

## **Effects of Rasht City Wastewater Discharge on Environmental Conditions of Pirbazar River**

### **Effets des Eaux Usées de la Ville de Rasht sur les Conditions Environnementales de la Rivière Pirbazar**

Pouraghniaei<sup>1</sup> M. J. & Ali Samiei<sup>1</sup> M.R.Ashrafzadeh<sup>2</sup>

<sup>1</sup>Department Water Resources and Environmental Sciences, GhodsNiroo Engineers Company, #82, Motahari St., Tehran, Iran, Email: [mpouraghniaei@ghods-niroo.com](mailto:mpouraghniaei@ghods-niroo.com),

<sup>2</sup>Department of Environment, Faculty of Natural Resources, Khorramshahr University, 669, Khorramshahr, Iran.

## **RÉSUMÉ**

L'évacuation directe des eaux usées municipales et industrielles dans les rivières ont des résultats néfastes pour les écosystèmes. Ce phénomène est perceptible en Iran, surtout au nord de l'Iran, avec l'augmentation rapide des industries, des usines et de l'urbanisation avec l'augmentation rapide de la population.

Les eaux usées de la ville de Rasht et de l'industrie dans le bassin versant de la rivière Pirbazar, se rejettent directement dans cette rivière, provoquant sa pollution, et des masses d'eau en mauvais état. La pollution de la rivière engendre la réduction de la production potentielle de pêche, la diminution, ces dernières décennies, de la diversité des poissons de valeur, des changements des conditions environnementales de cette rivière et sa zone riveraine.

Dans cette communication, les effets de la pollution causés par les eaux usées sur les variations spatiales des paramètres de qualité de l'eau dans les rivières Siahrood et Pirbazar sont analysés, grâce, d'une part à l'échantillonnage de différents lieux de rivières d'une part, d'autre part à l'échantillonnage des eaux usées de la ville de Rasht et des industries dans le bassin.

## **ABSTRACT**

Direct Disposal of municipal and industrial wastewater to receivers such as rivers cause harmful results for ecosystems. This phenomenon is noticeable in Iran, especially at north with rapid increase of industries, factories and urbanizing with increase of people, there. Wastewater of Rasht city and industries within watershed of Pirbazar River, directly enter to this river and cause its pollution and subsequently pollution downstream water bodies. River pollutions cause decrease of potential fish production and decrease of valuable fish diversity that has tangible decrease during recent decades and caused changes on environmental conditions of this river and riparian area.

In this paper effects of pollution caused by wastewater on spatial variation of water quality parameters along Siahrood and Pirbazar Rivers and on decrease of diversity are analyzed. It was done based on sampling data of different points at river in one hand and on the other hand data of wastewater production of Rasht City and industries within the basin.

## **KEYWORDS**

Ecosystem, Pirbazar River, Pollution, Rasht, Wastewater.

# 1 INTRODUCTION

Pollution of ecosystems and water resources not only disturb them, but also will cause entropy and threatened life and exist of humankind. A clear sample of ecosystem destruction can be seen at forested basins at north of Iran such as Pirbazar River. Pirbazar River passes from the middle part of Rasht City -the most populated urban area in the northern part of Iran- with more than 600,000 inhabitants and about 30 square kilometers area. Wastewater of Rasht city directly enters to Pirbazar River and causes its pollution and subsequently pollution of Anzali Lagoon at downstream.

## 2 MATERIAL AND METHODS

### 1.1 Study area

Pirbazar River has originated from a forested basin and passes from middle of city of Rasht and after a while enters to Anzali lagoon, located in north of Iran at southern parts of Caspian Sea. Pirbazar River is made from two branches - Siahrood and Goharrud- that pass Rasht city then join together after Rasht city and finally after 25 kilometers enter to Anzali lagoon from eastern side. Siahrood River that means black river was formerly named as Zarjoob that means golden or valuable. (Fig-1).

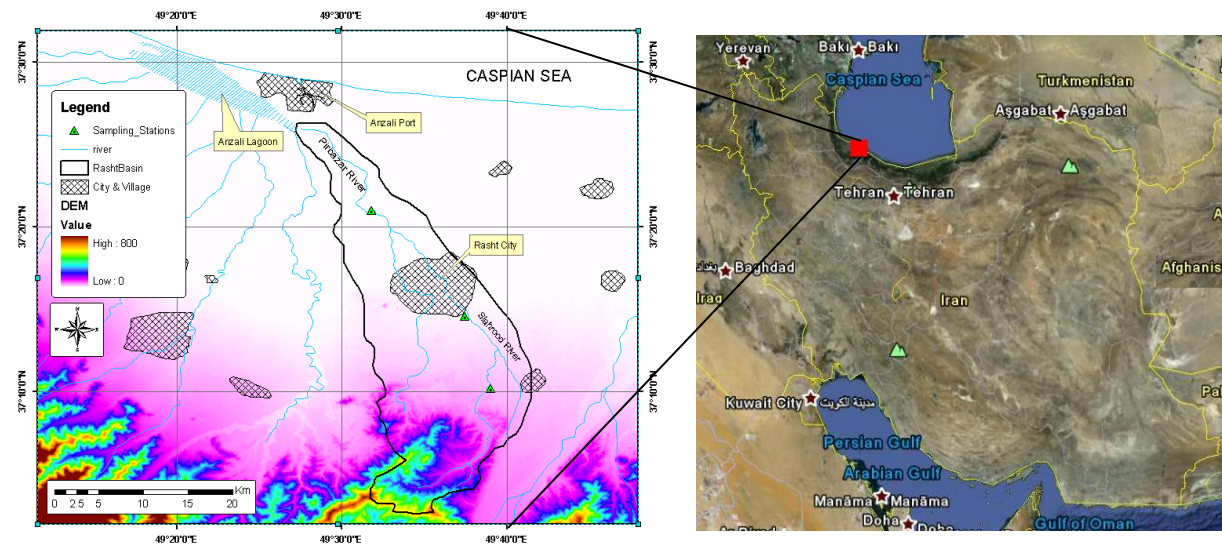


Fig-1- View of study area and its land use

Yearly discharge of Pirbazar River is about 270 million cubic meters (mcm) that pass from Rasht city and collect all of municipal and industrial sewages then passes from some agricultural area and finally after 25 kilometers enters to Anzali Lagoon. Within the Pirbazar River Watershed, there are 5 gauges for quality control that as it is shown in first picture, 3 of them were used for this study.

### 1.2 Assessment Method

Data of rivers discharge and sewage production of Rasht city have modeled for different time 1981 to 2026 to assess impact of produced sewage of Rasht city on pollution of Rivers. (Table-1) Changes of water quantity and quality for all 3 stations- upstream (near mountains), before Rasht city and after Rasht city (downstream)-, along Pirbazar River have analyzed that shows obvious changes at spatial variation of water quality parameters. Samples result averaged over all months for sampling stations along Siahrood and Pirbazar Rivers - Upstream, before and after Rasht City- and results are shown in Figure 1. [3] Based on protection plan of Pirbazar River and Anzali Lagoon, fish withdraw has decreased during this year's. It shows that it's withdraw capacity was about 218 kg/ha on 1934, 105 kg/ha on 1955 and 17 kg/ha on 1990, that mainly infected from Pirbazar River. [2]

Table-1- Ratio of Rasht City Sewage Discharge on Pollution of Siahrood & Goharrud River

Ratio of Sewage to River Discharge (%)	Sewage Discharge (MCM)	Population	Year
3.6	9.8	234350	1981
6	16.1	340225	1991
9.4	25.4	479602	2001
13.7	36.9	632138	2011
19.7	53.2	833139	2021
23.7	63.9	956553	2026

### 3 DISCUSSIONS AND CONCLUSION

Main results of decrease of production capacity of Pirbazar River, riparian area and downstream Lagoon are: 1- High volume entrance of municipal and industrial sewage. 2-Reduction of lagoon's area and overgrowth of vegetation, after nutrition material entrance. 3- Indisposition of physicochemical and biological conditions of river and lagoon. 4- Desiccate some parts of river, its flood plain and lagoon for agriculture.

These factors happen in a cycle and have synergic effect. For example, sewage cause nitrification in lagoon and ponds of river banks that cause increase grow for plants and consequently decrease dissolved oxygen and cause fish's death. Graphs show good quality for Siahrood and Goharrud Rivers before Rasht city but after the city it decrease and both rivers miss refining ability. Higher pollution has observed at last sampling station of Pirbazar River. Results are show at figure 2. [3]

Pollution studies inside of Anzali Lagoon shows Pirbazar River have enter major input water (about 43 percent of input water) and this part is most polluted part of the lagoon that receive high volume of municipal and industrial sewage of Rasht city from Pirbazar River. [2] To prevent decrease of quality at Pirbazar River, it is necessary to complete waste water collection and sanitation network that only half of it has completed. On the other hand collection and sanitation of industrial waste water along the river have to be completed and some other projects have been done for recovery and improve of river bed, riparian area, etc.

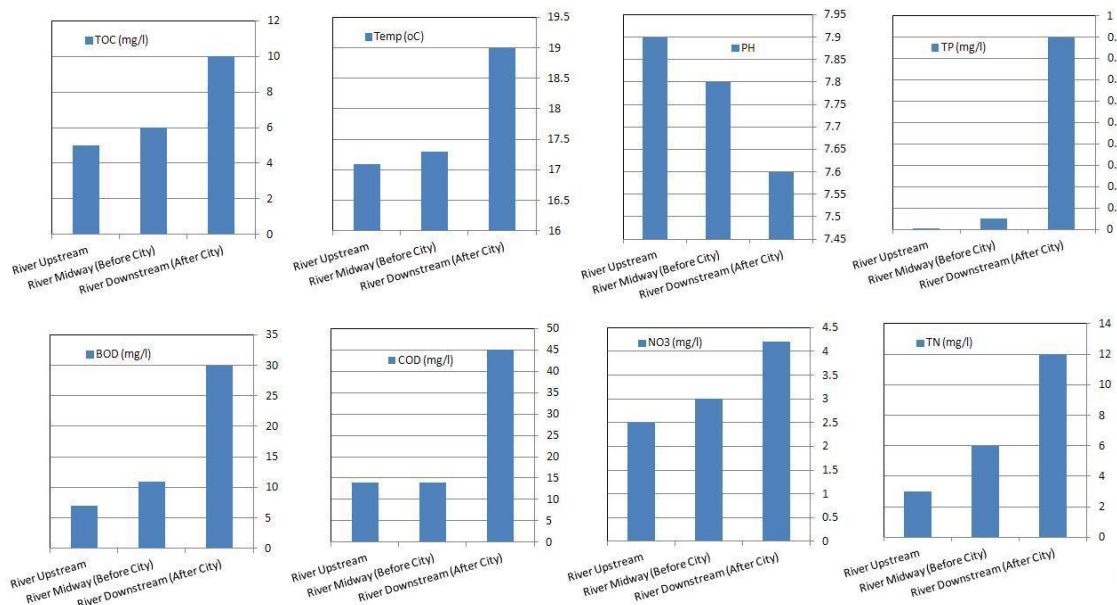


Fig 2- Spatial variation of water quality parameters averaged over all months in sampling stations along Siahrood and Pirbazar Rivers (Upstream, before and after Rasht City)

It is clear that value of Pirbazar River and same rivers is not only for fish production and diversity; many other values have to consider for a complete impact assessment of wastewater entrance to rivers such as ecotourism, other wildlife habitat such as birds, water transportations, etc.

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