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## **Boeotian landscapes. A GIS-based study for the reconstruction and interpretation of the archaeological datasets of ancient Boeotia.**

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## II.1

# The Boeotian Landscape: Topography and Environment

### THE ENVIRONMENT

Boeotia constitutes the middle *section* of Central Greece, a long strip of land between the Gulf of Corinth and Euboean straits. Boeotia extends, to use Strabo's term, as a '*tainia*'<sup>1</sup> from E to W, from the Euboean sea to the Crisean gulf, and in length it is almost identical to that of Attica (Strabo IX 2.1).

The rugged topography of Boeotia, and in general of mainland Greece, derives from the Alpine orogenic phase and the subsequent epi-orogenic subsidence events. The main topographical features are related to a system of ancient submarine ridges and furrows of predominant NW/SE orientation (Perlès 2001:9 summarising Bintliff 1977, Higgins and Higgins 1996, Jacobshagen 1986). During the epi-orogenic phase large basins were formed through subsidence, in direct relation with the pre-

existing NW/SE ridge and furrow structure: the West Macedonian plain, the Thessalian Plain, the Saronic Gulf and the Copais basin, which constitute the Sub-Pelagonian Intermediate Zone, as well as the lowlands of Elis and Messenia. Despite subsidence and active erosion that filled the basins with flysch deposits, the result of this epi-orogenic phase is that Greece is a largely mountainous country<sup>2</sup>.

The largest part of Boeotia belongs to the Sub-Pelagonian Zone and the Parnassos Zone. The Sub-Pelagonian zone is defined by Higgins and Higgins (1996: 19) as "*the great belt of ophiolites and associated rocks (limestones, cherts), that were originally part of a continental margin, between the Pelagonian continent and the Pindos Ocean*". During the Tertiary, they add, "*a deep continental trough developed, which filled up with up to 5 km of continental and shallow-water sediments, called molasses, and deep water flysch sediments*" (Higgins and

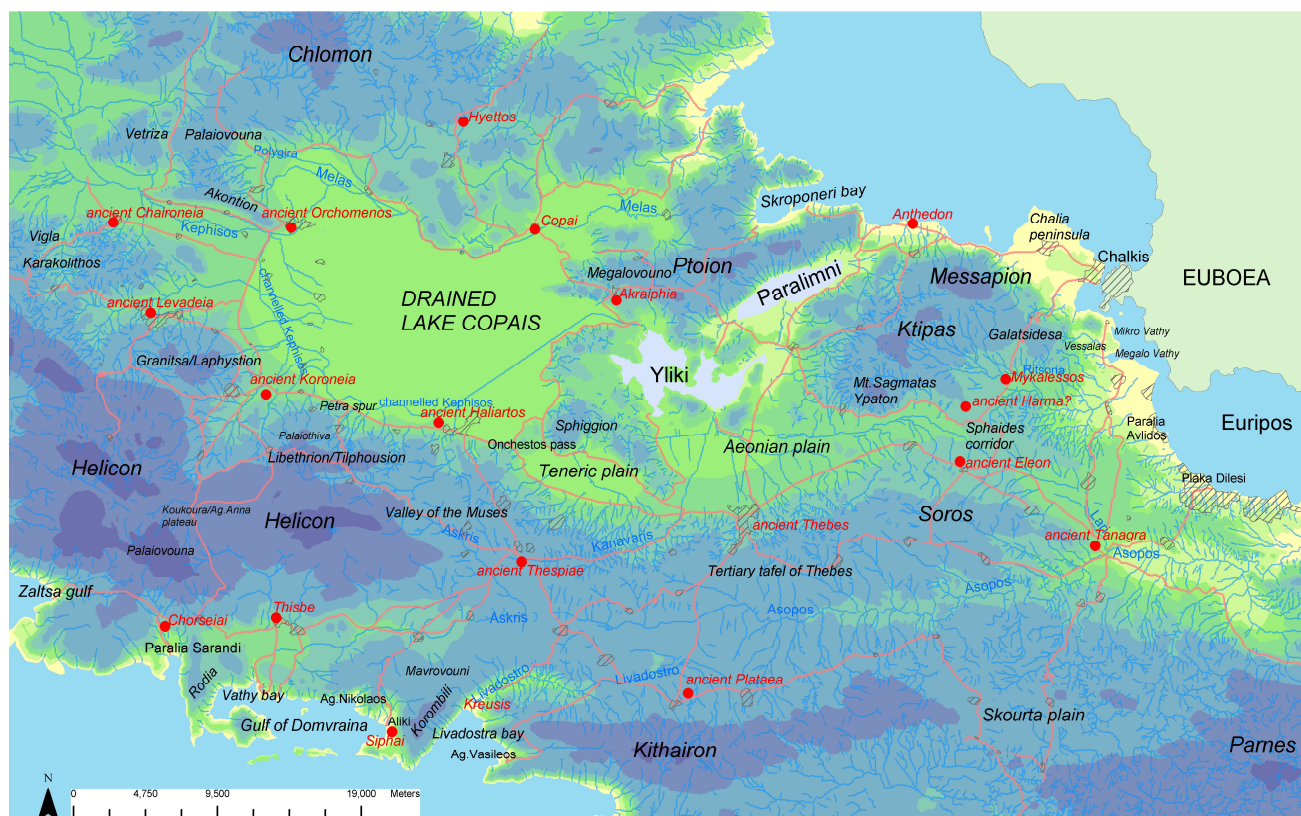


Fig.1. Boeotia general map, with main topographical features and physical routes.

<sup>1</sup> See Wallace 1979 for translation: 'ribbon-like stretches of country' / landstrip. Wallace (1979: 7) says: "Strabo uses the word '*tainia*' to describe land-strips dissecting large land-masses".

<sup>2</sup> 'More than two-thirds of Greece lies above 300m, and steep mountainous reliefs isolate the subsidence basins, creating constraints on inland communications' (Perlès 2001: 9).

Higgins 1996: 19). In contrast, the Parnassos zone is characterised by a large carbonate series beginning with a dolomitic sequence of the Secondary Era, covered during the Tertiary by flysch.

During the Pleistocene, Boeotia, generally speaking, follows the evolution typical of the Mediterranean area. At the last peak of the last glacial period (22.000 – 12.000 years BP ca.) the glaciers on the high mountains of Parnassos and Helicon were not particularly extensive. The sea-level was lower than today and relief was deeply incised by rivers. The erosive action was significant and relatively rapid, helped by the nature of what we can assume was the most probable vegetation coverage in the period: extensive dry grasslands and limited woodlands.

Around 10,000 years BP, the end of the glacial period, marked by a general rise of the temperature, was accompanied by an increase in the sea-level. The rise of the sea formed inlets in the coastal valleys, which were progressively filled by alluvial sediments. A large debate exists today about these alluvial sediments in the Mediterranean region, regarding issues such as their nature, explanatory factors behind their development (general and local), deposition phases, chronology (the so-called ‘older’ and ‘younger’ infill) as well as overall dynamics (among others, see Bintliff 1987; Pope-Van Andel 1984; Bintliff 2002 and, for alluvia in general, Brown 1997).

The morphology of Boeotia is therefore characterised by a sequence of valleys, created by tectonic depressions generically oriented NW-SE, which are surrounded by two types of carbonate relief:

- high mountains of limestone and dolomitic limestone of Lias-Trias, that reach considerable elevation (Parnassos, Helicon, etc.) and are located mainly in the SW-S area;
- lower relief groups, rarely reaching 1000m high, formed by alternate and overlain layers: limestone, sandstone and chert formations of Jurassic and Triassic age; Pliocene marl, sandstone and conglomerate, as well as Pleistocene sediments; these materials, subjected to erosion, form, along with the Pleistocene-Holocene fluvio-lacustrine sediments, the sedimentary deposits of valleys and inner plains.

These basins, or inner plains, belong to a series of basins (ellipsoidal in shape) that extend from Mount Oeta to the Euboia Gulf (on a line ca. 125km long) and run through Boeotia in a NW/SE direction, for ca. 80km E-W and ca. 40km N-S.

There are three main plains of Boeotia: the northernmost plain of Orchomenos, which derives its water mainly from the Kephisos river and was bordered by the former lake Copais; the Theban plains in the central area (namely the Teneric and Ionian plains) and the southernmost plains of eastern Boeotia, which derive their water mainly from the Asopos river.

Throughout the majority of the earlier periods, up until its drainage at the end of the 19<sup>th</sup> C AD, a large swampy lake lay among these plains; the Copais, of karstic origin, had a variable extension (see below) within a basin which extended ca 23km E-W and ca 13km N-S. Two other lakes characterise the landscape of central Boeotia: Yliki and Paralimni (see below).

Boeotia is in fact also characterised by extensive limestone karstic landscapes, with a number of both open and closed *poljes*. The karstic landscape is generally marked by a poor surface hydrography and by a well developed underground hydrography - factors which affect water availability as well as the fertility of the soil and land potential for agriculture. The principal examples of this kind of landscape in Boeotia are the Copais area and the Domvraina/Thisvi polje<sup>3</sup>.

### Physical borders of the region.

The borders of the Boeotia region (see map in fig.1 and fig.1 in chapter I.2.2) are clearly marked by high mountain ranges to the W (with the Helicon massif that separates Boeotia from Phokis) and to the S (with the Kithairon-Parnes ridge that separates Boeotia from the Megarid and Attica), and also by the sea to the SW and the NE (by the Gulf of Corinth and the Euboic gulf respectively). Less defined borders are to the NW, where the border with Phokis opens through the Kephisos valley, marking a free passage to Boeotia (with clear consequences for the history of the region – see chapter II.3.3), to the E, where the frontier between the political regions of Boeotia and Attica has fluctuated throughout history (see chapter II.3.14) and is difficult to pin down, and to the N, where the relatively low pass towards Opuntian Lokris could constitute an easy way through the hills bordering Copais towards the sea<sup>4</sup>. Through the low hills to the E of Mount Klomon (see fig.1) a route has long existed leading from Orchomenos and the Copais basin to Larymna (a harbour probably controlled by the Boeotians in certain periods<sup>5</sup>).

Due to these less defined bordering features, the borders we have used for our analysis are conditioned to being real in certain periods only<sup>6</sup>, thus partly arbitrary for use

<sup>3</sup> See appendix III for a more detailed description of the karstic landscape and the Copais. For the Domvraina/Thisvi polje see chapter II.3.10.

<sup>4</sup> The modern road running along the Paralimni lake was cut into the rock fairly recently and does not mark an ancient route, while the low water periods around 1990 onwards at Paralimni and Yliki revealed ancient roads running at lower levels along the lakesides.

<sup>5</sup> See Oldfather 1916; Fossey 1990a; Papachatzis 1981: 158; RE XII.1, s.v. *Larymna*: 880-1.

<sup>6</sup> Political historical borders of Boeotia were different in different periods, as we know from historical and epigraphical sources. In prehistoric periods the region can be seen as a whole, with the majority of cultural and topographical characteristics in common with one or other neighbouring regions. We should therefore define the borders historically, and we have often done so while examining individual *chorai*, but in the regional landscape description we have merely chosen a reasonable border.

all the time, but mostly have some geographic ‘attractors’ to make them come into use at certain times.

As mentioned above, the highest mountains in the area form an almost continuous mountain wall marking the SW and S borders of Boeotia: from the W, Helicon, Korombili, Kithairon, Pastra, and Parnes. The mountains are mainly Mesozoic limestone and form large blocks connected through mountain cols. The Kithairon-Parnes mountain chain appears as an impressive towering wall. As Munn (1989: 231) states: “*The ancient likewise thought of this mountainous region as a barrier between the lands of the Athenians and the lands of the Boeotians<sup>7</sup>, for this was a dividing line between ethnoi*”, and the frontier was primarily a cultural frontier. On the other hand, it was not inevitable that nations were divided by it, since, as Munn (1989: 231) points out: “*the mountain region itself is by no means impenetrable, nor is it all rugged terrain. There are valleys and small plains with good land for cultivation, and still more land for grazing, between and among the ridges of Kithairon and Parnes. And it was inhabited in antiquity*”<sup>8</sup>.

The main route joining Attica and Boeotia, Athens and Thebes, ran, in Pausanias’ time<sup>9</sup> and still at the end of the 19<sup>th</sup> century - Frazer 1898 (and even, in the form of a secondary road, still today), immediately to the W of Eleutherai, a small fortified citadel on the southern slope of Kithairon (see fig.1).

### The harbours.

Ephorus (indirectly quoted by Strabo IX 2.2) declares the superiority of Boeotia over its neighbours (Phokis and Attica included), not only due to the fertility of its soil (see below) but also because it is the only region that has three seas and a large number of good harbours; these advantages have allowed the development of contacts with Italy, Sicily, Libya, Egypt, Cyprus, Macedonia, Propontis, Hellespontus, etc.

In fact, along both shorelines of Boeotia numerous harbours were active in ancient times; they were more numerous and efficient on the E coast, up to the Gulf of Euboea (Larymna, Skroponeri<sup>10</sup> to the NW; Anthedon to the N; Aulis, Dilesi, and Oropos to the NE)<sup>11</sup>, as compared to the S coast, facing the Gulf of Corinth (Tiphera, Kreusis, Siphai, Hagios Ioannes, Vathy and Livadostro)<sup>12</sup>. Heurtley’s article (1923/25) is still a good, if slightly dated, study of Boeotian harbours.

Some of the natural landings were in use only or mainly in certain periods, as in the case of Anthedon and Dilesi, which saw their peak in Hellenistic and Roman times. Others functioned from Prehistoric times throughout antiquity, such as the harbours on the gulf of Corinth,

probably already in use in the Mycenaean period (Heurtley 1923/25), and then flourishing in the Late Roman period, being apt for long-distance trade.

### The shoreline.

The main factors involved in shoreline modifications are sea-level changes, tectonic activity and subsidence phenomena in general, and sedimentation or erosion processes.

After the extensive general modifications of the shoreline during the Pleistocene caused by changes in sea-level related to glacial phenomena, the shoreline may have further changed during the Holocene in the Neolithic period because of ongoing tectonic activity (Perlès 2001, quoting Morrison 1968; Stiros and Papageorgiou 1994). The tectonic nature of these transformations also seems to characterise overall changes in the Mediterranean area, though it is not so clear. Most probably, minor and local tectonic events, related to sedimentary phenomena, also had some considerable influence.

In the Volos gulf and the Franchthi area, for instance, detailed work has shown a rise in sea level of ca. 5m during the Neolithic (Perlès 2001, quoting van Andel 1987. See Bintliff 1977 for the Aegean picture in general, and Lambeck 1996). Detailed work on this coastline variation, focusing on the problem of the position of ancient sites in relation to the sea, has been carried out by Zangger (1993) for the Argolid, among others<sup>13</sup>.

### The climate.

Climate has, naturally, an important influence on the environmental conditions of a region, while topography has strong consequences on the climate.

In the case of Boeotia, the diverse and rough nature of the ground, marked by a series of valleys or lowlands surrounded by relatively high mountains, small plateaus, and closed basins, along with a greatly varying amount of exposure to the influence of the sea, and finally characterised by large-scale karstic phenomena, helps create and determines several local microclimates within the overall climatic picture.

Osborne (1996: 54) for instance notes: “*so local are the variations, that it is by no means guaranteed that a wet year in one place will also be a wet year 20 miles away. Some local variations are the product of physical relief: Thebes, in the middle of a basically flat Central landscape, receives on average only 63% of the annual rainfall of Levadeia, which is 25 miles west of it and in the rain-excess belt of Mount Parnassos*”.

<sup>7</sup> Herodotus VII 141.3; Xenophon *Mem.* III 5.25; Strabo IX 1.3.

<sup>8</sup> The Skourta plain is a nice example of this (see chapter II.3.14 and appendix I.14).

<sup>9</sup> Pausanias IX 1.1. Via this route Pausanias entered Boeotia from Attica.

<sup>10</sup> Fossey (in *Teiresias* Suppl. II 1979: 9-13) suggests that the Skroponeri bay was a key military harbour during the period of Epaminondas and the Theban hegemony.

<sup>11</sup> See Oldfather 1916, Heurtley 1923/25.

<sup>12</sup> See below, in the section with the description of the gulf of Corinth area.

<sup>13</sup> Sea level rose steeply 12,000-6,000 years BP, and this led to widespread submergence of old coastal plains; it then slowed down and in many basins alluviation kept place or even gained, thus over time many Aegean plains move forward into the sea, making ports landlocked (Bintliff 2000d and Bintliff 2002). See for instance the case of the Malian gulf (outside Boeotia to the N, constituting the northernmost part of the North Euboean Gulf) and of Thermopylae (Higgins and Higgins 1996: 81-83).

Included in the Mediterranean Zone, the climate of Boeotia is classified as ‘meso-Mediterranean’ (UNESCO-FAO 1963).

The mean annual temperature reaches 18.5°C and the rainfall trend, marked by a strong annual variability with short but heavy rainfalls, as is usual in the Mediterranean climatic zone, reaches its highest peak in November and December and its lowest trough in July, with rainfall concentrated in the period from October to March (75% of the total).

Inter-annual rainfall variability is even more important when the annual mean is low, particularly during the dry summer months. This element, associated with the high summer temperature, can cause dry stretches three months long, as often happens in the Mediterranean sub-semiarid zone. In the past, this fact often had an impact on the periodical risk of famine, related to the fall of climatic conditions below the minimum level required for cereal growth.

The mean annual rainfall in Greece, at the present day, fluctuates between 463mm (measured at Tanagra, eastern Boeotia) and 470mm (measured at Salonika – Shiel-Steward 2007), with a pluviometric gradient of ca. 40mm every 100m elevation gap. The suggested mean seems slightly higher than the one calculated for Central Greece, but many scholars note that both in Boeotia and Argolid the mean annual precipitation can drop under 400 mm (Perlès 2001: 14 quoting Greig and Turner 1974, Forbes 1989, Hansen 1991).

Seasonal fluctuation and inter-annual rainfall variability, even without regional or general climatic variations, along with the strength of rainfall, can be considered factors for erosion processes as well as soil weathering, recurrent in the whole region. C. Perlès notes: “*The effect of the Mediterranean climate on the mostly massive limestone elevations resulted in particularly steep slopes, which were conducive to important erosion. The sediments washed down by violent seasonal rains accumulated in the many deep depressions of tectonic and karstic origins, which are equally characteristic of the Greek countryside. Contrast between the rugged and steep mountains overlooking absolutely flat inner basins remains to this day a powerful experience*” (Perlès 2001:10).

The high variability and the violence of seasonal rainfalls also have a large influence on the systems of aquifers and springs, as well as on surface hydrology and the dynamics of wet zones. They can also be factors in the frequent flooding that still today affects some of the lower areas, which are also usually the most fertile areas. Finally they can explain the human effort since ancient times, to regulate and canalise water, which can be seen in high level hydraulic engineering work in the region<sup>14</sup>.

For thousands of years, most probably since the Final Neolithic / Early Bronze Age (from around 6000 BP onwards – Roberts 1998; Bintliff 1992b and 2002), the climate dynamic of Central Greece has been broadly comparable with the semi-arid Mediterranean climate today, characterised by winter rains and dry hot summers.

We can, however, trace some variation locally in different periods. Variations, such as increases and decreases in temperature, are recognisable on a general scale in different times from the Neolithic up to the so-called ‘Little Ice Age’ of Medieval-Early Modern times (from around the 16<sup>th</sup> to the mid 19<sup>th</sup> century AD). Generally speaking, Boeotia has (and most probably had) a less arid climate than neighbouring Attica, Euboea and the Argolid (Shiel 2000; Bintliff 2002).

As for Greece in general, average summer temperatures would have most probably been slightly lower around 7000BC and rainfall slightly heavier (Perlès 2001: 13 quoting Huntley and Prentice 1988 and Bottema 1994; Bintliff 2002).

In addition, as Osborne (1996: 55-6) notes, even though we have no ancient climatic statistics, we do have a number of descriptions of plant communities and of the agricultural year from ancient Greek writers of the Archaic and Classical period (for Boeotia, for instance, we can refer to Hesiod, living ca. 700 BC<sup>15</sup>), through which we can infer that the seasonal pattern in antiquity was much the same as the seasonal pattern today.

### The hydrology.

Both the geo-morphological structure and the climate of Boeotia influenced and determined the surface and underground water system.

### AQUIFERS

On a general scale, considering the main hydrogeological characteristics and geological formation of the area, three main aquifers can be recognised in the region:

1) *calcareous and calcareous dolomite aquifers*, formed by limestone and dolomitic limestone complexes with a medium or high fissure and karstic permeability, and characterised by a relatively deep and powerful subterranean hydraulic circulation. The flow of the springs of these aquifers is about 100 to 1,000 litres per second;

2) *gravel-silt-sand aquifers*, formed by deposits of fluvio-lacustrine detritus complexes with a variable porous permeability, and characterised by a quite shallow subterranean hydraulic circulation, located primarily in the cones of dejection or in the lacustrine deltas. The flow of the springs is only a few litres per second, unless they are also fed by the water-bearing strata of the calcareous complex;

3) *sandstone-marl, limestone-marl and clayey-schistose aquifers* (limestone-marl and sandstone-marl-clayey systems), with a medium to low or absent fissure and porous permeability, characterised by a poor subterranean hydraulic circulation. The flow of the springs is a few litres per minute.

### SURFACE HYDROLOGY

The modern landscape of central Boeotia is marked by two lakes: Yliki, formerly Likeri, and Paralimni (see below); it is also characterised by two karstic *poljes*, today drained: the Domvraina/Thisvi *polje* and the large

<sup>14</sup> See, for instance, appendix III for Copais, and chapter II.3.10 for the Domvraina/Thisvi area.

<sup>15</sup> Hesiodus *Op.* 609-17.

Copais basin (see appendix II and especially appendix III).

The main rivers which cross the Boeotian landscape (see map in fig.1) are: the Kephisos (see appendix II and appendix III) and Melas (see appendix II and appendix III), the main rivers of the NW area; the Asopos (see appendix II - iBb), the main river of eastern Boeotia; smaller rivers and streams around Copais (see appendix II and III); and other smaller rivers and streams such as the Askris, Livadostro and Kanavaris within the area of the Tertiary *tafel* of Thebes (see appendix II - Tertiary *tafel* section and chapter II.3.9), and the Lefkos and Ismenos in the eastern (Aeonian) plain of Thebes (see appendix II - iA).

### The vegetation.

According to Rackham (1983), within the panorama of vegetation in continental Greece, Boeotia is characterised by an extensive presence of low, woody and herbaceous vegetation (the so-called maquis, steppe and garrigue) with an important presence of wood coverage mainly limited to the N facing slopes and plateaus of the high mountains. Certainly a large part of the landscape, especially the fertile lowlands, the hill slopes and the gentle versants of the mountains, has been cultivated for millennia. The typical landscape of the Mediterranean polyculture is still today dominant in the larger part of the region. The core of the landscape seems to be still occupied by the original vegetation. Even these wild areas, however, show the vegetational characteristics of the well known group called “anthropic steppe” (grazing and forest cover alternated) – the result of biological migration encouraged by human vectors and ecological receptivity – which invaded the areas cleared, or at least occupied, by humans and then subdivided itself into *facies* according to the diverse microclimates.

As far as vegetational history and human influence are concerned, Perlès (2001:14-15) notes that the main distinctive character of Boeotia and central and eastern Greece compared with northern and western Greece, where the original oak forest coverage was very dense (due to more frequent rainfall), is that in the former the forest would have been naturally more open (at the beginning of the Neolithic era), especially from Boeotia southwards. The cutting of the forests due to agricultural requirements, along with the diffusion of grazing animals and the nature of the climate (marked by hot and dry summers), favoured the dispersal of steppe species and prevented the replacement of cut trees, causing a general diminishing of the forest. Low-growing shrubs and small trees (juniper and terebinth, usually under-represented in pollen analyses) would have been the dominant vegetation (Hansen 1991: 18).

The pollen diagrams for the former Copais Lake (Allen 1990; Greig and Turner 1974; Turner and Greig 1975; Turner 1978) indicate, for the first half of the Holocene, a deciduous oak woodland on the deeper soils, evergreen oaks on the thinner soils, and a steppe vegetation on the slopes (Perlès 2001: 14-15 quoting Rackham 1983). Pollen analyses and the study of the magnetic properties of the sediments from these cores, related to exposed sections of lacustrine sediments in the basin, allow for a first

reconstruction of the climatic-vegetational evolution of the basin and constitute a useful interpretative guide for the valleys and lowlands of Boeotia. This research also gives indications of traces of human intervention from ca. 27,000 years BP up to 3,000/2,500 years BP (Allen 1990; Turner and Greig 1975).

In the period between the Pleistocene-Holocene transition and 3,000/2,500 BP, vegetation is typified mainly by an abundance of *Quercus sp.* (oak) up to ca. 5,000 BP, and after that by the decline of this and the gradual development of other tree species, such as *Fagus sp* and *Carpinus betulus*, and most especially graminaceous and herbaceous species, as well as by a small but significant growth in the presence of *Olea sp.* (which might indicate agricultural activities). According to Bottema (1994: 56), the presence of terebinth and juniper indicated a dry, open woodland around Copais, at about 8000 BP. The forest became denser afterwards (Bottema 1994: 57; Perlès 2001: 14-15).

As for magnetic properties, in the most recent part of the sequence the decline of *Quercus* corresponds to a series of peak values of magnetic susceptibility: “...*It must therefore be considered a possibility that the sediment at these levels comes from the inwash of magnetically enhanced eroded topsoil from catchments slopes...*” (Allen 1990: 177). Both pollen and magnetic analyses seem to indicate the decline of the humid postglacial phase during the period ca. 5,000 years BP, along with the spacing out of forest coverage (due to the decline of oak) in favour of a more arid climate<sup>16</sup>, bringing about the denudation and erosion of hill slopes. According to several authors, these processes of vegetational transformation and increasing erosion can be related to human impact, in association with climatic changes, either to fairly destructive agricultural activities (for example the ‘slash and burn’ practice), or rather to an over-exploitation of land related to socio-economical factors (see Zangger 1992, Roberts 1998 and Bintliff 2002).

Unlike N and W Greece where the original oak forest coverage was very dense (due to more frequent rain), in central eastern Greece the forest would have been naturally more open (at the beginning of the Neolithic era), especially from Boeotia southwards, and the climate would have been more pronouncedly Mediterranean (Bottema 1994: 57; Turner 1978). Once the forest was cleared, the hot and dry summers and the presence of grazing animals would have prevented the growth of trees in favour of steppe species (Perlès 2001:14-15). Osborne (1996:57-69) points out how areas of aromatic plants, characteristic still today of the so-called garrigue (evocative of the Greek countryside, and of sage and thyme for instance), which develop on soils too short of moisture for woodland plants, would have been brought into existence solely by the pasturing of animals. On the other hand, Rackham (1983: 304-5) argued that for Boeotia he could find no evidence to support the view that garrigue and steppe are results of original woody vegetation (macchia) successively degraded by browsing,

<sup>16</sup> i.e. the traditional dry climate in the Mediterranean.

burning, and woodcutting<sup>17</sup>. He suggests that the ratio of macchia, garrigue and steppe depend mainly on soil moisture and, when water is scarce, garrigue and steppe can exploit even the water stored beneath the areas occupied by patches of macchia. The spacing of macchia patches would depend mainly on how much ground is needed to supply each patch with water, often independently from browsing activities.

## PHYSICAL LAND UNITS OF BOEOTIA

According to the methodology illustrated in chapter I.2.1, the study of the Boeotian landscape, which is the subject of the present work, also involves the examination of the physical landscape of the region and the evaluation of land potential (mainly for agriculture) by means of GIS.

### Physiographical classification of landscape units.

Some results of the GIS analytical work carried out on environmental data and described in chapter I.2.1 can be commented on here, at a general regional level, in order to describe the physical landscape of the Boeotia region. The division of Boeotian landscape into three main

1	P1_P2	lacustrine basin, valley	26.6%
2	P3	gentle slope	3.5%
3	P4	Foothill	9.8%
4	H1	Plateau	18%
5	H2	gentle slope	4%
6	H3	moderate slope	8.9%
7	H4	severe slope	10.2%
8	H5	very severe slope	7.5%
9	M1	plateau	2.7%
10	M2	plateau / gentle slope	1.7%
11	M3	moderate slope	3.6%
12	M4	very severe slope	3.4%

Table 1. *Percentage of the different physiographical classes present in the region of Boeotia (P=plain; H=hill; M=mountain)*

classes according to elevation (plain, hill, mountain), and then into physiographical units (such as valleys, plateaus, watersheds, hill slopes, etc. – fig.2), allows us to analyse sections of the landscape (as we will do in the examination of each individual *chora* or micro-region) as well as the Boeotian landscape as a whole, which is our technique in the present chapter. We will address here several questions regarding the whole region.

Is Boeotia a mountainous area? GIS analyses of topographical data revealed that 11.5% of the ancient Boeotian region<sup>18</sup> lies above 600m asl. On the other hand, 88.5% of it lies below 600m asl, with 40% lying below 200m asl (see pie-chart in fig.2).

Despite these values (which are due especially to the fact that our dividing line between hill and mountain has been

set at 600m asl), the presence of bordering mountains (such as Citaeron and Parnes) and the Helicon massif and the Ptoon-Messapion group marks and defines the character of the Boeotian landscape. The majority of the ancient *chorai* of Boeotia include mountainous terrain in their territory, which can be therefore considered almost as much a defining element as the fertile plains<sup>19</sup>.

Slope values higher than 45% are found in 30% of the mountain landscape.

Considering the statistics and the fact that 30% of the plain features are constituted by the lakes and the Copais lake, we should probably better describe Boeotia as a hilly landscape, since 48.5% lies between 600m and 200m asl. The hilly segment of the landscape (upland-plateau land), extended and widely fertile, actually constitutes a critical landscape key for Boeotia, as settlement choices in different periods of history nearly

<i>Hilly landscape</i> (above 200m and below 600m asl)	48.5%
<i>Mountainous landscape</i> (above 600m asl)	11.5%
<i>Plain</i> (below 200m asl)	40%

always concentrated there. Generally speaking, the most critical divisions of the Boeotian landscape can be defined as: crystalline limestone uplands; intermediate elevation hill and plateau land made up of flysch and soft limestones; lowlands of Plio-Pleistocene colluvia, alluvia and lake deposits. The middle area is nearly always the key one preferred for settlement in every period.

Looking at the variety within these landscapes, by separating the individual physiographical classes, we can differentiate between different morphologies, as can be seen in table 1.

By focusing on the pattern of the three main morphologies – hilltop, hillside and valley – we can see that as one would expect, the highest slope values and the largest frequency of high slope values can be seen in the mountainous zone, while the lowland is marked by the presence of the plains.

In the hilly landscape zones, both valleys and plateaus (H1) are recognisable throughout the whole region and actually constitute the second most represented physiographical class in such areas (see pie-chart in fig.2). The largest mid-land plateaus which mark the landscape are the large plateau south of Thebes running to Cithaeron (longitudinally crossed by the Asopos), the Skourta plain, the Hyettos area north of the Copais and the whole Thespieae area, as well as the low ridge separating the Tanagra and Thebes plains. Among the H1 class, hilltops can also be recognised, if larger than 30x30m, which is the grid size of the RASTER layer (see chapter I.2.1).

<sup>17</sup> Rackham (1983) points out that animals cannot stop woodland growing, as shepherds have to regularly burn it to allow them to graze.

<sup>18</sup> With the artificial borders marked according to that stated earlier in this chapter.

<sup>19</sup> See dedicated chapter for each *chora*.

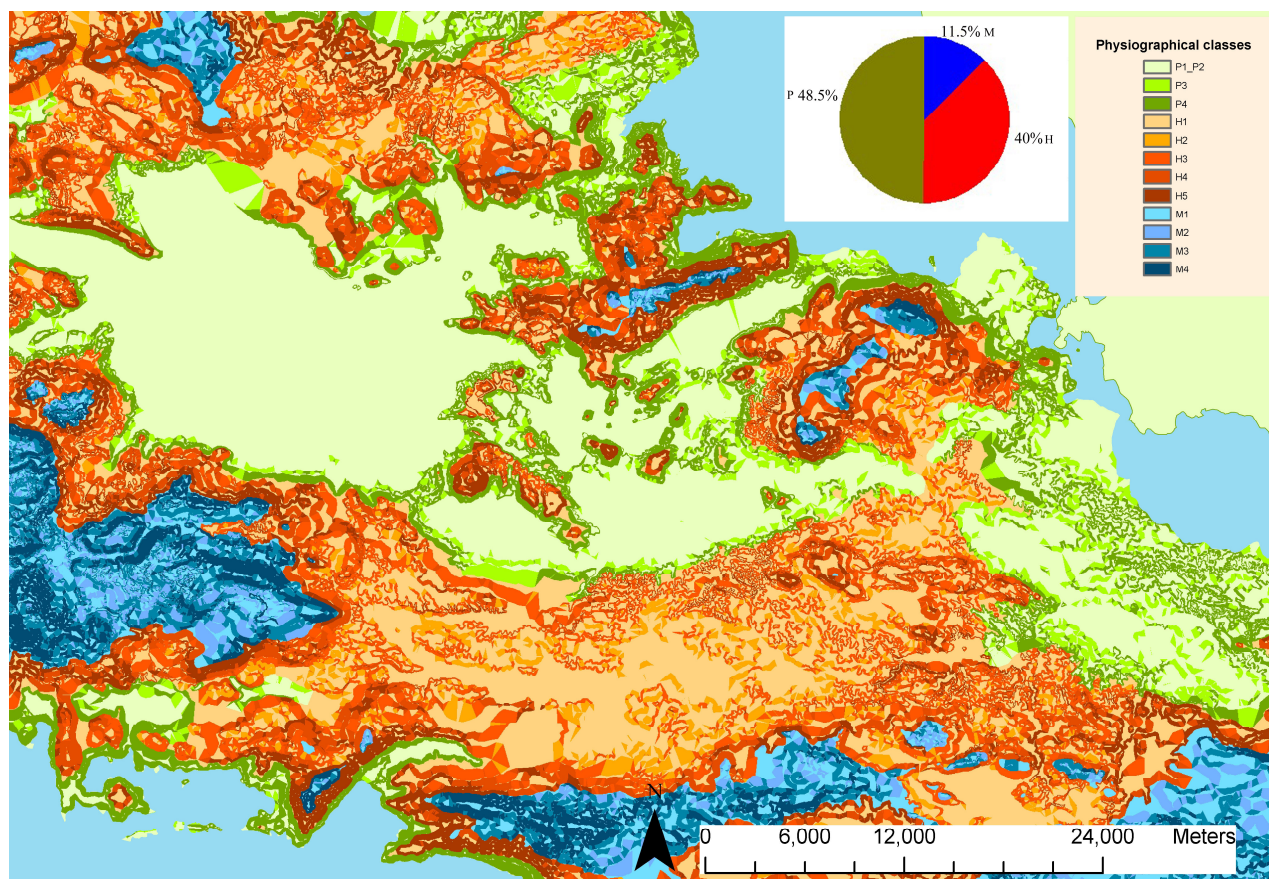


Fig. 2. Map showing the distribution of different physiographical classes in Boeotia. For code legend see table 1.

The ‘foothill’ class [P4] is clearly recognisable in several areas: at the edge of the lakes, along the coast to the Gulf of Corinth, around the Skroponeri bay, as well as corresponding to the dissected basins and plateaus round Copais, at Anthedon (modern Loukisia), or in the Valley of the Muses, or in a thin line at the edge of the Teneric plain west of Thebes. This morphology usually forms a line running along the base of the hills, or around basins and plateaus, but we can see areas with the same morphological characteristics (below 200m asl and slope  $\geq 10\%$ ), though much more dispersed over the landscape, in the area E and NE of Tanagra up to the shoreline.

Within the hilly landscape zone, 37% is  $<5\%$  slope (H1 plateau, see above). 21% is H4, 18% is H3, 16% is H5, and 8% H2. Therefore, if we exclude the upland plateaus (which I have pointed out as features characterising the Boeotian landscape), the rest of the hilly landscape is almost homogeneously distributed between the other classes, with a lower presence of H2 (gentle slope), which is limited to some fragmented areas mainly around the hill plateaus.

As mentioned above, the lowland is marked by the presence of the plains. 66% of the landscape below 200m asl is characterised by slope values lower than 5%, and

they are, as we have seen, either lacustrine basins or valleys.

#### Soils and Land Potential

The dominance of limestone in the geological substrate of Boeotia and the presence of karstic processes have a direct influence on the nature of the soils of the region. Soft limestone and calcareous sandstone are dominant in the uplands. Marls and flysch are extensively distributed in the mid-altitudes. Flysch presents great variability (see chapter I.2.1), but generally form deeper soils of good workability.

The bases of the relief frequently display cones of gravel and conglomerates of the Pleistocene age. On the gentle slopes of low hills at the borders of plains and valleys, the older fill can be found; the lowlands and the valleys are covered by Holocene silty alluvium and soil, as well as large areas of Pleistocene soil<sup>20</sup>. In general, within the Greek soil spectrum, the soils of the Boeotia lowlands are fertile and workable<sup>21</sup>.

<sup>20</sup> Large areas of Pleistocene soil are most of the Teneric and Aeonian Plains and some areas around the edges of Copais to the E, N and W of the lake.

<sup>21</sup> For soils see mainly Higgins and Higgins 1993. For a synthesis see Perlès 2001: 10-11. For Boeotia see Shiel and



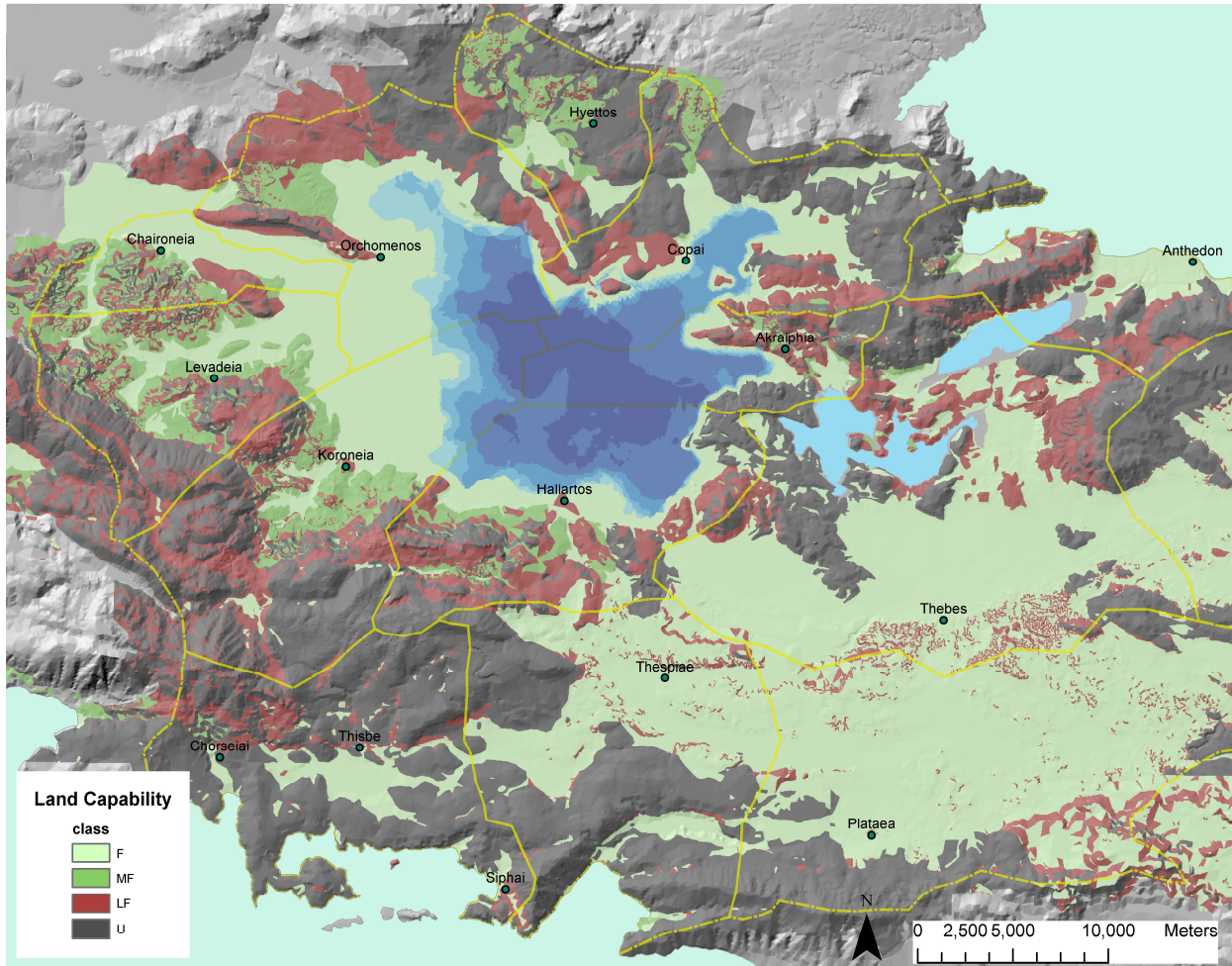


Fig.3. Map showing the distribution of land capability classes in Boeotia.

<b>F</b>	Soils with few limitations restricting their uses because they demonstrate a slight tendency to wetness or dryness or very moderate erosion.	41.9%
<b>MF</b>	Soils that have some limitations for agriculture, reducing the potential choice of crops or requiring moderate conservation practices, due to wetness caused by a variety of factors.	5.3%
<b>LF</b>	Soils that have more limitations for agriculture, reducing the potential choice of crops or requiring moderate conservation practices, due to dryness and limited soil depth, causing rooting problems.	17.4%
<b>U</b>	Soils that have severe limitations for agriculture, restricting the choice of crops and requiring very careful management, due to very limited soil depth and a high slope degree, causing acute difficulties for access and rooting.	35.4%

Table 2. Land potential classes and their occurrence in the Boeotia region.

A classification of land potential has been made for the Boeotia region, for the purpose of the present work (see chapter I.2.1). A summary of the classes and their occurrence in the region can be found in table 2 (see chapter I.2.1 for details).

As described above (see I.2.1), the land potential for agriculture has been evaluated mainly according to lithology and to some visits on the ground. Quantifying the results, a large part of the whole region can be considered suitable for agriculture with very little (almost no) limitation.

As we can see in table 2, the land best suited to agriculture (classes F and MF) accounts for 47.2%, while LF areas, where agriculture can be practiced if strictly necessary, occupy 17.4% of the whole region<sup>22</sup>.

<sup>22</sup> Bintliff (1985: 15-17) suggests that in antiquity possibly half of the total land of ancient Boeotia could have been in cultivation. In 1961 the cultivable area was put at around one-third of the country. Allowing for the slightly different boundaries of ancient Boeotia and the varying size of the large Copais Lake, Bintliff calculated that this would be equivalent to some 800 sq.km. of cultivable land in antiquity, applying the same ratio. He suggested, on the basis of historic sources, that around 650sq.km. of arable land would have been required to

Steward (2007). See the chart based on Shiel and Steward's work (2007) on Thespiac in chapter I.2.1 (table 3).

On the other hand, with regards to availability of pasturage areas, mountainous landscapes of Boeotia marked by sandstone and/or limestone can be devoted to husbandry, especially when the slope is steeper and scarce soil on the surface makes the land less suitable for cultivation. Quantitatively speaking, land suitable for pasturage, which can include LF and U classes, amounts to 52.8%. We should keep in mind, though, that F and MF land zones could also be used for grazing either during fallow or after harvesting, especially in the case of mixed economic systems or of agricultural systems characterised by culture rotation.

with distinctive physical and cultural characters, which can coincide with our 'settlement chambers' (see chapter I.1.2)<sup>25</sup>.

### THE GEOGRAPHICAL SUB-REGIONS OF BOEOTIA

A good description of both the physical and historical landscape of Boeotia was given by Philippson in his book '*Die Griechischen Landschaften. Eine Landeskunde*'. The description of the Boeotian landscape is included in one of the five volumes published between 1950 and 1959, and in particular in volume I, part II (*Das östliche Mittelgriechenland und die Insel Euboea*), published in 1951.

In his very detailed yet discursive way of describing the Boeotian landscape, Philippson follows two different levels of landscape analysis. The first, which is much more detailed and discursively treated, approaches the region through various small landscapes and describes them with a very high level of detail in terms of physical and cultural landscape, and the second, which constitutes the top level of description (containing the other), and divides the region of Boeotia into five areas with distinctive geographical characteristics. These divisions, generally speaking, either correspond to the historical divisions into *chorai* around the main *poleis* of Boeotia (which are mainly defined by topographical boundaries), or combine together more of them into larger geographical units. The geographical areas are the plain and foothills of Chaironeia, the Helicon district (West Helicon, Laphistion-Levadeia-Koroneia, East Helicon, South foothills of Helicon and the Korombili area), the Copais basin, the Mountains to the E of Copais, and Eastern Boeotia<sup>23</sup>.

In the treatment of archaeological data (mainly at a descriptive level), I will follow a subdivision by micro-regions/*chorai*, defined both by topographical and political-historical characteristics<sup>24</sup>. On the other hand, at the analysis level, my study will follow Philippson's detailed level, in individuating small cultural landscapes

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maintain hoplite and aristocratic classes alone. He inferred that probably in ancient times a far larger proportion of the landscape was under cultivation, or at least intensive herding, say 40 or even 50 per cent (in Classical times) rather than one-third (Bintliff 1985: 15-17 and 1997b: table 1).

<sup>23</sup> A brief general description of the geographical areas individuated by Philippson is included in appendix II.

<sup>24</sup> See chapter II.3 and *chorai* chapters.

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<sup>25</sup> I approach the small landscapes detected by Philippson and apply within this framework the revised settlement chamber approach discussed earlier in chapters I.1.2 and I.2.2.

