

Study on the changes of the quality of the Karoun River at Khouzestan Plain in the View of Agricultural Usages and its Environmental Effects

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ABSTRACT

The Karoun River flows in Khouzestan flat plain and provides all aquatic needs for adjacent industrial, urban and agricultural centers, directly or in indirect aspect, while, it has a close ditch basin, too. Consequently, study of the quality of the Karoun River and some arrangements for reducing its pollutions is considered as a necessary matter. Data related to the agricultural and drinking parameters from 12 stations, consist of TDS and SAR precipitations, and EC, as from Mehr 1364 (Oct. 1985) up to Shahrivar 1372 (Sept. 1993), and data related to the environmental qualifications from 11 stations, consist of COD, BOD5, turbidity and colyform. The entire data has been prepared and after statistical calculations, the related results will be presented graphs and tables for each of parameters, finally, each parameter will be compared with its acceptable standards in the field of agricultural and drinking usages. and in order to reduction the bad effects of the problematic parameter, a propose will be presented. General study has indicated that:

- 1) Most of those studying parameters that have effective role - in decrease of the quality of the Karoun River, have an increasing process.
- 2) Polluters and effective qualifications in reduction of the quality of tile Karoun River, along the direction, from the beginning of Khouzestan Plain, have an increasing process, because of population growth and increase in industrial, urban and agricultural centers at the border of the river.
- 3) Although the Karoun River has a good auto-purification ability, but in some regions, because of the polluter centers holding a center or outside-center, this auto-purification ability may not be able to eliminate all polluter facts and some times we observe the increase in some of those polluters more than the standard levels.

Key words: karun River, Agricultural, plain, enviromental.

Introduction

During the time, the most important civilizations have been formed along the large rivers and have developed by the same rivers. It is evident that unreasonable usage and following it, pollution of the rivers, will have irretrievable destructive effects on all development aspects by them. In order to achieve to this objective, it is necessary that a comprehensive data from the past and present times of the river to be prepared, and the interfering important parameters in reduction its quality be identified, and the amount of each of them be compared with the determined standards limits. As from the time that human understood the diseases transition through the polluted water, up to now, a lot of studies have been fulfilled on the methods of water pollution, types of pollution quality and different methods

to eliminate the polluters from the water resources. The Karoun River is one of largest and longest rivers in Iran and Persian Golf Ditch Basin and Oman Sea, its source is located at Zardkough Bakhtiari in a place named Kouhrang, in 890 kilometers length, and 360 kilometers of it flows in Khouzestan Plain. This issue is showed that:

- 1) Study of the changes in water quality of the Karoun River in the agricultural usages view
- 2) Study of the pollution changes of the Karoun River by industrial sewages
- 3) Study of the pollution changes of the Karoun River by agricultural sewages.
- 4) Study of the pollution changes by urban sewages
- 5) Study of the Karoun River polluters (DO, BOD5, COD, turbidity and colyform)

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For the first time, famous formula of Messrs Straighter-Fleps, for prediction the amount of oxygen, solution in the rivers has been presented in the year (1925). This relation has been written for studying the Ohio River in the United State. After Straighter and Feleps, the other scientists extended the range of these studies for different rivers in the world that Fier (1939), Mohr (1950), Churchill (1975), Hall (1960) and Buckingham (1922) studies may be pointed.

Those studies that have been fulfilled on the rivers in the recent years, many effective factors on auto-purification have been studied. Ocanes (1966) analyzed the distribution of solution oxygen in the "East" River in the United States.

Shoubret (1980) studied the restrictor factors on microbial auto-purification and qualification of the preventive effects of toxic materials in the water receiving the polluted sewages on the refiner bacteria of the river. Tasnin and his colleagues (1987) studied the constant amount of oxygen absorption in 6 low-depth rivers such as Macrofit

in Denmark. Marto and his colleagues (1989) studied the effect of flow rate of the presence solution oxygen in the river at the source and the end of Kanonigo Hydroactric power plant in Meriland. They proved that DO dynamic. basically, the oxygen requirements of the precipitations on the bottorn of the river, by application a simple method for BOD examine on the Danoub River, located at Austria were studied, and observed that the required oxygen for precipitations, consisting of two chemical and biological parts. One of the studies that has been fulfilled in Iran, consists of the researches by the experts of Environment Preserving Organization and following departments. One of the rivers that has been studied, we can point to the Zarjoub River in Rasht city that the studies on this river consist of studying of the pollution of the Zarjoub River, in Rasht city, determination of the polluter resources, by Parvin Binaei Motlagh (2002), determination of the amount and changes of Azoth and Phosphor in the Zarjoub River, Rasht City by Gholamali Salehi (2002), studying on the Kor River and determination of the polluter resources of it by Meraj Madadi (2000), all these studies indicate the importance of the consideration to water resources and surface water qualifications as an available water for different usages.

Material and Methods

The Karoun River is one of largest and longest rivers in Iran and Persian Golf Ditch Basin and Oman Sea, its source is located at Zardkouh Bakhtiari in a place named Kouhrang, in 890 kilometers length, and 360 kilometers of it

flows in Khouzestan Plain. Annually volume of water in it is more than 24 billions cubic meters and its time average watering has been measured 736.5 cubic meters per second. Optimum usage of aquatic resources and their adjacent lands (land preparation) and also presenting of development plans with consideration to the environment preserving (steady development) need the awareness about the current quality of water and lands of the region, effective facts in quality change and future status of these resources. In this direction, awareness about the current status of the Karoun River and the amount of the changes in the interference parameters on the quality of the water of the Karoun River along the direction of the river is the main objective.

The data related to the agricultural and drinking parameters from 12 stations, consists of TDS, SAR, precipitations and EC, as from Mehr 1346 (Oct. 1967) up to Shahrivar 1372 (Sept. 1993), and the data related to the environmental qualifications from 11 stations, consist of COD, BOD5, turbidity and colyform. In this research, because of the following reasons: 1) spread of the region and length of the river direction, 2) studying of a lot of parameters, 3) time limitations of the measured amounts by the Ministry of Agriculture, Industry and also Environment Organization and some of Consulting Engineering Co. These measurements have been fulfilled monthly and all of them have been as figures and each of the above-mentioned centers have fulfilled them with consideration to their own requires. After data gathering and accurate studying, classification and comparison between the data of different centers and determining of unknown amounts helping the statistic calculations, are performed, and the final results as a graph and table will be presented. Finally, in order to comparison and determination of the accuracy of the present data from two stations, at the border of the Karoun River, that we selected 6 parameters randomly, we will measure and helping t-student method, we compare them with the present data, such a way that any meaningful differences would not be in none of the items of the sampled numbers.

Study of water quality changes of the Karoun River in the agricultural usages view

Study of the precipitations in the Karoun River

The Karoun River may transport a large amount of materials and leave it on Khouzestan Plain where is in a low slope (0.5 per thousand), and also the flow water arising from the rainfall has not been without effect to transport of the precipitations at Khouzestan Plain. and together with the precipitations arising from the corrosion of the river coasts, have a major role for increase

of the amount of precipitations. These precipitations are transported up to the end of the direction and go out of the system or precipitate along the river direction and produce some islands along the river bed that will be led to either reduction of the total potential of the water of the river transportation or with consideration to the moment energy of the river cause to wide the river bed and make some parts of the river bed to be depth.

Conclusion:

Study of TDS of the Karoun River:

Increasing of TDS may be seen because of passing through those regions that have some soils having 504, Cl and HCO₃ compounds. The other major reason is a region with fine granules soil, steady with low thickness and stasis surface in a low depth. Being high of the underground water will be an important fact in increase of the solution mines (T.D.S.).

SAR changes (as compared with Na (sodium) absorption) in the Karoun River These changes are a combination of the cations changes in the water of the river that is an increasing process. Unforeseen changes in SAR is because of the increase of the amount of Sodium in the water of the river by drainage of returned agricultural waters from the lands adjacent to the river and it is clear that increase in the amount of Sodium has an important role in increase of SAR in the water of the river.

EC (electrical conduction) changes in the water of the Karoun River:

Electrical conduction consists of the water electricity transfer, has a direct relation with the amount and type of the ionized mines in the water. EC is as the most important parameter for examination the irrigation water quality, because non-performance of accurate management in usage of these type of water cause the soil would become salty and consequently, decreasing in fertilizing and reduction of the product utilization.

Changes process of EC is increasing. The most important facts in EC increase consist of the return of drainage water of the agricultural lands to the river, evaporation from the surface, being height of the surface of the underground water, passing of the river from the regions contain Cl, Sulfates and Bicarbonates. EC reduction may be seen, only in some regions of the river direction, because of reduction of the numbers of the returned directions of the water drainage to the river. EC increase will cause to decrease in the amount of the products. The amount of the product reduction has a direct relation with EC increase in irrigation water and it would happen

when the irrigation water would be used only for the requirement amount for the plant and it would not be used more in order to wash the mines.

Agricultural acceptable limitation for EC is equal to 750 micro-mhos/cm and the maximum permitted EC for drinking is 1250 micro-mhos/cm.

Study of the pollution changes in the Karoun River in the environmental view

The Karoun River encounters to danger by the polluter resources holding the related centers (industrial, urban and agricultural) and polluter without any center (dispersed and undetermined sewages that are evacuated to the Karoun River). At the border of the Karoun River, 37 industrial important centers and also agricultural farms, urban and rural assembling centers evacuate their wastewater to the Karoun River. One of the most important environmental parameters that are introducers for the Karoun River pollution, are as follows:

A) Study of BOD5 of the Karoun River:

BOD5 process is increasing as from 15-Kilometer of the northern side of Ahvaz to 35-Kilometer of the southern side of Ahvaz. This increase of BOD5 may be predictable as the following reasons:

- 1- Presence of different factories in the northern, center and southern sides of Ahvaz
- 2- Evacuation of sanitary sewages arising from human, slaughter and hospital activities to the Karoun River.
- 3- Concentration of rural population in the southern side of Ahvaz and BOD5 reduction in some regions, because of lack of major industrial-polluter centers of the river rural dispersion.

B) COD study of the Karoun River:

COD changes are as the same as BOD5 (but the amount of COD is some times of BOD5). The only remarkable reduction difference case for COD is at 30-Kilometer part of the southern side of Ahvaz. The reason for this matter is remarkable reduction in industrial sewages in this area.

C) Turbidity study of the Karoun River:

General process for turbidity changes is increasing that because of increase in suspension materials along the River at Khouzeestan plain.

- Agricultural sewages:

Water drainage of the farms under cultivation of flow water after rainfall in the farms is in the

group of agricultural sewages. This type of sewages has a wide range of chemical materials and elements such as fertilizers, fortifiers materials, herbicides. elements such as Na, K, Mg, N, P, mines and precipitations. Entrance of each of these materials will cause a lot of problems in the environmental view.

The Karoun River is one of the acceptor rivers of these pollutants. Although in the current situation, the amount of agricultural pollutants is not in critical limit, but with consideration to the plans for extension of concentrated agriculture that will put into operation in a near future, the danger alarm for the bad effects of the above-mentioned materials must be ringed. Total lands under water cultivation where are by the Karoun River at Khouzestan Plain, are 123,000 hectares and with consideration to the adjacent lands of the river, is about 300,000 hectares. Mostly, in dispersed aspect or some of them are in concentrated aspect (Karoun Cultivation and Industry) are under cultivation of corns (53%), rice (6.8%), sugar cane (7%), grains (2.2%). Sugar beet (1.2%), citrus fruits (1 %) and types of vegetables and patches (14.4%), and other products.

- Sanitary (Urban) Sewages:

While the cities and villages located at the direction of the Karoun River take the required water for the urban activities from the river, they evacuate the consumed water and wastewater to the river, again. Generally, these cities and villages do not have any sewages treatment system, and if they have any treatment system, they have not been operated yet, or if they have been used for a short time, they have been interrupted because of some problems in operation system. Because of the height of the underground water, drain from the around lands to the treatment network are a lot, therefore, the urban wastewater may be studied in the view of adding TDS, suspension solid materials, organics, Cl, S04 and BOD.

- Industrial Sewages:

The Karoun River at Khouzestan Plain is acceptor for types of urban (sanitary), agricultural and industrial sewages. Consequently, a wide range of physical, chemical and biological pollutants enter to the Karoun River, although the Karoun river may eliminate a lot of amount of entered pollutants (auto-purification) because of its high flow rate, but increase of the pollution amount more than the capacity of the river would cause irreversible effects. Different industries that have been established by the Karoun River, use their

required water from Karoun and the wastewater arising from their activities are poured to the river again. This pollution is different for each field of industry. For example, those industries that are producers of food stuffs, ordinary have more BOD5 and vice versa, waste waters of metal industries cause problems in the view of metal materials and generally; heavy metals. Some of the industries adjacent to the Karoun River consist of Ahvaz Roller and Pipe Plant, Steel National Group, Ahvaz Steel Complex, Kavian Roller Plant, Khouzestan Pipe Manufacturing Plant. Soulforin Company, Karoun Paper Mill and so on.

Results and Discussion

All effective parameters on the quality of the water of the Karoun River. either in the agricultural, urban or industrial views has an increasing process along the direction of the Karoun River that some of these reasons are pH, K and P are less than critical limitations and the other group such as TDS, precipitations, turbidity and EC sometimes are seen more than the acceptable limitations that a solution must be thought for their controlling, while urban development (population increase), industrial development (the plan for establishment of Karoun 1800-megawatt Atomic Power Plant) and agricultural development (activation of the centers for sugar cane development at the southern side of Ahvaz that is more than 70,000 hectares) would not produce so hopeful landscape in front of our eyes and the same facts must be a reason for the effort more than past time about this vital problem.

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