Science Arena Publications
Specialty Journal of Geographical and Environmental Science
Available online at www.sciarena.com
2019, Vol, 3 (1): 1-4

Pollution Status of River Kabul near Peshawar City

Jehangir Shah[1], Mujahid Sher[2*], Sudhair Abbas[3], Muhammad Sulaiman[2]

[1]PSO, PCSIR Laboratories Complex Peshawar, Pakistan,
[2] Abbottabad University of Science and Technology Abbottabad, Pakistan.
[3] Associate Professor Sarhad University of Information Technology, Pakistan.

***Corresponding Author**

Abstract: *For over two decades the villagers living on the banks of River Kabul have been complaining about pollution. The complaints are because of the increasing and obvious signs of pollution, including periodic fish kills. The river has also been blamed for a high prevalence of skin diseases in humans, as well as maladies in livestock.Some people have complained of reduced crop yield in fields irrigated with water polluted by industrial effluents.These complaints were taken serious by the scientific community and the investigations confirmed the presence of pollutants in the stretches of the river. The river does, however, have a high assimilative capacity due to its physical and chemical characteristics. Also its turbulence encourages arelatively quick re-oxygenation after receiving the pollutants which cause high biological and chemical oxygen demand. However this does not remove the threats posed to the aquatic ecosystem and to fish and human beings in particular.The current study being initiated with the view to identify the hot spot from pollution point of view in River Kabul wherein municipal sewerage and industrial effluent being entered without any treatment near Peshawar City.*

Keywords: *Pollution, River, Kabul, Peshawar.*

INTRODUCTION

Water is an, important component for life and it needs to be assessed at all stages in order to ascertain its safe usage (InayatUr Rehman, et al, 2017).Over the last few decades due to industrial revolution, the contamination of water bodies with organic and inorganic pollutants has become an issue of great concern (I. Ur Rehman et al, 2018). River Kabul and its tributaries including River Swat are major freshwater sources in the Khyber Pukhtoonkhwah and serve almost all the water needs of most of this province. These rivers also serve as a rich source of various fish species which local population depends on for their livelihood as well as the tourism industry. The Kabul River Water are being used mainly for irrigation, effluent and waste disposal, watering livestock, fishing, recreation, transportation, washing and bathing. For the last almost twenty years, complaints have been voiced about the declining water quality of these rivers and reduced crop production, decline in fish numbers as well as reports of mysterious fish kills. The deteriorating water quality has ultimately affected the livelihoods of rural communities along Rivers Kabul and Swat.

Due to limited resources this scientific study was initiated at River Kabul near Shah Alam Canal (Peshawar), as this point has been considered the most polluted site of the river. The objective of the study was to investigate the exact level of some of the pollutants and highlight its concern to the decision makers for taking appropriate steps.

Materials and Methods:

The study was undertaken during low flow conditions, when organic pollution was anticipated to be at its worst, and later repeated under high flow conditions when other pollutants were expected to be at their highest concentrations. Thus two 'worst case' scenarios were assessed. Water quality was assessed for its suitability for some mentioned purposes. As no villagers are entirely dependent upon river water for drinking, it was decided to compare all values against standards for the maintenance of fisheries and aquatic life. This normally ensures an overall healthy aquatic environment, and is more important.

Water samples were collected from the banks at a depth of about 30 cm using a locally made sampler. Samples were collected in one liter plastic containers whichhad previously been washed with distilled water. Samples were immediatelymarked for identification, placed in an ice box and brought to the laboratory wherethey were refrigerated at 4°C awaiting analysis.

A second set of samples were taken from the same sampling points under high flow river conditions, and subjected to the same laboratory analysis.

The social survey for questioning water usage, agriculture, health, fisheries and wildlifewas completed. In order to provide a more detailed perspective on the impact ofpollution of the Kabul River, and to enable that the village voices be clearly heard, interactions/discussions with the local people wasundertaken in one riverside village during sample collection.

Results and Discussions:

The dissolved oxygen (DO) levels within the river were not good enough (which ranges from 3.0 to 4.5 mg/l in the summer season) whereas the recommended level is usually 5 mg/l, necessary for fisheries and aquatic life. However in winter before the start of sugar crushing season the DO level reaches up to 5.0 mg/l which drops to 4.5 mg/l near Khazana Sugar mill. At this point the Biological Oxygen Demand and Chemical Oxygen Demand also increase from 14 mg/22 mg/l of BOD and 40 mg/l to 65 mg/l of COD (IUCN, 1994). The main reason attributed to this increase is the release of sugar mill effluent to the river.

Some 5 km downstream from this point, the level of DO increases and BOD and COD decreases due to its natural turbulent re-mixing process,raising again due to entry of two canals, Budnai Nallah and Ganda Erab each carrying sewage effluent from Peshawar city.

The River Kabul Water near Peshawar city at Shah Alam Canal, Budnai Nallah and Ganda Erabis stressful for fish and aquatic life from BOD and COD point of view. These three points are particularly 'hot spots' and are indicative of organic pollution near Khazana Sugar Mill, Budnai Nallah and Ganda Erab sewage drains.

As evident from literature study (Duffs, J.H., 1980) that the primary health hazard associated with nitrate-nitrogen in drinking water occurs, when nitrate is transformed to nitrite in the digestive system. The nitrite oxidizes the iron in the hemoglobin of the red blood cells to form methemoglobin, which lacks the oxygen-carrying ability of hemoglobin.

Ammonia oxidized in aerobic conditions tonitrite and eventually nitrate, which is significantly less toxic to aquatic life. Nitritesare usually present in very low concentrations in freshwater of < 0.001 mg/l, andare rarely higher than 1 mg/l (Chapman, 1992). High nitrite levels are generallyindicative of industrial effluents.

In the current study (Table 1, 2) nitrite concentrations appear high at almost all the sampling points during low and high flow conditions. Natural levels of nitrates seldom exceed 0.1 mg/l but when influenced by humanactivities, may contain up to 5 mg/l. Levels in excess of 5 mg/l usually indicate pollutionby human or animal waste, or fertilizer run-off.Nitrate levels in the Kabul River show the influence of human activity almost throughout its course.For Nitrate maximum values for maintaining fisheries and aquaticlife are <40 mg/l although currently it have not crossed the limits but leading towards dangerous zone.

Organic pollution is at its worst in those points where oxygen concentrationsdecrease steadily downstream, and ammonia is present at values which, if nottoxic to fish, must be extremely stressful. Conditions are also

worse under low flowconditions when less dilution is available.The level of hardness was 247 mg/l to 248 mg/l at Khazana and 318mg/l and 333mg/l at Budnai Nallah and Ganda Erab canals respectively during low flow conditions. Similarlydue to temperature rise in summer season, the BOD and CODlevels at all these points were very high. The reasons attributed to the high level of these compounds are the decomposition of organic and chemical compounds, whichlead to reduction of dissolved oxygen.

In previous studies lower values of dissolved oxygen have been encountered such as 3.5 mg/l below the combined Sarhad Colony Textile Mill, and the Nowshera DDT Factory, since both factories are closed, these figures were howeverundoubtedly within the mixing zone for the effluents (Khan et al., 1985).

In another study where sampleswere taken at a series of five stations over a distance of one kilometer downstreamfrom a major pollution discharge, the river substantially recovered its water qualityover this stretch (Khan et al., 1985).

In the present study the major sources of pollution are the Khazana Sugar Mill, Ganda Erab and Budnai Nalla, carrying sewage from Peshawar city. Under low flow conditions withheavy loadings from the sugar mills it is conceivable that oxygen and ammonia conditionsmay become critical for fish, and indeed fish kills have been observed, particularlywhen the mill is undergoing cleaning operations.

Conclusions and Recommendations

From the current study it appears that the industrial and sewage effluent drains have the most significant impact upon the river as their effluents are the poorest in quality.Although the quality of the river discharges is far better than the effluents, due to their enormous discharge volume its impact can be considerable. Looking into the rapid urbanization and industrializationaround Peshawar City, the discharge of high volume of effluent with toxic organic and inorganic compound would pose a severe threat to the quality of River Kabul in near future. The quantity of effluent discharges must be reduced to the River Kabul by taking conservative and recycling measures. The City Municipalities, EPA and Industries must have to take appropriate treatment measures to meet the national environmental quality standards of the effluent before its release to the River Kabul.

Table 1: Kabul River near Shah Alam Canal Peshawar

Parameter	After mixing of Khazana Sugar Mill effluents		Shah Alam Bridge	
	Low water flow(25.01.18)	High waterflow(06.07.18)	Low water flow(31.01.18)	High water flow(06.07.18)
Temperature (◦C)	11	29	12	29
pH	7.7	7.7	6.9	7.7
Conductivity (µ S (cm $^{-1}$)	775	188	1002	188
(mg/l)	228	80	90	46
Alkalinity	405	90	118	88
Hardness	248	238	247	233
DO	3.9	4.1	3.8	3.9
BOD	13	14	11	12
COD	51	55	32	46
NH_3-N	2.5	0.41	1.17	0.92
NO_3	0.020	0.00	0.00	0.176
NO_2	2.7	2.5	2.8	2.6
Dissolved Solids	540	290	400	220
Suspended Solids	480	800	800	1070
Total Solids	1020	1090	1200	1290

Table 2: Kabul River Peshawar at BudnaiNallah and GandaErab Canal

Parameter	After mixing of BudniNallah		After mixing of GandaErab	
	Low water	High water	Low water	High water
	25.01.18	06.07.18	25.01.18	06.07.18
Temperature (◦C)	13	26	14	27
pH	7.9	7.2	8.1	7.4
Conductivity (μ S (cm^{-1})	731	527	855	409
(mg/l)				
Alkalinity	282	180	340	144
Hardness	318	179	333	174
DO	4.5	4.2	4.0	4.1
BOD	15.0	34	16	48
COD	61	136	129	96
NH_3-N	0.00	0.054	4.200	0.125
NO_3	11.18	2.70	0.00	0.00
NO_2	1.137	1.016	0.000	0.250
Dissolved Solids	460	340	320	230
Suspended Solids	180	500	360	340
Total Solids	640	840	680	570

References

1. Chapman, D. 1992. Water Quality Assessment. London: Chapman and Hall, Table 1.3. ISBN 0 419 21590 5 (HB) 0 419 21600 6 (PB).
2. Duffs, J.H. 1980. Environmental Toxicology. London: Edward Arnold Publication, ISBN: 0713127988.
3. Inayat Ur Rehman, Muhammad Zahoor, Muhammad Tariq Bashir, Javid Ali, Farhat Ali Khan, MujahidSher, "Removal of Cu2+ from aqueous solution by activated carbon prepared from sawdust and nutshells."Desalination and Water Treatment 126 (2018) 171–180.
4. InayaturRehman, Jehangir Shah, Javid Ali, Salma Iman, Mohammad Ilyas, Farhat Ali Khan, MujahidSher, "Physico-chemical Investigation of Quality Characterization of Peshawar City Effluents, Specialty Journal of Chemistry,2017,Vol, 1(1):1-5.
5. IUCN. 1994. (International Union for Conservation of Nature) Pollution and the River Kabul, An analysis and Action Plan. IUCN - SPCS Unit Planning, Environment & Development Department Civil Secretariat, Peshawar.
6. Khan, K., Arif, M., Khattak, M.A., and Shad, R.A. 1985. Pollution Studies at Kabul River and Kheshki Lake. Journal of Engineering Applied Sciences. Source: Central Asia (1729-9802). Winter 2010, Issue 67, p83-97. 15p.