

THE INTEGRATED MANAGEMENT OF PLASTIRA LAKES'S BASIN UNDER THE FRAMEWORK OF THE 2000/60 EU DIRECTIVE

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ABSTRACT

The study area of this work is the Plastira lake basin, which is situated in the prefecture of Karditsa. The purpose of this study is to comment and provide some information on the basin management under the Water Framework Directive 2000/60/EU. Water quality and quantity of is crucial for the human and the natural environment. It represents also the most abundant element on earth. However, in the recent years there has been an uncontrollable environmental degradation and pollution of both surface and ground water. Humans, in order to facilitate their living conditions, often construct technical infrastructure within the natural environment which sometimes may cause huge and irreversible ecological damage. For this, any interference within the framework of the natural environment should ensure biodiversity and sustainability. Although the Plastira's Lake is a large technical intervention, it has been fully assimilated into the natural environment. In the present study the social, historical and cultural conditions of the area are analysed and the characteristics of biotic and environmental problems are recorded.

Keywords: water quality, natural resources, Greece

1. Introduction

The Framework Water Directive 2000/60 / EC (Water Framework Directive) was published in the Official Journal of the European Communities on the 23rd of October 2000. It was a holistic and innovative protection and management effort of water resources among the EU countries. Its aim was to achieve "quality" water by 2015. The Directive had common issues with the water management systems applied in the US, Australia and New Zealand (Lukatos *et al.* 2005). The directive aimed to establish a framework for the protection of inland surface waters, transitional waters, coastal waters and groundwater. In this directive there were some issues not fully covered, such as the drought problem. The Directive will contribute to tackling drought effects but not as its main target.

The Directive - Framework 2000/60 / EC was incorporated into the Greek law in 2003 by the Law 3199 (Government Gazette 280/TA/12.09.2003) "Protection and Water Management - Compliance with Directive 2000/60 / EC" (Law 3199/2003). With this law each region is responsible for the management and protection of aquifers belonging within its administrative limits (Nicolaidis *et al.*, 2009). According to the water framework directive (2000/60 / EC), lake is defined as a body of standing inland water system that has a minimum size of 0.5 km². The Directive on artificial lakes requires the achievement of a good ecological potential meaning a water quality status that would allow the ecosystems of the region to approach a natural, almost undisturbed situation. Artificial lakes are usually subject to a management regime that includes pumping of their water supplies, a possible hydropower generation and protection from floods. When these management activities are effectively designed and at low intensity, the ecological conditions of the region can recover and reach the initial natural situation.

2. Area description

The prefecture of Karditsa is located in the center of mainland Greece and in the southwestern part of Thessaly. Therein lays the "jewel" of Agrafa, the "Nikolaos Plastiras Lake" or "Lake

Megdova" or "Lake Tavropos". Located about 25 kilometers (km) west of Karditsa at an altitude of 800 m covering an area of 25000 acres (Psimmenos, 2010). This artificial lake is formed by the Megdova (ancient Tavropos) river, a tributary of Acheloos, which swarmed the Nevropolis plateau. The purpose of its creation was to irrigate the lowlands, provide quality (clean) water in the adjacent areas and to produce electricity (Michaloudis al, 2001). It has a length of 14 km, with a maximum width of 4 Km, a maximum depth of 60 m (near the dam) and covers an area of about 25 km² (Michaloudis 2001). The altitude level of the lake is 780 m asl, rendering it as one of the rarest mountain lakes of our country (Paliouras, 2006). The maximum capacity is approximately 400 million m³. The crest of the Lake Plastiras dam has a length of 220 m and 4 m width, maximum height of 83 m and is an arched type (Service for Land Reclamation., 1985). With a conductor pipe, some of the dam water is transferred from an altitude of 700m to the hydroelectric plant of the National Electricity Company (DEI, 2001). Water, after leaving the power station, is directed to the lake to be utilized for the irrigation of the Thessaly plain, for the water supply of the adjacent city of Karditsa and other smaller villages of the prefecture.

As study area was defined the catchment area of the "Nikolaos Plastiras" lake, which includes the communities Fylaktis, Pezoulas, Neohori, Karitsa, Karvasara and Belokomiti. The extent of the basin, representing the area covered by the watershed, was determined on a topographic map in the Mountainous Water Laboratory, Department of Forestry and Natural Environment Administration, TEI of Lamia, at a scale of 1:100,000, and was calculated being 166.36 km² and having a perimeter of 66.6 km. It should be noted that within the area there is a small island which was also recorded. The lake covers an area of 24.72 km², the «island» of 0.37 km², having a perimeter of 68.91 km and 3.1 km respectively.

The climate of the study area can be characterized as continental with low temperatures and high rainfall during the winter and low rainfall and high temperatures in the summer (E.P.E.M., 2001). The rocks of the area are sedimentary. The main geological formation observed at low and mid altitudes is flysch with limestone on higher altitudes (Ziakas, 1992). The surrounding the lake areas have gentle slopes and are derived from alluvial deposits. The hydrographic network of the study area includes about 15 torrent rivers ending into the lake. The two largest of these is the Karitsioti and Grand River (E.P.E.M., 2001).

3. Major ecosystems of the area

The major ecosystems of the study area are:

1. Sub-Mediterranean of *Quercetum cocciferae* ecosystems *Coccifero carpinetum* of the *Ostryo carpinion* subzone,
2. *Quercetum frainetto*,
3. Mediterranean mountainous coniferous - hybrid fir ecosystems (*Abietum borisii regis* or *A. hybridogenus*),
4. Mixed fir/oak ecosystems,
5. Oak/pine and areas with chestnut,
6. Beech ecosystems (*Fagetum moesiacaе*),
7. Subalpine ecosystems *Junipero-Daphnion*,
8. Riparian ecosystems (plane tree, willow, alder),
9. Sub-Mediterranean oak ecosystems, and anchovy and *Ostrias - Ostryocarpinion*, higher areas.

The fauna of the study area is extremely rich and interesting that according to the program "Natura 2000" (E.P.E.M., 2001) includes:

- 20 species listed in Directive 79/409 / EEC,
- 2 species of insects, one species, one amphibian species,
- 2 species of reptiles and 3 species of mammals which are protected by Directive 92/43 / EEC. It should also be noted that one of the mammals, the bear (*Ursus arctos*), designated as priority species,
- 2 species of insects, one species of fish, 5 species of amphibians, 5 species of reptiles 63 species and 7 mammal species protected by the Bern Convention,

- 2 insect species, 4 species, 2 species of reptiles, 6 species of birds and 9 species of mammals in the categories rare, vulnerable, endangered, threatened or poorly known locally, listed in the Red Book.
- 1 endemic fish exists in the region.
- 2 species of reptiles (turtles), listed in the IUCN, the one in the vulnerable category and the other in the low risk category.
- 2 species, 3 species of amphibians, 3 species of reptiles and 4 species of mammals are protected by the Presidential Act 67/1981.

4. Management applied

The artificial lake is owned by the Public Power Company (DEI), after the expropriation of the area for the construction of the dam and the power station. The company had the total control of the water supply for some regions as well as of the production of electricity. Therefore, other uses of the lake such as recreation and sports were excluded (Papadimitriou, 2003). In 1982, the possibility of agricultural, livestock and/or other alternative uses was given to the local authorities (OTA) to better accomplish their public services. However, this law was never actually applied because i.e in case of an accident due to rising water levels, DEI would hold the responsibility for not taking precautions to prevent such event and not the State. In 1988 the Board of Directors of DEI approved the provisional allocation of the “right to use” the lake and the lakeside areas to the State for 30 years (Michaloudis *et al*, 2001). The Lake Management Organization was committed to preserving the ecosystem of the protected area, its flora and fauna developing within its limits, to protecting it from disaster, to harmonically adapting the natural and human environment and to adopting a sustainable approach towards an ecosystem management philosophy. Moreover it focused on issues such as the preservation of natural resources and protection from natural disasters, human interventions, and risks from a possible intense touristic development of the region (Tsongas *et al*. 2006).

5. Environmental problems

One of the major environmental problems is the reduced water level of the lake. This can be attributed to the lack of an overall water management, the unorthodox management during drought periods and the deposition of silt loads transferred by soil erosion from the surrounding mountainous areas (Houliaras *et al*, 2003). The wide annual water level fluctuations negatively affect fish reproductive cycles so, a permanent natural population that would promote a touristic-fishing interest, cannot be easily developed. Another problem is debris accumulation onto the lake bed, brought in by the torrents as well as the remains of the trees trunks that were growing there before the flood of the area. The lake bed level is constantly rising causing difficulties to the operation of the hydroelectric plant. Based on E.P.E.M (2001) most fauna species are threatened by illegal hunting and the fragmentation / degradation of their habitats as a result of human activities (road building, logging). Disruption of the natural landscape by the construction of new roads and the widening of the old ones is a major environmental problem. The climate of the study area is characterized by numerous and heavy rains, which create a strong relief degrading the vulnerable bedrock (flysch and limestone) to torrents formation phenomena. Human interventions are equally important into affecting management. Agriculture in the area is limited mainly because of population shrinkage as well as dispersion and land fragmentation. A major problem for the region is waste management (collection and disposal) and household waste (Tsongas and others, 2006). Lately cultural events are often organized that attract more visitors than the region capacity. The adverse effects on the environment are intensified because of such events in areas susceptible to accidents near the banks of the lake. Touristic promotion and development is the most promising development for the study area. Recently, valuable planned efforts are undertaken towards touristic development. However, an integrated development plan should ensure minimization of impacts on the natural, social and cultural environment of the region.

6. Conclusions

To ensure effective protection and preservation of the natural environment a series of measures should be taken relating to both the natural and human environment of the study area such as (E.P.E.M., 2001):

- Management of forest resources in the region.
- Protection of soils against erosion and landslides.
- Conservation of extensive practices in the agricultural sector.
- Specification of allowed land uses.
- Management of urban waste water and household waste.
- Environmentally friendly leisure activities in the study area.

REFERENCES

1. D.E.I. (2011), Information brochure, Karditsa
2. E.P.E.M. (2001), Specific Environmental Study of the Plastira Lake area MINISTRY OF ENVIRONMENT, ENERGY AND CLIMATE CHANGE, Athens.
3. Houliaras, I., Sapountzis M., Soutsas K. (2003). 'Studies of management and erosion of the feeder basin of Smokovo and Plastiras, for a sustainable use of their surface water, 3rd Conference on the Development of Thessaly' Science Conference on Management of Water Resources and Sustainable Development of Thessaly ", under the auspices of the Y .PE.CHO.D.E.- General Secretariat of the Region of Thessaly, Organized Company Thessalian Studies TEI Larissa, University of Thessaly, Conference Proceedings, Vol. Karditsa AN.KA. SA
4. Loukatos A., Papapavlou K., Katsimpiri M., (2005), «New data for the integrated water management with emphasis on the directive 2000/60», TEE, Athens.
5. Michaloudis E., Mpitis I., Mpompori D., Brouziotis Th., Dallis D., Economou - Amilli A., Economou N., (2001), Lake Management Plan Tavropos, AN.KA. SA Karditsa.
6. Nikolaidis N., Skoulidakis N., Papadoulakis B., Tsakiris K., Kalogerakis N., (2009), Management plans of the agricultural basin of the Eurota river, Technical Report 134 p. in Nikolaidis N, Kalogerakis N. Skoulidakis N, Tsakiris, K., 2005-2009. Friendly towards the environment technologies for agricultural development. Program LIFE - Environment, Life05Env/GR/000245EE (EnviFriendly).
7. Paliouras, F.P. (2006), Reactions, perceptions, behaviors and attitudes of the local population in the actions taken for the management of protected areas: The case of Lake Plastiras Karditsa, University of the Aegean, Mitilini
8. Papadimitriou A. (2003), Environmental Study of the Nikolaou Plastira Lake , Kozani.
9. Psimenos, N. (2010), The Plastira Lake, George Achilleos Allamanis Scholarship Foundation, Karditsa.
10. Service for Land Reclamation (1985), Irrigation use of the average annual inflow into the reservoir Tavropos and conversion of the H.E.P. peak to base factory, Karditsa
11. Tsongas, D., Totsikas, O., Svana A. (2006), Proposal for the implementation of the requirements of ISO in protected areas. The case of Valia Calda Lake Plastiras and Olympus, Open University, Patras.
12. Ziakas, D. (1992), Nik. Plastira Lake: Ecology, Management – Rouristic Development of the area, Karditsa.
13. Οδηγία 2000/60/EK του Ευρωπαϊκού Κοινοβουλίου και του Συμβουλίου της 23-10-2000 για τη θέσπιση πλαισίου κοινοτικής δράσης στον τομέα της πολιτικής των υδάτων.