PLASTIRAS LAKE: THE IMPACT OF WATER LEVEL ON THE AESTHETIC VALUE OF THE LANDSCAPE

G.-F. SARGENTIS, K. HADJIBIROS and A. CHRISTOFIDES

National Technical University of Athens, Faculty of Civil Engineering,
Dept. of Water Resources
e-mail: F.Sargentis@itia.ntua.gr, K.Hadjibiros@itia.ntua.gr, A.Christofides@itia.ntua.gr

EXTENDED ABSTRACT

The Plastiras Lake is an artificial reservoir created in 1959 for hydroelectric production. Following different changes in the social, economic and physical context of the area, the water of the lake has been used mainly for irrigation and drinking water supply. Recently, the beautiful scenery of the lake has been considered attractive by visitors and therefore the area has seen a significant touristic development. However, because of the water release mainly for agricultural, but also for hydroelectric purposes, the surface level of the lake varies significantly in the range between the lowest level of 776 m and the overflow level of 792 m. The result is a considerably negative impact on the landscape. The aesthetic value of the scenery has been assessed by a research team through field visits, landscape visual examination, photographic recording, digital image processing, as well as with a survey among visitors. It has been noticed that the most important impact from the level variation is the development of a dead-zone around the lake shore. This zone has different characteristics in the northern and in the southern part. The analysis of the form and size of the dead-zone may provide a concrete assessment of the aesthetic impact, although a quantified approach remains difficult. Moreover, information from the survey gives a significant, yet subjective, estimation of the aesthetic impact. The inhabitants, the regular and the occasional visitors are partially in agreement that the scenery is significantly more valuable when the water level is around 786 m or higher, as compared to when it is around 782 m or lower. If the conservation of the environment and the touristic development of the area are priority objectives, the management of water release through the establishment of a lower limit for the surface level appears to be mandatory.

Key words: Plastiras, lake, landscape, aesthetic, dead zone

1. INTRODUCTION

The Plastiras Lake is an artificial lake in Greece, which was created in 1959, after the construction of a hydroelectric dam, also aiming at the irrigation of the Thessalic plain (Figure 1,2).

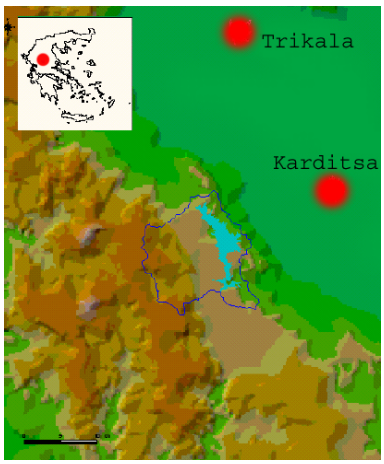

Figure 1: The Plastiras Lake

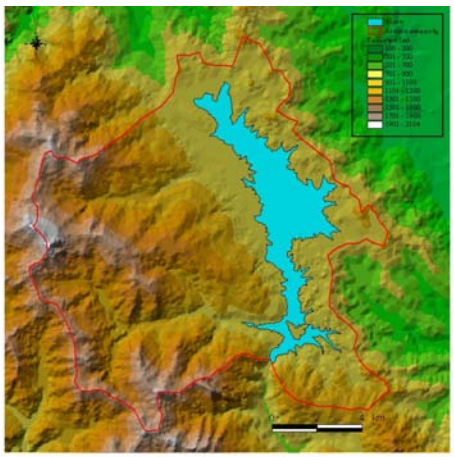

Figure 2: The boundary of Plastiras lake landscape

The beauty of the newly created landscape was the subject of studies from early on. The first study concerning the development of the landscape was carried out in 1967 [1], to be followed by more studies later [2,3,4]. During the last 10 years the local authorities have completed infrastructure works, such us roads and environmental trails, as well as infrastructure for environmental actions. At the same time various investments aiming at the development of the area have taken place (hotels, restaurants, etc.).

Tourism is an activity that sets new standards in the management of the lake, especially regarding the water balance, challenging the conventional uses which affect it. The main effect of the changes in water balance is that as the water level drops, the shoreline changes and a “dead zone” is revealed around the lake, creating a setback for the landscape.

2. APPROACHING THE LANDSCAPE

2.1 Aesthetic norms

“De gustibus et coloribus non est disputandum”

What does it mean that something is more beautiful than something else and how more beautiful is it? If this concept has to do with nature, the problem is unresolved because (according to Kant) nature is the pinnacle of beauty. Moreover, as Kant noted it would be a “fruitless endeavor to seek a principle of taste which would provide a universal criterion of the beautiful through determined concepts”.

Cartesian rationalism, which derived from the French philosopher Rene Descartes, considers that instead of regarding the aesthetic quality as an inherent quality of a physical object such as a landscape, the distinction of mind and nature have paved the way for humans to appreciate the role of their own subjective feelings in determining their aesthetic preferences. Other philosophers, such as Leibniz believed that there is a norm behind every aesthetic feeling which we simply don’t know how to measure [5].

Three centuries have past since this observation was made and we still lack a definite tool for measuring beauty. Until the codes of mind beauty are broken, beauty will remain a subjective case.

In this paper we will attempt to break the codes of beauty using objective method [6], and subjective method [7, 8], and "measure" the beauty of the landscape. But as the concept of the following statue presents: Nature will still circumvent any norm (Figure 3).

Figure 3: The tree of knowledge
G.-Fivos Sargentis, 2001

Therefore, we will not measure the beauty of the landscape quantitevely, but only examine the denaturation (the changes) of the Plastiras Lake landscape as the level of water varies.

2.2. The balance of the lake

The water level of the Plastiras Lake varies from overflow level at 792 m to its lowest level at 776 m.

The main problem of the landscape is the fact that when the lake is lower than its overflow level, a dead zone appears between the trees and the water (zone of water balance). The second problem is the decrease of the surface area of the lake from 25 to 15 km^2. This means that when the level of the lake is 792 m the water covers 1/7th of the landscape, while when it falls down to 776 m the water covers only 1/12 of the landscape. Therefore, as the water level drops, the power of water as a magnetic focus in the landscape is reduced [9].

Natural lakes comprise aquatic and terrestrial ecosystems. On the borders of land and water one intermediate ecosystem exists, (with e.g. nenuphars, reeds, frogs), which is very sensitive to the various changes [10]. In the Plastiras Lake the large variation in water-level becomes crucial for the development of this ecosystem. As a consequence, the dead zone has the image of a desert zone.

Because of the difference in morphology between the various parts of the lake, two types of dead zone may be distinguished:

- Normal dead zone. Normal dead zone development occurs when the shore has steep slopes and is perceptible as a band.
- Subnormal dead zone. Subnormal dead zone development occurs when the lakeshore has a gentle slope. In this case, the variation in the water-balance of the lake is perceptible as a decrease of the lake surface (desert figure).

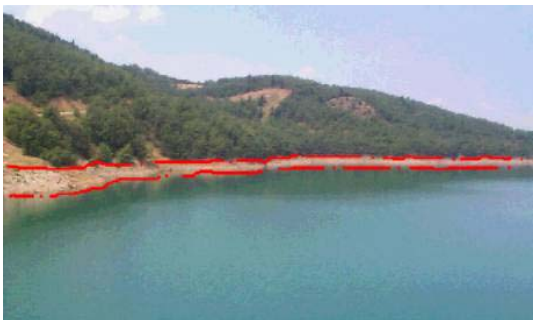

Figure 4: Normal dead zone

Figure 5: Subnormal dead zone

A dead zone is apprehensible only when the lower levels are reached. The overflow level is at 792 m, but at this level many trees are 1 or 2 m inside the water. As the dead zone starts appearing the trees that lie close to the water obscure parts of it. The gentle shore slopes make the subnormal dead zone appear faster, because it is more sensitive to the water-balance of the lake (Figure 4,5) [9,11].

In general it could be said that the normal and the subnormal dead zones become apprehensible when the surface level drops under 787 m or under 790 m respectively.

2.3. The effects of the balance of the lake

The most commonly observed zone is the normal dead zone on the east shore which faces the most often visited western part of the landscape (Figure 6).

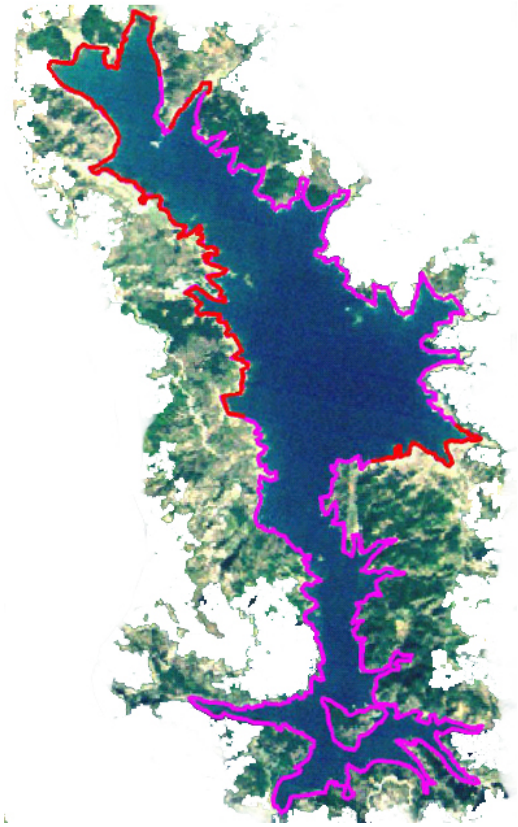

Figure 6: Normal (in magenta) and subnormal (in red) dead zone

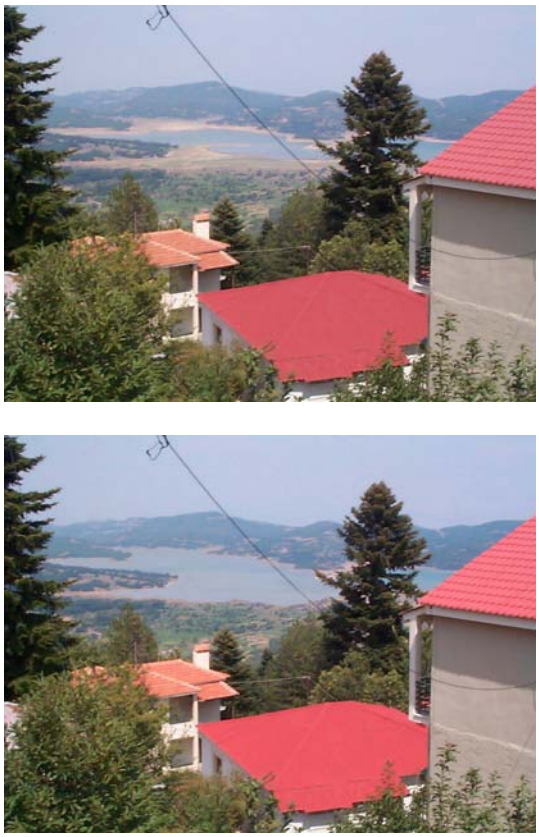

Figure 7: Subnormal dead zone

Figure 8: Normal dead zone

Figures 7, 8 show the image of the lake at levels of 783 m and 792 m. (not available in the time of study- completed with computer graphics).
The aesthetic problems become less important during autumn and winter when there is not such a color incongruity.

3. METHODOLOGY

Field research and theoretical analysis have been used to approach the issue of landscape aesthetics: [12, 13].

The field research included:

- Several visits to the area and landscape observation
- Photographs from different and specific positions of the landscape
- Filling-out questionnaires on the landscape (Table 1)
- The data was analyzed according to relative methods [6,7,8]

3.1 Field research

The examination of the landscape begins from the observation zones. GIS analysis shows that the usual zone of observation lies very close to the lake (Figure 9,10) [14].

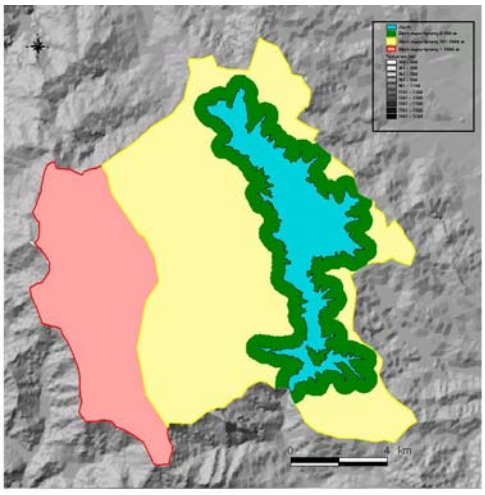

Figure 9: Observation zone. Green: 1st zone 0-500m; Yellow: 2nd zone 500-5000m; Red: 3rd zone >5.000m

Figure 10: Zone of common observation

The photographs were taken systematically from specified observation positions so that we could estimate the changes of the landscape following the water-balance of the lake. The observation positions are depicted in Figure 11.

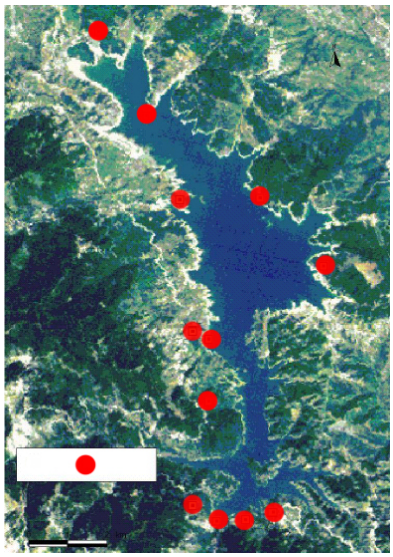

Figure 11: Positions of observation

Table 1: Fields included in the questionnaires

Field	Comments
Level of the lake	
Date	
Position	
Name, Surname	
Age	
Are you an inhabitant or a visitor?	
Have you visited the area before?	
How many times?	
Would you visit the lake again?	
If not why?	
Do you like the landscape of the lake today?	
Does anything displease you in the landscape?	
Other	

Filling out questionnaires has been useful in initiating a dialogue on the problems of the landscape that appear to be obvious to the visitors [7, 8]. Every observer has a different perception capacity. In the data analysis we divided the observers into two groups: those who experience the landscape systematically and those who encounter it once or twice a year and have no precise recollections of previous observations. Repeated observation assists the acknowledgement of parts of landscape. Increasing the time duration of observations hinders the apprehension of the landscape.

Forty questionnaires have been filled when the level was at 784.7 m (1.7.2001); 60% of the systematic observers and 10% of the sporadic observers noticed that the lake was unnatural. From 40 other questionnaires (level 781.3 m on the 22.8.2001), 95% of the systematic observers and 55% of sporadic observers noticed that the lake was unnatural. The most useful role of questionnaires was to help the researchers to begin a conversation with the observers about the general characteristics of the landscape and the rhythm of the degradation.

The Plastiras Lake can be observed from a distance of 0 to 5000 m. However, taking in consideration the main motorway network, it is obvious that the most common zone of observation lies between 0-500 m from the lake. For this reason, the effects of the dead zone are recognizable by every observer of the lake.

3.2 Analysis of the landscape

The main attribute of the landscape is its figure.

Applying the norms [7, 8] to the landscape of the Plastiras Lake, with psychometric elements, the landscape can be characterized as a “calos topos”.

One of the major psychometric elements is honesty; therefore the landscape must be “speaking with honesty”. And the dead zone is an aberration that shouldn’t exist in a natural landscape.

The landscape recites a myth which the observer listens to with his eyes. Against this, the appearances of the dead zone within a very short period of time (3 months) are unpleasant for the observer. A systematic observer who has already heard the myth is more sensitive than a casual observer. The landscape appears to be dishonest to the

systematic observer even at a water level of 786-788 m, while it only appears dishonest to the sporadic observer at levels 782 and 784 m.

The sporadic observer is not sensitive enough to notice the “hypocrisy” of the landscape and can only realize it when it becomes too obvious.

4. RESULTS

Most philosophers who study aesthetics begin with the principle that nature is beautiful. The landscape of the Plastiras Lake is artificial but comprises mountains, water and forest and therefore it is accepted as being beautiful. However, when humans use the water for production of energy and irrigation, the dead zone appears in the landscape. The “infected” landscape is no longer a natural landscape.

The results of the survey and the systematic observation are compiled in a table which is related with psychometric elements (Table 2).

In order to evaluate the questionnaires we should detect the limits of the water at which the quality of the landscape is altered. In specific water-levels the landscape loses a part of the psychometric element “honesty” and the quality of the landscape deteriorates. It is obvious that we may come across dead zones in many natural landscapes. But when we observe these zones we know that nature is responsible for them. For example:

- On the surface of a dead zone it is impossible to have vegetation.
- Generally, nature normalizes the borders. Nature has the element of sequence.
- We can observe subnormal zones in nature too, but it is not common that we observe the normal dead zones. Such zones are easily observed because they are a strange phenomenon.
- The surface of a dead zone is an infected ground of forest. A few years earlier, there had been a forest on this surface. The texture of this surface is denaturated.

We can be certain that nature functions consistently. However, in the Plastiras lake, the water-land interface varies periodically and abnormally between being a sharp line and a broad surface.

The observers noticed (as reflected in the questionnaires) that when the level drops the lake has little water. But how do the sporadic and infrequent visitors know that the lake has little water when even when at the lowest surface level the lake covers 15 km^2? The answer is that the dead zone, which at the lowest surface level covers an area of 10 km^2, serves as a “memory” of the landscape. The observers imagine the dead zone full of water and relatively conclude that the lake does not have much water.

However, only 20% of the systematic observers mentioned that they were displeased by the appearance of a dead zone. It is estimated that the 80% simply did not apprehend that the existence of a dead zone indicates a lack of water. That is because while the majority of systematic observers mentioned that the lake does not have much water at surface-level 784, only 20% of them were disturbed by the dead zone.

The conclusions of the above analysis are summarized in the Table 2.

5. CONCLUSIONS

It is obvious that in this landscape the drop of water-level occurs because of irrigation and electricity production. But when we define a landscape as a “calos topos” we have to obey its demands [15].

The development of the Plastiras lake, as well as other artificial lakes, as a location of touristic interest demands a water management that will guarantee the aesthetic quality of the landscape. Consequently, a limit must be imposed to the water balance. Concerning the Plastiras Lake the surface-level should not be lower than 786 m

(6 meters under overflow level). Today no such limit exists and when visiting the area, one usually encounters a landscape different from that advertised on promotional leaflets or postcards.

For this reason visitors question the quality of the landscape which they come across. This fact denotes an important problem for the touristic development of the area.

Table 2: Transformation of the quality of landscape relative to the balance of water.

Surface-level	Description
High (786- 792 m)	No landscape denaturation All observers consider it fabulous
Medium (782-786 m)	The landscape denaturation is increased Sporadic observers find it beautiful. Systematic observers notice the denaturation, but still consider it acceptable
Low (776-782 m)	The landscape is denaturated. Only sporadic observers may still consider it acceptable and only in a few observation places where the normal dead zone is observed from the 3rd observation zone

REFERENCES

1. Panagiotakis K. A. (Research Group), (1967), "Research of tourist development of lake Megdoba", Hellenic Tourist Organisation.
2. Zaharatos G. A. (1986), "Program for the touristic development of the Plastiras Lake (Megdoba)", KPOE, Athens.
3. Life program, (1994) "Lake Plastira area, A pilot sustainable touristic interference", ANKA Karditsa.
4. Life program, (1995) "Lake Plastira area, A pilot sustainable touristic interference", ANKA Karditsa.
5. Beardsley M. C., (1976), "Aesthetics from classical Greece to the present: A short history".
6. Hatzistathis A. and Ispikoudis I. (1995), "Protection of nature and landscape architecture", Giahoudi-Giapouli OE, Thessaloniki,.
7. Stephanou I. (2000), "The physiognomy of a place", NTUA.
8. Stephanou I., (2001), "The physiognomy of a place: Characteristics of the Greek city", NTUA.
9. Sargentis G.-F., Hadjibiros K., I. Papagiannakis, Papagiannakis E., (2005) "Plastiras Lake: Influence of the revelation of the water presence", submitted for publication at 9th International Conference on Environmental Science and Technology.
10. Nebel B. J. and Wright, R. T., (1981), "Environmental science", Prentice Hall.
11. Ageeta Elizabeth van den Berg (1999), "Individual differences in the aesthetic evaluation of natural landscapes", University Library Groningen.
12. Booth N. K. (1990), "Basic Elements of Landscape", Architectural Design, Waveland Press.
13. Daniel T. C. and Vining, J., (1983), "Methodological Issues in the Assessment of Landscape Quality", Behaviour and the Natural Environment, Chapter 2, Plenum Press.
14. Brabyn L. (1996), "Landscape Classification using GIS and National Digital Databases", Landscape Research.
15. Dearden P. A. (1980), "Statistical Technique for the Evaluation of the Visual Quality of the Landscape for Land-use Planning Purposes", Journal of Environmental Management.
16. Schüpbach B. (2003), "Methods for Indicators to Assess Landscape Aesthetic", Swiss Federal Research Station for Agro ecology and Agriculture.
17. Project for the potential for management and protection of Plastiras Lake (2002), National Technical University of Athens, Faculty of Civil Engineering, Dept. of Water Resources.