12. Conclusions
12.1. The goals and the accomplishments

This thesis provides high-resolution, layered specific microstratigraphic analysis of the lakeside settlement of Dispilio, as a means to examine the human selection strategies within an alternating lacustrine regime, observe the occupational history of the site in its lacustrine context and highlight the significance of lakes as favorable habitats for the Neolithic dwellers. The uniqueness of lakeside settlements lies on the fact that, while the low energy anaerobic settings, on which they are found, bury and preserve archaeological materials, at the same time, the fluctuating water action extensively modifies the archaeological contexts. Moreover, in cases of pile dwellings, the underlying deposits are not directly related to the actual anthropogenic activities and it is therefore difficult to determine the extent, to which natural processes have distorted the anthropogenic signal. These depositional complexities demand the application of multi-disciplinary methodological tools with varied scales of resolution.

This project, therefore, has integrated a multi-scalar methodology (i.e. sedimentology and micromorphology), to decipher the natural and anthropogenic sync- and post-depositional processes, which affected the formation of the site. The contribution of sedimentological analysis has been crucial for understanding the local sedimentological processes and for elucidating their impact both on the selection strategies of the dwellers and on the preservation of anthropogenic materials. On the other hand, the study of microstratigraphy shed new light on interpreting the intricate site formation processes, including the depositional conditions of the materials and the post depositional natural and anthropogenic disturbances. This type of analysis, therefore, reveals aspects of the cultural and social history of the site, by tracing human activities, episodes and discontinuities in the life cycle of the settlement with exceptional resolution.

Sedimentological parameters and micromorphological analysis have been supplementary used to decipher the alternating lacustrine micro-environments, the water energy and water level fluctuations and the sync and post-depositional natural and anthropogenic processes, which have altered the original structure of the sediments. Moreover, the qualitative analysis of the micromorphological method has contributed to the
identification of individual anthropogenic features (construction materials) and human induced interventions and processes (conflagration events, dumping and constructing).

The application of the mechanical coring equipment, which produced undisturbed stratigraphic sequences and micromorphological thin sections, is here recognized as an invaluable tool for the reconstruction of natural processes in high resolution. At the same time, the application of the same technique in the unexcavated parts of the archaeological site, has been implemented as a supplementary approach to complement for the lack of extended excavation profiles. In this way, one can trace the lateral variations of the facies in a relatively small scale of analysis. At the same time, the detailed micromorphological sampling from the excavated sectors refines the results, contributes to the qualification of the recognized facies and provides a more insightful comprehension and interpretation of the natural and anthropogenic processes.

Using the tools above, a major goal of this project has been to reconstruct a concrete stratigraphic background; to describe, in other words, the initial state of the surface interface, on which the anthropogenic activities took place and to transform this surface into a 3-dimensional entity. The three-dimensional image of a human-related space was therefore described at a given time, with the integration of the human activities, the nature of the habitation unit and the local environmental conditions. This process, together with the radiocarbon results led to the construction of a solid stratigraphic background, on which the excavation data and the results of the individual scientific analysis (archaeobotanical, archaeozoological etc) can be placed and interpreted.

In an interpretative level, this project raised theoretical questions associated with the intricate relationship of man with the surrounding landscape and to the role of the environmental impact on the human decision making. In this framework, it has been a challenge to avoid environmentally deterministic interpretations regarding the selection strategies of the first dwellers. The hypothesis though, that the environment has been the triggering force of cultural alterations in the site is far from being proved by the sedimentological and micromorphological data. The complexities of the site, therefore, limit the scope of arguments that are too simplistic. The objective here is hence to reverse this perspective and to develop new approaches capable to illuminate the
flexibility of the Neolithic societies to variably cope with climatic and environmental challenges.

Moreover, analogies from recent lake dwelling settlements (marsh Arabs) are discussed in the synthesis chapter as an approach to draw inferences about past practices, and highlight the potential for diversity and complexity. The use of ethnographic and ethnohistorical analogy can indeed have the effect of normalizing past behavior, and accentuating, or even constructing and superimposing, patterns from different temporal, cultural or spatial situations. Considering this limitation, these analogies have not been used as a projection of modern ideas to the Neolithic habits and practices, but as a means to approach what living in a wetland signifies, demonstrating all the aspects that make this selection less odd to our modern perception. These analogies therefore shed light on the wetland dwellers activities and practices, revealing a wide range of behaviors related to coping with the wetland environmental challenges. Moreover, these observations reveal the idea that what is today considered risky and demanding, may not reflect the social adaptations and abilities developed by the lake dwellers through time.

12.2. The landscape and the site in context
As a general statement, and following the discussion in the literature review, it is here attempted to explore how people interacted with the dynamic lacustrine microenvironments through time, and how the continuities and changes in the occupational history of the site could reflect environmental, cultural and social aspects. The understanding of the impact of sedimentological processes on the archaeological site and the correlation of these processes with regional environmental and cultural events, have contributed to the comprehension of the effect of environmental changes on broad cultural modifications.

The main occupational phases of the settlement extend throughout the MN and the LNI. During this period, the site underwent many phases of habitation and subsequent destruction from conflagration, destroying part of, or the whole settlement. At the same time, the site has been subject to several alternating inundations, cautiously associated with the lake transgressions recorded by Kouli (2002). These fluctuations, nonetheless, do not seem to pose a restriction to the evolution of the settlement, as it is attested by the intensive anthropogenic activity during and after the regression-transgression episodes. This observation is further reinforced by palynological data, verifying that the anthropogenic pressure recorded on the vegetation, is not related to the lake level
fluctuations. It is denoted therefore that floods must have had a diverse effect on the decision making of the lake dwellers, not always signifying a problem; the attractions of the lake margins apparently outweighed the perceived risk of inundations, with the post dwellings themselves constituting a significant means to cope against the rising of the water levels.

Concerning the micro-environments of the site, all the sedimentological and micromorphological evidence designate that the settlement was built on piles in a marshy regime, where low water level conditions predominate and no signs of exposure are noticeable in the sediments or the materials. Periodical stages of subaerial exposure cannot be entirely excluded; they must have been too brief though to leave any signal on the sedimentological and archaeological record. In this case, the construction of provisional structures on the ground is suggested; the prevailing humid conditions and the potential of periodical floods would not permit the investment of time, efforts and materials for constructing permanent ground structures as houses.

During the LNI the site has underwent at least 4 subsequent episodes of habitation; at the advent of this period (before 5200 BC), the first signs of subaerial exposure are recorded. The periodical exposure of sediments, nonetheless, is not necessarily associated with a lake regression, but can be a result of the taphonomy of the preceding destruction events, accumulating anthropogenic materials and forming elevated and periodically exposed mounds of collapsed and reworked anthropogenic deposits (Karkanas et. al, 2011). These factors explain the different microstructures in the successive sedimentological facies, even in cases, where similar environmental conditions predominate under analogous water levels.

After the destruction of the end of LNI, the settlement underwent a phase of terrestrialization. This process cannot be attributed to a general lake regression, due to its local character and small degree. It is therefore considered to result from the increased rate of sedimentation due to the accumulation of the remnants of human activity; there is evidence that this abrupt sediment accumulation combined with chronological discrepancies can be associated with construction works for flooding prevention. Besides, a gradual regression recorded during the late stages of the formation of the site, it is not so pronounced to justify the rapid terrestrialization of the site.
There is scarce evidence of habitation from 4800BC to 4000BC and then a hiatus of more than 1000 years, before the site was sporadically inhabited at the EBA. During the abandonment of the site, agriculture and grazing activities are steady, but not intensive; the vegetation and landscape though return to the conditions similar to those prior to the habitation of the site (Kouli, 2002), indicating that human activity is hitherto more terrestrial and not so closely associated with the lacustrine regime. This event is suggested to be part of a more generalized cultural phenomenon, linked to the abandonment of many sites between the LNII/Chalcolithic and EBA in the Balkans, with evidence though of a persistence in agropastoral activities (Lespez et al., 2016). At the time of the site abandonment, Kouli (2002) records a lake transgression, correlated to a surge in fluvial sedimentation between 4000BC and 3600BC in the eastern Mediterranean Sea (Bar- Matthews and Ayalon, 2011).

Regarding the impact of these environmental changes on cultural modifications, it is supported that the populations were relocated in order to cope with increased moisture and inundations, but although they moved away from areas most affected by the rising water table, they probably settled in the adjacent foothills (Lespez et al., 2016). Climatic instability would have thus necessarily had an impact on anthropogenic practices and agropastoral activities, but this change was not sufficient to prevent the sustainability of human populations.

Concerning the ecological choices of the first lake dwellers, there has been an existing hypothesis that the first settlements emerged during dry climatic conditions, when the lakes provided favorable ecological conditions with agricultural potential. The site of Dispilio and the adjacent site of Giole are however clearly associated with the formation of marshes at the lake shores. Dispilio was established at around 7500 BP, in a marshy regime, whose formation followed a period of successive storms, tentatively related to the lake transgression of 8000 BP, recorded at the lakes of the central Mediterranean. This association therefore, questions the preference of the early dwellers for dry fertile land. It has been further suggested that these type of wetlands could offer a mosaic of variable geomorphological regimes, including lakes, marshes, floodplains, and dry land (Gkouma and Karkanas, 2016, Bogaard et al., 2014), and can therefore accommodate a number of daily practices, as cultivation of variable species, grazing and fishing.
Indeed, early sites on high water-tables constitute a selection strategy of the first farmers in Northern Greece and Anatolia. At the surroundings of Dispilio, during the EN and MN, most neighboring settlements are associated with riverine, lacustrine and marsh environments. More importantly, recent research at the Florina - Amyndaio basin has revealed the existence of numerous sites at the shores of lakes Vegoritis, Chemaditis, Zazari and Limni Petron (Chrysostomou et al., 2015). The first occupation is established at the second half of the 7th millennium BC and the sites are found either in or close to the lakes or the marshes. These sites constitute the first evidence of pile dwelling habitation in Greece long after the discovery of Dispilio at the 1930’s.

12.3. Limitations and future research
This project has not been without limitations. During the process of analysis and synthesis several complexities have been encountered related both to the nature of the materials per se and the limitations posed by the availability of the data.

More specifically and as already thoroughly discussed, the mound was formed in diverse paces, due to the complexities that a dynamic lacustrine setting poses to the formation, the post depositional processes and the chronostratigraphic sequence of the site. The thorough reconstruction of these paces demands a very detailed chronological framework in vertical and lateral distribution, which was not feasible to accomplish here given the restrictions in the number of radiocarbon samples. This project resolved the major chronostratigraphic issues and formed a substantial chronostratigraphic framework; nonetheless, for a high-resolution dating of all the lateral and vertical variations, a very high precision radiocarbon sampling is demanded.

At the same time, the availability of the data has posed certain restrictions to the accomplishment of specific research goals. More specifically this geoarchaeological project was conducted at the end of a long-lasting excavation process; this fact has created a notable lacuna of the invaluable information, which are gained during the excavation process, and which give the opportunity to the geoarchaeologist to selectively collect data from diverse contexts. This discrepancy is further augmented by the fact that Dispilio is the first lake dwelling site being excavated in Greece and therefore several methodological and interpretative challenges have emerged through the excavation process. These are the reasons why this project has probably not accomplished to highlight many aspects on the use of space and differentiate between multiple activity
areas. This concluding remark is highlighted here, to raise the importance of the integration of the geoarchaeological input during the excavation process, in order to accomplish a thorough understanding of the stratigraphy and the individual contexts and implement in this way the geoarchaeological paradigm.