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The Quality Assessment of Kan River's Resources in Terms of Agricultural and Drinking Purposes

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Abstract: The quality assessment of water resources is one of the ways of using water quality management as a powerful management tool for relevant decision making. The main purpose of this study was to evaluate the quality of flood water resources of the West with regard to the parameters of physics and chemistry and heavy metals and its effect on the Ken River. The present study was an experimental-laboratory study in which the data collection was based on the collected data of field and documentation studies. In this research, the quality process of Kan River's resources based on the examined results of qualitative parameters were analyzed in details. For this purpose, first of all, the results of the analysis of the collected samples for one year were carried out to measure the physical and chemical parameters in 3stations. Heavy metals parameters are turbidity, Oxygen required for chemical usage, Oxygen required for biological usage, Phosphate, Nitrate, total soluble solids, electrical conductivity, pH, total Coliform and gastrointestinal Coliform, and Anions and Cations, according to the above parameters compared to the presentation of the process of quality changes along the river course and its impacts on agricultural and drinking uses were discussed. The results indicate that according to the results of the qualitative status of the water resources of the river, the range of the project due to the presence of heavy metals (Mercury, Cadmium, Manganese, and Chromium) which are above the limitations for agricultural use, the accumulation of heavy metals in the soil causes pollution of agricultural lands And through the soil-plant-animal cycle it may be at a human toxicity threshold. Also, the quality status of water resources of rivers in the project area is in moderate to good levels in terms of chemical parameters for drinking, but due to the quality of the heavy elements and the biological status and water pollution, drinking is not feasible.

Keywords: Agricultural and drinking usage, Heavy metals, Kan River, Qualitative evaluation, Water resources.

1. Introduction:

preserving water resources and controlling its pollution is an issue in the infrastructure of the country. Monitoring of surface waters for different uses is an imperative and necessary task in order to provide consumers with a suitable quality of water for different uses. Despite the fact that water is one of the most abundant compounds found in nature, factors such as heterogeneous geographical distribution, non-matching time distribution with water usage pattern and increasing population of the world, reduce the quality of available water resources. Therefore, while the need to use available water resources is urgently needed, attention must be paid to protecting it from pollution. Water quality is a determinant factor for human well-being and welfare. Now, in societies Rivers have long been considered by human societies and towns and industrial and agricultural centers have been in the proximity of the rivers to benefit from water resources. World population growth in recent decades and increasing of demands for nutrition and hygiene growth has led to an increase in capitation of water use and reduction of water resources. Unfortunately, in our country, excessive use of chemical fertilizers, pesticides, and plant diseases leads to an increase in the severity of pollutant sources of water that are sufficiently contaminated by passing through cities and villages. Considering that changes in the environment are affected by the decrease or increase of chemical substances, therefore, the necessity of having a strategy and program for

al., 2015) conducted a study on the contamination of greens with heavy metals by irrigation with urban runoff in the United States. The results showed that untreated surface runoff irrigation is truly possible, provided that suitable products are selected and the environment is regularly plowed. (Hu et al., 2015) examined the distribution of heavy metals in the last century and the relationship between heavy metals and human activities in the coastal area of the Changjiang River. They collected and tested forty-three samples of surface deposition for this purpose and found that the concentrations of metals at the entrance of the river were higher and by moving to the northeast, the concentration was reduced. (Liu et al., 2015) examined the distribution of heavy metals in the surface water sources of the Luanhe River in the northwest of the Bohai Sea (China). With the removal of 33 sediment samples from this river and their analysis to determine the spatial distribution of sediment and its ecological risk, they found that the concentration of metals in the mouth of the river and the southern regions is higher. Meanwhile, the resources of Zinc, Nickel, Cadmium, Mercury, and Chromium were found mainly from river and river flows, while the source of Copper, Lead and Arsenic was determined from the output of cars and the burning of coal and oil. that have contaminated water with bacteria and chemicals, the prevalence of diseases is inevitable, and many deaths are due to water pollution.

At present, a large part of the surface water resources of Tehran province are controlled and harvested by reservoir dams, pumping stations, interspersed reservoirs, and exploitation of groundwater resources is more than permitted capacity. However, water scarcity is evident in all consumer sectors, including agriculture, drinking, and industry. In addition to quantitative lack of water resources, the quality of water resources, especially in urban and rural areas around Tehran, is not well-suited. Due to the fact that there are agricultural lands around Tehran and one of the sources of irrigation of agricultural lands are the surface waters of Tehran, therefore, the necessity to study the surface water pollution in Tehran is quite obvious. The advent of these pollutants into agricultural and groundwater areas is due to the effects of non-pollution and surface runoffs' lack of control in Tehran. The main objective of this study is to evaluate the quality of flood water resources of the West with consideration of physicochemical parameters and heavy metals and its effect on the Ken River. There has been a great deal of research in this field, both nationally and regionally, which will be manifest to a number of them.(McCarthy et

2. Data and methodology:

World Health Organization (WHO) and the indicators of river water quality (NSFWQI, Schuler, Wilcox, etc.) in the area of the study, were compared for use of surface runoffs, and the possibility of using this water for various uses has been investigated. These parameters include heavy metals, turbidity; chemical oxygen demand, biochemical oxygen demand Phosphate, Nitrate, total soluble solids, electrical conductivity, ph, total coliform and coliform bacteria and anions and cations, respectively. According to the above - mentioned parameters, the trend of quality changes along the river route has been presented. Measurement of the quality parameters of the West runoff of Kan River was continued in three stations during the seven months from September 2016 to March 2017. Because of the existence of the information in the archive in Laboratory of Regional Water on the qualitative control of the water resources of the province on June 2016, the experimentation was done again, in order to study the more accurate and detailed trend Changes in the scope of the study which presented based on four seasons from summer of 2016 to spring of 2017.

This study is experimental-laboratory and practical. The population of this study is a surface runoff of west of the Kan River in Tehran. River Kan or Solghan River is 33 km long, which originated from the Tochal Mountain. It passes through Tehran and it's drying south of Tehran. This river is today the most abundant river that passes through Tehran. Ken River, as the largest current river in Tehran, plays an important role in the environmental and agricultural conditions of this province. Considering the wide range of the river's basin (about 215 square kilometers) in Tehran province extends from north to south, and the most important drainage is the surface sewage transmission of the central and southern part of Tehran, at the end of its route, enters to the southern agricultural lands of Tehran and their water reaches for irrigation of these lands and eventually reaches the brine. In this study, the surface water of the west of the Kan River, in terms of physical, chemical and microbiological parameters with the standards of the Organization of the Environment of Iran and the guidelines of the Food and Agriculture Organization (FAO), the

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Table 1 - Measuring stations and their specifications

explanations	Measurement type	Station's name	Number of station
The quality of west runoff	Qualitative	The end of the West Flood	1
Investigation of the Quality of Changes in Outlet Water in Mountain Range of Kan	Qualitative	Sulaghan Station	2
Investigating the Quality Changes of Kan River's water	Qualitative	Jahan Abad station	3

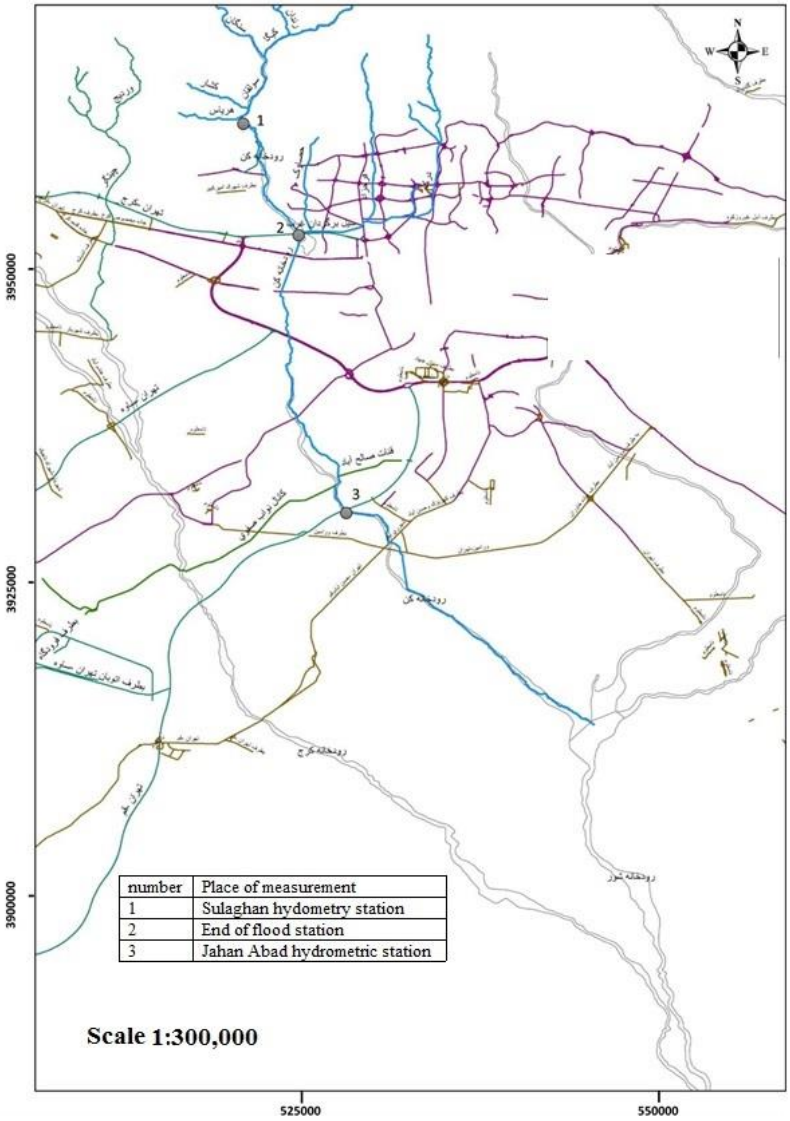

Fig. 1. Location of Quality Measurement Stations Kan River

3. Findings and Discussion:

Based on the research objectives in identifying the quality of Kan river's water resources, the study of

Water quality categorization for agricultural use

River's water has been categorized into two parts of general quality and special quality (toxic elements) as from agricultural usage.The general qualitative parameters are in fact, chemical non-poison elements that are commonly found in water resources, and it is used in irrigation water classification. Specific classification of toxic metals is heavy metals that should be separately evaluated.

the process of spatial and temporal changes of the physical, chemical, microbial and heavy metals parameters of the Kan river was considered. According to the number of sampling and planning performed in this regard, sampling was carried out in Tehran Regional Water Laboratory and the results of water quality parameters include heavy metals - turbidity, required Oxygen for chemical usage, Oxygen required for biological activity, Phosphate, Nitrate, total soluble solids, conductivity Electrical, PH, anions, cations, whole coliform and gastrointestinal coliform and heavy metals.

Table 2: Quality status of Kan River's water resources (Sulaghan station) based on the number of heavy metals in agricultural consumption.

Sampling location	Toxic and heavy metal's name	Maximum Allowable Irrigation Standard (WHO)	Mean concentration per month (mg / L)				qualification
			Spring 2017	Winter 2016	Autumn 2016	Summer 2016	
Khan River - Sulaghan Station	Mercury	0.01	0.43	0.65	0.81	0.95	Inappropriate
	Zinc	2	0.12	0.18	0.1	0.17	appropriate
	Cadmium	0.01	0.04	0.022	0.035	0.06	Inappropriate
	Cobalt	0.05	0.02	0.034	0.02	0.03	appropriate
	Copper	0.02	0.02	0.018	0.015	0.025	Inappropriate
	Manganese	0.2	0.42	0.72	0.65	0.8	Inappropriate
	Lead	5	0.18	0.24	0.15	0.3	Appropriate
	Chrome	0.1	0.13	0.14	0.2	0.25	Inappropriate

Table 3: Quality status of river water resources (West Aziz station) based on the number of heavy metals in agricultural consumption

Sampling location	Toxic and heavy metal's name	Maximum Allowable Irrigation Standard (WHO)	Mean concentration per month (mg / L)				Qualification
			Spring 2017	Winter 2016	Autumn 2016	Summer 2016	
River Kan - West Coast station	Mercury	0.01	1.02	1.08	1.88	1.9	Inappropriate
	Zink	2	0.15	0.21	0.14	0.23	Appropriate
	Cadmium	0.01	0.11	0.15	0.21	0.25	Inappropriate
	Cobalt	0.05	0.02	0.037	0.034	0.04	Appropriate
	Copper	0.02	0.03	0.036	0.055	0.08	Inappropriate
	Manganese	0.2	0.98	1.35	1.1	1.4	Inappropriate
	Lead	5	0.41	0.37	0.32	0.48	Appropriate
	Chrome	0.1	0.24	0.28	0.29	0.31	Inappropriate

Table 4: Quality status of the Kan River's water resources (Jahan Abad station) based on the number of heavy metals in agricultural consumption

Sampling location	Toxic and heavy metal's name	Maximum Allowable Irrigation Standard (WHO)	Mean concentration per month (mg / L)				qualification
			Spring 2017	Winter 2016	Autumn 2016	Summer 2016	
Kan River - Jahan Abad station	Mercury	0.01	0.51	0.71	0.86	1.1	Inappropriate
	Zink	2	0.12	0.145	0.117	0.16	Appropriate
	Cadmium	0.01	0.07	0.08	0.054	0.08	Inappropriate
	Cobalt	0.05	0.03	0.029	0.021	0.03	Appropriate
	Copper	0.02	0.01	0.02	0.025	0.028	Inappropriate
	Manganese	0.2	0.65	1.1	0.95	0.85	Inappropriate
	Lead	5	0.32	0.3	0.25	0.39	Appropriate
	Chrome	0.1	0.16	0.19	0.17	0.21	Inappropriate

Qualitative classification of drinking water

Toxic minerals are those of the chemicals that have the potential for toxicity in humans' health in short or long term. There is no clear classification like that of natural substances for toxic mineral substances in water. Depending on the type of water used, involved organizations have identified standards for which soluble materials are usually classified into authorized and unauthorized categories. To study the toxic minerals in the river water's classification, the standard organizations and Industrial Researches of Iran (1997) have been used for drinking water consumption. In this standard, the permissible limit for each toxic substance is determined, which more than limitation is non-drinkable water and below the limitation is appropriate for drinking. In tables (5) to (7), the measured values of heavy metals and the permitted amounts of these materials for drinking water were written by the Iranian Standard Organization in a separate column, which by comparing the measured values in the river and the standard authorized determined the state of the drinking water.

At the Sulaghan station, which is located at the beginning of the entrance to the river, a test of the concentration of toxic elements has been carried out. As shown in Table (2), the concentration of Mercury, Cadmium, Copper, Manganese, and Chromium is higher than the limit for agriculture in accordance with FAO and WHO standards in this station in comparison to the mean of measured seasons. Also, the concentrations of Lead, Cobalt, and Zinc are within acceptable limits. At the site of the Jahanabad station, the elements of Mercury, Cadmium, Manganese, and Chromium are higher than the limit in all seasons. The concentration of Copper in this station is lower than the maximum in the winter and spring and in the summer and autumn seasons is higher than the WHO standard. The concentrations of Zinc, Cobalt and Lead in this station are within the limits.

In general, the concentrations of Mercury, Cadmium, Manganese, Copper, and Chromium along the river of Kan are higher than the permitted agricultural use, during the fall and winter.

Table 5 - Quality status of Kan River's water resources (Sulaghan station) in terms of heavy metals in drinking water

Sampling location	Names of heavy and toxic metal	Maximum Allowable Irrigation Standard (WHO)	Mean concentration per month (mg / L)				results
			Spring 2017	Winter 2016	Autumn 2016	Summer 2016	
Kan river-Sulaghan station	Mercury	0.006	0.43	Mercury	0.81	0.95	Unauthorized
	Zink	3	0.12	on	0.1	0.17	Authorized
	Cadmium	0.003	0.04	Cadmium	0.035	0.06	Unauthorized
	Cobalt	*	0.02	Cobalt	0.02	0.03	Authorized
	Copper	2	0.02	Copper	0.015	0.025	Authorized
	Manganese	0.4	0.42	Manganese	0.65	0.8	Unauthorized
	Lead	0.01	0.18	Lead	0.15	0.3	Unauthorized
	Chrome	0.05	0.13	Chrome	0.2	0.25	Unauthorized

Table 6: Quality status of river water resources (West Midwest) in terms of heavy metals in drinking water

Sampling location	Names of heavy and toxic metal	Maximum Allowable Irrigation Standard (WHO)	Mean concentration per month (mg / L)				Results
			Spring 2017	Winter 2016	Autumn 2016	Summer 2016	
Kan river-Sulghan station	Mercury	0.006	1.02	Mercury	1.88	1.9	Unauthorized
	Zink	3	0.15	on	0.14	0.23	Authorized
	Cadmium	0.003	0.11	Cadmium	0.21	0.25	Unauthorized
	Cobalt	*	0.02	Cobalt	0.034	0.04	Authorized
	Copper	2	0.03	Copper	0.055	0.08	Authorized
	Manganese	0.4	0.98	Manganese	1.1	1.4	Unauthorized
	Lead	0.01	0.41	Lead	0.32	0.48	Unauthorized
	Chrome	0.05	0.24	Chrome	0.29	0.31	Unauthorized

Table 7 - Quality status of the river water resources (Jahan Abad station) due to heavy metals in drinking water

Sampling location	Names of heavy and toxic metal	Maximum Allowable Irrigation Standard (WHO)	Mean concentration per month (mg / L)				Results
			Spring 2017	Winter 2016	Autumn 2016	Summer 2016	
Kan River-Sulghan station	Mercury	0.006	0.51	Mercury	0.86	1.1	Unauthorized
	Zink	3	0.12	on	0.117	0.16	Authorized
	Cadmium	0.003	0.07	Cadmium	0.054	0.08	Unauthorized
	Cobalt	*	0.03	Cobalt	0.021	0.03	Authorized
	Copper	2	0.01	Copper	0.025	0.028	Authorized
	Manganese	0.4	0.65	Manganese	0.95	0.85	Unauthorized
	Lead	0.01	0.32	Lead	0.25	0.39	Unauthorized
	Chrome	0.05	0.16	Chrome	0.17	0.21	Unauthorized

plain too. Therefore, due to the higher concentrations of heavy metals such as Mercury, Cadmium, Manganese, Lead, and Chromium from

As the tables above show, the concentration of toxic elements along the river is higher than the limit. The interesting point is that heavy metals have a high concentration at the entrance to the

river. Based on the results obtained from this study, the minimum and maximum values of these parameters have been deduced. In general, the maximum of these values is related to Jahan Abad station and shows that from north to south water quality declines. Therefore, based on public health standards, the possibility to use water resources in existing conditions have been considered and the classification of the river water for different uses and finally the analysis of the quality of water resources based on qualitative indicators and effective factors on it and strategies for improving the management of utilization, have been presented. In addition, according to the results of the quality status of river water resources, the range of the project due to the presence of heavy metals (Mercury, Cadmium, Manganese and Chromium) which are above the limit for agricultural use, the accumulation of heavy metals in the soil causes pollution of agricultural land and through the cycle Soil - Plant -animal, may present at a human toxicity threshold. Also, the quality status of water resources of rivers in the range of the project is moderate to good in terms of chemical parameters for drinking water use; however, the use of it, for drinking purpose, is not possible due to the qualitative status of heavy elements and the biological status and water contamination. Although some of the measured parameters are consistent with the standards, the results indicate that some parameters need to be purified; especially there is a need to disinfection. Also, if it is used, it is necessary to have constant monitoring of these water flows in order to comply with the standards.

The results of Ebadati (2017) shown that average content of Na, So4, TH, Cl, Ca, Mg and the Sodium absorption rate in Dez river water during the statistical period has been by far lower than the maximum optimum and maximum permissible standard values. Accordingly based on the comparison to the Iranian national standard Dez River water quality within Dezful City range is at normal state.

the limit, there is currently the use of Kan River's water is not appropriate for drinking.

Conclusion:

Kan River, as the largest current river in Tehran, plays an important role in the environmental and agricultural conditions of this province. Considering the wide range of the river basin (about 215 square kilometers) which in Tehran province, extends from north to south, and the most important drainage is the surface sewage transmission of the central and southern part of Tehran, at the end of its route to the southeast agricultural lands, enters to Tehran and their water reaches for irrigation of these lands, and eventually reaches the brine. Due to the fact that there are agricultural lands around Tehran and one of the sources of irrigation of agricultural lands is the surface waters of Tehran, therefore, the necessity to study the surface water pollution in Tehran is quite obvious. The advent of these pollutants into agricultural and groundwater areas is due to the effects of lack of purification and flood control in Tehran.

The present study is an experimental-laboratory study and data was collected using field and documentation study. Achieving research questions and proving or rejecting hypotheses is done by analyzing the data resulting from the sampling and comparing it with the indicators and charts. In this research, the quality of water resources in the river basin examined based on the results of measuring the quality parameters in detail. For this purpose, firstly, the results of the analysis of the collected samples for one year were carried out to measure physical and chemical parameters in three stations. Parameters of heavy metals, turbidity, Oxygen required for chemical usage, Oxygen demands for biological purposes, Phosphate, Nitrate, total soluble solids, electrical conductivity, pH, total Coliform and gastrointestinal Coliform, and anions and cations, according to the above parameters, compared to the presentation of the process of the qualitative changes have been analyzed along the

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