A Managment Plan toward Water Protection and A Guidance in Shkodra Lake Watershed

Greta ANGJELI[a], Dritan ARAPI[b], Mirela LIKA (ÇEKANI) [b]

[a]Meditarranean University of Tirana, Blvd "Gjergj Fishta", No.52, 1001 Tirana, Albania

[b]University of Tirana, Faculty of Natural Sciences, Department of Biology, Bulevardi ZOG I, 1001 Tirana, Albania

Abstract

Watershed management is the study of the relevant characteristics of a watershed aimed at the sustainable distribution of its resources and the process of creating and implementing plans, programs, and projects to sustain and enhance watershed functions that affect the plant, animal, and humancommunities within a watershed boundary. Features of a watershed that agencies seek to manage include water supply, water quality, drainage, s tormwater runoff, water rights, and the overall planning and utilization of watersheds. Landowners, land use agencies, stormwater management experts, environmental specialists, water use surveyors and communities all play an integral part in the management of a watershed.

Developing Management Plan for Shkodra Lake watershed in respect of water quallity protection and improvement was based on the best practices and guidelines of development countries due to the needs for setting appropriate tools and mechanisms toward water quallity of Shkodra lake watershed.Developing a Watershed Management Plan is a useful and neccesary process to select and guide the implementation of komplex management techniques toward water quallity in a watershed. The management plan is always setting overall management goals and laying out the techniques and tools for the wise use of the water resources, preventing pollutions as well as approaching water standards on the frame of EU Water directive. The management plan is regards of water quallity protection promotes the coordinated development and management of Shkodra Lake watershed, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustain abillity of Shkodra Lake vital eco-system.

KEYWORDS: Shkodra Lake, Plan Management, Water Quallity, Best Management, Watershed

INTRODUCTION

The cross-border Shkodra Lake watershed lies within 5,500 km^2 shared by Albania and Montenegro (Fig.1). The area targeted is the home of about 600,000 people living in watershed; Most of the population (about 60 percent) lives in a few cities – Shkodra and Koplik in Albania and Podgorica, Niksic, Danilovgrad, and Cetijne in Montenegro. The rural population is spread out around the lake in Montenegro is the largest tributary to the lake watershed (Fig.2).

Fig.1. Shkodra Lake

Fig.2. Shkodra Lake watershed

Its average discharge is about 200m^3/s. Royal Haskoning (2006). Significantly additional flows come from groundwater flows and springs that discharge in the northern part of the lake. The lake Shkodra drains to the Adriatic Sea through the Buna River. The estimated outflow is about 330m^3/s. Integrated Lake Shkodra Monitoring (2002). During the storm of 1846, the river Drin diverted its primary channel into the Buna River a few kilometers below its origin in Shkodra Lake. The Shkodra Lake watershed has a largely subtropical Mediterranean climate. Winters are mild and rainy (the lowest average monthly temperature of water in January is about 7^{o}C); summers are dry and hot with maximum air temperature over 40oC and water temperature over 27^{o}C. Currently water residence time is about 12 days.

Because of preservation and protection of the rich watershed fauna and flora, the development of management plan was assessed as a neccessity toward protection and improvement of water quallity according to EU water frame and fish direvtives. It is a process wich promotes the coordinated development and management of watershed in order to maximize the resultant economic and social welfare in equitable manner without compromising the sustainabillity of vital eco-system.

MATERIAL AND METHODS

The methods used for developing management plan toward water quallity protection are based on the followings: Data base collection and elaboration; tables and graphics designing; situation analyzing; consultations with key authorities and stakeholders in national and local level hold; interviews conducting and data elaborating, financial analyze doing and budget required foreseen; [1-5] human resources analyze; results and conclusions of the study

The area investigated includes Lake Shkodra watershed mainly in Albania side involving impacts from Montenegro side as well. Being wetland of international importance it was designated as a unique regarding the rich flora and fauna includes numerous endemic species. It is one of the most significant wintering sites fpr water birds in Europe, including many species that are globally threatened [4-9]. Ninety percent of the bird species are migratory. The lake watershed has a diverse fish community with high productivity. As a natural lake, with mostly unregulated water levels and natural shores Shkodra Lake watershed hosts a very diverse set of different

habitats with unique biodiversity, wich is recognized at both national and international levels [2,6,12,13].

Due to current situation, the management plan developing considered as first priority for Shkodra Lake watershed. It represents the fulfillment obligations for the watershed management based on the current enviromental conditions of the watershed as well as the financial costs assessment, human resources analyze and responsibilities for the plan management execution. It is not a final document wich avail forever but as a continou process wich need to be revised and adopted according to the quallity protection of the Lake Shkodra watershed is to set priorities and objectives for sustainable use of natural resources, biological diversity conservation and water use priorities [5,10,11]. On the other hand this management plain aim to define tools and mechanisms approaching the water frames directives and EU standarts.

The main interested target groups for developing a Plan Management in national and local levels are the followings: Ministry of Environment, Forestry and Water Administration, Municipality of Shkodra, Council of Shkodra District, Communes living around the watershed, directorates in the Regional level like: Directorate of Forestry, Water Basin Council in national and regional levels, Directorate of Food and Agriculture, Development Agencies, Academic Institutions (University of Shkodra) Regional Directorate of Education, Directorate of Hygiene, Primary Heath Service, Fishing Insoctorates etc.

RESULTS AND DISCUSSION

As a result of the high replenishment/refreshment rate of the Shkodra Lake water (as a special characteristic of this ecosystem) about two time per year, the quallity of water remains within acceptable limits in respect of nutrients (wich are present mainly in the northern part within limits) and chemical elements despite uncontrolled developments around the watershed of Shkodra Lake. The following definition are the maintopics where the management planning was focused:

1. Unsustainable use of the lake's biodiversity

Uncontrolled fishing, over-fishing, the use of illegal fishing methods (explosives, electricity, etc.) and fishing during the spawning seasons, which endanger the viability of commercial fishing. The disturbance of migratory routes of species – sturgeon, sea perch, whitefish and eel.

Deliberate or accidental introduction of alien species (gold fish, perch) that severely alters the composition and dynamics of fish communities.

Disturbance to nesting grounds and bird colonies by fishermen, tourists, local harvesters of branches of willow and laurel trees, reed and others, which resulted in disappearance of species like herons (*Ardea cinerea*, *Ardeola ralloides*), egrets (Egretta garzetta) and cormorants (*Phalacrocorax pygmeus*, *P. carbo*) from many of their traditional nesting places.

Gathering certain amphibian and reptile species – e.g frogs, Greek turtles (*Testuda hermanii*) – for human consumption, or selling to collectors of exotic species

Destruction of habitats and disturbance to natural sites.

Conversation of natural biotopes into agricultural land.

Increased load of agrichemicals reaching the lake.

Deforestation of extended parts of the lake's drainage basin (e.g in the upper Shkodra Valley) during the last decades, causing the increased inflow of silt and organic matter, which speeds up natural succession processes. Transport on road and railways along some sections of the lakeshore and shipping on the lake (especially northern part).

Construction and the expansions of settlements (e.g the city of Shkodra)

Sand and gravel excavation from the Moraca and Drini rivers, peat exploitation – still quite limited or just in plans, however if done at a larger scale could seriously damage the whole ecosystem.

2. Risks of water pollution from industrial sources households around the lake and agricultural areas:

Lack of pollution prevention measures (water treatment facilities, dumpsites) accompanying urban and industrial growth of the last five decades;

Increased load of nutrients (phosphorus and nitrogen) from untreated wastewater and agricultural fertilizers;

Lack of research and degradation of habitats – hinders the design of appropriate and efficient management and protection measures.

3. Water quality is indicated by the following factors:

The demographic movement after 90^{th} increased the human pressure on water resource using (watershed of Shkodra) due to the extension activity around the watershed while the population density is really high especially in Shkodra and Koplik, cities.

The Drin River water enters into the lake in some winter periods and is a source of pollutants. The river water carries waste products from the mines located at various places upstream in its watershed and municipal wastewater of Shkodra city.

Moraca River as the largest tributary of the watershed brings sediments and wastes which influence on the water quality

Lake Shkodra and its watershed receive untreated communal wastewater from most of its residents causing negative impact toward increasing quantity of nutrients.

In 2004 (Hydro Meterological Insitute of MNE) a total of about 18.5 million m^3 of communal and industrial sewage waters were discharged from the Podgorica Waste Water effecting water quality of Shkodra lake watershed.

In Shkodra city, wastewater is discharged in the Buna River just below its origin when the system's pumps are operating. When the city's pumps are not operating, the wastewater goes directly into the lake. The total annual amount of wastewater from Shkodra city is estimated at about 9 million m^3 per year

Generally, the concentration of the nutrients is higher in northern parts of the lake because of the inflow of the Maraca River and the agricultural lands there than in the southern part of the lake. Although water quality monitoring conducted by several parties clearly shows the phosphorus concentrations are in the atrophic range.

The Aluminum plant in Podgorica is also a potentially large contributor to the pollution in Shkodra Lake. This plant houses several components, including an

alumina processing unit (bauxite in NaOH), an anode factory, an electrolysis unit, a refining furnace, a cold rolling mill, and various final processing and production lines. The plant discharges about 39.8 million m3 of wastewater per year into the Moraca River which affect directly a variety of trace chemical elements in the groundwater, fish caught from Shkodra Lake, and food produced in the region, including cow's milk and meat, cabbage, and eggs.

Illegally place of solid waste is often recognized along the lakeshore. They are mainly placed into canals and on the river banks. During the rainy season, these wastes are washed into the watershed. Groundwater contamination may also be occurring from many unauthorized waste disposal sites. The general direction of ground water flow in the watershed is from north-west to south-east.

Agricultural activities around the watershed affect the water quality due to the pesticides and fertilizers using by the farmers especially in the northern part of the lake.

Deforestation is another challenge influencing water quality, erosion, soil irrigation and sediments increasing in the watershed.

Human activity was intensified significantly along the Lake shores, Buna River and Drini River from 1992 up to now.

Planed and contracted mega projects around the watershed might have negative impacts regarding water quality.

Except the upper listed definitions of Shkodra Lake watershed, the priorities of the water uses of the watershed were defined based on the Albania legislation, international conventions ratifies as well as current activities developed around Shkodra Lake watershed. The primary criterion for water quality of Shkodra lake watershed was whether the watershed meets the designated uses. The Designated uses were recognized as uses of water established by legislation and current status protection of the basin. Based on the last ones of the following priorities have been defined:

CONCLUSIONS

For a proper management of Shkodra Lake watershed the priorities to be solved are dealing with protection of freshwater fishery; reduction of sediments from eroding and pollutions; providing swage waters treating plant; proclaiming the watershed National Park aiming unify both AL-MNE status as well as establishing administrative body and state budget for natural resources management based on the best practices of National Parks.

There is at present an important window of opportunity to put in place a management coordinated planning for the Lake Shkodra watershed since both governments Albania and Montenegro are striving to harmonize their policies, legislation and practices with European Union instruments, such as the Water Framework Directive. The last one set standards for water quality and calls for integrated watershed management still tend to be top-town approaches- focusing on inter- governmental cooperation, mainly due to political considerations.

The implementation of watershed management plan must be undertaken at the local levels by local governments and communities. Issues related to watershed

management could be solved at different levels: regional, national, local and community levels. Incorporation of local communities in watershed management, and effectively implement regionally developed policies and management plans at the community level will eventually determine the success of sustainable watershed management.

References:

1. Anonymous (2007): Watershed Management Plan Outline: 7-92
2. Brown E., Peterson A., Kline-Robach R., Smith K.,Wolfson L. (2000): Developing a Watershed Management Plan for water quality: An Introductory Guide: 1-52.
3. Emma T and Lisa-Ann H (2010); Public-Private Partnerships for Storm Risk Management in the Cayman Islands; Sustainability Research Institute, The University of Leeds.
4. Erickson, J.D., Messner, F. and I. Ring, eds. (2007). Ecological Economics of Sustainable Watershed Management.Elsevier.
5. Ewalt, J. G. 2001. Theories of Governance and New Public Management: Links to Understanding Welfare Policy Implementation. Paper Presented at the Annual Conference of the American Society for Public Administration.
6. Junge N. (2006): Social action plan for Shkodra lake area. World Bank, LSIEMP: 18-35
7. Kashta L., Dhora Dh., Rakaj M.(1997): Checklist of plants and animals of Shkodra Lake-Albanian part:1-24
8. Mark L, Mark S, John T and Mihriye M (2002); Watershed Partnerships and the Emergence of Collective Action Institutions American Journal of Political Science, Volume 46 No.1 Page 148-163.
9. Miho A., Cullaj A., HaskoA., Lazo P., Kupe L., Schanz F., Brandl H., Bachofen R., Baraj B. (2005): Environmental state of some rivers of Albanian Adriatic Lowland evaluation report. 1-56
10. Milward H and Provan K (2000). “How Networks Are Governed.” In Heinrich C and Lynn L eds. Governance and Performance: Models, Methods and Results, Page 243. Washington, DC: Georgetown University Press.
11. Sabatier, P. A. (2005). Swimming Upstream: Collaborative Approaches to Watershed Management. The MIT Press.
12. Ziu T., Filipovic S. (2002): A survey of Shkodra Lake: 10-14, 21-33
13. Wagner, W., Gawel, J., Furumai, H., De Souza, M. P., Teixeira, D., Rios, L., Hemond, H. F. (2002). Sustainable watershed management: an international multi-watershed case study. Ambio, 2-13.