

Numerical analysis of hydro-geomorphological, environmental potentials of touristy Ormieh lake basin and shoreline for land Planning (North West of Iran)

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Abstract: Due to economic, tourism, agricultural activities has a special role in the northwest of Iran. Where this lake is the biggest cache met in the western Asia. This lake basin area is 52700 km² with 102 islands, familiar national park, with 186 species of birds, and animals. Due to economic, tourism, agricultural activities has a special role in the northwest of Iran. The water of lake are very salty (240 gr in winter and 260gr in summer) and fluctuation of lake water level threaded 500km² of banks or shorelines lands. Water level rising in intensive rainfall years caused damage for ports instruments in shoreline and agricultures lands. This tectonically Orumieh *lake* surrounded by agricultural plains and consists of 10.5 % of basin area and has 340 million m³ water resource. The ratio of salt in soils is from %1 an Ec 8 mmhose to %3 and Ec more than 40 in around lake expanded in vast area. For control satiation preceding and rehabilitation marginal soils due to environmental potential, some techniques suggested for land using of shoreline.

Keywords: ecological changing - soil erosion – environmental management

Introduction

Coastal population always are threatened or at the risk of sea or lake water fluctuation (Almost rising). Also the coastal area is an aggravatingly to management and to day it is of crucial significance for the future humanity and the ecosystem processes upon which we all depend (Timothy & et al, 2000).The coastal marginal areas include, shorelines offshore sediment nourishment and estuaries. Iranian shorelines due to infrastructures and impact land use, in future will be comforted with problems such as coastal erosion, ecosystem variation, water pollution, marginal soil Salinity and decrease of aquatic lives (Saiko, 2001). The touristy *Ormieh lake* shoreline waters production due to the economical, ecological conditions, absorbing more people increasable. and also intense human interfere to the shorelines area led to the ecology variation, soil erosion, waters pollution and fluctuation of lake level. Therefore study and management of basin and especially shorelines of them via impact are necessary.

1. Natural Condition (Geology, Climatology and Hydrology)

The Study area is located in the northwest of the Iran between the *Caspian Sea* and *Van Lake, Turkey* located (fig 1). *Uromieh lake* basin receives 398 mm annual average precipitation and with semi-arid climate has second rank between the regional basin of Iran. Also study area is the portion of Iranian flatus with Alpine sedimentary folded and mountains.

The lake water levels from Ocean base sea level is the 1274m upper and average depth of them 6 m ,also occupied between 9.5 to %10.5 of whole basin area. The whole water of them is 5500km² have equal about 1000 million m³ (Movahed Danish, 2003). According to the hydrology zone, study basin is divided to three areas such as western, eastern and southern sections. The main rivers of east area *include Aji, Buok, Galeh, Sofi, Mordag and Lillian* all together occupied 34.4% (17075 km²) of whole basin area. The main rivers of South area including *Zareneh, Semineh, Moehabad and Gadar* rivers, all together occupied allocated 37.6% (19815 km²) of whole basin area .Also the main river of west area *including Barandoz, Roza, Nazi*, and some small rivers with area of about 15.4(8116km² a) and all together occupied 34.4% (17075 km²) of whole basin area.

In the small portion of whole basin area (about %25 of marginal and mountainous area) from heights of 1350 m to maximum heights (*Sabalan* Mountains with 3852m) soil erosion via runoff is high. Also in the about 55% of basin with deferential heights of about 1000 m included low gradient slopes and scattered mountains sediment yield is possible and via local runoff erosion. But in the 40% of basin included plains and small plains areas with deferential heights of 226m occurred some riverbank and bed erosion, sediment deposit to be accomplished (table 1).

These areas almost allocated to agricultural, residual, and shoreline structures (Except small salty area near the shorelines). To day with satellite technology it is possible to map potential wave energy for different wind

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directions, and thus to explain the pattern of erosion and accretion zone for subsequent planning purposes (Timothy & et al, 2000; 246); Charles & Charlif, 2005).

2. Environmental potentials and economical and social capability

The *Ormieh Lake* is the important protected area with 102 islands, familiar national park, with 186 species from birds, and animals. Where this lake is the biggest basin in the western Asia, and due to Rio conference published Declaration in 1994, the *Ormieh* lake ecosystem and national park of it as known one of the protect area between the 9 protected area. So must be utilized from Global Environmental Facilities (GEF) between the developing country. Also the National park of *Ormieh*, among the 14 national park in the world utilized from spatial limitations. The *UNESCO* organization in the world program (*Human and Biosphere or Man And Biosphere* (MAB) emphasized on the protection settlement regain and one of them is *Ormieh* Lake. In this framework other direct observation from Iran *Ormieh* lake ecosystem as known primary area for protecting. This lake basin area is 50892 km² with 102 islands, familiar national park, with 186 species from birds, and animals. Due to economic, touristy, agricultural activates has a special role in the northwest of Iran. Every year more than three million people visit attractive national park, shoreline and for swimming. The Islands of *Ashak Dagi* (with 3175 ha), *Aspher* (2550 ha) and *Arizo* 2500 hac) are important locations for wildlife and utilization of bioenvironmental tourism attractions with worldwide value. In the Islands of national park are recognized some big animals and about 27 kinds of shorelines and land birds, more than 33 kinds of migration birds. The water of lake is high density salty (240 gr in winter and 260 gr in summer) Toluoi(1996). In the salty water of lake several kind of *Planktons* such as *Enteromorpha* and *Artima Uormiana* are exist and some migrating birds feeding from *Artima*. Investigation of Azari (1368) indicated that the *Ormieh lake Artimia* is a special species in the world, and he called *Artimia Ormiana*. The result of cooperation study together by Iranian Fishery and Gaunt university of Belgium, estimated the average alive or wet *Artimas Ovals* to be about 400000 tons and dried 3200 tons. This production has annually more than 1000× 106 economical value income for Iran (Mohammadi, 2006).

According to the Hydro-chemical study of *Engineering Consulting Energy And Industry* (EECI), this lake water known one of the high salty water of lake with suspended solution elements of Na, Mg, So₄, CL in the world. Density of salt rates in water is various due to the season's variation and draught year. The average weight of salt in years fluctuated deferent between 150 to 400 mg/liter and usually are changed in spring 240 mg/liter and in summer 280 gm/liter. According to the annual salt input ratio, it is possible every year could be 2 to 5.5 million tons salt approvable (Mohamadi, 2006).

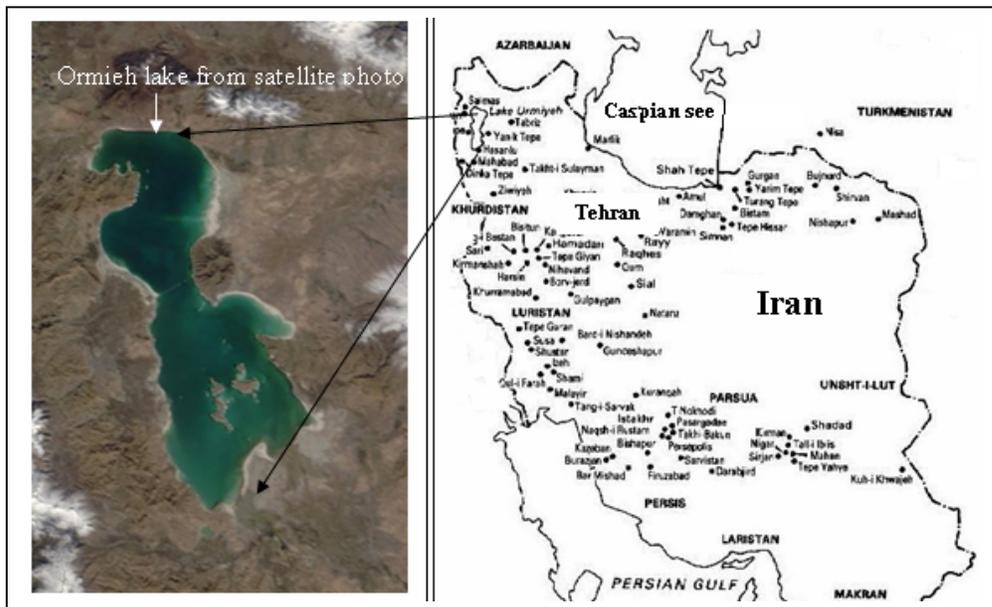


Figure 1 shows the situation of *Ormieh Lake* in the Northwest of Iran

Table 1 Shows hypsometric condition of Ormieh lake basin

x	topography	Relative Height M	Height m	Percentage of area in upper basin	Percentage of area in down basin	percentage of distribution
Deposition area	Shoreline	0	1274	100	0	40.9
Deposition area	marginal area (Plaines)	226	1500	58.4	40.9	34.4
Both erosion and deposition	Pediment and low gradient slopes	726	2000	24.20	74.70	19.8
erosion dominated to deposition	Debris or gentle slope	1226	2500	4.90	95.01	4.40
High erosion	High gradient slopes	1726	3000	0.6	99.35	0.7
Very High erosion	Very High gradient slopes	2226	3500	0.03	99.97	0.02
Very High erosion	Mountain apex	2576	3850	0	100	0

3. Human activities, basin and shorelines management

Due to the concentration of city, village, infrastructure, agricultural land use and tourism structures (Intensive human activities) ecosystem condition changed almost during the several decade. Investigations showed around the lake, especially in sweet water valleys and some slopes the forest land distracted. Therefore many biology species are of animals, birds, plant of lake and land died or immigrated. Establishment of causeway has an important role that can be attributed to its effect in connecting West and East *Azerbyjan*. This causeway led to interruption of north and south lake waters connection. Therefore ecological effects of them with concentration of more sediment and suspended salty elements in the north section, and lake water level appeared. But in the south section Lake water level increased and sediment and salinity of water decreased. Also this cited subject with ecological variation recognized by satellites photos and labratovary analyzing (Sadigyan & Bzorgmeher; Jamab Engineering Consul ,1994; Alavipanah & Khodai,2005).

Infrastructure of dames, rise up salinity of lake water and irrigation saline water in some point intensified soil salinity almost in east ward, caused of lake water and marginal agricultural land .To control progress of soil salinity and rehabilitation of salient soil lands some techniques are useable as flow:

- 1- Controlling of lake level rising is the very important factor (with dam's reservoir).
- 2- Establishment of derange system adaptation with condition of area.
- 3- Irrigation with clean water (especially in *Autumn and Spring* due to available more rainfall water).
- 4 –Addition of chemical fertilizer such as *Nitrate and Soleplate Ammonium*, because *Soleplate Ammonium* is one of the best fertilizer for saline soils and prevents the concentration of suspension salty elements in the soils with acidification and decrease of *PH ratio*.

4. Conclusions & Suggestions

Ormieh lake water and National park of it have important roles in the economy of Iran via, tourism, and approving *Artimia*, salt, healing plant and flowers, moderating local climate an also connecting east and west Azerbaijan. During several decades by impact land use ecological variation emerged in the lake basin and especially in the shorelines and water. Some species of life creatures (planet and animals and birds) are destroyed.

Establishment of causeway between the lake caused the emergence of water suspended materials density in the then must be the new up water way without interruption of water connection way soon completed. According to this case study results, some suggestions are proposed:

- 1-Controlling the lake level fluctuation especially water level rising (with dams reservoirs) is very important factor in decrease of salt progressing in marginal soil.

- 2-Establishment of tourism structures in shorelines especially in port *Shakhe Vally*, Sharafkhaneh, (e.g. according to topography condition establishment of *Telehcabin*) is very necessary.
- 3-Completing up water bridge Arial causeway and destroying land causeway between the East and West Azerbaijan provinces according to ecological problems, water sediment and suspended salty elements and water level variation, is very necessary.
- 4-Rehabilitation of salient soils especially in east of lake shoreline margin with, controlling water fluctuation, artificial drainage system, irrigation with surplus *Autumn and spring* clean water, addition chemical fertilizers(*Nitrate and Soleplate Ammonium*),and halophyte trees and vegetables.
- 5-Increasing of the number of boats and transporting ships between ports of East and West Azerbaijan provinces is very necessary.
- 6- Determining wind direction and speed over long time and also relationship between speed and direction of wind heights. For management of offshore transport and touristy recreational (Touristy structures) are necessary.
- 7- Establishment of resistant protecting walls, dunes with long rooted tree or shrub, and big stone fragments for controlling shoreline erosion are necessary.

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