COASTAL MANAGEMENT OF THE ECOSYSTEM
VLORA BAY- NARTA LAGOON - VJOSA RIVER MOUTH.

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Abstract

The results of an integrated study, performed in the framework of DAC Program, concerning protection and management of Vjosa River and Narta Lagoon environment in Albania, financed by the Greek Ministry of Environment Planing and Public Works, and European Community, are presented in this paper. This is a scientific collaboration of Albanian scientists (University of Tirana and Academy of Sciences) and Greek scientists (Aristotle University of Thessaloniki and University of Athens, and Albanian Foundation "Spirit of Love".

Vlora Bay - Narta Lagoon - Vjosa River Mouth ecosystem is situated at the SE coast of the Otranto Strait. This ecosystem is distinguished for its particular natural individuality, and ecological values of international importance. The principal elements of the hydrological regime of the Vjosa River, the principal elements of the limnological regime of the Narta Lagoon, and the principal elements of the Vlora Bay in the Adriatic Sea in this paper are analyzed.

The ecosystem biodiversity and human activity impact are important part of the study. The study is based on information, which is collected during the monitoring in the framework of the DAC Project.

Key words: Vjosa River Mouth, Narta Lagoon, Vlora Bay, biotic monitoring, abiotic monitoring.

1. Introduction

Vlora Bay - Narta Lagoon - Vjosa River Mouth ecosystem, is located at the SE coast of the Otranto Strait (Fig. 1). This ecosystem, of great aesthetic value, distinguished for its particular natural individuality, and ecological equilibrium, constitutes the platform of the studies of the DAC project.

Vlora Bay is one of the most representative bays of the eastern coast of the southeastern Adriatic Sea (Photo 1, 4, 5).

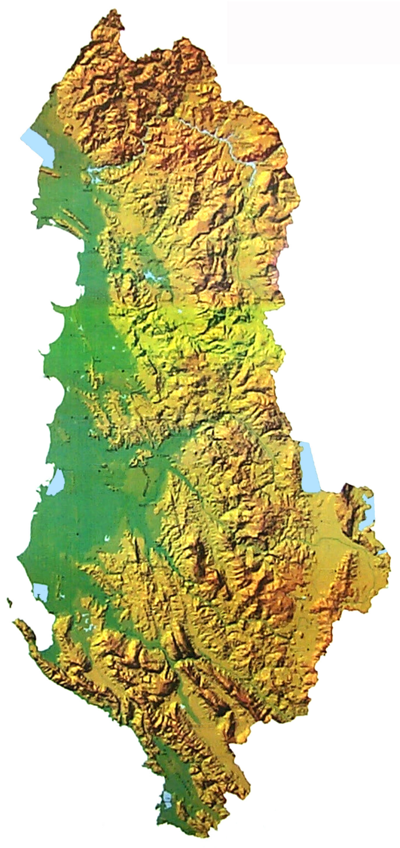

Fig. 1. Geographical Map of Albania

Photo 1-View of Vlora Bay

Photo-4- View of Coast of Vlora Bay

Photo-5- View of Coast of Vlora Bay

Vjosa-Aoos River is one of the biggest and most important rivers in the Albanian and Greek hydrography (Photo 2).

Photo-2- View of Vjosa River

The Narta Lagoon is one of the most important lagoons of Albania (Photo 3). This is situated in the northern part of the Vlora Bay, about 3 km from Vlora City. Two islands are located in the south part of the lagoon, with an approximate surface of 7 ha. The bigger of the two is covered with cypress. The famous Monastery of St. Mary, built in XIV century is situated in this island.

Photo-3- View of Narta Lagoo

Anthropogenic activities have a great impact on Vjosa River Mouth- Narta Lagoon- Vlora Bay water system. Both Albania and Greece do not have a regional or international program for pollution monitoring in Vjosa-Aoos River System. So the project DAC concerning the Vjosa River and Narta Lagoon, has created the conditions for the realization of a regional network for pollution monitoring. In this monitoring network physical-chemical, hydromorphological and biological approaches have been followed.

2. Material and methods

The geomorphological regime of the Adriatic Sea coastline, analyzes is based on the collection and examination of archival documentation (Topographic Map of Albania of Austro-Hungarian Institute, 1870, Military Geographic Institute, 1918 and 1938, Soviet Naval Institute, 1955, Albanian Military Topographic Institute, 1958, Landsat imagery of 1975, 1982, 1984, 2001 etc). Determination of littoral sediment transport and coastal sedimentation, the classification of erosion and accumulation processes under the wave refraction etc. are studied by analyzing of the archival materials and field surveys data.

Several physical-chemical parameters have been measured either in situ or in the laboratory. In situ measurements: Water velocity and discharge of the Vjosa River, pH, dissolved oxygen (D.O), temperature, conductivity and total dissolved solids (TDS). Water samples have been analyzed for the determination of the content of PO_4-P, NO_3-N, NO_2-N, ammonia N, and total suspended solids (TDS).

Length, the width and the depth of the Vjosa River bed have been estimated, respectively for the minimal, average and the maximal water levels. Water velocity and discharge in the channels from Narta Lagoon with Adriatic Sea has been estimated.

Lithology has been studied through geological maps, geophysical data, and during the field surveys. Granulometry of riverbed sediments have been estimated using the Wentworth scale.

Results of the observed data have been presented by graphic-analytic relations $R_o=f(Q_o)$ and $R_o=f(F)$, where Q_o is water discharge and R_o is suspended load discharge.

3. Analyses of the results

3.1. Hydrography

Aoos- Vjosa River flows in Greece and Albanian territory (Fig. 2,3). The Aoos river springs are located in the Smolek and Agos Mountain in Greece.

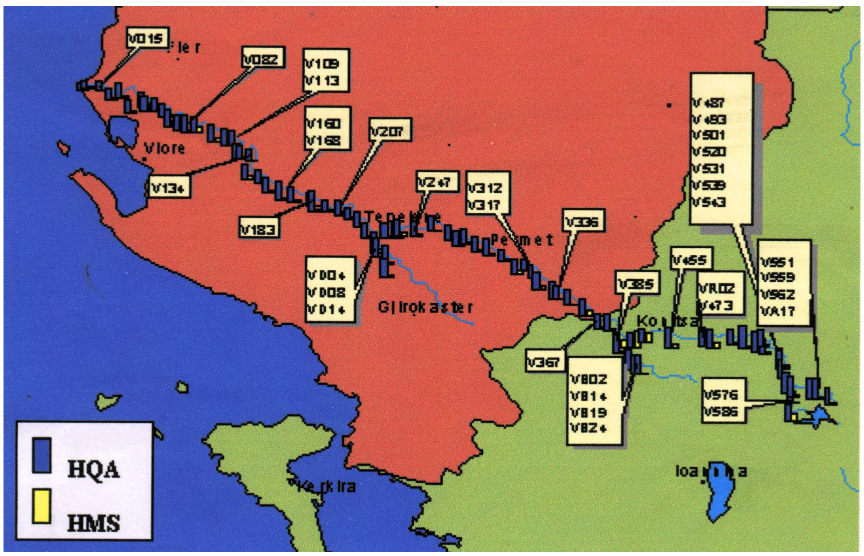

Fig. 2. Vjosa-Aoos River Minitoring

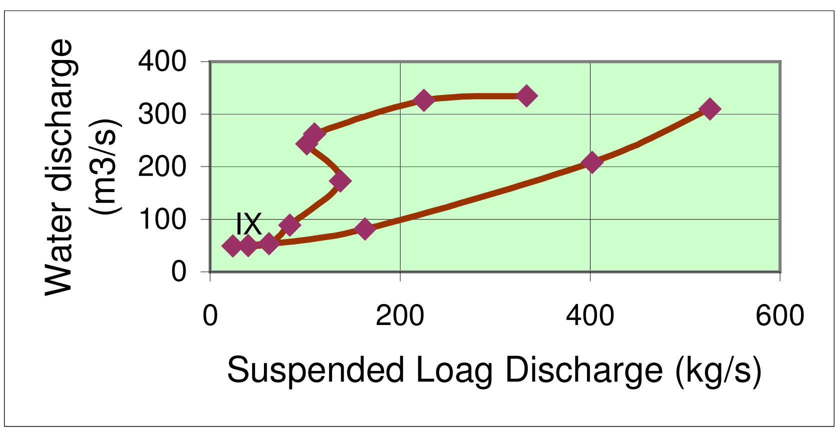

Fig. 3. Correlation between monthly-suspended load discharge (Rm) and monthly water discharge (Qo) of the Vjosa River in the Adriatic Sea.

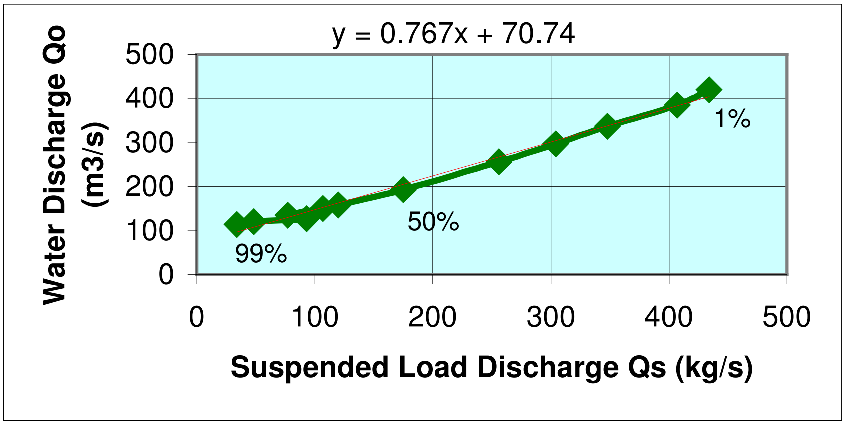

Fig. 4. Correlation between annual suspended load discharge (R_o) and annual water discharge (Q_o) of the same probability (p=1%-99%) by the Vjosa River in the Adriatic sea.

The main direction of the flow of the Vjosa River system is from SE to the NW, with a general tendency towards the coastal lowland from where it finally discharges into the Vlora Bay of the Adriatic Sea in Albania. The mouth of this river is situated in the northern area of the Narta Lagoon. Some of its main characteristics are the following: its catchment area is F=6710 km^2, the mean altitude H=855 m, the length L=272 km and the density of hydrographic network is D=2.2 km/km^2 (Pano N. 1984)..

The principal hydrological characteristics of Vjosa River System are presented in the Tab. 1. The average annual water discharge in Aoos-Vjosa River System ranges from Q_o=61.0 m^3/sec in Drino- Biovised area up to 164 m^3/sec at Vjosa River Mouth in Adriatic Sea. The minimum discharges vary respectively from Q_{min}=11.3 m^3/sec to 41 m^3/sec, to the maximum discharge Q_{max}=170 m^3/sec to 6130 m^3/sec. Equations describing mean annual water discharge (R_0) with the catchment area (F) for the main hydrometric principal axes of the Vjosa River are as follow:

$$R_o=0.00027.F^{1.55}; \quad R^2=0.85; \quad E_2=\pm 12\%$$

The main load suspend discharges ranges from R_o=53.3 kg/sec to 184 kg/sec.

The suspended load discharge of Vjosa River i the Adriatic Sea varies in very wide limits from R_o=480 kg/sec for the hydrological years of the low water discharge to R_o=3.8 kg/sec for the years of high water discharge. Correlation between monthly-suspended load discharge (Rm) and monthly water discharge (Qo) of the Vjosa River in the Adriatic Sea is presented in fig. 4. The dynamics of the change of the coastline in the Vjosa River Mouth is also determined by variation of the suspended load discharge impact of this river in the Adriatic Sea during the multi-annual cycles. Correlation between annual suspended load discharge (R_o) and annual water discharge (Q_o) of the some probability (p=1%-99%) by the Vjosa River in the Adriatic Sea is presented in fig. 5. Long-term distribution of the water and suspended load discharges of Vjosa River Mouth in the Adriatic Sea is presented in fig. 6.

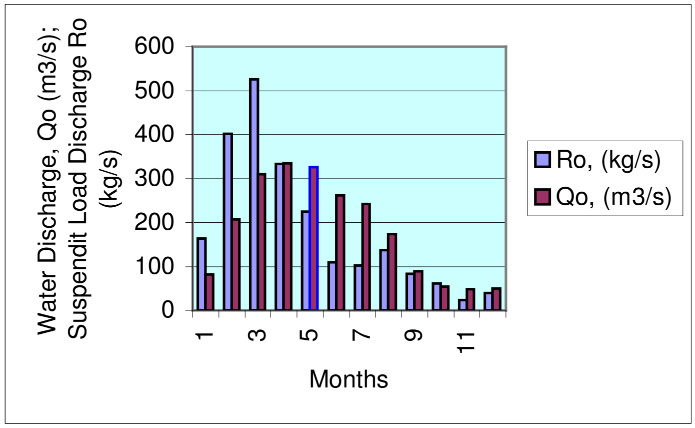

Fig. 5. Long term distribution of the water and suspended load discharges in the Vjosa River Mouth in the Adriatic Sea.

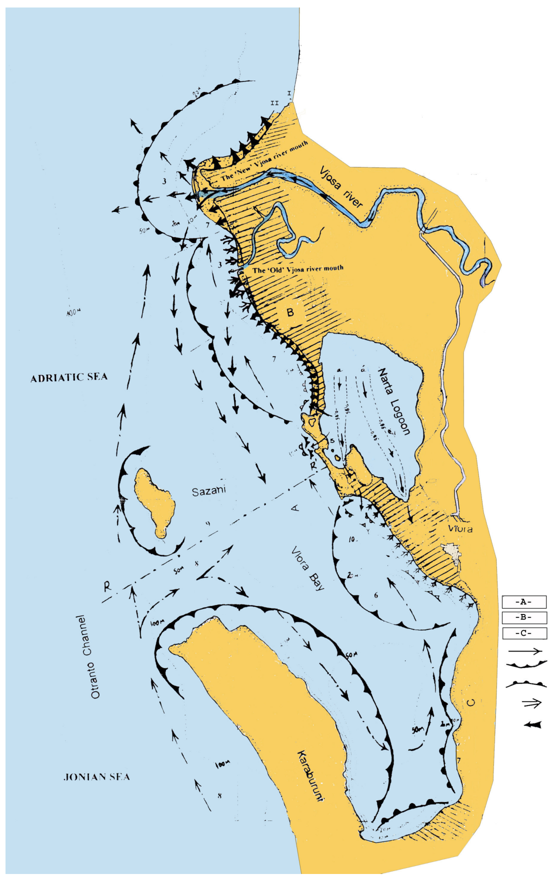

Fig. 6. General Evolution Map of the Vlora Bay-Narta Lagoon-Vjosa River Mouth coastline, during the period 1870-2001.

1) Coastline in 1870; 2) Coastline in 1992; 3) Sediment contribution; 4) "Old" Vjosa River Mouth; 5) "New" Vjosa River Mouth; 6) Coastal erosion; 7) Coastal sedimentation; 8) Sea current direction; 9) Line zero sediment transport.

Narta Lagoon has a surface of 41.8 km^2, the maximum depth 1.5 m and the average depth is 0.7 m. About 1/3 of its surface is used for salt extraction. Narta Lagoon is divided from the Adriatic Sea by the low hills of Zverneci- Treporti and by a littoral cordon of about 8 km long and width of 100-1400 m. The shape of the Lagoon is ellipsoid, with the main axe parallel to the coastal line. The Narta Lagoon is connected with the Adriatic Sea by two artificial channels, the South and the North Channel. The South Channel is 110 m long, 18 m wide, 1.67 m deep and the North Channel is 650 m long, 20 m wide and 0.54 m deep**.** Limniological regime of Narta Lagoon is determined by the hydrologic and climatic conditions of surrounding area and the water exchange degre with the Adriatic Sea. At the same time a shallow zone forms a barrier in the middle southwestern part. These conditions have an important impact in the general scheme of the geographical distribution of the limniological parameters in the Narta Lagoon.

The principal limniological characteristics of Narta Lagoon are: water balance the elements, water exchange intensity of from Narta Lagoon with the Adriatic Sea, the water temperature, etc. The annual precipitation rate is x_o=949 mm, with its minimum in July (22 mm) and maximum in November (148 mm). A water layer with an annual average of Z_o=1271mm evaporates in this lagoon, with its minimum in January (32 mm) and maximum in July (208 mm). Water exchange process between Narta lagoon and the Adriatic Sea is realized through two channels. The mean average discharge of this process is 1-5 m^3/sec. Narta Lagoon temperature rises from 1-7 ^oC to 29-40 ^oC.

The principal hydrochemical characteristics of the Narta Lagoon, as the dissolved Oxygen (O_2), salinity (S$‰_o$), pH etc, are presented in the Tab.2. The concentration of the dissolved Oxygen and other physical and chemical factors in Narta Lagoon water ranges widely in space and time. The O_2 in the Narta Lagoon water, during July 2001, rises from 3.45 mg/l to 8.19 mg/l and the salinity from 44.60 to 62.73 $‰_o$. The salinity from 46.70 $‰_o$ to 50.55$‰_o$ has been decreased during the December 2001. Evaporation of the Narta Lagoon water has greatly increased during the summers, with high temperatures. In parallel, the water exchange between sea and lagoon is decreased; the flow from the affluent basin is practically zero and the rainfall is almost completely absent. Under such conditions, the quantity of the water evaporating causes a great increase of the average salt concentration. The gradient of this change is increased in the relation with the distance from the lagoon inlets. During the winter the effect produced by the evaporation of the Narta lagoon meteorological conditions and the effect of drainage basin determine water shortage. The pH in the Narta Lagoon water depends on the concentration of bicarbonate and carbonate ions and dissolvent carbonic gas. In general, pH in this lagoon during July 2001 has risen from 7.5 to 8.4. Other physical-chemical characteristics of the Narta Lagoon: Nitrites (NO_2-N), nitrates (NO_3-N) etc are presented in the tab. 2.

Vlora Bay covers an important part of the southeastern coastline of the Otranto Strait. This Bay has a length of 36 km and 10 km width (Fig. 7). The maximal depth of this bay is 57 m. The coastline of Vlora Bay-Vjosa River Mouth area has continuously modified its configuration by sedimentation of alluvium transported by Vjosa River water and the swell of the Adriatic Sea. The coastal area is characterized by prevalence of winds blowing from the NW direction with a maximal speed 35-45 m/sec. The tidal range in this part of Adriatic Sea is low, reaching a maximum of 30-50 cm. The wave action is characterized by calm in 35% of the cases, by wave with a higher of less than 0.5 m in 20% of cases and waves higher than 2.00 m in 3% of cases.

The general evolution map of coastline during the period 1870-2001 is presented in fig. 7**.** Sediment contribution, coastline configuration from 1870 to 2001 years, coastal sedimentation, erosion and accumulation processes, sediment transport, etc are presented in this map (Photo 4, 5). Many coastal transformations have taken place due to modifications caused by the river mouth migration, with the abandonment of old channels following a decreased discharge or creation of the new river mouths (Pano N. 1994).

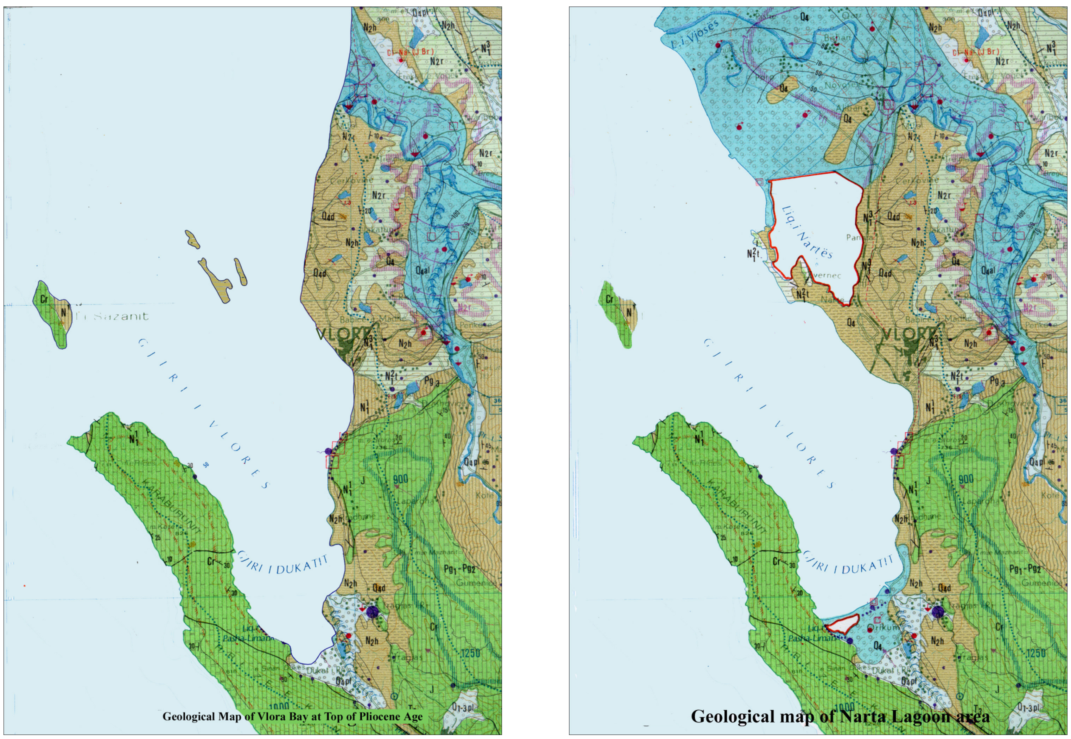

Fig. 7. Paleogeographic evolution of the Vlora Bay from End of Pliocene Age (a) up to Present days (B) (According to the Geological and Hydrogeological Map of Albania, at scale 1: 200 000, 1985, 1985).

Vjosa River Mouth has changed its position in the last century two times and these replacements have covered an area of the littoral about 10 km long in the northern direction.

The outlet of Vjosa River was shifted from position “A”- the old mouth to position “B”- the new mouth. The old mouth of this river is undergoing on important erosion process under the wave action. So there are important sources of coastal sediments in the coastline of Vlora Bay- Vjosa River Mouth area: First, the present Vjosa River Mouth and, and second the old Vjosa River Mouth.

The total Vjosa River sediment discharge in the Adriatic Sea is W_T=7.5x10^6 tons/year. About 20% of total sediment load equivalent to W_F=5.6x10^6 tons are the bottom-load, and about 80% equivalent to W_P=1.9x10^6 tons are the sediment load. This river discharge is the main source of coastal sediments in Vlora Bay (Pano N., 1984).

The dynamics of solid deposits along the coastal zone and the accumulation intensity of sand are closely tied up with the warning process and particularly with the maximum wave effect.

The southward shift of the Vjosa River mouth during the XX century has created serious erosion problems in the northern coast of the Narta lagoon. The sediments input to the old delta ceased, the latter has almost been completely eroded and the sediment was removed to create a spit, which formed an accumulative zone in the southern part of the Vjosa River old mouth. This spit tends to vide of the littoral cordon of the Narta Lagoon in the west direction.

In Pasha Liman-Vjosa River Mouth coastal area, the corridor connecting Sazani Island in the West and Treport Hills in the East represents the line of zero sediment transport. In these conditions, the Vlora bay is an independent and separate geomorphological area, where coastal erosion processes dominate (Kedhi M. 1987).

3.2. Geological Setting and Quaternary Evolution

Geology, its dynamics, structure of hydric system, and climate have conditioned the morphology of the most beautiful Ecosystem, Vlora Bay and Narta Lagoon-Vjosa River Mouth, in the Adriatic Coast (Fig. 7-b, Photo 4).

Continental Area. Upper Cretaceous Limestone Mountain of the Karaburuni Peninsula, with 800-1600 m height encircles Vlora Bay at the southwestern side. In the South and eastern direction Vlora Bay is encircled by Mesozoic carbonate formation of the mountains: Llogara Col (1050 m), Çika Mountain (2045 m) and Lungara Mountain. Upper Miocene and Pliocene molasses and quaternary deposits fill Dukati Valley at the south side of the bay. In the north, the mountain chain is continued with Shashica hills. There lies the Aquitanian flyschoidal formation and Pliocene molasses of the Helmesi and Rogozhina suite of Panaja Hills (Geological Map of Albania, at scale 1:200 000 , 1984, Hydrological Map of Albania at scale 1:200 000, 1985).

Coastal Area. Limestone coast of the Adriatic Sea in Vlora Bay is generally abrupt. At the northwestern direction of the Vlora City, there is a coastline of the Albanian Adriatic Shelf. Narta lagoon was formed in a sea bay, which is closed by solid sediments transported by Vjosa River to the sea. The neotectonic phenomena also characterize the lagoon area. At southwestern direction, the Tortonian molasses Zvërneci hills chain from the isle separated Narta lagoon from the Adriatic Sea. Very interesting textures have been formed in this formation. Different sedimentological kinds and forms have represented these textures, with a scientific and didactic importance. There are observed many concretions and stamps. Geological section is extended from the beach to the northern direction and by erosion abrupt slope has been formed rising over the seaside. These characteristics make Zvërneci a rare geo-monument, with great international scientific, didactic, and tourist interest. These values and the beach beauty make Zvërneci area very attractive (Photo 6).

Around the Narta lagoonside the lagoon Quaternary deposits (Q_4^1) are extended. These deposits are represented by sky-blue-gray color silt, with silstone interbeds of gray color. Thickness of these deposits varies from 0.5-1 m up to 20-30 m. Lagoon deposits have covered marine Quaternary deposits (Q_4^m). Marine deposits are represented by arkose sand, with green silty clay and gray silstone interbeds. Marine deposits are represented in the form of sand beach and dune belts. Quaternary deposit thickness is more than 100 m. At Aliban village airport area, 4 km north of Narta lagoon, lagoon and marine deposits have a resistitity of 0.37-086 Ohmm, up to the depth of 30.6 m. Under this depth, marine Quaternary sisltone sediments have a resistitity of 18 Ohmm. At Poro village, 8 km north of Narta Lagoon, according to the electrical sounding results, up to the depth of 14 m deposits with a resistivity of 6.4-21.9 Ohmm are extended, which are represented by clay and silstone. Under these deposits, a layer with a resistivity of 2 Ohmm, and thickness 31 m is extended. Very low values of the resistivity shows that this layer is presented by sand saturated by saline water. The same phenomenon was observed by electrical soundings at Pisha village area, at the northern side of Vjosa River. But here, deeper than 25 m, a saturated by saline water sand layer is extended (Frasheri A., 1962, Kapllani L. et al. 1995, 1996).

Marine deposits, filling the coastal plain of Orikum, are in the south side of Vlora Bay.

Vjosa River flows through Periadriatic Depression. In plain area, the valley is wide and many meanders are formed by river. Through the Quaternary deposits (Q_4) Vjosa flows from Panaja to the Adriatic Sea. Clay, silstone, sand, and gravel or clastic materials in some areas compose these deposits (Frasheri et A., 1996). At Panaja area, Quaternary valley deposits are extended up to 4 km.

Marine Area. Offshore Later Quaternary Marine deposits (Q_4^m) in the marine area of Vlora Bay according to the electrical marine soundings and shallow boreholes, are 190 m thick (Fig. 8). At the western direction of the Zvërneci Hills, these deposits are covered the Tortonian molasses.

Configuration the Vlora Bay has started to form from the Pliocene age, when the molasses of the Panaja Hills have been outcropped at surface (Fig. 7-a). Actually, Later Quaternary Marine deposits (Q_4^m) are created the present Vlora Bay (Fig. 7-b).

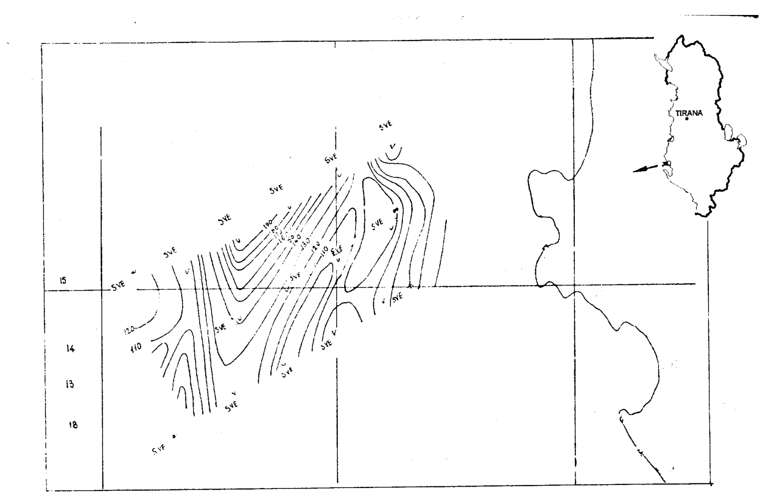

Fig. 8. The offshore floor configuration of the Quaternary Marine deposits in Vlora Bay, according to the marine electrical soundings data

Agricultural soils. Different kinds of agricultural soils are extended in the area (Cara K. et al. 1996, Cara K. et al. 2000, Gjoka F. et al. 2000, Pedological Map of Albania, Zdruli P. et al. 1995). Their thickness is over 1 m. In the lower parts of these soils, the subargille thin interbeds have been observed. Agricultural soils have covered the lagoon deposits. According to the electrical soundings and pedological studies, agricultural lands at the north of the Narta lagoon are saline soils. Considerable soluble mineral salt quantity, in particularity natrium, contents the upper soil layers, and the lower ones, too. Salt content varies from 0.3%-3 %, and in some cases up to 15%. Alluvium soils, which are extended near the riversides are represented by coarse alluvium (sand, clayed sand, and silty clay) and are poor of aliment matters. Heavier and richer with aliment matters are the soils, which are located farther from the riversides.

3.3. Biology, physicochemical parameters and anthropogenic impacts of the Narta lagoon

Narta Lagoon is considered as one of the most important wetland areas of Albania for its biodiversity and the number of habitants. Narta natural ecosystem is an important part of natural potential of Europe and a complex of international importance. Birds are the most important group of all with 182 winter inventories that register an average a number of 18700 waterflows. The area fulfils the criteria of Ramsar Convention (Bino T., 2000). The Narta lagoon is characterized as a Geo-monument of international importance (Seriani A. 1991, 1999) and as a Special Protected Area for birds.

Neither the analyses of the physicochemical characteristics that took place during the present study nor the benthos, that predictably consisted of taxa tolerant to organic pollution since the substrate is silty, did directly detect any important problems of pollution. The soil industry is extracting water from the lagoon without a preliminary study. In the surrounding area of the lagoon, oil is drilled and gas is extracted from deep wells. But intensive agricultural and industrial activities, as well as the development of tourism, without being based on a management plan, may provoke serious problems to the lake in the future. The most important danger that the lagoon confronts is the imminent isolation from the sea. In the Narta Lagoon are observed intensive solid deposits of the Vjosa River on the coastal area tending to stop the active water exchange between the lagoon and the sea resulting in lack of fresh water in the lagoon. Dirty untreated urban water flow also exists in the lagoon.

The same anthropogenic impact is observed in the Vlora bay: flow of the dirty untreated urban and industrial water in the sea, exploitation of the sand and gravel from beaches for constructive materials, deposition of the solid industrial waters (Cu, mercury, clay etc) in the onshore and offshore coastline.

Biodiversity of the Narta Lagoon area:

Birds: Pelecanus crispus, Platalea leucorodia, Phoenicopterus ruber roseus, Anas penelope, Anas crecca, Bucephala clangula, Oxyura leucocephala, Haliaeetus albicilla, Aquila clanga, Falco naumanni, Recurvirostra avosetta, Larus genei, Sterna albifrons, Steptopoelia turtur, Strix aluco (Bino T. 2001).

Fish: Mugilidae, Maronidae, Sparidale, Atherinidae, Anguillidae, Cyprinodontidae+Poecilidae, Sparidae (Rakaj N. 2001).

Amphibia: Triturus criststus, Triturus vulgaris, Mombina variegata, Bufo bufo, Hyla arborea, Bufo viridis, Rana dalmatina, Rana balcanica.
Reptiles: Emys orbicularis, Mauremus caspica, Testudo caretta, Caretta caretta, Hemidactylus turcicus, Lecerta trilineata, Lacerta muralis, Coluber jugularis, Elaphe loghissima, Malpolon monspensulanum, Natrix natrix, Natrix tesellata, Vipera ammodytes.

3.4 Biology , Hydromorphology , Habitat Survey of the Vjose river and Environmental impacts.

According to the sampling results of the Aoos-Vjose river benthic fauna, the latter was diverse and included many sensitive to organic pollution taxa, except from two sites during the high flow season. First site is located near the river mouth, which were affected by oil and sand extraction in the area. Memaliaj coal mine waste and Gorisht-Kocul-Gernec oil reservoir and Selenica bitumen mine wastes in the Vjosa River catchment create pollution of soils, surface and underground waters. Unfortunately, this environmental human activity has caused the decrease of surface and impoverishment of the soils. Based on the biotic indices, the water quality appears to be excellent in all the sites except from these two last ones, which consist of poor fauna mainly due to the oil plants, therefore more effective technology in the extraction process is recommended. Aoos – Vjose river differs from all the rest of the studied rivers in the northern part of Greece which have never had such an excellent quality of water all the seasons long (Kamba et al, 2000; Lazaridou et al, 2000).

Additionally, the physicochemical characteristics also confirmed this status. As to the collected fish fauna, it consists of seven freshwater species in the Greek part of the river and of 18 species in total, five of them common in the Hellenic and the Albanian part, including species of the family Acipenseridae, that are protected. The avifauna also consisted of many species, almost 200, three of them being in danger universally.

As to the habitat quality of the Aoos-Vjose River, it was found that it is of the few least modified rivers in Europe. That is why the qualification score (structure of habitat) is very high in most of the studied sites. However, the relatively high modification score of the river habitat at certain parts is due to dams, quarrying (sand/gravel extraction) and water abstraction for irrigation purposes. Consequently, better planning or enforcement of the existing law for such activities is necessary to prevent serious degradation.

Vjosa valley ecosystems, from the Albanian-Greek frontiers up to the river mouth at the Adriatic coastline, confront though many problems: erosion, pollution of the soil and waters, loss of the land and water habitats, fractures in the biodiversity, land fragmentation and progressive impoverishment, salinity etc. that have caused their degradation. This degradation has attained stability and productivity of agricultural ecosystems.

Very intensive erosion in Vjosa catchment area provokes great quantity of solid material, which is transported by the river. This erosion is caused by many factors:

Firstly, in Vjosa cathchment area high precipitation takes place. Vlora has in average 954.8-2405 mm/year precipitation. Soils and rocks have a great erodibility, and are without organic matter. Shallow and tilt agricultural soils are the result of this intensive erosion that is intensified by human activities:

a) Abusive deforestation during the last years, opening new agricultural lands and their intensive cultivation, destruction of the meadow and permanent pastures, and missing of the adequate land protection (Gjoka F. et al. 2000).
b) Exploitation of the gravel and sand in the riverbed.

Discharge of untreated urban waters from many dwelling centers into the river, and deposit of solid urban waste in the riverbed are caused great polution of hydric system.

Biodiversity of the Vjosa-Aoos River:

Amphibia: Salamandra salamandra, Triturus cristatus, Triturus vulgaris, Hyla arborea, Rana graeca, Rana lessonae, Rana balcanica, Rana dalmatina, Bufo bufo.

Birds: Ardea cinerea, Neophron percnopterus, Gyps fulvus, Accipiter gentiles, Aquila chrysaeatos, Falco peregrinus, Bubo bubo, Dryocopus martius, Dendrocopos leucotos, Cinclus cinclus, Monticola saxatilis, Monticola solitarius, Parus lugubris, Sitta europaea, Sitta neumayer, Tichodroma muraria, Loxia curvirostra (Bino T., 2001).

Fish: Acipenseridae, Salmonidae,, Clupeidae, Cyprinidae, Barbus, Barbus graceus, Chondrostoma nasus nasus, Pseudorasbora parva, Pachychilon pictum, Paraphoximus epiroticus, Leuciscus illyricus, Anguillidae (Rakaj N. et al. 1995, Rakaj N. 2001).

Reptiles: Emys orbicularis, Mauremys caspica, Testudo hermanni, Caretta caretta, Hemidactylus turcicus, Lacerta trilineata, Lacerta viridis, Padarcis muralis, Coluber jugularis, Elaphe longissima, Malpolon monspensulanum, Natrix natrix, Natrix tesellata, Vipera ammodytes.

4. The conflicts in the Albanian part of Vjosa River and some managerial propositions.

• The rising building sector and quick uncontrolled industrial development, in Albania, is connected with gravel/sand extraction, which form an extremely difficult problem to solve.

• The overthrow of trash into the river is inevitable because of the lack of an appropriate waste disposal management system while at the same time the river is used by the locals for recreational purposes and fishing.

Therefore the need for rise the locals' awareness on environmental issues through seminars, information centers etc. is recommended. Such a prospective could affect positively the already developed ecotourism and promote sustainable land uses and activities in the area. Better understanding of the natural processes, with the income compensation by the ecotourism, in combination with better planning and management of the area could lessen the conflicts and lead the region into sustainable economic development.

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Photo-3- View of Narta Lagoo
Photo-4- View of Coast of Vlora Bay
Photo-5- View of Coast of Vlora Bay

Tab. 2-1

PHYSIC-LIMNIOLOGICAL PARAMETERS AT THE NARTA LAGOON

No	Sites	Data	Hydrographical Parameters		Physic-chemical Parame				
			Coordinates	Depth H (in m)	Level	t ^{0}C	PH	O_2 (mg/l)	NBO_3
1	1 N	13. 07. 2001	44^o 86 850 N	-0.30	Min.	33.2	8.2	3.45	6.75
			43^o 68 160 E		Mean				
		12. 12. 2001			Max.				3.85
2	2 N	13. 07. 2001	44^o 88 200 N	-0.40	Min.	31.4	8.0	5.46	2.15
			43^o 67 710 E		Mean				
		12. 12. 2001			Max.				3.00
3	3 N	13. 07. 2001	44^o 88 125 N	-0.35	Min.	29.4	8.0	4.73	0.85
			43^o 64 890 E		Mean				
		12. 12. 2001			Max.				1.70
4	4 N	13. 07. 2001	44^o 89 520 N	-0.45	Min.	29.7	7.8	5.27	0.75
			43^o 65 110 E		Mean				
		12. 12. 2001			Max.				2.80
5	5 N	13. 07. 2001	44^o 89 660 N	-0.60	Min.	31.2	7.6	4.91	0.55
			43^o 67 470 E		Mean				
		12. 12. 2001			Max.				2.80
6	6 N	13. 07. 2001	44^o 90 110 N	-0.35	Min.	32.3	7.5	7.28	0.38
			43^o 69 100 E		Mean				
		12. 12. 2001			Max.				1.00
7	7 N	13. 07. 2001	44^o 91 530 N	-0.55	Min.	31.2	8.4	6.15	0.87
			43^o 64 700 E		Mean				
		12. 12. 2001			Max.				0.85
8	8 N	13. 07. 2001	44^o 91 740 N	-0.60	Min.	31.8	8.2	8.19	1.55
			43^o 66 470 E		Mean				
		12. 12. 2001			Max.				0.90
9	9 N	13. 07. 2001	44^o 92 110 N	-0.35	Min.	31.8	7.7	6.00	1.30
			43^o 68 210 E		Mean				
		12. 12. 2001			Max.				1.20