can give geological details on all these places, provided the competent ministerial authorities take interest in it.

We list below some of them.

1. Lake Kourna of Crete (the only lake in the Island)
2. The rock of Monemvasia
3. Palamidi
4. Akrokorinthos (runs the danger to be denudated because of the gravel removal).
5. The area of the Ancient Theatre of Epidavros and generally of all ancient theatres.
6. The ancient marble quarries of Naxos, Paros and Thassos.
7. The debris mantle covering the upper parts of the slopes of Euboea, Dirphis Mountain.
8. The Euboea Xerovouni area (Steni Dirphis) where the surficial karst is very impressive because of its great extent and depth.
9. The Mavrovouni-Skotini area (Euboea), hosting extensive holokarst and subsoil karstic nets.

10. The long coast of Potamia in Kymi.

11. "Zostiras" separating the sea from the Lagadas Lagoon.

Besides we underline another two general problems concerning:

a. The morphology deformation of the Hellenic mountains due to various exploitations (mines or quarries).

In most cases of mines, landscape deformations, holes, stock of gangue materials remains are slightly cured. Many times, the restoration works to initial form of any area, generates the danger of collapse or even complete catastrophe of the landscape. In these cases, we think that after the removal of any deposit, a geological study for the restoration

and generally the settlement of any disturbance is necessary.

b. The static balance disturbance of the Hellenic coasts due to sand removal from coastal areas.

Besides the destruction of the biological environment in these cases, the coast dynamic balance runs the danger to be destroyed (submarine slides, change of the coasts morphology, etc.).

It is therefore concluded that sand removal from the sea bottom should be subject to a geological study of the area, advising on distance, the depth and the thickness of the sand removal. This study should proceed the issue of sand removal permit.