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Assessment of the Impacts on Water Quality of the Area by Landscaping Activities of Greater Iqbal Park Project, Lahore, Pakistan

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Abstract

The present study is focused on the assessment of the impacts of undergoing landscaping activities in Greater Iqbal Park, Lahore on the water quality of project area. The project area formerly known as Minto Park is located on the north of the Lahore Fort and the Badshahi Mosque at the busiest intersection of Circular Road and Multan Road. For the impact assessment on water quality of area three composite drinking water samples D-1, D-2 and D-3, were collected from tap, hand pump and tub well respectively. Whereas three wastewater samples W-1, W-2 and W-3 were collected from three different points of a drain present in the project area. Drinking water samples were tested for twenty two chemical and two microbiological parameters recommended by NEQS, Pakistan. Waste water samples were tested for thirty parameters of waste water quality provided by NEQS, Pakistan. When compared with NEQS to check their compliance resulting values revealed that D-1 , D-2 and D-3 had 0.051 mg/l , 0.071 mg/l and 0.090 mg/l of Arsenic respectively and W-1,W-2 and W-3 showed BOD values 125 mg/l, 129 mg/l and 127 mg/l, COD values 293 mg/l, 298 mg/l and 288 mg/l and sulphide values 4.01 mg/l, 4.48 mg/l and 4.2 mg/l respectively which are higher than the permissible limit of NEQS. Except these the resulting values of remaining tested chemical and microbiological parameters were in compliance with NEQS.

Keywords: Assessment; Landscaping; Impacts; Quality

Introduction

The mission to protect the earth from further debasement has been of worldwide sympathy towards numerous years now [1]. Ecological effect appraisal (EIA) is strategy instrument utilized for assessing a venture proposition from physical and financial natural points of view. It is obligatory to present an Environmental Impact Statement before beginning a super venture as required by Environmental Protection Act of 1997 and Environmental Policy of Pakistan [2].

Ecological effect evaluation (EIA) was initially presented in Pakistan in light of the Environmental Protection Ordinance 1983 [3]. The EIA in Pakistan is included the accompanying strides Screening, Scoping, Impact evaluation, Considering of alleviation measures, Development of natural checking arrangement, Preparation of draft ecological effect proclamation, Final endorsement of the venture [4].

Landscapes are seeing able and coordinated socio-environmental frameworks with variable spatial and fleeting measurements. Scenes are naturally and socially sensitive to varieties at nearby through worldwide scales [5]. Landscaping has both negative (deforestation, adjustment of biological community and water, air and arrive contamination) and positive effects (financial impacts, and the stipulation of contact with culture and nature) on the encompassing environment [6]. There are three primary sorts into which distinguished wellbeing impacts fall. (1) Short-term recuperation from stress or mental exhaustion. (2) Physical recuperation from a disease or diminished occurrence of physical sickness. (3) A long haul behavioural change and a general change in prosperity (expanded social collaboration and diminishment of forceful conduct) [7].

Water significantly impacts and shapes the scene. It can make amazing formed situations. Designing impacts of water are for the most part the blend of cutting disintegration and building testimony. Since water is an exceptionally basic component in dry scenes, regularly the constraining element, even moment changes in water amount or quality can prompt to noteworthy changes in vegetation, natural life, and small scale climatic conditions. Changes in water stream can change the presence of streams, modifying or notwithstanding dispensing with particular water structures, for example, the vertical (water falls), rakish (falls), and level water bodies, and some may totally vanish [8].

Materials and Methods

Sampling procedure

Prior to study the impacts, baseline study was conducted to assess the water quality of the project area. The Sampling of proposed site for checking water quality followed by the development of water sampling plan, identification of sampling sites around study area and implementation of quality control and assurance protocols during sampling, handling, transportation and laboratory testing.

Sample collection and labelling

Random sampling was carried out. Drinking water samples were taken from tap, hand pump and tube well near the project area, represented as D-1, D-2 and D-3 respectively. Wastewater samples were collected from three different points of a drain near to the project area represented by W-1, W-2 and W-3 respectively. Sample bottles were properly labelled so they can be identified. Sample containers were marked so that they can be distinguished from other samples in the laboratory.

Sample transportation and storage

The samples were transported to the laboratory by car and were

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stored in refrigerator. Glass and plastic (polyethylene) bottles were used for the storage of water and was preserved at 4°C.

Laboratory determinations

Twenty two chemical and two microbial parameters were checked for drinking water samples whereas thirty chemical parameters for wastewater samples were tested by applying standard methods of parameter testing to check their compliance with NEQS.

Results and Discussion

Chemical parameters, including pH, colour, turbidity, total hardness, total dissolved solids, cyanide, fluoride, chloride, nitrate nitrogen, nitrite nitrogen, barium, cadmium, chromium, copper, lead, manganese, nickel, selenium, zinc, antimony and mercury were tested for all three drinking water samples and their resulting values were compared with NEQS. The comparison showed that all these chemical parameters were within the permissible limit of NEQS except Arsenic. It was the only chemical parameter of all the drinking water samples which was showing value higher than the permissible limit i.e., 0.051 mg/l, 0.071 mg/l and 0.090 mg/l for D-1, D-2 and D-3 respectively. Whereas tested microbial parameter, total coliform bacteria and faecal coliform bacteria, were absent in all three drinking water samples (Tables 1 and 2).

For chemical analysis, wastewater samples were subjected to chemical parameters testing. Total thirty chemical parameters which include, temperature, pH, oil and grease, TDS, TSS,COD, detergents, phenols, chlorine, BOD, cyanide, fluoride, sulfate, ammonia, chloride, sulphide, arsenic, barium, cadmium, chromium, copper, boron, iron, lead, manganese, nickel, selenium, silver, zinc and mercury were tested. All these tested chemical parameters were within the permissible limit of NEQS except sulphide, BOD, COD. The resulting values of BOD, COD and sulphide for W-1 were far above than the permissible limit i.e., 125 mg/l, 293 mg/l and 4.01 mg/l respectively. Same trend was found in W-2 and W-3. For W-2, resulting values of COD, BOD and sulphide were 298 mg/l, 129 mg/l, 4.48 mg/l respectively. W-3 showed BOD 127 mg/l, COD 288 mg/l and sulphide 4.2 mg/l respectively.

Water contamination is one of the real dangers to general wellbeing in Pakistan. Drinking water quality is ineffectively overseen and checked. Pakistan positions at number 80 among 122 countries in regards to drinking water quality. Drinking water sources, both surface and groundwater are tainted with coliforms, poisonous metals and pesticides all through the nation [9]. Overall population, in Pakistan, utilize subjective quality criteria like salty, putrid, terrible tasting, turbid or shaded water to confirm that it is not reasonable for drinking. The offices in charge of observing of water quality perform occasional checks of the fundamental water parameters against certain suggested gauges [10].

In 2014, it was found that Arsenic focus was high in surface and groundwater in Pakistan basically in two regions, that is, Punjab and Sindh. Water assets (3% and 16%) having As pollution level of more than 50 µg/l were reported in both Punjab and Sindh, individually, while 20% and 36% of water assets of Punjab and Sindh are trained with arsenic over 10 µg/l respectively [11]. A review was done in Southern Lahore to assess the water quality provided by WASA, Lahore, in which water tests from twelve distinct sources were gathered. The results of the review showed that physicochemical and bacteriological nature of water at source was agreeable [12].

Sr. No.	Chemical Parameters	Units	Resulting Values of			Limits as per NEQS
			D-1	D-2	D-3	
1	pH	pH unit	7.9	6.9	7.2	6.5-8.5
2	Colour	Pt-Co	3.8	4	4.5	≤ 15 TCU
3	Turbidity	NTU	0.20	1.5	2	< 5 NTU
4	Total Hardness	mg/l	156	154	180	<500
5	TDS	mg/l	212	230	238	<1000
6	Cyanide	mg/l	0.04	0.02	0.03	≤ 0.05
7	Fluoride	mg/l	0.090	1.2	1.5	≤ 1.5
8	Chloride	mg/l	21.05	25.0	22.4	≤ 250
9	Nitrate Nitrogen	mg/l	0.6	1.2	2.0	≤ 50
10	Nitrite Nitrogen	mg/l	0.8	1.1	0.002	≤ 3
11	Arsenic	mg/l	0.051	0.071	0.090	0.01
12	Barium	mg/l	0.182	0.321	0.62	0.7
13	Cadmium	mg/l	0.002	0.004	0.007	0.01
14	Chromium	mg/l	0.02	0.04	0.03	≤ 0.05
15	Copper	mg/l	1.2	1.4	1.6	2
16	Lead	mg/l	0.03	0.05	0.04	≤ 0.05
17	Manganese	mg/l	0.5	0.4	0.04	≤ 0.5
18	Nickle	mg/l	0.02	0.01	0.003	≤ 0.02
19	Selenium	mg/l	0.01	0.001	0.013	0.01
20	Zinc	mg/l	0.7	1.5	0.0170	5
21	Antimony	mg/l	0.001	0.004	0.003	≤ 0.005
22	Mercury	mg/l	0.0001	0.0002	0.001	≤ 0.001
Microbial Parameters						
1	Total Coliform Bacteria	CFU/100 ml	Absent	Absent	Absent	0 CFU/100 ml
2	Fecal Bacteria	CFU/100 ml	Absent	Absent	Absent	0 CFU/100 ml

Table 1: Drinking water quality of samples collected from the project area as compared to NEQS, Pakistan.

Sr. No.	Chemical Parameters	Units	Resulting Values of			Limits as per NEQS
			W-1	W-2	W-3	
1	Temperature (at sampling time)	oc	29	27	25	40
2	pH (at sampling time)	pH unit	7.9	8.0	7.4	06-09
3	Oil and Grease	mg/l	1.0	1.5	1.8	10.00
4	TDS	mg/l	410	417	409	3500.0
5	TSS	mg/l	65	62	58	200.0
6	COD	mg/l	293	298	288	150.0
7	Detergents, Anionic	mg/l	0.390	0.348	0.341	20.000
8	Phenols	mg/l	0.01	0.05	0.07	0.10
9	Chlorine(Residual)	mg/l	1.0	0.4	0.5	1.00
10	BOD	mg/l	125	129	127	80.0
11	Cyanide	mg/l	0.08	0.05	0.07	01.0
12	Fluoride	mg/l	2.1	2.5	2.0	10.0
13	Sulfate	mg/l	8.9	8.84	9.6	600.0
14	Ammonia	mg/l	2.89	2.92	3.0	40.00
15	Chloride	mg/l	50.01	52.64	50.59	1000.0
16	Sulphide	mg/l	4.01	4.48	4.2	01.00
17	Arsenic	mg/l	0.011	0.014	0.016	01.0
18	Barium	mg/l	0.082	0.086	0.079	1.5
19	Cadmium	mg/l	0.005	0.002	0.008	0.10
20	Chromium	mg/l	0.01	0.02	0.03	01.0
21	Copper	mg/l	0.4	1.0	0.6	01.0
22	Boron	mg/l	0.012	0.017	0.013	6.00
23	Iron	mg/l	1.5	1.0	1.7	8.00
24	Lead	mg/l	0.04	0.05	0.03	0.50
25	Manganese	mg/l	0.2	0.5	0.8	01.50
26	Nickel	mg/l	0.05	0.03	0.07	1.0
27	Selenium	mg/l	0.003	0.005	0.006	0.50
28	Silver	mg/l	0.8	0.3	0.5	1.00
29	Zinc	mg/l	0.011	0.014	0.013	5.0
30	Mercury	mg/l	0.003	0.001	0.005	0.01

Table 2: Waste water quality of samples collected from the project area as compared to NEQS, Pakistan.

An exploration done in the range of East Lahore intended to assess the nature of water being provided for drinking purposes to the inhabitants of East Lahore. For this reason six inspecting areas were chosen which included four examining focuses from urban ranges and two from the rustic areas. For appraisal physical, chemical and natural parameters were tried. The outcomes were contrasted with National Standards for Drinking Water Quality (NSDWQ) which showed that bacteriological parameters gave practically acceptable status. Although minor issues of hardness and turbidity were found [13].

An insignificant extent i.e., 8% of wastewater in Pakistan is dealt with through sedimentation ponds to an essential level just yet a large portion of the treatment plants are not practical [14]. Chemical oxygen demand test is regularly used to measure the organic mixes in water. Most uses of COD decide the measure of organic pollutants found in surface water or wastewater, making COD a valuable measure of water quality [15]. Biological oxygen demand is the measure of dissolved oxygen required by vigorous natural living beings in a waterway to breakdown natural (organic) material present in a given water test at certain temperature over a particular day. BOD can be utilized as a gauge of the viability of wastewater treatment plants. It is recorded as a routine contaminant in the U.S Clean Water Act [16].

Conclusion

The purpose of this study was to get familiar with the impacts that water of the project area was facing because of undergoing landscaping activities in the largest recreational park of Lahore, Greater Iqbal Park. For this, chemical and microbial, analysis of the samples taken from the project area was done which revealed that the landscaping activities were becoming the cause of deteriorating water quality of the project area. Arsenic was found higher than the optimum level in all three drinking water samples. Whereas, wastewater samples also showed abnormal values for the parameter COD, BOD and Sulphide. These findings clearly demand appropriate attention which can be provided not only by following but also implementing EPA guidelines and by the installation of proper water treatment plants. So, that the inhabitants of the area can receive safe water supply which is their constitutional right as well.

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