Quality Assessment of Karkheh River on the Basis of Aq. Qa in Iran

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ABSTRACT

Rivers have special role on the sources of sweet water for the industry, agriculture and urban sections utilization. Beside permanent rivers with amplitude and simple availability of desirable water, there is often no anxiety about water quality and unfortunately, incorrect an irregular utilization of rivers water and considering water deficit tension an industrial development in Iran, planning and examination river water quality and utilization management is one of the most vital issues which has to be considered. Karkheh River emanate from middle and west south of regions of Zagros mountain in west and west south of country. Karkheh latrine zone with two sub zones Simereh and Kashkan is located in states Lorestan and Khorramabad. The river water utilization regarding the recent drouth and increasing mineral content in the river and salinity and mineral increasing threat in agricultural lands, utilization management of this river is mandatory. The studied subzone, Kashkan contains 8 sampling satati ons on the river and sub branches, which have been analyzed and sampled. The data received from these stations were transformed to seasonal data and generally 352 nombers relative to (NH4+, NO3-, PO43- , DO , BOD , COD) were input to Aq. Qa. Software and salinity risk because of irrigation and water kind in 8 stations and 4 seasons were avowed. The results show that in utilization management of river water for agriculture, station 2 in summer season, station 3, 6 and 7 in all seasons, station 4 in winter and fall and station 8, 5 in spring and summer, salinity risk is high and water using is not recommended. Depending on the water kind, the river is arranged in 4 types (N-PO4- N-NO3- N-OH- NH4-P O4) and except of station 2, in all the stations, the water type in different seasons changes.

Key words:

Introduction

As the main sources supplying the drinking water of the urban and rural regions through the countries, rivers play important role for human health and environment safety. However, unfortunately, by improper and irregular exploitation of streams’ water during recent years man resulted in pollution in the most fundamental living liquid [2].

Karaj stream originated from the middle and western south regions of Zagros Mountain in the west and south west of the country. Basin of Karkhe River, with its two sub-basins, Simareh and Kashkan, has been located in Lorestan and Khorram Abad provinces. Using the river water, considering recent droughs and increased minerals in the river as well as risk of salinity and increased minerals in the agricultural lands all indicate the necessity of exploitation management of such rivers. This research is studying a part of sub-basins of Kashan and Simareh located in the Karkhe basin. Total area of study is 64688 km2. Total area of Simareh are is 16423.4 km2, and Kashkan is 9498 km2, with 22% of Simareh area and 30% of Kashkan area are located in this study range.

Main Polluting Sources of Study Area:

Because this study area topographically has high latitude and located in a specific area, so there is no
specific industry located there. Table 1 indicated the pollutants of study area and the source where accepting such pollutions.

Main factors for measuring the water quality categorized into four groups: (1) total density of dissolved salts (2) relative concentration of sodium than other Cations (3) concentration of heavy metals (4) content of bicarbonate

**Total Density of Dissolved Salts:**

Due to irrigation, even with desirable quality, the content of salts will be increased annually such that it seriously decreases the soil fertility. Total content of salts can be easily and accurately determined by electric conduction. According to the USDA, 1954, classification, electric conduction has been indicated between 0.1 to more than 2.25 dS/m. figure 1 indicates four classes of salinity. C1, low salinity: it can be used for irrigating most plant. It is unlikely that soil becomes salty in the pollutant, unless soils with very low water conduction, it needs some leaching. C2, average salinity: one can irrigate plants tolerable against average salinity without needing any specific activity for salinity control. C3, high salinity: it may not be sued for less drainable soils. Such soils require specific management for controlling the salinity besides draining. High tolerant plants must be selected. C4, very high salinity: it may not be used for irrigation normally but it may be used under specific environmental conditions. Soil is required to be permeable and with suitable drainage. Beside irrigation, it is necessary to add considerable amount of water for leaching the additional salts. It is required to culture very high tolerable plants to salinity in such regions [7].

There are different methods for determining the water quality by chemical analysis. Indicating such analysis by graphs can be more comprehended. Some of such graphs include Piper, Schoeller, star diagrams, etc… [9]. According to Piper graph, water quality may be grouped as follows:

- Calcium type
- Magnesium type
- Bicarbonate type
- Chlorine type
- Without any specific type
- Sodium & Potassium type
- Sulfate type

**Literature Review:**

Firoozbakht (1997) studied on the pollution status of Karoon River in Khozeestan plain and dealt with its temporal and spatial changes. Results from most studied parameters indicated that in recent years the contents of average pollutions was desirable to maximum allowable [4]. In their study, Pourmohammad and Rahimi Nejad (1997) about changes of water quality in Zayandeh Rood concluded that the salinity of its water in the lowermost part of the river has increasingly been increased such that it is not suitable for being used in agriculture. [4]. Abolghasemi Rahim Abadi (1999) studied the pollutants of water quality of Zayandeh Rood and concluded that the water quality of Zayandeh Rood has no problem before entering to Zarin Shahr, but between Zarin Shahr and Isfahan, where there are many industrial, civil and agricultural discharges to its river, its quality is decreasing. From the east of Isfahan to Gave Khooni marsh, its water quality has been decreased due to discharges of wastewaters of treatment houses from South Isfahan and even after Farfan Bridge, it is not possible to use its water for agricultural purposes [1]. Soltani Mohammadi A. (2006) studied the water quality of Zayandeh rood for agricultural purposes and in all stations, from Ahvaz to Khoramshahr, the water quality according to exchangeable sodium ion was grouped in class 1 and its salinity in class 3 [4].

Studying the springs, surface and ground waters in Troia, Turkey, Ozcan Hasan (2007) drawing the Piper, Schoeller and Wilcox diagrams for 25 samples, determined the types of sampled eaters for most samples of Mg-Cl-HCO3 and for three samples Na-HCO3 [8].

Studying the quality of ground waters of Tumkur Karnataka, India, Sadashivaiah, C. (2008) drew Piper diagram for two stations and determined the type of water for studied area for Ca-Mg-HCO3 [9].

Using Aq.Qa software, Mohseni Far. K. (2008) determined the water quality of Zayandeh Rood for agricultural usage for 10 stations and 4 years of time and stated that river is qualitatively in a bad situation.

**Materials and Methods**

Studied sub-basin, Kashkan, includes 8 sampling stations on the river and its sub-branches, so such stations were being sampled. Data obtained from these stations change to seasonal data and additionally 352 data for PO43-, NO3-, NH4+, DO, BOD, COD, turbidity, coli form, and nitrogen entered to Aq.Qa software and then there was determined the salinity risk for irrigation and type of water in 8 stations and 4 seasons.

**Results:**

Determining the water quality, there was used Aq. Qa V.1 software. In the software, entering the parameters for PO43-, NO3-, NH4+, DO, BOD, COD, turbidity, coli form, and nitrogen, there was determined the water quality and using software, the water type was given.
Table 1: Pollutants and accepting sources.

<table>
<thead>
<tr>
<th>Item</th>
<th>Name of unit</th>
<th>Accepting source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Unit for producing the sand from Helilan Sadaf Co., located at Shir, Ancherdaul, Helilan</td>
<td>Simareh River</td>
</tr>
<tr>
<td>2</td>
<td>Output of Noorabad wastewater</td>
<td>Kashkan River</td>
</tr>
<tr>
<td>3</td>
<td>Aligoodarz water treatment</td>
<td>Kashkan River</td>
</tr>
</tbody>
</table>

Fig. 1: Classification of irrigating water according to salinity and sodium content risk (USDA, 1954, 1954) [7].

Fig. 2: Piper Diagram [9].
Fig. 3: Salinity risk in different stations during different seasons.

Table 2: Water type in all other stations changed

<table>
<thead>
<tr>
<th>Stations</th>
<th>Water Type</th>
<th>Spring</th>
<th>Summer</th>
<th>autumn</th>
<th>winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N-PO4</td>
<td>N-PO4</td>
<td>N-NO3</td>
<td>N-NO3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>N-NO3</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>NH4-PO4</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>N-NO3</td>
<td>N-NO3</td>
<td>N-NO3</td>
<td>N-NO3</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>N-PO4</td>
<td>N-PO4</td>
<td>N-NO3</td>
<td>N-NO3</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>N-OH</td>
<td>High</td>
<td>Medium</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>N-PO4</td>
<td>N-PO4</td>
<td>N-NO3</td>
<td>N-NO3</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>N-OH</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td></td>
</tr>
</tbody>
</table>

Results indicate that for exploitation management, there are used water river for agricultural usage, the salinity risk is higher in station 2 during summer, stations 3, 6 & 7 during all seasons, station 4 during winter and fall and stations 8 & 5 during spring and summer, so it is not recommended to use their water in such seasons. Considering the water type, river was categorized in four types (N-PO4, N-NO3, N-OH, NH4-PO4) and except station 2, the water type in all other stations changed (table2).

Recommendations:

As indicated in figure 3, and reduced rain falls, the river quality is mostly undesirable and in most stations it is N-NO3. If irregular exploitation continues with entering different pollutions to the river and according to the recent droughts, it is anticipated that in future years, the water quality of Zayande Rood reduces seriously. Therefore, it is recommended to manage and plan for exploitation of this river considering the rainfall content and river quality.

References