

# Usage Alteration of the Nazlu-Chay River of Iran due to Excessive Exploit of Its Material Includes Sand and Gravel in the Lake Urmia Catchment

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**ABSTRACT:** From Ancient times rivers were so essential for human beings and they had a major role in the formation of societies and civilizations. Construction of dams, pollution due to the sewage vacating and excessive exploit of sand and gravel located within the kip of the river are the main factors which affected the environment. These affections are so obvious and since there was no strict control over the exploit operations, the ecosystem is ruined severely. According to the scope investigations linked to the exploit of sand and gravel most of the exploitations are done from the bottom scope of river. These exploitations had led to severe destruction of solid quality, hydrology system of river and brutes. It is worth to point out that the drawbacks of these exploitations is not only limited to the scope of river but also we can see ruins traces within beach scope and other scopes of the river. Some direct influence of exploits includes: river hydraulic alteration, sediment place and river scope morphology.

**Keywords:** Environmental on sequences, River ecology, Sand and Gravel exploit

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## INTRODUCTION

As it was mentioned river always played an important role in the creation of civilizations and societies. The life of watery construction is originated from the existence of rivers (Ardakani 2011). Optimum exploit and protection is national task and all nations should pay heed to this issue. As the growth of urbanism and by execution of civil projects, natural environment is affected considerably. As well as this, population growth is the other factor which forces governments to exploit the lands in non-normative manner. So ecosystem is highly affected by these abuses. A natural mechanism has been always under the influence of factors like human activity such as destruction of plants, construction of settlement within the scope of river and wrong pattern of agriculture (Gholami and Shahi, 2000). Usage alteration is a topic which comes up when issues like drought, fire, flood, non-normative human activities and natural resource management practices is discussed. River scope excessive exploitation has unfavorable affects like affecting ecosystems. These non-normative exploits lead to disorganization of the natural equilibrium of rivers and destruction of watery constructions like bridges (Biyeer et al., 2013).

Sometimes, especially during the season that there is an emergence need for building the bridges, material exploitation is done by the authorities. These sediments are not so qualified to be used in the construction of the buildings but instead they are used in the road projects. The consequences of wrong uses of river scope include

reduction of the self-purging capacity in absorbing mineral substances, decreases in water quality, scope erosion of beach and river, and regional descendent of water level and its backwashes (Lu and Weng, 2007). Particularly Nazlu-Chay River is always influenced by sand and gravel exploitation. Its strategic location has led to exploiters settled in this area in a way that there is not much space for movements of aquatics. Moreover, an economic development has taken place at dissonant pace, which has caused severe problems that directly affects natural environments and river scope. Unfortunately, the brush off of these consequences is impossible. The rivers that are influenced by sediment process over time may encounter with severe changes in their direction, linear and phenomenal replacement, category of river, river scope balance, grading, and some of their geometry features. The main focus in this survey is to be more familiar with rivers and some other destructive factors. Moreover, this paper aims to extract more required information from Geophology and biological point of view linked to the purposed controlling design and finally this investigation tries to offer some methods to maintain river valuable resources. The planning phase plays an important role in preventing future exploitation to cause severe damages to the ecology of the river. This phase includes some strategy for the time and way of exploitation.

Sabzivand et al. (2009) surveyed the morphological considerations linked to the initial positioning of exploitations location. First of all they introduced the indices and parameters which play an

important role in the initial act of positioning. Then, after case studies, they calculated the mentioned parameters for Ala River, Khuzestan province. During the preceding survey, the method of morphological study of positioning the initial locations is completely presented.

Rostami et al. (2009) examined the sediment modeling and seasonal organization of sand and gravel pits. Golenjin River located in Boyin Zahra County. The modeling was based on 1 dimensional HEC-6.

Nikmanesh (2006) investigated the erosion of the scope and river beach which was due to the material exploitation. In this survey, the influence of the scope erosion is examined and some useful methods are purposed in order to reduce the exploitations consequences.

Memari et al. (2006) fulfilled a survey by comparison of sediments with the amount of sand and gravel exploitation in the Farub River; they also take impacts of these activities into consideration. In the previous paper, the allowable amount of sand and gravel that can be exploited and the one that relate to recent years is calculated. Therewith, the influence of this exploitation on the sanctum of the river and its morphology is examined.

## MATERIAL AND METHODS

This river originates from the eastern hillside of Zagros Mountains and consists of three sub-river named Gonbad- Chay, Sero- Chay and Arzin-Chay. After it traverses Urmia city, it joins to the Lake Urmia. The Catchment area of Nazlu-Chay is located in the north side of Urmia city and the west side of Lake Urmia. This Catchment coordinates 37 degrees, 27 minutes up to 37 degrees and 59 minute northern widths from the Equator and 44 degrees, 16 minutes up to 44 degrees and 23 minutes eastern length of the Greenwich Hour circle. Indeed, the wide section on the catchment scope of this river is consisted of mountainous areas and Zagros Mountains. So that minor part of this catchment places in turkey and its sub-branch of the Sero - Chay River originated from turkey then enters to Iran. The total area of scope and its sub-branches is stated in following table.

**Table 1.** Total area and sub-branches (Namdar and Ale-Ebrahim,2011)

The area of catchment (Km <sup>2</sup> )	Main and sub branches
1975	Total scope of Nazlu-Chay river
1715	From Nazlu-Chay River till to Tipic Station
506	From Muvana Sub-branch till to Karim Abad Station
215	From sub-branch of Sero till to Sero boundary
635	From Gonbad Sub-branch till to Golkani Station
1003	From Sero Chay till to Ney-Chalan Station

## Scrutiny of polluting resources in Nazlu-Chay River

The most prominent pollutes of Nazlu-Chay river that we can consider are sewage of villages located near the scope of catchment, Industrial places situated near the river and also agriculture slops. The main factor in polluting the river is the sewage of villages close to the

river. This sewage main substance is consisted of the washing water and animals garble. The mainstream of this sewage origin from rivulets. These streams generally follow the wash-aggregation process. This process is depended on the percentage of impenetrable surfaces like road surface (Asphalt), roofs and generally isolated surfaces. The density of pollution within the urban streams is variable and depended on the conditions and season of quality of the drinking Water. The main sources of urban streams are presented in the following table.

**Table 2.** The main sources of urban and village streams located near the river

Pollution Source	Minerals	Suspense Inorganics	Nutritive Materials	Heavy Metals	Bacteria
Animals Garbage	*		*		*
Atmospheric Drops	*		*	*	
Solid Erosion	*	*		*	
Isolated Surface Streams	*	*		*	

The other source of pollution is the use of agriculture poison in antitoxin process. These poisonous substances enter the river through surface waters. As the river is polluted by these poisonous substances, its biological balance and the life of it's animates is endangered. So, the degree of danger of the use of these poisonous substances in agriculture activities depends on the duration and dose of these chemical substances.

### Determination of the Sampling Stations

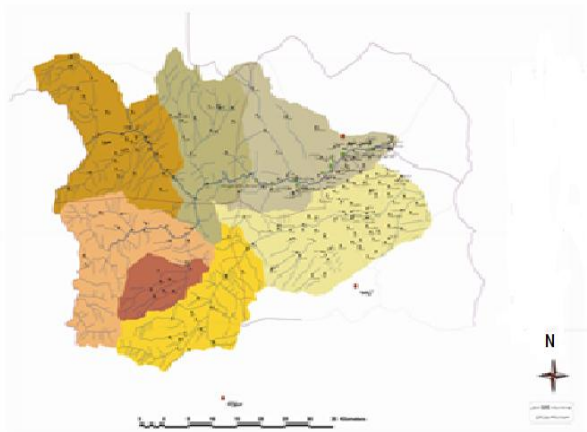
We just have chosen two stations in order to determine and analysis the quality and Physico-Chemical of the Nazlu-Chay water. These two points have major differences in terms of environmental conditions with each other. The main concert is choosing the stations are following:

- Easily accessible even during severe conditions
- Real reflection of water state from the Physico - Chemical and biological point of view
- Taking into consideration of the pollution centers such as industrial units and deployed services near the river
- The entrance place of sewage into the river
- Location of exploitation
- The distance between the stations

Since the first station is located at the exit of river stream, we can easily evaluate the quality of water. The quality of water is so deterministic in comparing the Nazlu-Chay River with those rivers that is polluted and located at below the tracks. The second station is located exactly in place that major exploitation and pollution activities take place to show the negative influence of these activities on the ecology of the river. In the following figure the exact location of stations is illustrated.

In the methodology section a brief description of the study that includes: sampling process of biological and physical -Chemical laboratories, analysis methods, the materials which used in this study, laboratories means and

equipment and finally the range and kinds of parameters which are used on account of the project nature, are discussed.



**Figure 1.** River and sampling stations geographical location

### Sampling Methods

In the predefined stations over duration of study, some measure has been taken monthly and continuously for two phases of biological and physical-chemical in order to sample and analysis of parameters. All the sampling process was done continuously and the result was handed in manual and in composition form. These samples were taken from 20 meters of width of the river with 1 hour interval. The combined samples were held in a polyethylene container in order to do experiments like Power of Hydrogene (PH), Total Suspended Solids (TSS), Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), Opaque, electrical conductivity, temperature, Dissolved oxygen(Do) and Total Dissolved Solid (TDS). These samples also were held in refrigerator below 10 C till the moment that they were handed in to the laboratories. Since the conservation place was close to the sampling locations, the samples were not fixed. Biological sampling of the river was so sensitive and complex when it is compared with the first phase. Because, we faced with living animates then we aimed to sample every kind of species. Fish samples collected by the system in the laminar flow of the river called Electro choker. All fish samples were collected to determine the need and the type of fish has been fixed in 10% formalin. To obtain samples of plankton and algae and benthos and plankton net of mesh of different sizes are used.

### Methods of Measurement and Testing

All tests and assays are done by using standard methods described in the book 1992. All parameters such as PH, turbidity, conductivity, temperature, dissolved oxygen, water (DO) and TDS within the sampling area are measured directly by multi-sensor water analyzer. This device was installed by aid of its manual. The amount of BOD5 is measured via Monomeric method I at  $20 \pm 10^\circ$  C within 5 days. The fish samples which are collected by Loop device with magnification of up to 40x enlargement and these are put under the examine by autopsy Tools.

The species of samples are recognized via Berg Recognition Key (Berg 1949) and Coad Checklist

(Coad/1980.195) mentioned in Abdoly and Vosoughy and Mestiger books respectively published in 1994 and 1992.

### The physical and chemical treats of Nazlu-Chay water at sampling station

The results of the sampling at these stations are presented in the table 3. In this table the average of the measured parameters is stated. Rivers due to several factors, including fast and slow water flow in the river bed, latitude, longitude, dissolved oxygen; water temperature Physico-chemical alterations of water include different biological communities, species, plants and animals. In order to clarify the characteristics of water and sediment discharges from glacier-covered basins. Organisms living in riverine ecosystems so sensitively and accurately reflect water quality conditions in the area and we can also consider them as an efficient cause, changes in water quality conditions, therefore, these creatures like mirrors reflect the condition of ecosystems act.

The act of surveying biological of the Zanlu - Chay river is fulfilled in account of its ecological conditions in order to recognizing its green face beside its aquatic close to the area of investigation by use of sampling method and direct observations and at the predefined stations. According to this study it was deduced that different species of plant like trees, shrubs, herbs and microscopic lives within this river and they are the major nutrition source for its most important fish stocks Called Kapur. The first station is placed at a location which is not so deep and has an appropriate temperature without any pollution and exploitation of sand and gravel that makes it a suitable place for aggregation of minerals which are essential to the growth and proliferation of phytoplankton. The living organism within the ecosystem of flowing water are mostly creatures-living palm (Benthic), which are washed by the velocity of water and maybe are they placed in the stream of water, they are moved to the end point of the river. Thus, the animal must live in died waters like the back surface of the water or on the rocks at the bottom of the bed which is a vital area. Each of the entities represents the quality and quantity state over the passing time. The results of sampling and analysis show that bottom-living organisms in Nazlu-Chay observed in a number of stations including 6 families and 6 genera and more important in a number of sampling stations have been found to be the dominant mode.

**Table 3.** Mean values of the physicochemical Nazlu-Chay River

BOD Mg/l	COD Mg/l	TSS Mg/l	TDS Mg/l	DO Mg/l	Temp °C	Tub JTU	Cond Ms/cm	PH	Geographical Features		Station
									E	N	
1	4	20	500	7.89	8.5	35	0.489	8.03	44° 54.469'	37° 46.510'	1st
3	16.7	98	520	6.75	11	506	0.506	8.10	45° 03.035'	37° 42.289'	2nd

## RESULTS AND DISCUSSION

### Physical and chemical influence of sand and gravel exploitation

Excessive exploitation of river bed has led to increase in destructive influences of the mechanical pollution and changes in morphodynamic within the area

of exploitation. These alterations are not limited to the specific parts of the exploitation, but these changes can be observed in up and below areas so clearly. These changes result in changes in the composition and balance of the ecology of the river, the river's aquatic and reproductive function in the ecosystem and the river regime has fallen sharply. Studies performed during the study, interpretation and analysis of experimental results show that uncontrolled exploitation and removal of sand from the river bed Nazlu-Chay cause severe disorder in biological and ecological balance of the river. So that three fundamental changes in the physicochemical quality of water, alteration of natural water flow patterns, resulting in changes in the deeper sections of the river bed and the longitudinal and transverse resonance riverside erosion and improving the environment with the materials suspended sediment (TSS) in the discharged water used for washing the sand has occurred. The biological effects of harvesting on three important groups of Zistmandan river sand have been studied. Although exploitation of sand and gravel has its drawbacks but this operation was not the main cause of entrance of sediment material to the river, but the main cause of this phenomena should be traced in agriculture activities close to the bed of the river.

#### **The influence of exploitation of aquatic plants of Nazlu-Chay**

Opacity over the river and deposited silt and mud within the lower classes and the instability of the river due to sand harvesting has reduced the population of aquatic plants such as algae and microfitte at the second station even these factors has led to extinguish of these aquatic plants. River opacity reduced population of diatoms and amount to about 95 percent in the second station to the first station is reduced and clean. The settling of suspended sediment deposition on plants has limited the gas exchange and photosynthesis activities are decreased and plant led to asphyxia in the long-term.

#### **The influence of exploitation on river benthos**

Experimental investigation shows failure to act of collecting river benthos at Station Number Two. Suspended mineral composition of sand removal activities, effluent discharge and structural changes in benthic communities on the excavation of the river bed and biomass (active) decomposition of organic material having a negative effect. The population density is greatly reduced so that at the lower kilometers of the place up to 95%, this reduction was observable.

#### **The influence of exploitation of Fish populations**

Deposition of suspended shows its negative effects observable by blocking the grill of fishes. If the density of the suspended solids load is high fish respiratory system will be impaired and cause their death. Investigation has proved that 3 types of species that were detected at the high level of exploitation location close to the river border were not observed in the lower areas of 2<sup>nd</sup> station. Removal of sand from the river bed causing fish to migrate upstream, where the river bed erosion has damages spawning areas and has had deleterious effects on the reproductive and spawning of fish species in the river. River suspended sediment material is considered as an obstacle to fish feeding and fish feeding are more or

less inhibited. Disruption of feeding linked to fish species depends on density of suspended sediment concentration.

#### **Environmental consequences of exploitations operation in Nazlu-Chay River**

Environmental effects of river sand mining in the study area are easy to see. Lack of control is the main cause of damages to river and beach area's ecosystem. According to surveys collected, the most of exploitation is done from the bottom of the river bed and its coastal zones. Negative effects of removing sand exploitation are not confined to the area and has spread to other parts of the river systems and coastal. The consequences of perceptions, excessive consumption of resources and exploitation of sand and suspended sediment includes the followings: decreased self-purification capacity of rivers to absorb organic matter, reduce and degrade water quality requirements.

#### **CONCLUSION**

Sand extraction projects and the construction and deployment of sand gradation industrial in the river have been increasingly at odds with biological systems and ecological conditions of the river. Since most of exploitations are limited to the business purposes such as industrial uses like production of required materials is construction of road, concrete, embankment and landscaping and also these exploitations are done in several areas and at various time intervals so these activities drawback are somehow safer. Studies show that the rate of extraction of sand from the river store is not in harmony with the amount of its storage and so no time is being left for renewable of sands. Extractions of alluvial of river bed or near riverbeds are likely to impact on physicochemical parameters. Most importantly, uncontrolled harvesting of sand from the river bed has negative impacts on its physical parameters of such as bed height, composition and stability of the earth, the ripples of the river, depth, velocity, transparency, local precipitation, river discharge, water temperature and dissolved oxygen. The direct effect of violence exploitation includes the followings: hydraulic items alterations, changes in the location and morphology of river bed sediments which is directly affected by human activities such as uncontrolled exploitation of sand. Changes in habitat and physicochemical parameters of water may have negative consequences on the community's proximate and critical habitat in rivers and its marginal areas.

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