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Assessment and Correlation of Physico-Chemical Parameters of Waste Water

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Abstract: The present research work explores the important physico-chemical parameters of waste water collected from different areas i.e. Domestic sewage area, Hospital sewage area and Industrial sewage area of Sagar (M.P.), India. An intensive analytical program was followed by January to December (2013) for monitoring waste water. Monthly changes in physical and chemical parameters of water such as pH, Temperature, Total Dissolved Solids (TDS), Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Hardness, Chlorides, Alkalinity, Phosphate and Nitrate were recorded and their correlations were estimated. The study reveals that dumping of waste materials in different drainage systems pollute aquatic and surroundings of terrestrial environment thereby affecting the growth of vegetation and aquatic life. The outcome of the present investigation points out that it requires to implement common objectives, compatible policies and programs for improvement in the waste water treatment methods. Waste should be properly disposed or recycled. Relevant agencies should make continuous efforts to educate, regulate and control people for environmental changes and suggest them to change their policies of waste water management.
Keywords:- BOD, COD, DO, TDS.

Introduction

Water, the elixir of life, is becoming dearer to mankind due to unwise use and mismanagement of water resources. Wastewater discharge from domestic and industrial sewage is major source of water pollution, contributing to nutrient loading of the water bodies, promoting toxic algal blooms and leading to a destabilized aquatic ecosystem [1], [2]. Sewage is the waterborne waste, derived from anthropogenic activity and impacts water and terrestrial ecosystem. These ecosystems exhibit interrelationship between inhabiting organisms and varying physico-chemical and biological parameters. Uncontrolled dumping of waste in ecosystem leads to the accumulation of excess of sewage, thereby recycling and self regulatory capability of ecosystem is lost. Discharge of untreated or partly treated sewage in water bodies are primary sources of water pollution resulting into depletion of oxygen level of water and stimulation of algal growth. Phosphates favour luxuriant growth of algae which form water blooms. This extensive algal growth also consumes most of the available oxygen from water. The decomposition of waste by aerobic microbes decrease due to higher level of pollutant and it becomes unfit for drinking and other domestic uses. Since decomposition of sewage and other waste is largely an aerobic process, accumulation of these in water increases its Biological Oxygen Demand (BOD).

Present waste management strategies have failed to keep pace with the industrial growth and urbanization. Wastewater effluents often contain high amounts of dissolved salts however, it can increase the salinity of the receiving water, which may result in adverse ecological effect on aquatic biota [3].

Materials and Methods

Study Area

Present study was carried out at the sewage areas of Sagar, Madhya Pradesh, India, which are surrounded by dense population. Sagar is situated a few kilometers in north of the tropic of Cancer between 23°50'N latitude and 78°40'E longitudes.

Waste water samples were collected from three different sewage sites viz. Site I (SI), Site II (SII) and Site III (SIII).

1. SI – Isarwara Drainage (Industrial effluent)
2. SII – Kakaganj Drainage (Domestic Sewage)
3. SIII– District hospital Drainage (Hospital sewage)

Figure1: Location of three different waste water sites of Sagar, M.P. (Image captured from Google earth)

Sites are subjected to human interferences and receive discharge from the surrounding localities which makes the water highly polluted and pollutants like domestic sewage, straw, hospital discharge and industrial effluent etc. get accumulated in large quantities.

Climatic conditions

Sagar has dry deciduous vegetation. It receives heavy rain fall in the monsoon season from mid June to September. The normal annual rainfall of the district is 1234.8 mm [4]. During winter minimum average temperature goes up to 11.6 ^{0}C. January is the coldest month. Maximum average temperature noticed during the month of May is 40.7 ^{0}C.

Sample Collection

Waste water samples were collected from January 2013 to December 2013. Samples were taken in the mid of the each month in plastic bottles thoroughly cleaned with diluted HCl and washed with tap and distilled water twice, again rinsed with the water sample to be collected.

Physico-chemical Study

The samples were collected and analyzed for pH, Temperature, Total Dissolved Solids (TDS), Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Alkalinity, Phosphate, Chloride, Nitrate. Standard methods were followed for collection, preservation, analysis and interpretation [5], [6], [7], [8], [9], [10], [11], [12], [13]. Standards for the potable water quality have been taken from Bureau of Indian standards (BIS) and Central Pollution Control Board (CPCB) [14], [15].

Table and graph which has been given made by using computer software Originpro 8.5 and MSExcel 2007.

Results and Discussion

Following parameters have been estimated to assess the water quality.

1. pH

pH is extremely important parameter, since the aquatic life are controlled by chemical changes in aquatic environment.Thus, pH is having primary importance in deciding the quality of waste water. Exceptional value of pH may reflect contamination by strong base such as NaOH and $Ca(OH)_2$ [16]. The range of desirable pH of water prescribed for drinking purpose by ISI [17] and WHO [18] is 6.5 to 8.5. The average values of pH of waste water samples collected from different sites vary minimum 6.72 in SII and maximum 11.3 in SI. In both the cases, pH values were slightly below but extremely high above the permissible limit.

2. Temperature (Temp)

Temperature is one of the most important ecological features. Salts in water, solubility of gases, behavioral characteristics of organisms all are controlled by temperature. In the present study, the average temperature of different sites varies between minimum of 15.7 ^{0}C for SIII and maximum of 35.5 ^{0}C for SI. High water temperature recorded during pre-monsoon. Similar data have also been recorded [19], [20], [21].

3. Total Dissolve Solids (TDS)

TDS content in water is a measure for salinity. A large number of salts are found dissolved in natural waters, the common ones are Carbonates, Bicarbonates, Chlorides, Sulphates and Nitrates of Calcium, Magnesium, Sodium, Potassium, Iron and Manganese, etc. A high content of dissolved solid elements affect the density of water, influence osmoregulation of organisms and reduces solubility of gases (like oxygen). It affects utility of water for drinking, irrigation and industrial purposes. Based on the concentration of TDS [22] water can be classified as desirable for drinking (up to 500mg/L), permissible for drinking (up to 1000mg/L), useful for irrigation (up to 2000mg/L), not useful for drinking and irrigation (above 3000mg/L). In present investigation, the average value of TDS lies in the range of 199mg/L in the waste water from SI and 379mg/L in the waste water sample collected from SIII. The high amount of TDS during Pre –monsoon season might be due to increase in the rate of evaporation. High concentration of TDS leads to eutrophication [23].

4. Dissolved Oxygen (DO)

DO is very essential for metabolism of all aquatic organisms that possess aerobic respiratory biochemistry [24]. According to vijayanan [25], assessment of dissolved oxygen is a prime characteristic in all pollution related ecological studies. Present investigation shows average minimum value 2.03mg/L in the SI and maximum value 6.75mg/L in the SIII.

5. Biological Oxygen Demand (BOD)

BOD may be defined as the rate of consumption of oxygen by microorganisms in aerobic degradation of the dissolved organic matter in water. Increase in BOD can be due to heavy discharge of waste water effluent, animal & crop wastes and domestic sewage [26]. Low BOD content is an indicator of good quality water, while a high BOD indicates polluted water. According to UN Department of Technical Cooperation for Development the maximum permissible BOD content is less than 100 to 300mg/L. The experimental data of present investigation shows average BOD value of minimum 11.24mg/L and maximum 24.27mg/L of SIII.

6. Chemical Oxygen Demand (COD)

COD determination is a measure of the oxygen equivalent of that portion of the organic matter in a sample that is susceptible to oxidation by a strong chemical oxidant. COD value is useful in specifying toxic condition and presence of biologically resistant substances. COD test is used to measure the load of organic pollutant in the waste water. The COD and BOD values both are a measure of the relative oxygen-depletion effect of a waste contaminant. Present investigation shows average COD minimum value 22.26mg/L from SI and maximum value 58.02mg/L from SIII.

7. Alkalinity

The value of total alkalinity gives an idea of natural salts present in water. Total alkalinity shows lowest average value 281mg/L and higher average value 594.3mg/L only in the SI.

8. Phosphates

Phosphate is one of the essential nutrients present in the water in small quantity. During the present study the minimum average value 0.03mg/L and maximum average value 0.7mg/L in SIII.

9. Chlorides

Chlorides occur widely in all natural waters in varying concentrations. Excessive chlorides in potable water is not particularly harmful and the criteria set for this anion are based primarily on palatability and its potentially high corrosiveness [27]. The chloride concentration in all investigating sites are below 250mg/L at all season within desirable limit. The average value of chlorides lies in the range of 96.32mg/L in the waste water from SI and 198.63mg/L in the waste water sample of SIII.

10. Nitrate

Investigation shows average maximum value 19.89mg/L in SIII and average minimum 3.79mg/L in SII.

The experimental data on physico-chemical properties of water samples collected from different sewage sites are presented in Tables 1, 2 and 3.

Table 1: Physico-chemical properties of waste water samples of SI.

Parameters	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
pH	6.94 ± 0.62	8.21 ± 0.025	9.12 ± 0.045	11.3 ± 0.26	9.35 ± 0.047	7.56 ± 0.30	7.16 ± 0.25	7.71 ± 0.26	7.9 ± 0.1	7.61±0.025	8.01 ± 0.01	7.56 ± 0.055
Temp	18.4±0.05	19.1 ± 0.05	25.4±0.05	29.7± 0.05	35.5± 0.05	35.4± 0.05	25.7± 0.05	22.2± 0.11	21.2± 0.05	19.2± 0.1	19.3± 0.1	19.1±0.1
Alkalinity	292.6 ±10.2	439.4 ± 5	514.9 ± 5.1	597.4 ± 2.9	525.7 ± 4.7	347.1 ± 4.8	330.4 ± 2.6	410.6 ± 8.6	444.4 ± 4.5	318.9 ± 4	337 ±3.6	391 ± 9
TDS	348 ± 8.1	295 ± 5.6	267 ± 2.5	363 ± 6.0	262 ± 5.5	206 ± 7	386 ± 6.2	302 ±12.8	352 ± 11.1	355.6 ± 7.5	223 ± 9	376 ± 6.5
DO	3.7 ± 0.07	3.4 ± 0.06	3.2 ± 0.06	2.9± 0.1	2.9 ± 0.04	2.8 ± 0.07	2 ±0.07	4.8 ± 0.05	3.6 ± 0.07	5.1 ±0.04	2 ±0.08	4.1 ± 0.02
BOD	12.9 ± 0.08	18.3 ±0.3	19.2 ± 0.3	16.3 ± 0.4	19.9 ± 0.2	23.7 ± 0.3	24.1 ± 0.8	19.5 ± 0.3	17.7 ± 0.3	12.8 ± 0.4	13.5 ± 0.3	11.3±0.3
COD	54 ± 1.8	41.4 ± 0.9	45.2 ± 0.7	39.5 ± 0.6	30.6 ± 0.6	29.4 ± 0.5	31.2 ± 0.3	22.2 ± 0.3	28.4 ± 0.9	39.6 ± 0.4	33.2 ± 0.7	39.3 ± 0.4
Total Hardness	165.81±6.8	164.53± 2.9	121.±1 3.3	206.1 ±6	145.33±3.37	192.15±6.64	198.17±4.79	178.09±4.23	185.59 ±5.06	166.66 ±4.37	187.5±2.8	159.1± 0.3
Ca	54.4±2.75	52.85±2.68	51.64±1.71	47.19±2.77	52.55±1.21	43.31±1.52	53.59±1.22	46.22±2.5	42.01±1.35	55.71±2.41	40.81±0.91	54.54±0.55
Mg	32.2±1.03	40.1±0.49	42.65±0.51	36.58±2.19	42.3±0.727	37±0.305	41.19±0.62	36.45±0.441	34.75±0.26	42.29±0.30	38.91±0.65	35.85±1.39
Nitrate	9.7 ± 0.3	17.3 ± 0.5	16 ± 0.8	18.6 ± 0.8	20.2 ± 1	17.1 ± 1	20.5 ± 0.6	13.2 ± 0.2	8.4 ± 1	9.3 ± 0.7	8.9 ± 0.4	5.2 ± 0.07
Chloride	163.2 ± 5.6	97.3 ± 3.1	135.6 ± 6.4	138.1 ± 7.2	150.2 ± 8	174.9 ± 5.5	187.5 ± 5.4	190 ± 0.8	185.6 ± 3.8	197.1 ± 3.8	143.9 ± 5.75	127.6 ± 3.8
Phosphate	0.78 ± 0.2	0.37 ± 0.03	0.21 ± 0.06	0.1 ± 0.02	0.22 ± 0.04	0.18 ± 0.05	0.23 ± 0.05	0.19 ± 0.03	0.58 ± 0.03	0.42 ± 0.04	0.38± 0.07	0.2 ± 0.1

Table 2: Physico-chemical properties of waste water samples of SII.

Parameters	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
pH	6.72 ± 0.025	8.95 ± 0.035	9.04 ± 0.025	8.40 ±0.041	8.94 ± 0.025	7.99 ± 0.01	8.36 ± 0.04	7.73 ± 0.20	8.23 ±0.20	7.43 ± 0.15	7.45 ± 0.70	7.13± 0.03
Temp	17.41±0.01	18.91 ±0.01	23.3 ± 0.1	24.64 ±0.02	30.82 ± 0.02	26.7 ± 0.1	24.8 ± 0.15	26.4 ± 0.05	24.7 ±0.05	24.3 ± 0.02	21.3 ± 0.03	16.71±0.01
Alkalinity	311.2 ± 2.1	448.8 ± 1.8	504.6 ± 4.2	327.5 ± 3.9	349.3 ± 2.9	414.2 ± 3.6	323.4 ± 3.3	315.6 ± 3	341 ±1.8	300 ± 2.4	395.2 ± 4.6	348 ± 2.6
TDS	252.6 ± 9.2	292.3 ± 9	275 ± 6.8	364 ± 7	293.3 ± 10.9	292 ± 14.6	346.6 ± 5.8	279.6 ± 12.2	355.6 ± 7.5	282.3 ±6.1	324.3 ± 5.5	358 ± 4.5
DO	4.7 ± 0.07	4.4 ± 0.09	3.6 ± 0.04	2.8± 0.04	2.3 ±0.04	2.2 ± 0.4	4.4 ±0.07	5.0± 0.09	5.6± 0.06	5.3 ±0.05	3 ±0.08	4.9 ± 0.04
BOD	13.1 ±0.3	17.8 ±0.2	16.6 ±0.3	15.7 ± 0.4	20.2 ± 0.5	24.6 ± 0.3	25.3 ± 1.9	19 ± 0.9	16.6 ±0.5	13.4 ± 0.6	11.3 ± 0.4	13.9±0.3
COD	56.7 ± 0.6	51.1 ± 0.3	48.1 ± 0.4	41 ± 0.3	31 ± 0.7	27.6 ± 0.9	29.7 ± 0.3	28 ± 1.1	31.2 ± 0.7	38.3 ± 1.5	42.2 ± 0.4	34 ± 0.4
Total Hardness	125.11±1.68	127.26±3.77	127.68±3.72	138.99±0.23	142.16±0.61	142.85±0.56	125.46±0.86	140.76±2.27	131.73±1.20	139.72±2.28	129.17±4.96	129.27±1.14
Ca	20.61±1.13	29.79±0.43	29.29±0.60	34.44±0.51	39.78±0.39	35.77±0.98	23.78±1.63	25.64±0.66	29.22±0.72	25.79±2.25	29.88±0.74	22.95±0.88
Mg	20.19±0.20	18.75±0.45	19±0.40	17.04±0.69	15.39±1.19	18.02±0.19	17.9±0.5	19.1±0.170	17.05±0.78	19.58±0.62	18.38±0.14	17.07±0.83
Nitrate	11.6 ± 0.6	17.9 ± 0.3	20.1 ± 0.8	17.9 ± 0.2	21.7 ± 0.8	23 ± 0.2	23.8 ± 0.6	14.7 ± 0.4	7.9 ± 0.8	6.4 ± 0.4	4.7 ± 0.9	6.7 ± 0.4
chloride	148.4 ± 5.4	177.2 ± 4.2	196.4 ± 4.8	182.4 ± 3.5	190.1 ± 2.8	187.4 ± 3.7	194.5 ± 4.1	140.2 ± 3	142.7 ± 2.7	114.3 ± 4.2	138.2 ± 2.6	158 ± 2.6
phosphate	0.05 ± 0.01	0.17 ± 0.05	0.19 ± 0.02	0.2 ± 0.03	0.27 ± 0.05	0.29 ± 0.04	0.18 ± 0.03	0.15 ± 0.05	0.36 ± 0.04	0.27 ± 0.06	0.25 ± 0.1	0.16 ± 0.05

Table 3: Physico-chemical properties of waste water samples of SIII.

Parameters	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
pH	6.92±0.2	8.72±0.02	9.32 ± 0.02	8.72 ± 0.02	8.7 ± 0.2	8.26± 0.25	8.66 ± 0.03	7.43 ± 0.25	7.88± 0.040	7.52± 0.03	6.94± 0.04	7.72 ± 0.02
Temp	15.7 ± 0.01	18.52± 0.02	21.6 ± 0.03	26.5 ± 0.02	28.5 ± 0.01	26.6 ± 0.05	25.5 ± 0.03	24.2 ± 0.35	23.5 ± 0.05	24 ± 0.2	20.7 ± 0.02	19.5 ± 0.02
Alkalinity	295.8 ± 6.1	439.4 ± 4	507.1 ± 5.4	381.5 ± 5	498.2 ± 3.2	350.3 ± 3.5	371.2 ± 1.9	436.7 ± 4	420.7 ±6.1	324.6 ± 3.8	295.1 ± 3.4	427.6 ± 4.8
TDS	305 ± 9.1	328.3 ± 8.5	365.6 ± 5.8	312.6 ± 4	216.6 ± 7.7	266.6 ± 5.8	374 ± 8.1	289.3 ± 5.1	311 ± 8	351.3 ± 9.6	291 ± 6	368 ± 6.2
DO	2.3 ± 0.03	3.45 ± 0.06	5.18 ± 0.09	3.7 ± 0.03	4.03 ± 0.06	2.2 ±0.03	2.3 ± 0.06	6.6 ± 0.1	4.7 ± 0.06	2.9 ± 0.03	4 ±0.08	1.4± 0.08
BOD	15.2 ± 0.5	16.6 ± 0.4	20.2 ± 0.7	17.8 ± 0.5	22 ± 0.8	24.9 ± 0.7	21.8 ± 0.5	19.2 ± 0.3	15.9 ± 0.8	11.8 ± 0.5	8.4 ± 0.4	14.9 ± 0.9
COD	58 ± 0.1	42.7 ± 0.4	49.7 ± 0.3	39.5 ± 0.6	29.2 ± 1.2	32.4 ± 0.6	28 ± 0.8	29.2 ± 1.2	29.8± 1.5	27.4 ± 1.7	47.1 ± 1	41.2 ± 0.4
Total Hardness	73.07±1.84	67.28±1.55	68.5±0.75	82.86±1	79.48±1.45	73.1±0.83	66.9±2.8	85.22±2.28	55.57±1.88	64.15±1.58	55.03±1.75	84.86±0.65
Ca	24.41±1.55	28.23±1.01	31.77±1.21	20.32±0.73	26.44±1.2	28.77±0.57	28.84±0.53	28.1±0.85	21.02±0.05	20.55±1.14	26.25±1.72	24.81±1.71
Mg	19.3±0.79	17.04±0.74	16.34±0.48	15.55±0.22	19.45±1	19.15±0.26	15.18±0.43	17.54±0.48	18.96±0.25	14.88±0.74	18.34±0.32	20.55±1.02
nitrate	12.2 ± 0.5	16.1 ± 0.2	19.7 ± 0.4	20.8 ± 0.8	16.5 ± 0.7	19.2 ± 1	23.7 ± 0.3	11.9 ± 0.1	8.7 ± 1.9	8.9 ± 0.2	5.38 ± 0.7	4.9 ± 0.1
chloride	154.5 ± 4.1	181.2 ±3.7	189.6 ± 4.2	185.5 ± 6.2	200.3 ±2.8	118.7 ± 9.7	204 ± 7.9	121.3 ± 1.7	117.9 ± 2.5	98.6 ± 3	151.5 ± 9.4	139.5 ± 1.4
phosphate	0.17 ± 0.04	0.39 ± 0.2	0.14 ± 0.04	0.3 ± 0.4	0.2 ± 0.03	0.34 ± 0.6	0.3 ± 0.02	0.17 ± 0.05	0.24 ± 0.05	0.52 ± 0.09	0.35 ± 0.05	0.69 ± 0.01

Statistical regression analysis

Correlation analysis measures the closeness of the relationship between independent and dependent variables. If the correlation coefficient is nearer to +1 or -1. It shows the probability of linear relationship between the variables. A low p-value suggests that dependent variable DO may be linearly related to independent variables.

Table 4: Correlation between physico-chemical parameters of waste water site SI.

Parameters	pH	Temp	TDS	DO	BOD	COD	Alkalinity	Phosphate	Nitrate	Total hardness	Ca	Mg	Chloride
pH	1												
Temp	0.4643	1											
TDS	-0.0641	0.7637	1										
DO	-0.2166	-0.416	0.332	1									
BOD	0.0366	0.6694	-0.3051	-0.4292	1								
COD	0.0438	-0.358	0.2382	0.0723	-0.5186	1							
Alkalinity	0.9124	0.4527	-0.0339	-0.1184	-0.0697	0.0697	1						
Phosphate	-0.4997	-0.5739	0.1941	0.1925	0.1941	0.442	-0.5032	1					
Nitrate	0.4524	0.7241	-0.2145	-0.492	-0.2145	0.1758	0.4496	-0.5082	1				
Total hardness	0.0019	-0.2543	-0.0829	0.0006	-0.0828	0.188	0.0884	0.0772	0.2171	1			
Ca	-0.1395	-0.1982	0.5087	0.3343	0.0509	0.569	-0.107	0.0774	0.076	0.192	1		
Mg	0.2367	0.2973	-0.252	-0.178	-0.252	-0.1243	0.231	-0.4416	0.4963	0.147	0.3036	1	
Chloride	-0.477	-0.1888	0.1231	0.312	0.1231	-0.3114	-0.4081	0.2953	0.1145	0.3834	0.306	0.0516	1

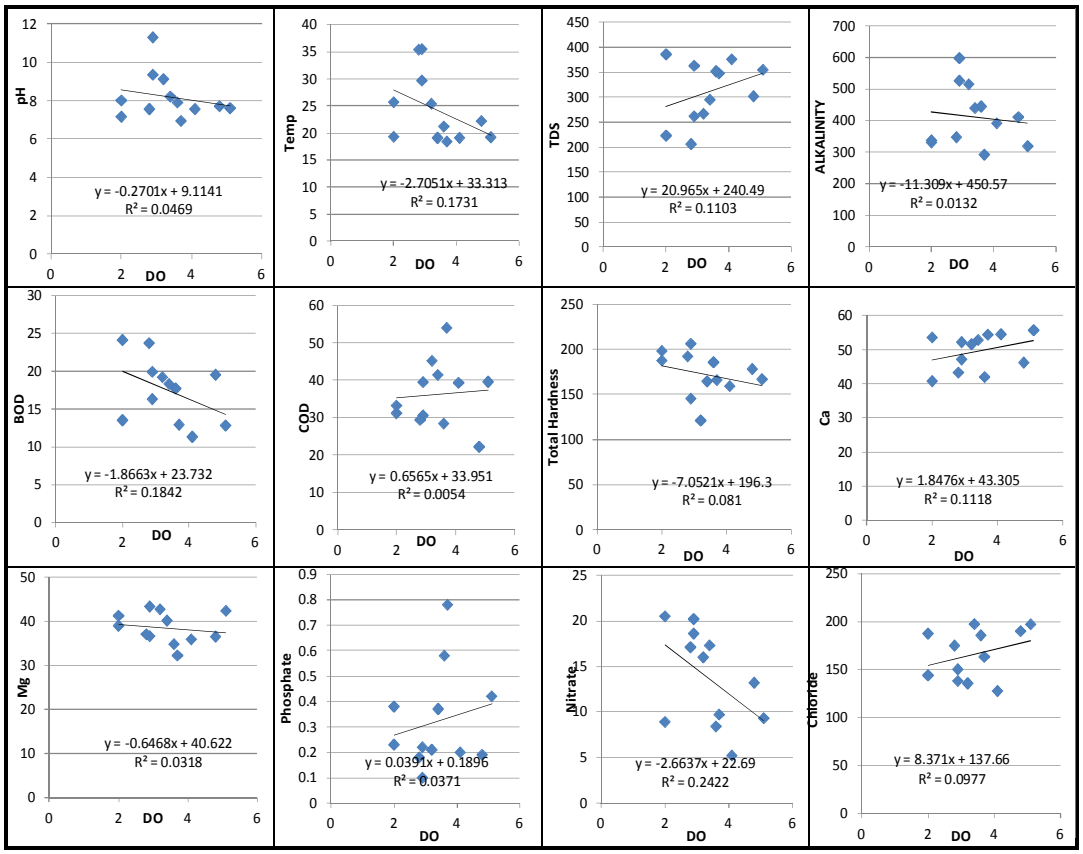
Table 5: Correlation between physico-chemical parameters of waste water site SII.

Parameters	pH	Temp	TDS	DO	BOD	COD	Alkalinity	Total Hardness	Ca	Mg	Phosphate	Nitrate	Chloride
pH	1												
Temp	0.5029	1											
TDS	0.7783	-0.0272	1										
DO	-0.3764	-0.4285	0.025	1									
BOD	0.4885	0.572	0.3245	-0.2943	1								
COD	-0.0891	-0.652	-0.4031	0.07586	-0.5777	1							
Alkalinity	0.5561	-0.1103	-0.2123	-0.3772	0.8986	0.3217	1						
Total Hardness	0.109	0.7373	-0.088	-0.3769	0.256	-0.5812	-0.2515	1					
Ca	0.6348	0.684	0.0771	-0.7901	0.3214	-0.2834	0.3161	0.625	1				
Mg	-0.4315	-0.468	0.6189	0.4203	-0.2937	0.5462	0.0649	-0.331	-0.6428	1			
Phosphate	0.3321	0.5765	-0.1475	-0.1819	0.1756	-0.5527	0.08193	0.4638	0.5924	-0.5022	1		
Nitrate	0.6745	0.4986	0.3432	-0.5341	0.8379	-0.1727	0.3145	0.1772	0.453	-0.2346	-0.0764	1	
Chloride	0.6975	0.258	0.111	-0.6086	0.6482	-0.0455	0.503	-0.0705	0.4623	-0.4236	-0.0751	0.8784	1

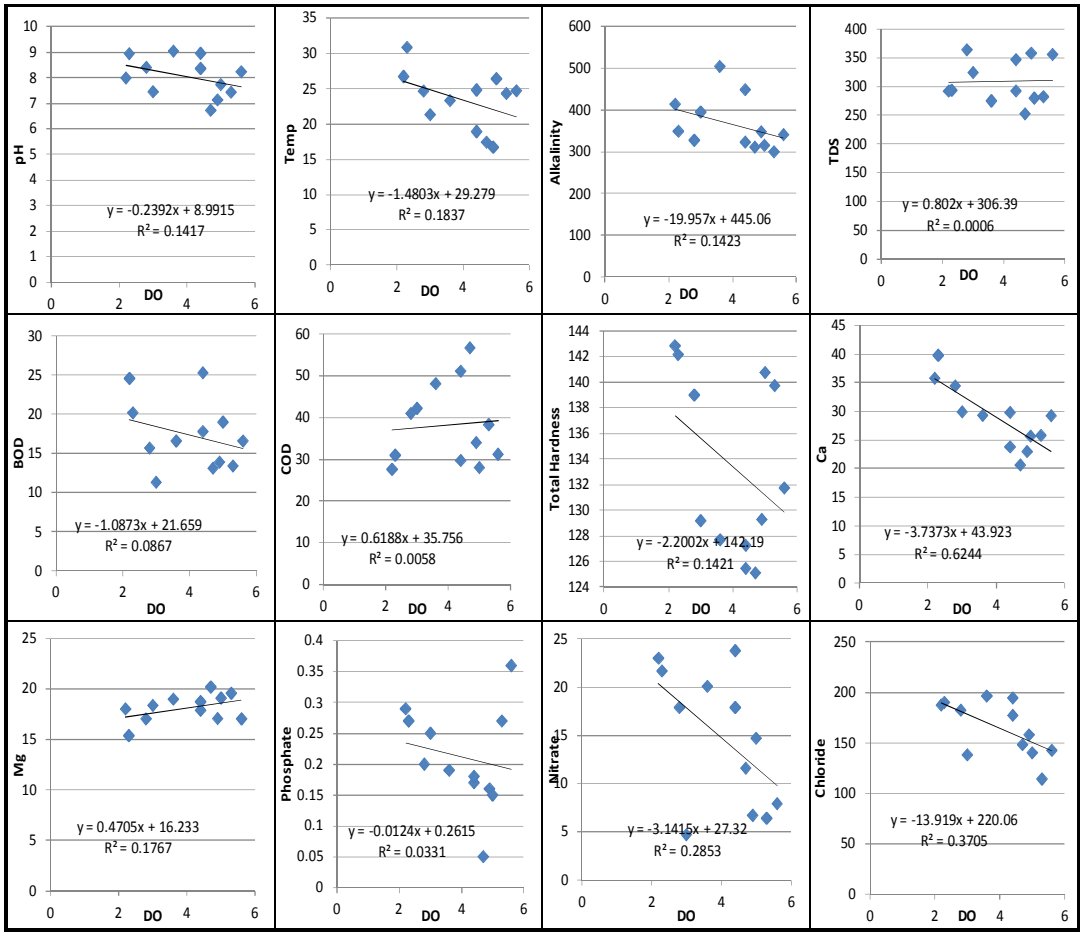
Table 6: Correlation between physico-chemicals parameters of waste water site SIII.

Parameters	Ph	Temp	TDS	DO	BOD	COD	Alkalinity	Total Hardness	Ca	Mg	Phosphate	Nitrate	Chloride
pH	1												
Temp	0.4339	1											
TDS	0.1436	-0.3769	1										
DO	0.0992	0.2056	-0.2563	1									
BOD	0.6568	0.5506	-0.2375	0.0371	1								
COD	-0.1766	-0.785	0.1625	-0.1378	-0.3415	1							
Alkalinity	0.6956	0.2616	-0.0504	0.4566	0.489	-0.194	1						
Total Hardness	0.1562	0.1886	-0.1379	-0.0304	0.4336	-0.0513	0.3412	1					
Ca	0.3808	-0.0585	-0.0048	0.1708	0.4996	0.1667	0.3856	0.0683	1				
Mg	-0.3584	-0.2506	-0.4839	-0.18	0.0094	0.2262	0.0793	0.1798	0.0458	1			
Phosphate	-0.194	-0.1594	0.4055	-0.6235	-0.3927	-0.1324	-0.2226	0.0621	-0.3131	0.0914	1		
Nitrate	0.7732	0.453	0.0214	0.0089	0.7792	-0.1282	0.2674	0.2035	0.4082	-0.483	-0.4581	1	
Chloride	0.6438	0.0878	0.0389	-0.0146	0.3371	0.2468	0.3943	0.145	0.3964	-0.2073	-0.3305	0.6352	1

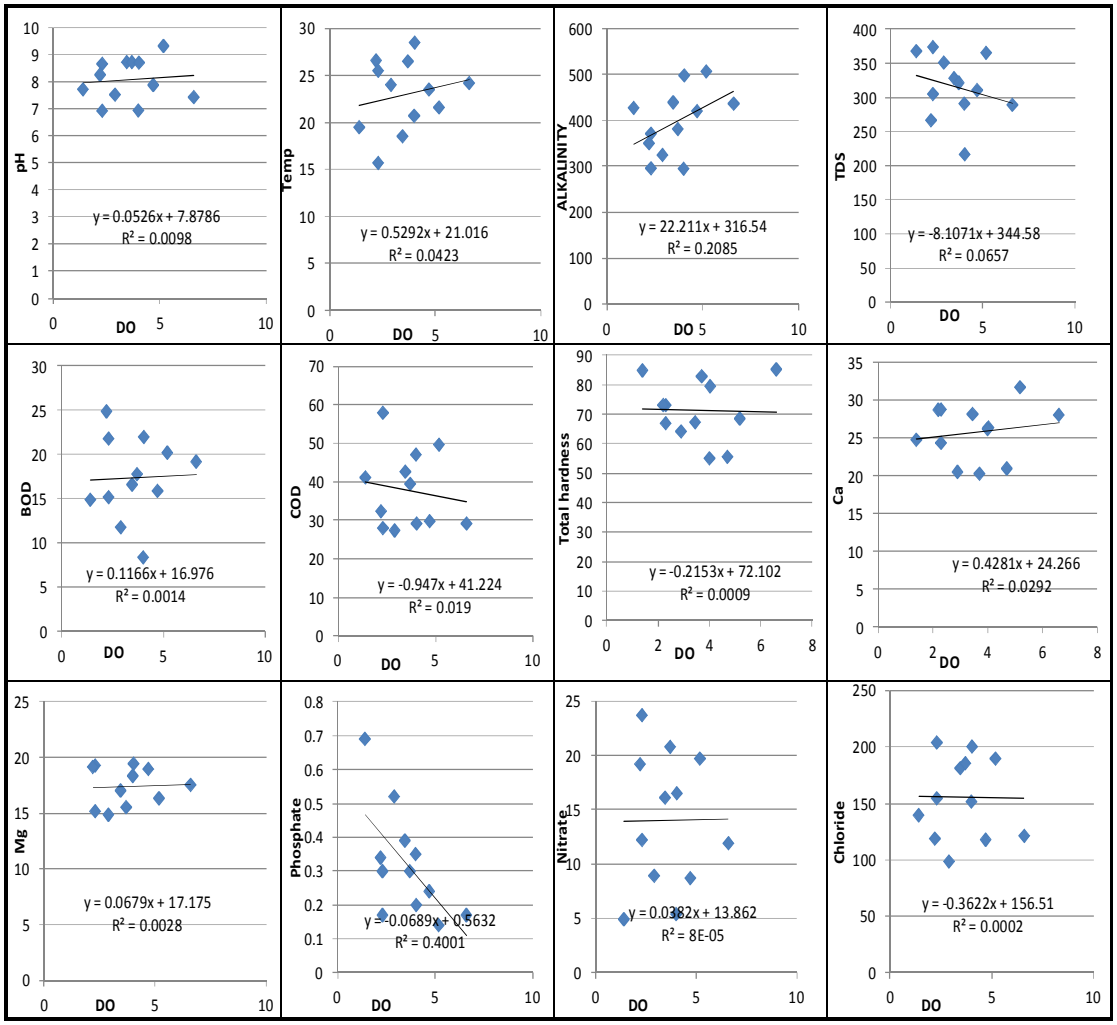
Regression curve between the mean of dependent and independent parameters of SiteI (I).



Regression curve between the mean of dependent and independent parameter of SiteII (SII).



Regression curve between the mean of dependent and independent parameters of SiteIII (SIII).



Conclusion

Developed/developing countries in the world are targeting to minimise the impact to the ecosystem by discharging minimum waste. Trash and garbage sites are very common in urban and rural areas of India. Root cause of many environmental issues such as degradation of forest and agricultural land, mineral resources depletion, poor public health, loss of biodiversity, loss of resilience in ecosystem, healthy and secure livelihood for mankind especially poor.

Results from the various studies conducted are inconsistent; they actually testify the disturbance in the ecosystem and aquatic diversity and the lack of land fertility. The discharge of untreated sewage is most important cause of pollution for surface and ground water. There is a large gap between generation and treatment of domestic waste water. These sites are highly polluted due to disposal of untreated sewage. The experimental data shows that the policies to treat the water needs to be adhered with and the plants need to be set up.

The problem is not only lack of sufficient treatment capacity but also the sewage treatment plants that exist do not operated or maintained. It is imperative to recycle the domestic waste possible to control the pollution.

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