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Determine Water Quality of Barapukuria Coal Mine Company Ltd and Its Surrounding Area in Dinajpur District

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Abstract: The purpose of this programme is to determine water quality of Barapukuria Coal Mining Company Ltd. and its surrounding area in Dinajpur district. 36 samples of water (Coal water flow stream drain water, surrounding area Water samples of water from the surface of the surface and tube type of tube well) are collected from this study area. Current pH, Conductivity, TDS, DO, temperature Samples physical character are measured and recorded in notebooks. After marking it properly, by adding HNO_3 control the collected samples pH 500 ml Polypropylene bottles are stored in ice box samples for chemical laboratories. Besides, the information related to the impact on the area is collected by the Barapukuria Coal Mining Company Ltd. and Barapukuria Coal-based thermal power plant. The amount of Al, Fe, Ti, Cu, Co, Cd, Zn, Ca, Mn, Mg, Na, K, As of the samples collected from the Analytical Chemistry Laboratory of Geological Survey of Bangladesh was determined. Chemical analysis of the samples showed that excessive presence of any element was not exist ECR (Environment Conservation Rule). 1997 of Bangladesh Standard value.

Keywords: Barapukuria, pH, Plant, Chemicals

1. Introduction

1.1. Purpose and Scope of the Work

Barapukuria coal mine & Barapukuria thermal power plant are situated at Parbotipur upazilla in Dinajpur District, Bangladesh. Area of Barapukuria coal mine is 646 acres of agricultural plain land. Barapukuria thermal power is established of 245 acres land. Coal, a natural mineral resource, is a black or brownish-black rock that is formed from plants, which died about 100 to 400 million years ago [1]. It is a heterogeneous mixture of several components such as sulfur, elemental carbon, arsenic, ash and heavy metals etc [2]. Coal has been a major means of fuel used in electricity generation. It has played a huge role in the development drive of several nations. Industrial revolutions had been powered by coal and the energy it supplied. In many countries coal is the primary source of energy [3, 4].

Coal is the second largest stock of energy in Bangladesh. 41.5 percent electricity in the world is produced from coal [7]. In order to alleviate the electricity crisis of Bangladesh, Barapukuria Coal and Power project is a blessing indeed. Estimated energy from the project is equivalent to 53 trillion cubic feet (TCF) of natural gas; more than threefold of gas reserves of the country. So, a new dimension is added to the economy of Bangladesh, regarded as coal mine industry. Bangladesh is one of the top coal production countries and supply coal for its internal industrial energy source [13]. Barapukuria coal mine has the capacity to extract 3,500-4,500 tons coal per day. Among them 3,500 tons is used Barapukuria thermal power plant for electric power generation [6].

Assessing the coal mine and its versatile impact over the industrial revolution time, the researcher, end of the 20th century revealed that there is huge risk of health, potential air pollution, noticeable change in landscape, political and social problem, overall sustainability of the environment could get seriously affected by coal mine operation [12]. During the mining process huge amounts of water are discharged on the surface, which often contains high loads of TSS, TDS, hardness and heavy metals and consequently contaminates the surface and groundwater [5]. Therefore, it is obvious that an assessment of the local environment should go prior and along the project of Barapukuria before any unexpected consequence overwhelms this project. In order to find out

possible positive and negative benefits, a thorough analysis considering all the impacts on soil, water, sound levels, and changes in aesthetic environment, were carried out in this study [15, 16]. The major objectives of the study were (i) to assess the socioeconomic impacts of these projects, (ii) to assess the impacts on land use pattern and (iii) to identify and quantify the environmental effects.

Coal is washed before reaching the thermal power plant. This coal washed water is drained into near paddy filed, pond, canal and river. Thus the areas of Barapukuria coal mine are severely contaminated by coal waste water [11]. In spite of the role coal plays, there are strong evidences of coal's impact on human health and the environment during every stage of its mining, use, and post-combustion disposal [14]. Air pollution generated by coal mining and combustion in power plants [8]. This programme aims is to identify the influence of mine and thermal power plants on the adjoining areas.

1.2. Location of the Study Area

The present study area was carried out to observe environmental effects from Barapukuria coal mining industries and Barapukuria thermal power plant in Dinajpur, Bangladesh. Barapukuria coal mine and power plant site is located in flat paddy land of the north-western corner of Bangladesh at about 45 km east of the district headquarters of Dinajpur, 20 km east from the border of India. The geographical location of the studied area is in between 25.6533°N to 25.6533°N & 88.9155°E to 88.9155°E. Location of the working area was noted in terms of longitude and latitude by using GPS.

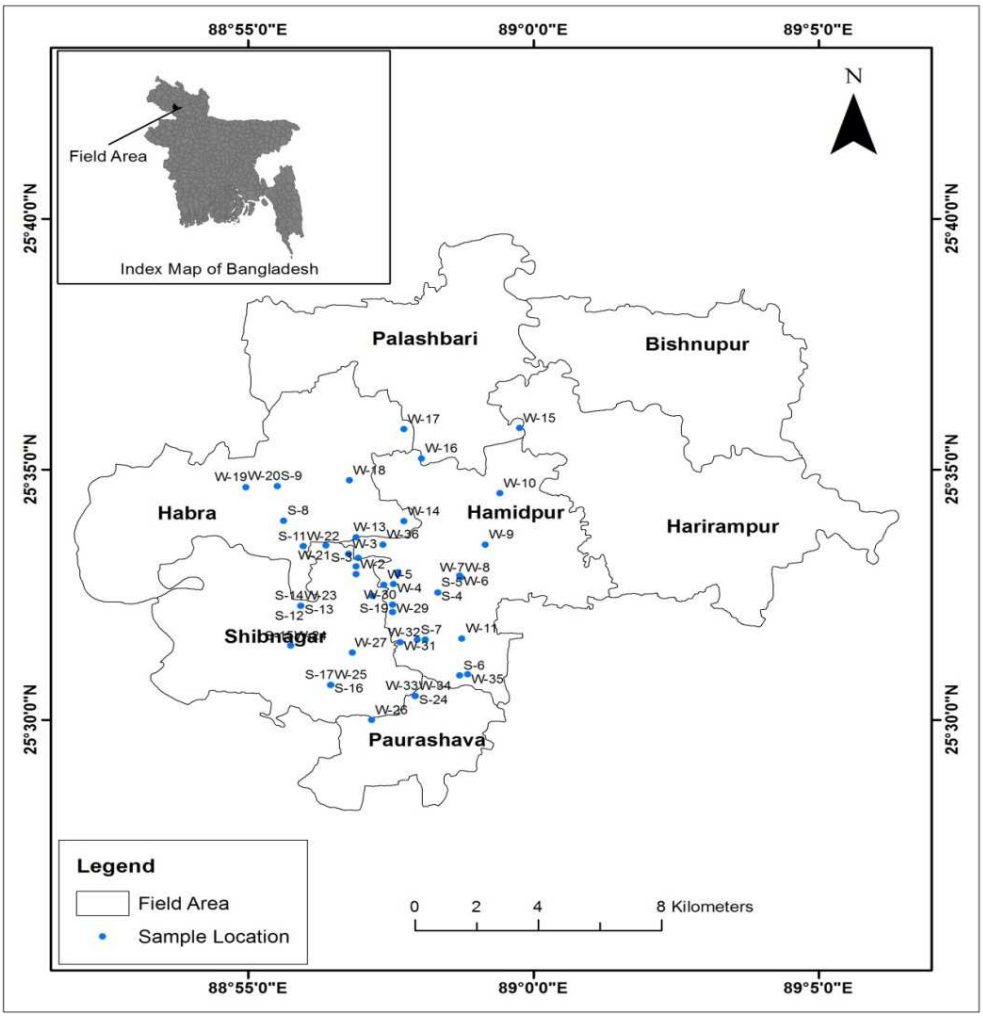

Figure 1. *Location of the study area and water sample sampling point.*

1.3. Previous Work

Different research and studies have been done by different scientists throughout the world including our country about the impact on the environment of Baropukuria coal mine industry & Barapukuria thermal power plant. Geological Survey of Bangladesh has not done yet any complete relevant study.

2. Methodology

2.1. Sample Collection

Assessment the effect of Barapukuria coal mine and thermal power plant on surrounding environment, the effect of coal water on soil, water, coal waste water and emissions

from power plant had been evaluated. The study was based on field observations, sample collections and testing. Soil and drain water samples were collected from the study area for sampling.

Table 1. *Description of location of collected water samples.*

Sl No	Sample No	Sample source	Village	Post Office	Upazilla & District	Latitude	Longitude	Depth
1	RMW-1	Baropukuria coal mine ETP outlet water	Chowhati	Baropukuria		25°32'55"N	88°57'38" E	Surface
2	RMW-2	Baropukuria Thermal Power Plant Ash dump pond area	Durgapur	Baropukuria		25°33'04" N	88°56'54" E	Surface
3	RMW-3	Baropukuria Thermal Power Plant drainage outlet	Durgapur	Baropukuria		25°33'19" N	88°56'46" E	Surface
4	RMW-4	Baropukuria coal mine Gondoana layer water outlet	Zigagari	Baropukuria		25°32'43"N	88°57'33" E	Surface
5	RMW-5	Baropukuria coal mine Gondoana layer water outlet end point	-	Baropukuria		25°32'42"N	88°57'23" E	Surface
6	RMW-6	Tube-well water	Bashpukur	Baropukuria	Parbotipur, Dinajpur	25°32'53"N	88°58'43" E	30 m
7	RMW-7	Tube-well water	Bashpukur	Baropukuria		25°32'51"N	88°58'44" E	30 m
8	RMW-8	Pond Water	Bashpukur	Baropukuria		25°32'51"N	88°58'44" E	Surface
9	RMW-9	Tube-well water	Dhulaodal	Baropukuria		25°33'30" N	88°59'09" E	30 m
10	RMW-10	Tube-well water	Khalilpur	Khaierpur		25°34'32" N	88°59'25" E	33 m
11	RMW-11	Tube-well water	Pachghoria	Baropukuria		25°31'38" N	88°58'45" E	30 m
12	RMW-12	Tube-well water	Baigram	Baropukuria		25°31'36" N	88°58'07" E	30 m
13	RMW-13	Tube-well water	Eusufpur	Shohidpur Hat		25°33'39" N	88°56'54" E	28 m
14	RMW-14	Tube-well water	East Eusufpur	Shohidpur Hat		25°33'58" N	88°57'44" E	30 m
15	RMW-15	Tube-well water	Hossainpur	Khaierpukur		25°35'50" N	88°59'46" E	36 m
16	RMW-16	Tube-well water	Kalikapur	Shohidpur Hat		25°35'13" N	88°58'03" E	30 m
17	RMW-17	Tube-well water	Khamarpara	Durgapur		25°35'48" N	88°57'44" E	35 m
18	RMW-18	Tube-well water	Bhabanipur Bazar	Bhabanipur		25°34'47" N	88°56'47" E	32 m
19	RMW-19	Tube-well water	Chowhali	Habra		25°34'39" N	88°54'58" E	38 m
20	RMW-20	River water	Chowhali	Habra		25°34'40" N	88°55'31" E	Surface
21	RMW-21	Thermal plant drainage water	Dhutipukur	Hagirdanga		25°33'29" N	88°56'22" E	Surface
22	RMW-22	Thermal plant drainage outlet end point water	Dhutipukur	Hagirdanga		25°33'28" N	88°55'58" E	Surface
23	RMW-23	River Water	Ramvadrapur	Rajarampur		25°32'17"N	88°55'56" E	Surface
24	RMW-24	River Water	East Jaforepur	Rajarampur		25°31'29"N	88°55'45" E	Surface
25	RMW-25	River Water	Ghatpara	Rajarampur		25°30'42"N	88°56'27" E	Surface
26	RMW-26	River Water	Phulbari	Phulbari		25°30'00"N	88°57'10" E	Surface
27	RMW-27	Tube-well water	Sultanpur	Rajarampur		25°31'21"N	88°56'50" E	32 m
28	RMW-28	Tube-well water	Ramchandrapur	Barapukuria		25°32'29"N	88°57'11" E	29 m
29	RMW-29	Coal mine drainage water	Kalupara	Barapukuria		25°32'09"N	88°57'32" E	Surface
30	RMW-30	Tube-well water	Kalupara	Barapukuria		25°32'09"N	88°57'32" E	35 m
31	RMW-31	Coal mine drainage water	South Rasulpur	Barapukuria		25°31'33"N	88°57'40" E	Surface
32	RMW-32	Tube-well water	South Rasulpur	Barapukuria		25°31'33"N	88°57'40" E	35 m
33	RMW-30	Coal mine drainage water	Mubarakpur	Barapukuria		25°30'29"N	88°57'56" E	Surface
34	RMW-30	Tube-well water	Mubarakpur	Barapukuria		25°30'29"N	88°57'56" E	36 m
35	RMW-35	Tube-well water	Chak Moheshpur	Barapukuria		25°30'55"N	88°58'51" E	32 m
36	RMW-36	Tube-well water	Barapukuria Coal mine area	Barapukuria		25°33'30"N	88°57'22" E	36 m

For water samples some physical parameter such as Temperature, pH, Dissolved Oxygen (DO) and Conductivity were also carried out in the field (Table 2). Finally, Collected samples were selected according to priority of location for chemical analysis in the Analytical Chemical laboratory of GSB.

Table 2. *Description of physical parameter of collected water samples.*

Sl No	Sample No	Temperature (°C)	TDS (ppm)	DO (mg/l)	Conductivity (µs)	pH
1	RMW-1	38.6	124	4.51	176	7.33
2	RMW-2	33.1	86.9	5.32	174.6	8.25
3	RMW-3	46	41	5.2	114.5	7.95
4	RMW-4	34.2	56.8	5.51	110	7.80
5	RMW-5	32.4	98.3	5.07	198.7	7.74
6	RMW-6	29.3	78.0	8.03	155.4	7.81
7	RMW-7	27.9	46.8	8.51	93.9	7.92
8	RMW-8	29	78.4	9.40	114.9	7.87
9	RMW-9	27.2	41.0	8.46	82.2	7.79
10	RMW-10	27.6	45.5	8.56	91.8	7.79
11	RMW-10	26.8	58.1	9.86	116.4	7.26
12	RMW-12	28.1	63.3	9.32	126.9	7.58

Sl No	Sample No	Temperature (°C)	TDS (ppm)	DO (mg/l)	Conductivity (µs)	pH
13	RMW-13	27.1	45.5	5.77	91.9	7.18
14	RMW-14	28.6	68.9	8.46	112.8	7.46
15	RMW-15	28.8	60.6	5.45	66.8	7.34
16	RMW-16	27.6	69.6	7.76	139.1	6.97
17	RMW-17	27.9	77.4	7.32	153.2	7.34
18	RMW-18	27.2	56	8.78	92.1	7.44
19	RMW-19	28.3	71.6	9.26	143.2	7.42
20	RMW-20	29.0	68.2	8.36	136.8	7.42
21	RMW-21	33.6	128	4.01	257	7.87
22	RMW-22	30.3	128	4.02	256	7.83
23	RMW-23	27.3	127	5.32	252	7.57
24	RMW-24	27.2	126	5.86	252	7.67
25	RMW-25	28.8	127	5.92	256	7.65
26	RMW-26	29.4	120	6.32	242	7.26
27	RMW-27	26.9	53.2	8.57	106.3	7.23
28	RMW-28	26.8	66.1	8.56	131.7	7.50
29	RMW-29	31.9	68.2	6.22	196.4	8.21
30	RMW-30	28.88	76.3	8.78	149.7	7.51
31	RMW-31	31.6	98.1	6.32	232	8.18
32	RMW-32	27.5	83.1	8.32	164.3	7.66
33	RMW-33	32.1	97.7	6.97	230	8.11
34	RMW-34	27.2	86.7	8.98	172	7.61
35	RMW-35	27.4	56.4	8.96	87.6	7.58
36	RMW-36	27.4	67.5	8.98	136.0	7.46

2.2. Preservation of Water Sample

Water sample were preserved at P^H 1.5 to 2.0 with addition of Nitric acid just after collection in the field. Samples were stored in individual polypropylene bottles at room temperature with proper identification mark.

2.3. Chemical Analysis of Water Sample

The heavy metal ion Lead, Copper, Zinc, Cobalt, Nickel, Cadmium were determined with the help ICP-OES using their selective wave length. The concentration measured as ppm level.

Table 3. *Chemical Analysis of water samples.*

Sl. No	Sample no	Cd (ppm)	Co (ppm)	Cu (ppm)	Mn (ppm)	Ni (ppm)	Pb (ppm)	Zn (ppm)
1	RMW-1	0.000599	0.00546	0.01012	0.1395	0.0292	0.0263	0.1672
2	RMW-2	0.00431	0.02133	0.2939	0.5741	0.0966	0.1261	0.1576
3	RMW-3	0.001836	0.00529	0.0132	0.1013	0.0316	0.0204	0.0532
4	RMW-4	0.00248	0.00762	0.01035	0.1725	0.0216	0.0248	0.047
5	RMW-5	0.001138	0.00401	0.01314	0.2058	0.0306	0.0300	0.0681
6	RMW-6	0.002429	0.00587	0.01269	0.0766	0.0221	0.0236	0.0600
7	RMW-7	0.001789	0.00320	0.01399	0.2656	0.01843	0.0274	0.13044
8	RMW-8	0.001456	0.00643	0.01623	0.7440	0.01260	0.0239	0.05353
9	RMW-9	0.00208	0.00537	0.00978	0.06836	0.02725	0.01843	0.05809
10	RMW-10	0.00159	0.00427	0.01395	0.02223	0.00726	0.03366	0.04487
11	RMW-11	0.001176	0.00653	0.01838	0.2586	0.01931	0.00722	0.01719
12	RMW-12	0.00129	0.00343	0.00952	0.03138	0.02377	0.02024	0.10409
13	RMW-13	0.00199	0.00171	0.01569	0.03177	0.02299	0.02917	0.04330
14	RMW-14	0.001076	0.00221	0.01183	0.04520	0.02905	0.02671	0.01621
15	RMW-15	0.001636	0.00511	0.00932	0.002108	0.01877	0.02022	0.03798
16	RMW-16	0.001601	0.00396	0.01068	0.01418	0.03681	0.03757	0.03116
17	RMW-17	0.001967	0.00513	0.00977	0.1863	0.04545	0.02974	0.02739
18	RMW-18	0.001783	0.00523	0.01008	0.00183	0.04297	0.02099	0.07777
19	RMW-19	0.001500	0.00275	0.01325	0.0710	0.02320	0.02072	0.0474
20	RMW-20	0.0011	0.00477	0.01330	0.2056	0.00889	0.0109	0.0474
21	RMW-21	0.002527	0.00238	0.01497	0.1084	0.02511	0.03597	0.03568
22	RMW-22	0.002125	0.00538	0.01540	0.12183	0.02647	0.01215	0.0588
23	RMW-23	0.001467	0.0041	0.01538	0.1060	0.02460	0.02879	0.0588
24	RMW-24	0.001657	0.00402	0.01475	0.09593	0.02403	0.02503	0.02641
25	RMW-25	0.003109	0.00287	0.01348	0.07937	0.01703	0.02605	0.03956
26	RMW-26	0.002575	0.00516	0.01434	0.03414	0.01860	0.04132	0.02687
27	RMW-27	0.002301	0.00291	0.01326	0.17985	0.02052	0.02248	0.02888
28	RMW-28	0.00166	0.00319	0.01129	0.18292	0.02458	0.01896	0.01764
29	RMW-29	0.002506	0.00505	0.01158	0.10898	0.01925	0.01998	0.03106
30	RMW-30	0.00187	0.00464	0.01128	0.2052	0.0270	0.02109	0.0744
31	RMW-31	0.00224	0.00448	0.01389	0.12299	0.0281	0.03178	0.0392

Sl. No	Sample no	Cd (ppm)	Co (ppm)	Cu (ppm)	Mn (ppm)	Ni (ppm)	Pb (ppm)	Zn (ppm)
32	RMW-32	0.00098	0.00209	0.01103	0.15089	0.0233	0.02655	0.0381
33	RMW-33	0.00157	0.00615	0.010119	0.0823	0.0238	0.0175	0.0538
34	RMW-34	0.00228	0.00434	0.00969	0.1976	0.0283	0.02516	0.0909
35	RMW-35	0.002398	0.00329	0.01055	0.1955	0.0267	0.01051	0.0579
36	RMW-36	0.001512	0.00330	0.01306	0.36979	0.0212	0.0398	0.0055

Table 4. *Chemical Analysis of water samples.*

Sl. No	Sample no	Al (ppm)	Ca (ppm)	Fe (ppm)	Mg (ppm)	Na (ppm)	K (ppm)
1	RMW-1	0.42455	26.2127	1.3924	9.6399	19.2680	14.0639
2	RMW-2	46.2870	26.6653	3.9565	7.5385	17.5438	10.1691
3	RMW-3	1.6361	1.4346	0.1157	0.2831	0.9372	2.3932
4	RMW-4	2.3254	2.1030	0.1598	0.4073	1.3650	7.2613
5	RMW-5	2.7760	2.4870	0.1879	0.4701	0.9854	7.8560
6	RMW-6	2.5630	2.29698	0.1708	0.4543	1.2624	2.2894
7	RMW-7	2.18927	1.97678	0.1402	0.3850	1.2184	2.2409
8	RMW-8	2.1668	1.99539	0.1283	0.3651	1.2409	16.1534
9	RMW-9	1.5100	1.4447	0.0862	0.2466	0.8440	1.6350
10	RMW-10	1.550	1.3915	0.0878	0.2578	0.8627	4.1021
11	RMW-11	1.4308	1.3252	0.0763	0.2323	0.8275	1.2555
12	RMW-12	0.9910	0.8766	0.0541	0.1567	0.5225	5.64516
13	RMW-13	1.0088	0.8957	0.0551	0.1608	0.5797	6.42626
14	RMW-14	1.0451	0.9488	0.0545	0.1625	0.5453	0.7494
15	RMW-15	0.7564	0.72076	0.0426	0.1194	0.4510	2.4867
16	RMW-16	0.7229	0.67687	0.0378	0.1157	0.4178	0.75323
17	RMW-17	0.6778	0.62886	0.0353	0.10713	0.3501	0.8931
18	RMW-18	0.5557	0.4986	0.0279	0.0824	0.2549	0.3494
19	RMW-19	0.4707	0.59816	0.0235	0.0684	0.2234	1.9290
20	RMW-20	0.4508	0.68371	0.0211	0.0642	0.21417	4.5324
21	RMW-21	0.5374	0.5122	0.0260	0.863	0.2565	5.970
22	RMW-22	0.4206	0.6246	0.0198	0.0620	0.1942	5.2580
23	RMW-23	0.5789	0.5635	0.0303	0.11006	0.2817	6.705
24	RMW-24	2.2229	25.7398	0.6011	8.6409	20.9964	5.9465
25	RMW-25	0.8700	25.9851	0.7396	8.7592	21.8164	6.3779
26	RMW-26	0.4288	24.0763	0.2754	8.1267	23.3166	7.3639
27	RMW-27	0.0518	7.2724	2.2154	2.7361	14.1131	0.8698
28	RMW-28	0.05266	8.4242	2.2913	3.8452	17.3691	1.3034
29	RMW-29	0.51669	25.2039	1.2053	9.429	19.0092	7.451
30	RMW-30	0.06167	11.1777	0.1463	4.6642	15.2152	3.0522
31	RMW-31	0.3362	15.2887	1.18763	9.49732	21.0992	6.8966
32	RMW-32	0.1385	14.2725	2.40421	6.4139	19.3978	2.625
33	RMW-33	0.2904	12.1848	1.01344	9.3415	19.9985	7.945
34	RMW-34	0.06533	13.0987	4.8102	6.1034	21.8866	1.850
35	RMW-35	0.16737	11.9877	0.75933	7.1438	22.098	1.0532
36	RMW-36	0.1292	8.6799	1.3399	4.73924	17.0689	2.5723

3. Meteorological Condition

Meteorological information relevant to the Barapukuria site is available from weather stations at Dinajpur and Rangpur. These stations are about 30 km west and east respectively from the project site. The average annual precipitation in the area is 1,800 to 2,000 mm of which 85% comes from May to September. Heavy rainfall for 24 h or more are recorded which in succession causes 1 to 1.5 m depth flood in the low-lying areas of the vicinity. The relative humidity is above 80% at daytime and 90% at night time. The maximum temperature is 38°C in June and the lowest is 4°C in December. The available data on wind directions and speeds indicate that, the wind blows predominantly from East to West (40%), West to East (25%) and from North-East (18%). The wind speed rarely exceeds 8 m/s and mostly the wind is calm.

4. Results and Discussions

The International Accountability Project reports that mining operations at Barapukuria have destroyed roughly 300 acres of land, impacting about 2,500 people in seven villages, as land subsidence of over one meter in depth has destroyed crops and lands and damaged homes. People in 15 villages have also reportedly lost their access to water, as huge quantities of water pumped out for the Barapukuria mine caused a rapid drop in water levels. [9] The environmental impact of Barapukuria Coal Mining Company Ltd. and Barapukuria Thermal Power Plant Ltd. is generally observed in two ways. Physical effects are the physical changes in the vegetation, soil, water and structure around the area. The chemical effect is a change in the amount of chemical elements present in the soil and water in the area.

Physical effects show in a short time. Chemical effects are usually seen after a long time.

The colour of the water samples of coal leached drainage water appeared blackish and the agricultural land water samples appeared slightly blackish. Therefore, the water was unsuitable not only for aquaculture but also for domestic, industrial or agricultural purposes. However, the groundwater and surface water were colorless. The temperature recorded in water samples beside the mine drainage was 40°C whereas the temperature of agricultural land water, surface and groundwater was 32, 25 and 22°C, respectively (Table 2).

The pH values measured in Barapukuria coal mine industry showed that all of the samples have pH values of greater than 7, which is slightly alkaline whereas the standard value of pH was 6 to 9 (ECR 1997) [10]. The pH value of mine drainaged water was recorded 7.55 whereas the pH values of agricultural land water, groundwater and surface water were 7.4, 7.45 and 7.52, respectively (Table 1), which reflects its suitability for aquatic life and for all types of water uses.

The EC and TDS at different sampling points were ranged from 204-370µS/cm and 104-198 mg/l, respectively. The highest TDS (198 mg/l) and EC (370 µS/cm) were founding surface water and in mine drainaged water, respectively (Table 2). Water that contains less than 500 ppm of dissolved solid is generally satisfactory for the domestic use and other industrial purposes and water containing more than 1000 ppm of dissolved solids usually contains minerals that give it a distinctive taste or make it unsuitable for human 68 defined the standard value of TDS for the inland surface water as 2100 mg/l. As the total concentration of dissolved solids in water is a general indication of its suitability for any particular purpose, the result of the study concluded that the water at the downstream of the river is considered as suitable for fish culture and other purposes.

The mining authority release remaining waste water into the mining drain. The local people used this water in agriculture. Last December 2017 Barapukuria Thermal Power Station has already started using unused water from Barapukuria Coal Mine in this thermal power plant. The Barapukuria thermal power plant discharges unused water into the nearby Tilai river through a drain. The temperature of the water is about 46°C. The high temperature of abandoned water is affecting the biodiversity.

Figure 2. *The end of the drain of the abandoned water flow of the Barapukuria coal mine.*

Figure 3. *Drainage water used by thermal power plants.*

Most of area of Bouddhanathpur (Jigagari) and Gopalpur (Maupukur) near Barapukuria Coal Mining Company Ltd. have been subside, creating a reservoir about 5-6 m deep.

Figure 4. *Subside reservoirs created as a result of coal extraction.*

Figure 5. *Reservoir created in the new area of Subside as a result of coal extraction.*

5. Conclusion

The study showed the overall scenario regarding the concentration of different water quality parameters resulted from the Barapukuria coal mine activity and their suitability for aquatic life as well as for irrigation. The results of the study concluded that the water in the coal mine industrial area were found quietly contaminated, which can deteriorate the aquatic life and agriculture. The study showed that all the water quality parameters of mining area i.e. temperature, pH, EC, TDS, DO were in standard levels. The average concentration of Cu, Fe and Zn content in the water samples was below the standard level. The study identified that the pH of the water samples were in permissible level and thus suitable for agriculture. Although the concentration of heavy metals in the water samples was in permissible limits, however the study depicted that high levels of these heavy metals from the coal mine can pose a serious threat on the environment within a short period of time.

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