# Wastewater quality used in agriculture and natural resources: a case study in Zahedan

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**Abstract:** Due to recently witnessed drought, reduced water resources and low precipitation in the country, farmers in different parts of Iran started to use new water resources (wastewater). These resources are widely in use, but we need to carefully check wastewater parameters before using this water resource. Thus, this research aims to assess the permissible limits of wastewater parameters. In the present study, several parameters including chloride, boron, nitrogen, cadmium, lead, DO, $BOD_5$, pH as well as COD was measured and evaluated in Zabol wastewater refinery, according to the existing standards. The results showed that all parameters are within the permitted range that was in accordance with Iran Department of Environment standards for wastewater re-use in agriculture. Nevertheless, chloride, boron, and nitrogen levels were above the limit set. The results showed that there is no limit to use the aforementioned wastewater due to its low heavy metals content. We recommend that this wastewater may be used for planting windbreaks and greenbelt in countryside.

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## 1. Introduction

Iran is a vast country with an area of over 165 million hectares which is widely covered with arid and semi arid climates. Latitude, distance of many areas from the sea, and distribution of high and low areas are the factors that cause drought intensification (Department of Agriculture, 1996). Moreover, the average rainfall of 240 mm in Iran as compared to 860 mm average rainfall in other parts of the world has placed our country among arid and semiarid countries. Furthermore, population growth, expansion of Faryab land, urbanization, development of new industries, and high life quality which is closely linked to the consumption of clean water not only has increased the demands for food and agriculture products, but also water use for agriculture, industry as well as drinking (Department of Agriculture, 2000). Although ownership and planning on water has a historical background, but in sustainable economic, social and cultural development of the country, water access is so critical that authorities may need to adopt a strategic plan so that all activities and economic development take place based on water plans. Achievement of this goal requires a detailed program and study on the soil and water engineering from one side, and systematic development of technology from the other side so that based on which desirable programs may be developed and implemented. Therefore, besides emphasis on reduction of population growth, policies and strategies on efficient use of water resources, along with technologies to confront these limiting factors should be taken into consideration. Among the solutions, reforming the priorities in water projects, management of water consumption and demands, re-use of the consumed water and wastewaters, and consumption of low quality waters can be mentioned. Lack of attention to this important issue will face the country with a water supply crisis. Although in the average climatic conditions due to the low rainfall and high evaporation potential, severe water shortages will manifest itself critically, in drought conditions this will face the country with a more severe water supply crisis (Zolfaghari et al., 2008). One of the most important applications is irrigating crops. Therefore, having regulations to notice the qualitative characteristics of wastewater or other waste types in order to maintain product quality, environmental protection and public health is completely essential. A recent survey has shown that the best water reuse projects in terms of economic feasibility and public acceptance are those that have replaced drinking water with water recovered from irrigation and industrial usage. The major benefits of this alternative have been storage and protection of water resources and reduction of the pollution (Almas & Scholz, 2007). The overall goal of the reuse of wastewater in agriculture is optimization and maintenance of water resources through returning wastewater into the ground and rational use of fresh water resources. Experience has shown that significant amounts of

substances such as phosphates, potassium hydroxide, and nitrogen in wastewater which all have an important role in fertility of agricultural lands has been effective in increasing crops amount. On the other hand, due to the water supply for agriculture, new lands can be cultivated, and this will have a major role in the control of rural-urban migrations (Amjad et al., 2006). The aim of this study was assessment of Zahedan refinery wastewater quality and measurement of some of the wastewater parameters based on Iran's Environment Department standards.

## 2. The study area

The study area covers an area of 4400 hectares, and is located 15 kilometers northwest of the city of Zahedan in Sistan-Baluchistan. The study grassland is located in geographical coordinates of 60° 36′ 18″ to 48″ 24′61° E 30° 03′ 32″ to 31° 32′ 50″ N (Fig.1). According to Do marten climate classification, Sistan plain is classified as hyper-arid areas. Moreover, according to Guosen climate classification, it is considered as desert area, and with coupon climate classification it is classified as hot arid area with dry summer. Sistan-Baluchistan province is considered as desert and arid area in terms of climate classification. The rainfall in different regions usually is 70-130 mm.


**Figure 1. Location map of the study area.**

## 3. Materials and methods

This was a cross-sectional study in which sampling from refinery treated wastewater was carried out in both hot and cold seasons in order to specify the required quality parameters, maximum and minimum temperature impact on wastewater refinery performance, and ultimately the quality of the wastewater on a monthly basis in 2014. Composite samples were provided at the intervals of six hours (four times daily), and were carefully transferred to the laboratory (Shojaei et al., 2015). Heavy metal test samples were transported to the laboratory by adding nitric acid and bringing the pH below 2. Moreover, the COD test samples were transported to the laboratory by adding sulfuric acid and bringing the pH below 2. Some parameters such as dissolved oxygen (DO) and pH were measured by portable devices at sampling site. All tests were performed based on 2005 recommended standard methods (Nasery et al., 2012). In order to determine the health risks, heavy metals indicators of high importance including cadmium and lead were measured. BOD5 and COD were measured in order to determine the wastewater organic material content. Data analysis and mean calculations was carried out in Excel program.

## 4. Results

Table 1 shows the average value of COD and BOD5 which is reported as 55.6 and 22.4 ml, respectively. The parameters according to the limit set by the standards organization was below recommended limits of 200 ml for COD and 100 ml for BOD5. pH average for the entire year in Zahedan wastewater refinery was 7.5. Considering Iran's Department of Environment limits of standard pH of 6 - 8.5, this average is within the standard limit. Our results on water samples analysis showed DO mean value of 9.1 ml that is below our standard limit. There was no significant difference in DO mean value among different seasons. Our results on wastewater chloride content among different seasons showed no significant difference between cold and hot seasons, and the amount of chloride was fixed during the whole year, but it was above our standard limit. Our results showed higher wastewater boron content in cold seasons as compared to hot ones. Wastewater nitrogen

content was above the standard limits of Iran's Environment Department, and was fixed during the whole year. The average of wastewater cadmium and lead heavy metals content was 0.056 and 0.51, respectively which is in accordance with Iran's Environment Department standards.

**Table1. Assessment of Zabol refinery wastewater based on Iran's Environment Department standards.**

| Parameter | Unit | Standard | Average for the cold season | Average for the hot season | Average for the entire year |
|---|---|---|---|---|---|
| COD | (mg/L) | 200 | 55.40 | 55.6 | 55.6 |
| BOD5 | (mg/L) | 100 | 24.70 | 21.0 | 22.4 |
| pH | - | 6 – 8.5 | 7.6 | 7.2 | 7.5 |
| DO | (mg/L) | 2 | 1.8 | 1.8 | 1.8 |
| Chloride | (mg/L) | 4> | 8 | 8 | 8 |
| Boron | (mg/L) | 0.7 | 4 | 3.3 | 3.7 |
| Nitrogen | (mg/L) | 5 | 13.1 | 13 | 13.1 |
| Lead | (mg/L) | 1 | 0.55 | 0.54 | 0.51 |
| Cadmium | (mg/L) | 0.05 | 0.06 | 0.052 | 0.056 |

**4. Discussion**

According to the results of this study, wastewater parameters met the standard limits; nevertheless some of the wastewater parameters including nitrogen, boron and chloride were above the standard limits of Iran's Environment Department. But as compared to heavy metals, these parameters cause less damage to plant life, though they are above the standard limits of Iran's Environment Department. So it can compensate for nitrogen shortage in areas with low nitrogen content. Due to its high mass, wastewater can be used to compensate for Zahedan water shortage, too. Wastewater can also be used to irrigate greenbelt at city entrance and thereby protect the area from wind and wind erosion. Wastewater can also be used for the artificial recharge of aquifers. With artificial recharge of desert aquifers, we can avoid advancing of salt water into underground aquifers. Therefore, comparing Zahedan wastewater quality with the World Health Organization standards, Zahedan wastewater can be used to irrigate barren trees. Irrigation of the vegetables or crops that are consumed in the raw form is not recommended (Shojaei et al., 2015). Though the results of this study showed wastewater heavy metal content of below Iran's Environment Department standard limits, but due to the collective effect of heavy metal elements, priority for wastewater irrigation is given to industrial non-food crops such as cotton and wood trees (Salehiargmand et al., 2002; Qadir et al., 2010).

**References**

1. Shojaei S, Homayun Nejad A, and Shojaei S. 2015. Assessment of urban wastewater quality in vegetation restoration (a case study in Zabol). First international and third national conference on architecture, reparations, urbanism, and stable environment.
2. The Agriculture Department. 1996. Agriculture development facilities with looking at 2021 horizon. Internal reports, page 98.
3. Keshavarz A, and Sadegh Zadeh K et al. 2000.Agricultural water management, estimation of future demand, drought crises, the current situation, future prospects, optimizing water use. Agricultural Education Research, The registration number 71 879, Center of the Agriculture Information and Documentation.
4. Zolfagharan A, Haghayeghi Moghaddam A, et al. 2008. The Greywater effect on canola yield and soil properties in surface irrigation. The second conference on strategies for improving surface irrigation systems.
5. Almas AAM, Scholz M. Potential for wastewater reuse in irrigation: case study from Aden (Yemen). International Journal of Environmental Studies. 2007; 63(2): 131-142.
6. Amjad M, Salimi Saboor S, Maghsoodloo B. Study the opportunities of reusing municipal wastewater of the city of Yazd. 9th National Congress on Environmental Health. Isfahan. 2006. (Full text in Persian).
7. Nasery s, sadeghi t, vaezi f, nadafi k, evaluation Quality of waste water ardabil Refinery In order to Reusein Agriculture. (2012) Journal ofHealth. N:3; pp73-80.

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