

CHAPTER -7

RESULTS AND DISCUSSION

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Statistical analyses were conducted for the purpose of identifying water quality trends in the Mahananda River. Chapter 3 is a presentation and discussion of the results from both the standard regression analysis and comparative discussion of arithmetic mean, standard deviation and variance on the individual water quality variables at each of the monitoring stations from 2001 to 2006 (as per the WBPCB data). The Karl-Pearson correlation coefficient values, the regression slope for each water quality parameter at each of the stations are presented in 3.7 and 3.8.

It should be reiterated at this point that the results of the regression analysis are applied with great caution. This is because the data were characterized by skewness, nonlinearity, non-normality and a possible lack of independence and thus violated the assumptions required for linear regression.

The results from statistical analysis show that, the water is certainly unfit for drinking purposes without any form of treatment, but for various other surface water usage purposes, it still could be considered quite acceptable. But as it is known, once a trend in pollution sets in, it generally accelerates to cause greater deterioration. So few years from now, serious water quality deterioration could take place.

As per the water quality data during 2005-2006 (March-July) the statistical analysis of mean value (ref. below mentioned statistical results table.) and the result of DO shows that in dry season it is just 3.83 mg/L i.e the water becomes so polluted at this period at Siliguri .Since the river Mahananda is totally rain fed so in rainy season the DO value goes up to 6.92mg/L and it becomes low polluted then i.e this statistical result collinear with the physical and natural phenomena of this river.

The difference pollution situation can be understood from the results of BOD and COD also. The result of standard deviation and variance of these parameters also show the rate of pollution load at dry and monsoon season. Since the soil of this region is highly porous

and temperature goes up in summer then it flows very slowly and it becomes highly polluted.

Parameters	DO		BOD		COD	
	Dry	Monsoon	Dry	Monsoon	Dry	Monsoon
Mean	3.83	6.92	4.43	2.72	27.07	30.83
Standard Deviation (SD)	1.42	2.04	3.09	1.31	7.68	8.87
Variance	2.01	4.16	9.56	1.72	58.92	78.68
Min	1.40	2.03	1.33	0.90	24.43	13.01
Max	5.77	8.36	6.13	3.60	40.72	30.24

Statistical Analysis of water quality parameters of River Mahananda at Siliguri during 2005-2006. All units are at mg/L and 26⁰C

7.1 Analysis of pH:

Since the river originates from Darjeeling hill of Himalaya (See 3.1 of chapter 3) where some dolomite ores are there so the difference of result of pH is negligible over the length of the river. In fact it was found that total hardness of the Mahananda River increases

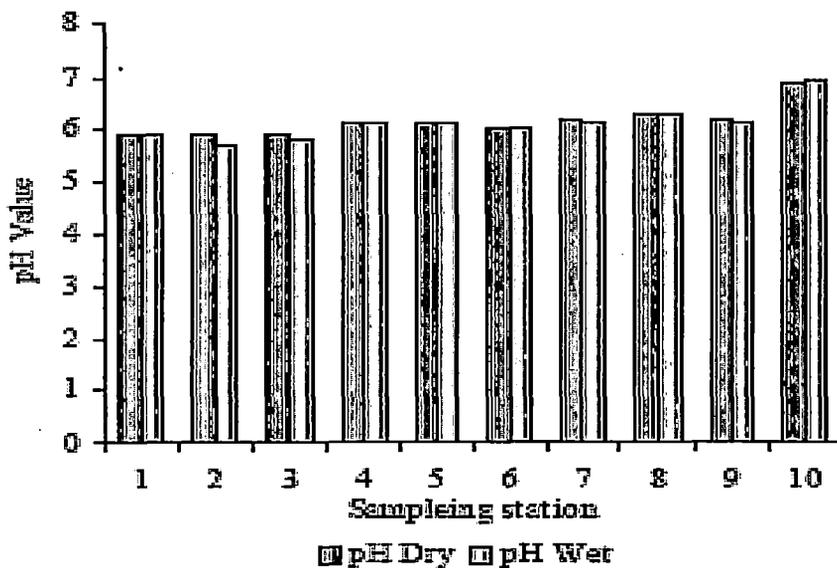


Fig-7.1 pH value at different sampling stations of Mahananda along the downstream from Siliguri to Malda since some industrial and agricultural effluents are directly connected to this river over this region.. Actually there are no significant trends in pH values at any of the stations during the study period (Table 3.3 and Table 3.4).

7.2 Results analysis of Dissolved Oxygen (DO):

It is observed from the statistical data fitted in the figure 3.6, 3.7 and 3.8 that at location A of Siliguri DO value was decreasing up to 2004-2005 but returned in 2005-2006. In location B i.e just the river is entering the city it is decreasing i.e. its get polluted over the years .Again in location C i.e. after crossed over the city its water quality is sharply falling (DO value from 5.5 to 3.08).

At English Bazar, Malda (ref.figure 3.15, 3.16 and 3.17) the zigzag graphical models of DO value are generated. After receiving all effluents from Malda city it gets polluted.

The same scenario is coming from the results of correlation coefficient and regression analysis both for Siliguri and Malda. (ref. 3.6.4 and 3.6.5).

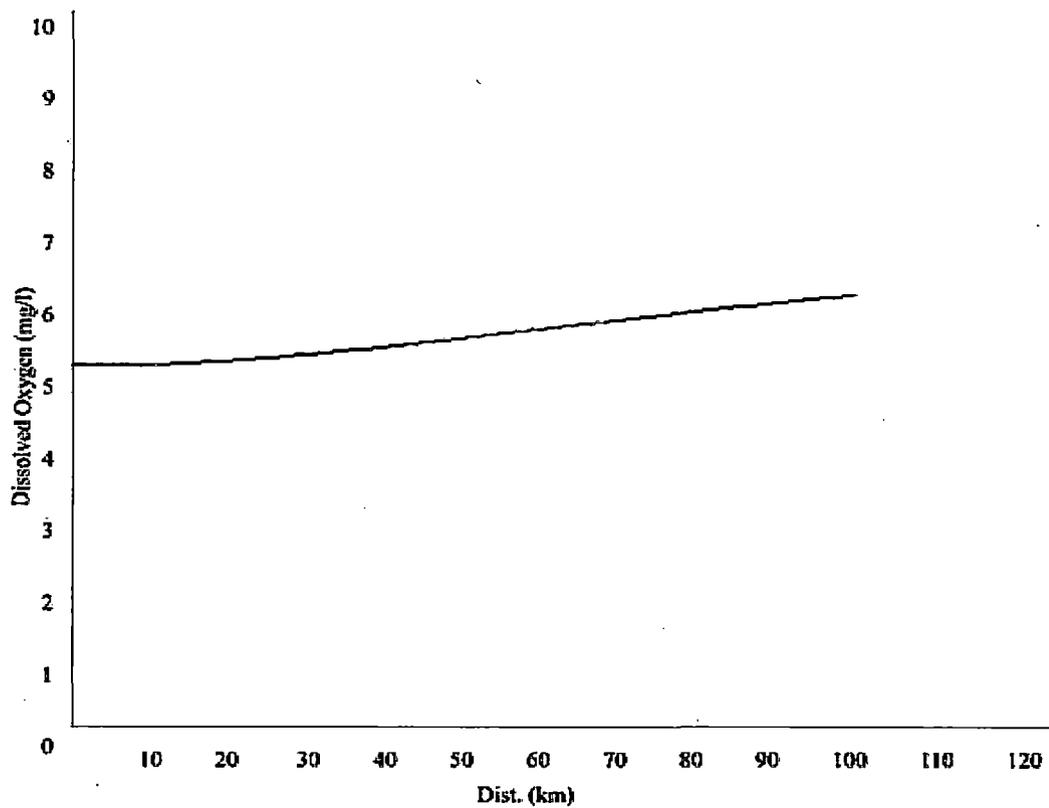


Fig. 7.2: DO along the river reach from simulation model curve

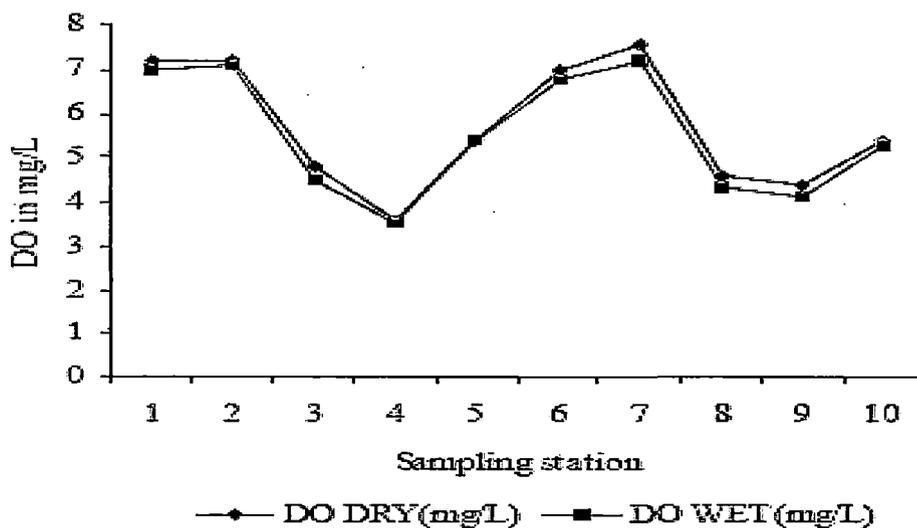


Fig 7.3 DO at different sampling station

7.3 Results analysis of BOD:

Graphical models 3.9, 3.10, 3.11 for Siliguri and 3.18, 3.19, 3.20 for English Bazar (Malda) shows the slightly monotonic increasing pollution load of this river. The linear regression line analysis (ref.3.6.5) between DO and BOD, BOD and COD also states the pollution status of the river which is not in alarming standard. The figure 7.4 states the BOD status during summer time around Siliguri in 2003. Figure-7.5 is giving the BOD variation between dry and monsoon season at different sampling points.

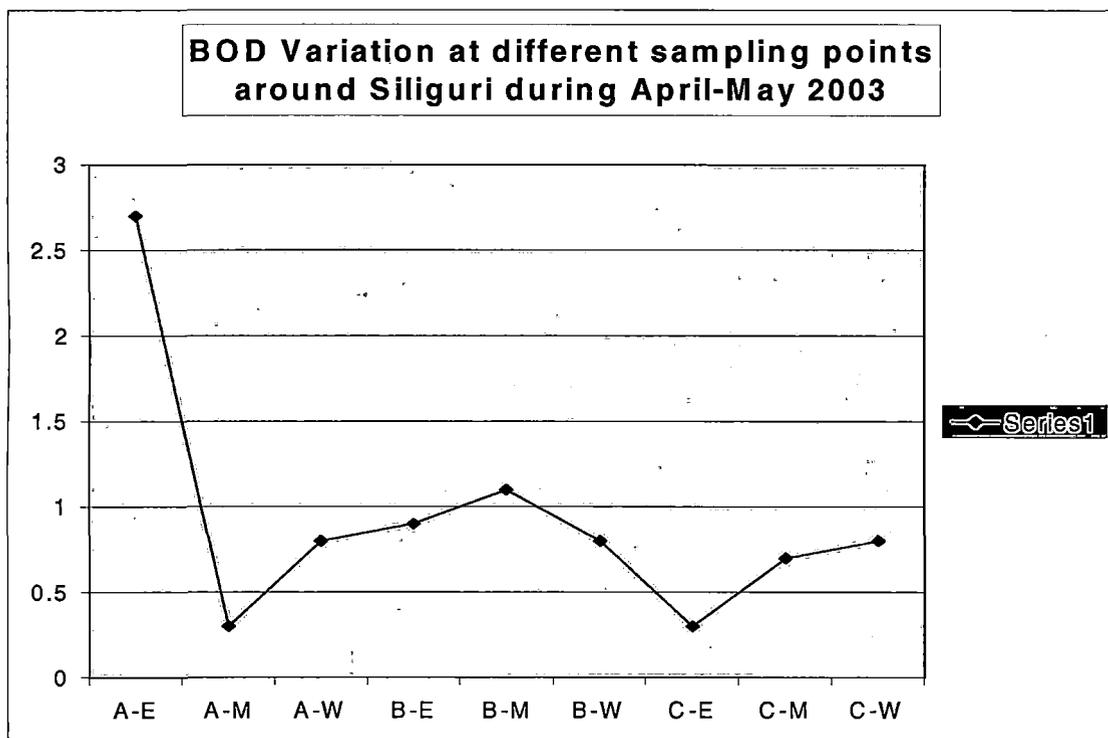


Fig.7.4 (X axis as sampling pts and Y axis as BOD (mg/L))

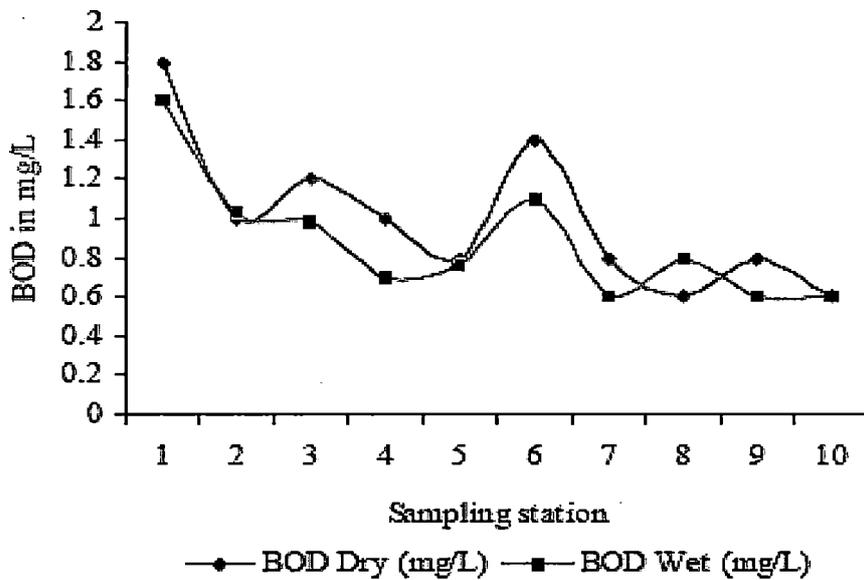


Fig 7.5: BOD at different sampling stations

7.4 Results analysis of COD:

The linear regression models are presented at 3.6.5 and the results analysis of different correlation coefficients (ref.3.6.4) reveals that the rate of water pollution of the river Mahananda is gradually increasing over the last five years. Also the graphical models 3.12, 3.13, 3.14 (around Siliguri) and 3.21, 3.22, 3.23 (around Malda) are giving that the water quality is falling. The results suggested that it is going to be dangerous for aquatic life as well as drinking purpose. The model 7.6 is presenting the COD fluctuation during summer time around Siliguri in the year 2003.

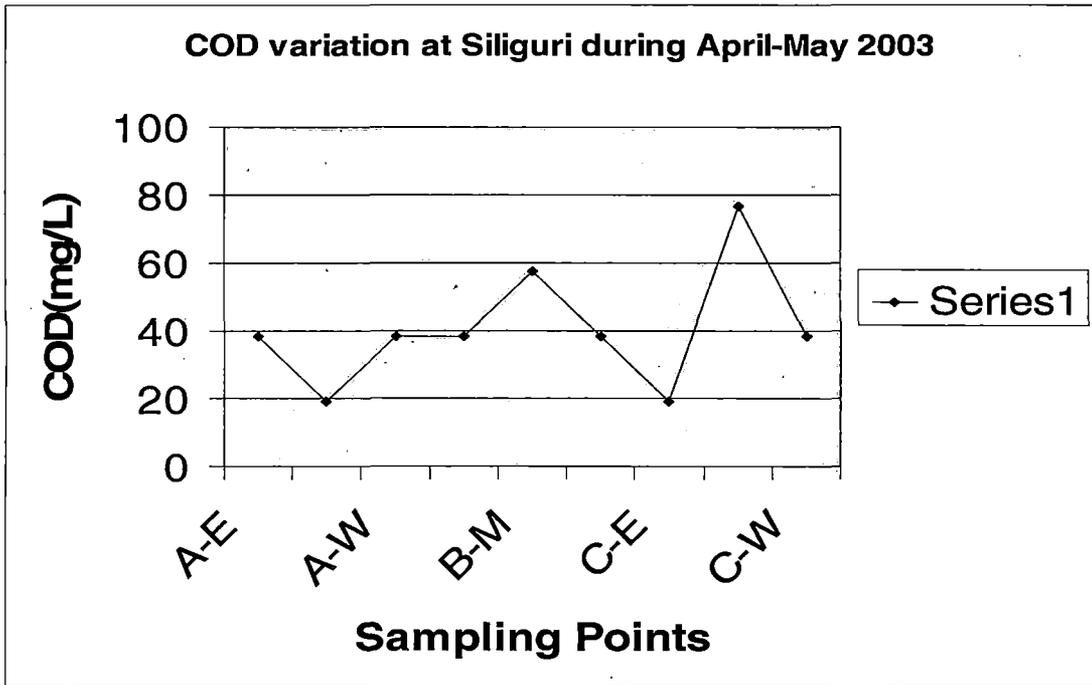


Fig.7.6

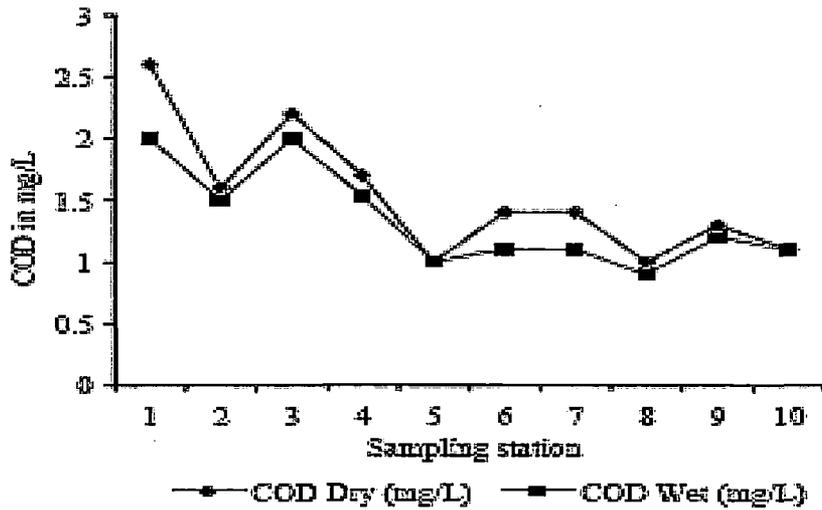


Fig.7.7 COD at different sampling stations

Station Name	Dissolved Oxygen(mg/l)		Bio Chemical Oxygen Demand(mg/l)		Chemical Oxygen Demand(mg/l)	
	2001	2006	2001	2006	2001	2006
A.Siliguri	7.47	3.08	1.53	20.79	22.24	52.47
B.Malda	6.90	2.96	1.94	22.78	19.67	53.77

Table 7.1 Summer Average Values for Water Quality of River Mahananda

Above table 7.1 shows the overall rate of depletion of water quality of the river Mahananda over the period of five years. In one side DO falls, another side BOD, COD values are raised which clearly indicate the total scenario of this river.