Chapter-III

DESCRIPTION OF THE ENVIRONMENT

3.1 Introduction

The present environmental scenario has been described in this chapter in respect of meteorology, micro-meteorology, ambient air quality, water and effluent quality, noise level measurement, soil quality, socio-economic scenario, flora & fauna, hydrogeology and land use/cover pattern.

3.2 Micrometeorological Status

The study was carried out by M/s ENVIROCON, Digboi, Assam during the period January'07 to March'07. The transport and diffusion of the pollutants in the atmosphere are governed by meteorological factors. The meteorological data is very useful for proper interpretation of the baseline information and it provides an input for prediction models of air quality

Methodology

Micrometeorological and microclimatic parameters were recorded by installing one meteorology station in core zone to represent the prevailing micrometeorological aspects of the study area of Tikak Extn OCP. During the study period, rainfall data for 24 hours and hourly reading of wind velocity, wind direction, temperature, relative humidity, cloud cover and were recorded and reported.

Micrometeorological Data

Site specific continuously monitored meteorological data for one full Season (Winter Season, January to March, 2007) have been summarized in the following table.

Site Specific Meteorological Data for Winter Season (January 2007 to March 2007)

Location: Existing Tikak OCP Residential Area

Item	Parameters	Particulars
Rainfall in mm.	Minimum	1.0
	Maximum	16.0
Temperature range in ^{o}C (monthly mean of daily Temperature)	Minimum	12.62
	Maximum	29.32
Relative humidity range (monthly mean of daily RH)	Minimum	61.90
	Maximum	79.94
Wind speed range in km/hr. (monthly mean of daily wind speed)	Minimum	1.29
	Maximum	2.14

Month wise details are as below

Month	Wind Speed (km/h)		Temperature (ºC)			
			Mean (Dry Bulb)			
	Min	Max.	Max	Min	Highest	Lowest
January, 2007	1.04	4.27	21.07	11.8	24.7	10.1
February, 2007	1.22	5.52	22.07	13.93	28.5	11.1
March, 2007	1.17	5.31	27.65	17.97	33.6	15.3

Onsite Meteorological Observations: January '2007

Date	Temperature ^{0}C		Humidity (%)	Rainfall (mm)	Cloud Cover	Wind Speed (Km/h)	Wind Direction (from)
	Max	Min					
01.01.2007	17.4	15.3	65	1.0	C	CALM	ENE
02.01.2007	17.2	15.5	74	Nil	Cl	CALM	NE
03.01.2007	17.3	14.3	71	Nil	Cl	1.89	NE
04.01.2007	20.5	14.2	65	Nil	Cl	1.81	NNE
05.01.2007	20.2	13.5	67	Nil	PC	1.14	E
06.01.2007	21.3	13.6	61	Nil	Cl	1.10	NE
07.01.2007	22.4	11.2	59	Nil	Cl	CALM	NE
08.01.2007	22.2	12.4	47	Nil	Cl	1.04	N
09.01.2007	22.6	13.7	61	Nil	Cl	1.05	NE
10.01.2007	21.7	15.4	59	Nil	Cl	1.80	ENE
11.01.2007	20.1	12.7	53	Nil	Cl	CALM	NNE
12.01.2007	21.2	14.3	61	Nil	Cl	CALM	NE
13.01.2007	18.3	14.0	55	Nil	Cl	CALM	NE
14.01.2007	18.2	13.2	63	Nil	PC	1.92	ESE
15.01.2007	16.4	11.3	60	2.0	C	CALM	NNE
16.01.2007	16.7	11.6	53	Nil	Cl	2.65	NE
17.01.2007	20.5	10.4	52	Nil	Cl	2.10	NNE
18.01.2007	20.4	10.1	66	Nil	PC	1.51	E
19.01.2007	16.3	10.7	47	Nil	Cl	3.05	NE
20.01.2007	18.5	10.4	50	Nil	Cl	1.92	N
21.01.2007	19.2	13.5	66	Nil	Cl	1.72	NE
22.01.2007	15.6	10.3	62	Nil	Cl	1.65	NE
23.01.2007	18.5	10.2	51	Nil	Cl	CALM	NE
24.01.2007	21.6	11.2	56	Nil	Cl	1.10	E
25.01.2007	23.4	11.4	62	Nil	Cl	1.30	ENE
26.01.2007	22.7	12.3	70	Nil	Cl	4.27	NE
27.01.2007	21.8	12.6	64	Nil	Cl	1.96	NNE
28.01.2007	24.7	13.4	75	Nil	PC	2.09	NW
29.01.2007	24.5	13.4	76	Nil	Cl	CALM	NNE
30.01.2007	22.5	14.1	78	Nil	Cl	1.95	NE
31.01.2007	23.3	11.1	70	3.0	C	1.05	NNE

C: Cloudy Cl: Clear PC: Partial Cloudy

Onsite Meteorological Observations: February '2007

Date	Temperature ^{0}C		Humidity (%)	Rainfall (mm)	Cloud Cover	Wind Speed (Km/h)	Wind Direction (from)
	Max	Min					
01.02.2007	22.7	14.1	67	Nil	PC	1.82	NE
02.02.2007	23.5	14.3	69	7.0	C	1.99	E
03.02.2007	21.4	15.2	68	Nil	C	2.02	NE
04.02.2007	22.6	15.4	66	9.0	C	2.37	NNE
05.02.2007	23.2	14.6	68	16.0	C	1.52	NNE
06.02.2007	22.1	13.6	65	02.0	C	1.94	N
07.02.2007	21.5	14.3	70	1.0	C	1.31	NNE
08.02.2007	22.5	15.3	71	9.0	C	CALM	NE
09.02.2007	23.3	14.6	67	Nil	PC	2.13	NE
10.02.2007	25.6	12.1	70	Nil	PC	CALM	NNE
11.02.2007	23.7	13.2	67	Nil	PC	1.22	NE
12.02.2007	23.5	14.3	71	11.0	C	CALM	NNE
13.02.2007	21.7	15.4	71	3.0	C	1.78	ENE
14.02.2007	24.3	14.8	75	4.0	C	CALM	NE
15.02.2007	22.2	14.5	71	2.0	C	CALM	NE
16.02.2007	24.1	12.7	73	6.0	C	1.64	NNE
17.02.2007	26.3	13.1	76	Nil	PC	1.81	N
18.02.2007	23.4	11.1	77	Nil	Cl	2.30	NE
19.02.2007	25.8	13.7	79	Nil	Cl	5.52	ENE
20.02.2007	26.4	15.4	74	Nil	Cl	CALM	NE
21.02.2007	25.6	14.6	71	Nil	Cl	1.42	NNE
22.02.2007	27.3	16.5	74	Nil	Cl	2.73	E
23.02.2007	28.2	16.4	79	Nil	PC	CALM	NE
24.02.2007	28.5	15.5	78	Nil	Cl	1.42	NE
25.02.2007	28.3	16.2	83	Nil	C	5.44	NNE
26.02.2007	26.4	14.4	89	10.0	C	2.37	NNE
27.02.2007	26.4	15.4	83	Nil	PC	1.61	NE
28.02.2007	27.6	16.1	81	Nil	C	CALM	NE

C: Cloudy Cl: Clear PC: Partial Cloudy

Onsite Meteorological Observations: March '2007

Date	Temperature ^{0}C		Humidity (%)	Rainfall (mm)	Cloud Cover	Wind Speed (Km/h)	Wind Direction (from)
	Max	Min					
01.03.2007	24.3	15.3	79	9.0	C	1.18	NE
02.03.2007	23.0	15.4	80	7.0	C	1.43	NE
03.03.2007	24.2	16.7	79	Nil	PC	1.57	NE
04.03.2007	25.1	16.7	81	Nil	Cl	1.47	NE
05.03.2007	25.4	17.6	78	Nil	Cl	1.64	NE
06.03.2007	25.6	18.5	77	Nil	Cl	1.91	NE
07.03.2007	26.0	19.7	79	Nil	Cl	1.49	NE
08.03.2007	26.1	18.5	81	Nil	Cl	2.14	NE
09.03.2007	26.4	18.4	81	Nil	Cl	2.33	NNE
10.03.2007	27.3	19.2	80	Nil	PC	1.68	NE
11.03.2007	26.2	19.6	82	1.0	C	2.23	NNE
12.03.2007	27.6	19.4	80	Nil	C	1.97	NNE
13.03.2007	29.0	19.3	82	Nil	Cl	3.42	NE
14.03.2007	29.6	20.4	79	Nil	PC	4.57	NE
15.03.2007	29.1	20.2	78	2.4	C	CALM	NE
16.03.2007	30.0	20.5	80	Nil	PC	2.11	NNE
17.03.2007	30.2	20.3	80	Nil	Cl	1.36	NE
18.03.2007	30.0	19.7	80	Nil	Cl	1.42	NE
19.03.2007	31.3	20.8	81	Nil	Cl	3.35	NE
20.03.2007	31.0	21.1	79	Nil	Cl	2.36	NNE
21.03.2007	30.4	20.7	79	Nil	Cl	2.44	NE
22.03.2007	31.1	21.5	78	Nil	Cl	1.85	ENE
23.03.2007	32.6	21.7	81	Nil	Cl	1.90	NE
24.03.2007	32.3	22.4	81	Nil	Cl	1.17	NE
25.03.2007	33.5	22.7	83	10.0	C	2.59	NE
26.03.2007	33.3	21.8	79	Nil	Cl	3.61	NNE
27.03.2007	34.2	22.6	80	Nil	Cl	CALM	NE
28.03.2007	34.0	21.9	81	Nil	Cl	2.43	NE
29.03.2007	33.2	22.2	81	Nil	Cl	5.31	NE
30.03.2007	33.6	21.7	79	Nil	Cl	3.11	NNE
31.03.2007	33.2	20.8	80	Nil	Cl	2.14	NE

C: Cloudy Cl: Clear PC: Partial Cloudy

3.3 Ambient Air Quality Study

Ambient Air Quality (AAQ) Data

Ambient Air Quality (AAQ) data generated for one complete season (Winter season, from January to March, 2007) as per the norms of Central Pollution Control Board.

Present Air quality study

Present air quality data have been generated as per guidelines of Central Pollution Control Board and in line with point No. 21(b) of the **Proforma for Environmental Appraisal of Mining Projects**. Twenty four (24) hours data have been generated for each parameter i.e. SPM, RPM, SO_2 and NO_x at each monitoring station for two days in a week for four consecutive weeks in a month for three months (i.e. January to March, 2007) during Winter Season.

Location of air sampling stations

To assess the ambient air quality, sampling stations were fixed on the basis of meteorological parameters like predominant wind direction and wind speeds besides physiography of the area. The locations of air sampling stations are shown in **Plate No- XVII** and the details are given in Table below.

Description of the air sampling stations

Sl. No.	Location Code	Name of location	Direction w.r.t. centreof core zone	Aerial distance from Project boundary	Remarks
1.	TA_1	Core Zone	---	---	Located in the proposed mine area, Sub-Pit-1
2.	TA_2	Core Zone	---	---	Located in the proposed mine area, Sub-Pit-3
3.	TA_3	Buffer Zone	NW	1.5 km	Located in residential area near Kalpara Gaon
4.	TA_4	Buffer Zone	NW	0.75 km	Located near Tikak Shiv Mandir
5.	TA_5	Buffer Zone	SW	0.70 km	Located near Malgaon-3

Sl. No.	Location Code	Name of location	Direction w.r.t. centreof core zone	Aerial distance from Project boundary	Remarks
6.	TA_6	Buffer Zone	NE	2.5 km	Located at Ledo Bazar Basti

Parameters for monitoring

The following parameters were monitored for assessment of air quality

- Respirable Particulate Matter (RPM)
- Suspended Particulate Matter (SPM)
- Sulphur Dioxide (SO_2)
- Nitrogen Oxide (NO_x)

  24 hourly samples were obtained following the National Ambient Air Quality Standard (NAAQS) protocol.

Frequency of air sampling

Air samples were collected as per guidelines of Central Pollution Control Board norms at 24 hours intervals for two days in a week for four (4) consecutive weeks in a month for all the three months (i.e. January, February and March, 2007) of Winter Season.

Methodology and Instruments used for air quality analysis

For collecting samples for the determination of RPM, SPM, SO_2 and NO_x, *'ENVIROTECH High Volume Respirable Dust Sampler, APM 460'* together with gaseous attachment *APM 411* was used. The instrument is capable of drawing air at a flow rate of 1 to 1.3 m^3/ min, with very little pressure drop.

The High Volume Respirable Dust Sampler and other equipments for monitoring are placed at a height of 3 to 4.5 feet above ground level at each monitoring station to avoid the effects of wind-blown ground dust. It is also ensured that the sampler is free from any vertical obstruction within a cone of 120^0 from its actual position so that any impedance to the pollutants from entering into the sampler is avoided. The equipments are placed in the open, away from dense trees and vegetation cover, which otherwise acts a sink for pollutants resulting in lower than normal levels during the monitoring. At all

locations the sampler is placed at a distance of at least 100 m from highways/ roads to avoid inclusion of traffic related emissions.

The APM 460 sampler uses an improved cyclone to separate the coarser particles (larger than 10 microns) from the air stream before filtering it on the 0.5 micron pore-size filter allowing a measurement of both SPM (Suspended Particulate Matter) and the Respirable fraction of Suspended Particulate Matter. Glass micro-fibre filter papers (GFA sheets, Whatman or equivalent) were used for the collection of RPM. To determine the SO_2 component in ambient air, sample was collected by drawing air at a flow rate of 0.5 liters per minute (LPM) through an absorbing solution of *Sodium tetrachloromercurate*. For the NO_x component, sample was collected by drawing air at a similar flow rate through another absorbing solution (*a mixture of Sodium hydroxide and Sodium arsenite*). While the measurements of RPM and SPM were done gravimetrically, measurements of both SO_2 and NO_x were carried out colorimetrically. Samples for SPM & RPM were collected after twenty-four hours of sampling period at each of the sampling points. All the analysis was done as per standard methodology of **IS-5182.**

Parameter wise methodology and the required instruments are listed in the following table.

Sl. No.	Parameters	Method	Instrument
1.	SPM & RPM	IS:5182 (Part-IV) (Gravimetric method)	Respirable Dust Sampler, electronic balance, oven etc. Average flow rate of RDS > 1.1 m^3/min.
2.	SO_2	IS:5182 (Part-II) (Sodium tetrachloromercurate method, also known as improved West and Gaeke Method) (Photometric method)	Respirable Dust Sampler with Gaseous Sampling Attachment, Spectrophotometer.

Sl. No.	Parameters	Method	Instrument
3.	NO_x	IS:5182 (Part-VI) (Jacob & Hoccheiser Method) (Photometric method)	Respirable Dust Sampler with Gaseous Sampling Attachment, Spectrophotometer.

Results

The analytical results of air samples are given in Table. The results are summarized below .

Summary of Ambient Air Quality Data for One Season
(January '2007 to March '2007)

AAQ Station	Concentration ($\mu g/m^3$)			
	SPM	RPM	SO_2	NO_x
TA_1 Core Zone				
Maximum	96	48	28	31
Minimum	64	27	11	12
98 Percentile	96	48	28	31
Mean	77	36	19	22
Permissible Limit	500	200	120	120
TA_2 Core Zone				
Maximum	110	62	26	36
Minimum	59	24	10	14
98 Percentile	110	62	26	36
Mean	81	40	19	26
Permissible Limit	500	200	120	120
TA_3 Buffer Zone				
Maximum	94	42	21	29
Minimum	41	19	09	10
98 Percentile	94	42	21	29
Mean	60	25	13	20
Permissible Limit	200	100	80	80
TA_4 Buffer Zone				
Maximum	86	38	25	34
Minimum	39	12	06	12

AAQ Station	Concentration (μg/m³)			
	SPM	RPM	SO_2	NO_x
98 Percentile	86	38	25	34
Mean	63	25	15	24
Permissible Limit	200	100	80	80
TA_5 Buffer Zone				
Maximum	92	42	26	30
Minimum	50	16	10	15
98 Percentile	92	42	26	30
Mean	65	24	15	22
Permissible Limit	200	100	80	80
TA_6 Buffer Zone				
Maximum	91	49	27	29
Minimum	47	20	08	11
98 Percentile	91	49	27	29
Mean	60	27	17	21
Permissible Limit	200	100	80	80

Ambient Air Quality Data

TA_1 (Core Zone): Proposed Mine site of Tikak Extension OCP (near Sub-Pit 1)

Month	Date of Sampling	Concentration (μg/m3)			
		SPM	RPM	SO2	NOx
January	03.01.2007	81	33	15	23
	06.01.2007	74	29	19	21
	09.01.2007	77	31	13	17
	11.01.2007	69	30	22	13
	15.01.2007	72	36	20	21
	18.01.2007	87	32	17	26
	22.01.2007	85	40	19	28
	23.01.2007	68	31	24	25
	29.01.2007	76	42	16	19
	31.01.2007	69	29	14	16
	07.02.2007	93	43	25	24
	10.02.2007	75	32	23	30
	13.02.2007	68	38	15	25
	15.02.2007	79	35	12	24
	19.02.2007	96	48	28	31

February	23.02.2007	83	41	19	19
	26.02.2007	71	39	23	23
	27.02.2007	65	28	16	27
March	05.03.2007	64	27	11	12
	08.03.2007	79	42	19	23
	12.03.2007	85	44	21	17
	16.03.2007	81	45	25	21
	20.03.2007	68	31	20	27
	22.03.2007	73	36	17	24

Ambient Air Quality Data

TA_2 (Core Zone): Proposed Mine site of Tikak Extension OCP (near Sub-Pit 3)

Month	Date of Sampling	Concentration ($\mu g/m^3$)			
		SPM	**RPM**	**SO_2**	**NO_x**
January	03.01.2007	84	31	19	27
	06.01.2007	75	33	22	29
	09.01.2007	76	35	15	22
	11.01.2007	67	29	24	19
	15.01.2007	70	42	23	24
	18.01.2007	94	38	19	29
	22.01.2007	88	48	16	32
	23.01.2007	71	37	23	30
	29.01.2007	73	45	15	25
	31.01.2007	66	37	12	23
February	07.02.2007	98	47	22	27
	10.02.2007	82	34	20	34
	13.02.2007	74	41	17	23
	15.02.2007	85	39	14	21
	19.02.2007	110	62	26	36
	23.02.2007	89	44	24	23
	26.02.2007	77	41	21	20
	27.02.2007	69	25	19	25
March					
	05.03.2007	59	24	10	14
	08.03.2007	86	46	15	27
	12.03.2007	95	52	19	23
	16.03.2007	90	50	22	34
	20.03.2007	79	36	17	31
	22.03.2007	84	41	14	21

Ambient Air Quality Data

TA_3 (Buffer Zone): Residential area near Kalpara Gaon

Month	Date of Sampling	Concentration (µg/m^3)			
		SPM	RPM	SO_2	NO_x
January	01.01.2007	46	27	12	20
	04.01.2007	49	29	11	19
	13.01.2007	60	25	14	24
	14.01.2007	71	31	10	18
	16.01.2007	52	22	14	16
	20.01.2007	49	24	11	19
	25.01.2007	46	20	12	21
	28.01.2007	69	31	15	22
	30.01.2007	54	30	10	15
	31.01.2007	77	27	12	23
February					
	02.02.2007	41	19	09	10
	03.02.2007	48	21	15	24
	05.02.2007	57	23	13	22
	08.02.2007	41	20	11	24
	12.02.2007	55	22	12	27
	17.02.2007	50	21	11	17
	20.02.2007	44	19	14	19
	23.02.2007	65	22	12	20
March					
	01.03.2007	84	34	10	18
	03.03.2007	87	37	11	24
	06.03.2007	71	20	14	19
	10.03.2007	68	23	11	20
	14.03.2007	94	42	21	29
	24.03.2007	52	21	17	18

Ambient Air Quality Data

TA_4 (Buffer Zone): Tikak Siva Mandir

Month	Date of Sampling	Concentration ($\mu g/m^3$)			
		SPM	RPM	SO_2	NO_x
January	01.01.2007	53	24	15	23
	04.01.2007	52	32	13	22
	13.01.2007	66	22	12	20
	14.01.2007	78	25	16	27
	16.01.2007	58	16	18	24
	20.01.2007	55	25	13	17
	25.01.2007	52	23	17	25
	28.01.2007	71	26	19	26
	30.01.2007	59	21	14	19
	31.01.2007	83	23	16	27
February					
	02.02.2007	39	12	06	12
	03.02.2007	54	18	21	18
	05.02.2007	60	28	19	33
	08.02.2007	47	23	08	28
	12.02.2007	59	28	16	24
	17.02.2007	54	25	15	21
	20.02.2007	47	22	11	17
	23.02.2007	67	24	17	23
March					
	01.03.2007	85	29	19	26
	03.03.2007	83	31	13	29
	06.03.2007	75	23	08	24
	10.03.2007	72	26	14	29
	14.03.2007	86	38	25	34
	24.03.2007	54	25	22	26

Ambient Air Quality Data

TA_5 (Buffer Zone): Near Malugaon No.3

Month	Date of Sampling	Concentration (µg/m^3)			
		SPM	RPM	SO_2	NO_x
January	02.01.07	72	21	12	19
	05.01.07	59	18	11	15
	10.01.07	62	23	15	17
	12.01.07	52	20	17	21
	17.01.07	60	19	13	23
	20.01.07	68	24	11	24
	24.01.07	50	16	10	15
	27.01.07	57	22	16	21
February	05.02.07	69	20	19	25
	09.02.07	76	26	16	28
	12.02.07	63	19	15	23
	16.02.07	57	17	18	23
	20.02.07	74	28	12	22
	23.02.07	71	34	15	27
	26.02.07	61	26	11	18
	28.02.07	79	31	24	29
March	02.03.07	56	22	16	20
	08.03.07	64	25	13	22
	13.03.07	53	18	18	26
	14.03.07	68	21	19	18
	19.03.07	63	24	13	21
	22.03.07	52	27	10	23
	26.03.07	70	22	19	27
	29.03.07	92	42	26	30

Ambient Air Quality Data

TA_6 (Buffer Zone): Near Ledo Bazaar Basti

Month	Date of Sampling	Concentration (µg/m^3)			
		SPM	RPM	SO_2	NO_x
January	02.01.07	47	20	08	11
	05.01.07	49	24	15	20
	10.01.07	51	22	13	22
	12.01.07	57	25	13	17
	17.01.07	62	28	19	21
	20.01.07	53	21	14	18
	24.01.07	49	23	20	27
	27.01.07	52	26	16	19
February	05.02.07	59	22	18	23
	09.02.07	51	25	13	20
	12.02.07	44	20	19	24
	16.02.07	58	21	21	22
	20.02.07	63	23	18	25
	23.02.07	50	52	14	19
	26.02.07	81	39	17	21
	28.02.07	59	21	20	23
March	02.03.07	66	25	15	20
	08.03.07	54	23	18	27
	13.03.07	59	29	16	21
	14.03.07	67	24	23	26
	19.03.07	91	49	27	29
	22.03.07	78	22	10	16
	26.03.07	72	31	13	18
	29.03.07	65	26	17	22

OBSERVATIONS

- 24 hourly concentration levels for SPM, RPM, SO_2 and NO_x are within the limits of the **Standards for Coal Mines, September, 2000 [GSR 742(E)]** for the air quality monitoring stations, TA_1 & TA_2 representing Core Zone in the Tikak Extension OCP Area.
- The concentration levels (24 hourly) for SPM, RPM, SO2 and NOx for other stations representing Buffer Zone/ Residential Area are within the limits of the National Ambient Air Quality Standards (NAAQS).

3.4 Water & effluent quality study

Water quality of various inland surface water and ground water sources in and around this project besides mine discharge water has been assessed. The findings have been incorporated in this chapter.

Location of sampling stations (Ref. Plate No-XVIII)

Five sampling stations, one for industrial water, three for surface waters and one for drinking water were selected in the core and buffer zone of the project. The locations of water sampling stations and details are given below.

Description of the water sampling stations

Sl. No.	Location Code	Location Type	Water Type	Details of Location
01	WE_1	Buffer Zone	Mine Water	Existing Tikak OCP
02	WD_1	Buffer Zone	Drinking Water	Tube Well water from Hamukjan Gaon
03	WS_1	Buffer Zone	Surface Water	Upstream Ledo Pani Nallah
04	WS_2	Buffer Zone	Surface Water	Hamukjan nallah near railway track
05	WS3	Buffer Zone	Surface Water	Downstream Ledo Pani Nallah

Frequency of sampling

Water samples were collected once in Winter Season (January to March, 2007) for analysis.

Methodology and instruments used for water and effluent analysis

Water and effluent samples were collected for physical, chemical and bacteriological parameters taking suitable precautions. The methodology and instruments used for water and effluent analysis are given in Table 4.02.

Methodology & Instruments used for Water Analysis

Sl. No.	Parameters	Methods/Instruments
1	pH	Electrometric/ pH Meter
2	Turbidity	Nephlometric/ Nephloturbidity Meter
3	Total Suspended Solids, Total Dissolved Solids, Oil & Grease	Gravimetric/ Oven, Electronic Balance, TDS Meter
4	Dissolved Oxygen	Electrometric/ DO Meter
5	BOD	Respirometric/ BOD incubator, BOD Auto Analyser
6	COD	Thermo-reactor digestion and Photometric measurement
7	Coliform	MPN test/ MPN kit
8	Calcium, Chloride, Hardness, Alkalinity	Titrimetric/ pipette, burette, etc.

9	Cadmium, Copper, Iron, Lead, Manganese, Mercury, Nickel, Total Chromium, Zinc, Ammonical Nitrogen, Arsenic, Colour, Phosphate, Fluoride, Hexavalent Chromium, Nitrate Nitrogen, Phenols, Sulphate, Sulphide, Total Residual Chlorine, Total Kjeldahl Nitrogen & Boron.	Spectrophotometric/ Photometer

Results

The analytical test results of water analysis are given in the following tables.

INDUSTRIAL WATER QUALITY DATA

Name of the Source: 1) **WE_1 : Mine Water; Existing Tikak OCP**

Project : Tikak Extension OCP

Season : Winter

Date of Sampling : 13.02.2007

Sl. No.	Parameters	WE_1	MoEF Schedule-VI Standard
1	Colour & Odour	Acceptable	Acceptable
2	Total suspended solids, mg/l	49	100
3	pH vale	6.3	5.5 - 9.0
4	Temperature (ºC)	20.4	*
5	Oil & grease, mg/l	1.4	10
6	Total residual chlorine, mg/l	ND	1
7	Ammonical nitrogen(as N), mg/l	0.73	50
8	Total Kjheldahl nitrogen(as NH_3), mg/l	1.87	100
9	Free ammonia (as NH_3), mg/l	ND	5
10	BOD (3 days 27º C), mg/l	6.3	30
11	COD, mg/l	43	250
12	Arsenic (as As), mg/l	ND	0.2
13	Lead (as Pb), mg/l	ND	0.10
14	Cadmium (as Cd), mg/l	ND	2
15	Hexavalent chromium (as Cr^{+6}), mg/l	ND	0.1
16	Total chromium (as Cr), mg/l	ND	2
17	Copper (as Cu), mg/l	ND	3
18	Zinc (as Zn), mg/l	0.14	5
19	Selenium (as Se), mg/l	ND	0.05
20	Nickel (as Ni), mg/l	ND	3
21	Fluoride (as F), mg/l	ND	2
22	Dissolved phosphates(as P), mg/l	0.16	5
23	Sulphide (as S), mg/l	0.10	2
24	Phenolic compounds (as C_6H_5OH), mg/l	ND	1
25	Manganese (as Mn), mg/l	ND	2
26	Iron (as Fe), mg/l	0.34	3
27	Nitrate nitrogen (as N), mg/l	2.2	10

* Shall not exceed 5º C above the receiving temperature.

SURFACE WATER QUALITY DATA

Name of the Source: **1) WS_1 : Upstream Ledo pani nallah**

2) WS_2 : Hamukjan nallah near railway track

3) WS_3 : Downstream Ledo pani nallah

Project : Tikak Extension OCP

Season : Winter

Date of Sampling : 13.02.2007

Sl. No.	Parameters	WS_1	WS_2	WS_3	(IS:2296) Surface Waters Tolerance Limits
1	Colour, Hazen units	16	11	24	300
2	Dissolved oxygen, mg/l	6.3	6.8	4.9	4
3	pH value	6.7	6.6	6.4	6.5 to 8.5
4	Iron (as Fe), mg/l	2.4	3.7	2.7	50
5	Chlorides (as Cl), mg/l	63	58	153	600
6	BOD (3 days at 27ºC), mg/l	11	8	23	30
7	Total dissolved solids, mg/l	228	193	341	1500
8	Copper (as Cu), mg/l	ND	ND	ND	1.5
9	Total chromium (as Cr) mg/l	ND	ND	ND	--
10	Sulphates (as SO_4), mg/l	104	64	249	400
11	Nitrates (as NO_3), mg/l	17.2	14.1	33.1	50
12	Fluorides (as F), mg/l	ND	ND	ND	1.5
13	Total coliform organisms, (MPN/100 ml)	267	159	877	5000
14	Cadmium (as Cd), mg/l	ND	ND	ND	0.01
15	Selenium (as Se), mg/l	ND	ND	ND	0.05
16	Arsenic (as As), mg/l	ND	ND	ND	0.2
17	Lead (as Pb), mg/l	ND	ND	ND	0.1
18	Zinc (as Zn), mg/l	0.19	0.23	0.87	15
19	Chromium (as Cr^{+6}), mg/l	ND	ND	ND	0.05
20	Phenolic compounds (as C_6,H_5OH), mg/l	ND	ND	ND	0.005
21	Oil & grease, mg/l	ND	ND	ND	0.1

ND; Not Detected

DRINKING WATER QUALITY DATA

Name of the Station : **WD_1: Tube well water from Hamukjan Gaon**

Project : Tikak Extension OCP

Season : Winter

Date of Sampling : 13.02.2007

Sl. No.	Parameters	WD_1	(IS:10500) (Desirable Limit)
01	Colour, Hazen units	2	5
02	Odour	Odourless	Unobjectionable
03	Taste	Acceptable	Agreeable
04	Turbidity, NTU	2	5
05	pH value	7.2	6.5 - 8.5
06	Total hardness (as $CaCO_3$), mg/l	126	300
07	Alkalinity (as $CaCO_3$), mg/l	71	200
08	Iron (as Fe), mg/l	0.1	0.30
09	Chlorides (as Cl), mg/l	48	250
10	Dissolved solids, mg/l	233	500
11	Calcium (as Ca), mg/l	57	75
12	Copper (as Cu), mg/l	BDL	0.05
13	Manganese (as Mn), mg/l	BDL	0.10
14	Sulphate (as SO_4), mg/l	31	200
15	Nitrate (as NO_3), mg/l	4.6	45
16	Fluoride (as F), mg/l	BDL	1
17	Residual free chlorine, mg/l	BDL	0.20
18	Cadmium (as Cd), mg/l	BDL	0.01
19	Selenium (as Se), mg/l	BDL	0.01
20	Arsenic (as As), mg/l	BDL	0.05
21	Lead (as Pb), mg/l	BDL	0.05
22	Zinc (as Zn), mg/l	BDL	5
23	Hexavalent chromium (as Cr^{+6}), mg/l	BDL	0.05
24	Boron (as B), mg/l	BDL	1.00
25	Phenolics (as C_6,H_5OH), mg/l	BDL	0.001
26	Faecal coliform (as MPN/100ml)	Nil	Nil

BDL: Below Detection Limit

Observation:

- **Drinking water**

  Sample WD_1 was from ground water source (tube well). The analysis shows that various physical and chemical parameters are within the limits of Indian Drinking Standards (IS: 10500 – 1991).

- **Surface Water**

  Sample, WS_1, WS_2 and WS_3 were collected from natural streams. The analysis show that various parameters are within the limits as per IS:2296 – 1982 (Surface water, Class "C" : Tolerance limits for surface waters used as drinking water sources with conventional treatment followed by disinfection).

- **Effluents**

  Sample WE_1 was collected from the mine discharge water of existing Tikak Opencast. The analysis result of WE_1 indicates that various parameters are within the limits of MoEF's General Standards (Schedule-VI), Part-A: Effluent.

3.5 Noise level Measurement

Noise level assessment

The present ambient noise level assessment for the project covering both core and buffer zones was carried out during Winter season (January to March, 2007). The results of noise level measurement have been incorporated in this chapter.

Location of noise level measurement stations (Ref. Plate No-XIX)

Six stations were selected for measuring the noise levels. The locations of noise level measurement stations are shown in Plate 3 and details are given below.

Details of the noise level measurement stations

Sl.No.	Station Code	Location Type	Details of Location
1.	NC_1	Core Zone	Proposed Mine site, Near Pit 1
2.	NC_2	Core Zone	Proposed Mine site, Near Pit 3
3.	NB_1	Buffer Zone	At Kalpara Gaon

Sl.No.	Station Code	Location Type	Details of Location
4.	NB_2	Buffer Zone	At Tikak Shiva Mandir
5.	NB_3	Buffer Zone	Malugaon no-3
6.	NB_4	Buffer Zone	At Ledo Bazaar Basti

Frequency of noise level measurement

Once in day-time (6.00 AM to 10.00 PM) and once in night-time (10.00 PM to 6.00 AM) in each month of Winter Season (January to March, 2007).

Methodology and instrument used for noise level measurement.

Noise level was measured in A-weighted sound level i.e. dB(A) using a noise level meter.

Results

The noise level measurements from above stations are given in Table below:

Ambient Noise Monitoring Results (Core Zone)

Sl. No.	Date	Location	dB (A), Leq		Permissible Limits	
			Daytime	Night time	Daytime	Night time
01	12.03.2007	NC_1	53	43	75	70
02	13.03.2007	NC_2	52	41	75	70

Ambient Noise Monitoring Results (Buffer Zone)

Sl. No.	Date	Location	dB (A), Leq		Permissible Limits	
			Daytime	Night time	Daytime	Night time
01	14.03.2007	NB_1	52	39	55	45
02	16.03.2007	NB_2	49	38	55	45

Sl. No.	Date	Location	dB (A), Leq		Permissible Limits	
			Daytime	Night time	Daytime	Night time
03	17.03.2007	NB_3	47	40	55	45
04	19.03.2007	NB_4	50	37	55	45

Observation

From the noise Noise Monitoring result is can be seen that the Ambient Noise Level at all the Six locations are well within the permissible limits.

3.6 Soil Quality Analysis

In order to assess the quality of soil of the Tikak Extension OCP area three typical sites were selected which would be representative of the entire area. These were Barren land, Agricultural land and Forest land. The sites were named as ST_1, ST_2 and ST_3. **(Ref. Plate No-XX)**

A brief description of the sites are as follows

1. ST_1 (Near Tikak Shiva Mandir- Buffer Zone)
2. ST_2 (Near Kalpara Goan – Buffer Zone)
3. ST_3 (Near Pit No. 2- Core Zone)

Sampling details

A total number of Nine samples were collected from three sampling pits, details of which are given below.

90 cm. depth trial pits were dug at each location to collect the soil samples. Samples were taken at 20 cm., 40 cm. and 70 cm. depth of each sampling pit. One packet of disturbed sample were taken at each depth of 20 cm., 40 cm.

and 70 cm. These packets were marked indicating location, depth etc. One undisturbed soil sample has been taken at a depth of 40 cm. of each sampling pit. The undisturbed sample has been taken through a 7" long sample tube. The undisturbed sample was immediately sealed to protect the moisture. For determination of moisture value, separate sample were taken at every depth of 20 cm., 40 cm. and 70 cm. of the sampling pit.

Field and Laboratory Tests

Laboratory analysis and Field test requirements are as follows

(a) Soil Texture
(b) Grain Size distribution
(c) Plastic limit
(d) Liquid limit
(e) Infiltration rate
(f) Wilting Co-efficient
(g) Bulk density
(h) Water holding capacity
(i) Field capacity
(j) pH value
(k) Conductivity
(l) Nitrogen
(m) Phosphorous
(n) Magnesium
(o) Potassium
(p) Moisture content

SOIL QUALITY DATA

Location : **ST_1** (Near Tikak Shiva Mandir- Buffer Zone)

Project : Tikak Extension OCP

Date of Collection : 16.01.2007

Parameter	**Depth (cm)**		
	0-30	**30-60**	**60-90**
Chemical Analysis			
a) pH	6.5	6.2	6.6
b) Electric Conductivity (□mhos/cm)	680	595	610
c) Nitrogen (%)	0.12	0.15	0.09
d) Phosphorous (%)	0.06	0.03	0.05
e) Potassium (%)	0.02	0.03	0.03
f) Available Magnesium (%)	0.02	0.005	0.025
g) Natural Moisture content (%)	4.1	4.3	4.0
Grain Size Distribution			
a) Gravel (%)	9.1	9.3	9.9
b) Sand (%)	12.2	11.8	12.0
c) Silt (%)	24.7	24.9	24.3
d) Clay	54.00	54.00	53.8
Texture	CL	CL	CL
Bulk Density (g/cc)	1.3	1.6	1.8
Liquid Limit (%)	49	53	54
Plastic Limit (%)	24.4	25.1	25.9
Infiltration Rate (cm/day)	1.15		

	Depth 60 cm
Field Capacity (%)	25.1
Wilting Coefficient (%)	2.10
Water Holding Capacity (%)	20.1

SOIL QUALITY DATA

Location : **ST_2** (Near Kalpara Goan – Buffer Zone)

Project : Tikak Extension OCP

Date of Collection : 16.01.2007

Parameter	**Depth (cm)**		
	0-30	**30-60**	**60-90**
Chemical Analysis			
a) pH	6.4	6.6	6.4
b) Electric Conductivity (□mhos/cm)	525	560	580
c) Nitrogen (%)	0.18	0.14	0.16
d) Phosphorous (%)	0.05	0.06	0.08
e) Potassium (%)	0.05	0.021	0.010
f) Available Magnesium (%)	0.03	0.02	0.02
g) Natural Moisture content (%)	5.6	5.2	5.4
Grain Size Distribution			
a) Gravel (%)	12.8	12.6	12.6
b) Sand (%)	18.9	19.2	19.4
c) Silt (%)	33.00	32.10	32.15
d) Clay	45.30	36.10	35.85
Texture	CL	CL	CL
Bulk Density (g/cc)	1.65	1.67	1.87
Liquid Limit (%)	33.0	34.0	36.0
Plastic Limit (%)	19.50	20.50	21.10
Infiltration Rate (cm/day)			

	Depth 60 cm
Field Capacity (%)	16.5
Wilting Coefficient (%)	1.20
Water Holding Capacity (%)	18.5

SOIL QUALITY DATA

Location : **ST_3** (Near Pit No. 2 – Core Zone)

Project : Tikak Extension OCP

Date of Collection : 16.01.2007

Parameter	**Depth (cm)**		
	0-30	**30-60**	**60-90**
Chemical Analysis			
a) pH	6.5	6.6	6.7
b) Electric Conductivity (□mhos/cm)	520	525	530
c) Nitrogen (%)	0.10	0.11	0.13
d) Phosphorous (%)	0.09	0.08	0.07
e) Potassium (%)	0.025	0.026	0.027
f) Available Magnesium (%)	0.012	0.013	0.015
g) Natural Moisture content (%)	4.4	4.5	4.3
Grain Size Distribution			
a) Gravel (%)	9.8	9.5	9.7
b) Sand (%)	13.5	13.8	13.7
c) Silt (%)	25.5	25.6	25.8
d) Clay	51.2	51.1	50.8
Texture	CL	CL	CL
Bulk Density (g/cc)	1.5	1.3	1.4
Liquid Limit (%)	55	56	57
Plastic Limit (%)	30	31	32
Infiltration Rate (cm/day)	1.6		

	Depth (60 Cm)
Field Capacity (%)	26.5
Wilting Coefficient (%)	2.21
Water Holding Capacity (%)	23.6

Observation

From the soil analysis results it can be seen that the soil quality of the study area is normal and satisfactory.

3.7 Hydro-geological Study and Water Balance

Ground Water Resources in the area

Rainfall is the major recharge source for ground water. The area is having average annual rainfall of 3000 mm. The rainfall infiltration factor of 13% was calculated for the study area. The summarized land use for the area of study is as follows:

Sl. No.	Land use	Area (in ha)
1	Irrigated Land	-
2	Forest	192.00
3	Village	-
4	Tanks	-
5	Small ponds	-
6	Others	-
7	Total	192.00

The net ground water recharge and draft for the study area has been estimated as million cubic meter. The detailed ground water balance with recharge and discharge estimates is shown in the following table:

Ground Water Balance of Buffer zone Area

A	Ground Water Recharge	
	Recharge through rainfall in sedimentary geographical area (Rg) = 314 Sq Km area x 3000 mm rainfall x 8 % infiltration	75.36
	Natural discharge & other losses (20% of Rg)	(-) 15.07
	Net annual ground water recharge	**60.28**
B	Ground Water Draft	
	1. Net Irrigation Use i. For 4150 Ha area @ 145 Cum = 0.601 ii. (20%) Return flow to ground water = 0.12	0.48
	2. Community Use i. Projected Population (1,40,000)@70lpd for 365 days = 3.57 ii. For cattle population (10% of item 'i') = 0.35 iii. Domestic consumption of proposed mine = 0.23	4.15
	3. Net proposed mine discharge i. Mine Pumping = 1.00 ii. 20% return flow to the ground system = 0.01	0.90
	Net Annual Ground Water Draft (1+2+3)	**5.53**
C	Balance available for annual Ground Water Recharge (A-B)	**54.75**

Ground Water Development Factor = 10 %

(It falls well within safe zone as per Ground Water Estimation Committee Norms 1997).

3.8 FLORA AND FAUNA SURVEY/ ECOLOGICAL STUDY

The Tikak Extension OCP project area is situated in the Tinsukia district of Upper Assam. The region's climate is generally subtropical in nature with high rainfall (2000 – 3000 mm per annum), moderate to high temperature (Min. 6 –

25 ^{0}C and Max. 20 – 45 ^{0}C) and high humidity (35% Min and 95% Max). Four distinct climatic seasons can be identified in a year.

The landscape of the project area presents a complex of agricultural land, rural habitation, hilly forests, industrial establishments and patches of vegetation. The surface is hilly, rolling and undulating with a distinct northerly slope towards river Buri-Dehing. The land area comprise of-

Cultivated land with Tea Gardens

Existing and Proposed Forests

Barren lands and

Other surface features like industrial activities, road, river, settlement areas etc.

The overall condition of land and soil profile, even after large scale mining, reveal the potentiality of both limited agricultural practices and large scale afforestation

FLORA & FAUNA

This survey report has been prepared covering both Core Zone & Buffer Zone areas of Tikak Extension OCP.

The Core Zone of Tikak Extn. OCP falls in the state of Assam and Buffer Zone covers Assam and Arunachal Pradesh state (south side from a distance of approximately 1.4 km onwards). NH 38 & Railway line passes through the study area.

The core zone area of Tikak Extn. OCP falls under the Proposed Saleki Reserve Forest area. The area is devoid of any major forest trees and human habitat. The area is hilly, having small trees and shrubs only. Hence, the Flora-fauna survey covered mainly the buffer zone areas having forest cover and the main water bodies together with the vegetation and small ponds in the

adjacent villages. Lekhapani RF and Upper Dehing RF fall within the 10 km radial area of the project site.

The different reserve forests and the main water bodies around the project area are as under-

Sl. No.	Location Name	Approximate distance from project boundary	Direction from project area
01	Lekhapani Reserve Forest	9 km	E
02	Upper Dehing Reserve Forest	9 km	NW
03	Buri Dihing River	4 km	W to NW
04	Tirap River	2.5 km	N

No endangered species of flora or fauna were spotted in the study area of Tikak Extension OCP. Also, the project does not fall within any corridors of migratory birds.

The vegetation consists of forest areas in the interiors and multiple variety of vegetation on the fringes of the hills. Some wild animals also exist in these forest areas. As many as 51 different forest types and sub-types have been recognized for this region. The forest in this area is broadly known as Tropical Wet Evergreen Forest or Upper Assam Dipterocarpus Musua Forest (Champion and South Classification – 1 B/C).

FLORA

In this study of the flora of the area around the project site, none of the endangered plants of Assam listed in the Red Data Book of Indian Plants (Nayar and Shastry, 1990) has been recorded in natural state

A detailed field survey was carried out in the areas surrounding the project area. Vegetation in the project area is composed of trees, shrubs and herbs. Most of the naturally growing plants are shrubs and herbs. List of the different available species are given in the following tables-

CORE ZONE RESULTS

The core zone area of Tikak Extn. OCP falls under the Proposed Saleki Reserve Forest area. The area is devoid of any major forest trees and human habitat. The area is hilly, having small trees and shrubs only. A list of the available species of flora in the core zone area is given below-

Trees

Sl. No.	Botanical Name	Local Name
01	Citrus maxima	Rabab tenga
02	Delonix regia	Radha chura
03	Dillenia indica	Outenga
04	Melia azedarch	Ghora neem
05	Plumaria acutiafolia	Katgolap
06	Psidium guyava	Madhuriam
07	Zigyphus jujube	Bagari

Herbs and Shrubs

Sl. No.	Botanical Name	Local Name
01	Ageratum conyzoids	Gondhoa ban
02	Amaranthus spinosa	Hati khutura
03	Bambosa nutans	Jati bah
04	Cuscuta reflexa	Akashi lata
05	Datura sp.	Dhatura
06	Eupatorium odoratum	Jarmani bon
07	Lantana camara	Goo phool

08	Lucus aspera	Doron
09	Mimosa pudica	Lajuki lata
10	Mikania scandens	Japani habi
11	Solanum indicum	Tita vekuri

BUFFER ZONE RESULTS

The buffer zone area of Tikak Extension OCP consists of a number of villages in the 10 km radial area around the project site. The various species of Flora found in the area are as follows-

Trees

Sl. No.	Botanical Name	Local Name
01	Aegle marmelos	Bel
02	Anona reticulata	Atlos/ Ata
03	Anthocephalus codomba	Kadam
04	Artocarpus heterophyllus	Kathal
05	Azadiracta indica	Moha neem
06	Bombax ceiba	Simalu
07	Caesalpinia pulcherima	Krishna chura
08	Cassia fistula	Bandar lathi
09	Cinnamomum tamala	Tejpat
10	Citrus maxima	Rabab tenga
11	Delonix regia	Radha chura
12	Dillenia indica	Outenga
13	Dysoxilum binectiferum	Bandardima
14	Dipterocarpus macrosarpus	Hollong
15	Eugenia jambolana	Jamu
16	Eugenia pracco	Boga jamu
17	Ficus bengalensis	Bar
18	Ficus religiosa	Ahat
19	Ficus hispida	Dimaru

20	Flacourtia jangomas	Panial
21	Garcinia pedunculata	Bor thekera
22	Gmelina arborea	Gamari
23	Lagerstroemia parviflora	Sida
24	Lagerstroemia speciosa	Ajhar
25	Melia azedarch	Ghora neem
26	Machilus bombycina	Chom
27	Magnifera indica	Aam
28	Mesua ferrea	Nahar
29	Michelia champaka	Tita chopa
30	Mimusops elengi	Bakul
31	Phyllanthus emblica	Amlakhi
32	Plumaria acutiafolia	Katgolap
33	Polyalthia longifolia	Debdaru
34	Psidium guyava	Madhuriam
35	Punica granatum	Dalim
36	Spondius mangiferce	Amara
37	Tamarindus indica	Teteli
38	Tectona grandis	Segun
39	Terminalia chebula	Silikha
40	Terminalia myriocarpa	Hollok
41	Zigyphus jujube	Bagari

Herbs and Shrubs

Sl. No.	Botanical Name	Local Name
01	Ageratum conyzoids	Gondhoa ban
02	Amaranthus virdis	Khutura
03	Amaranthus spinosa	Hati khutura
04	Bambosa nutans	Jati bah
05	Cuscuta reflexa	Akashi lata
06	Cassia alata	Khar pat
07	Cassia sophera	Medeluwa
08	Clerodendron viscosum	Bhet tita

09	Datura sp.	Dhatura
10	Chrysopogan aciculatus	Bon guti
11	Cynadan dactylon	Dubari bon
12	Centella asiatica	Bor manimuni
13	Euphorbia hirta	Dudh bon
14	Eupatorium odoratum	Jarmani bon
15	Hydrocotyle japonica	Saru manimuni
16	Imperata cylindrica	Ulu kher
17	Lantana camara	Goo phool
18	Lucus aspera	Doron
19	Mimosa pudica	Lajuki lata
20	Murraya koenigi	Narasingha
21	Melastoma malabathricum	Futkala
22	Mikania scandens	Japani habi
23	Ocimum sanctum	tulasi
24	Phyllanthus niruri	Pani amlakhi
25	Polygonum hydropiper	Beh
26	Pouzalzia zeylanicia	Barli bokua
27	Plumbago sp.	Agachhit
28	Rumex maritimus	Bar palang
29	Smilax sp.	Hostikana lata
30	Solanum indicum	Tita vekuri
31	Ricinus communis	Era goch
32	Saccharum spontaneum	Kahua

Climbers and twiners

Sl. No.	Botanical Name	Local Name
01	Cuscuta reflexa	Akashilata
02	Clitorea ternate	Aparajita
03	Dioscorea sp.	Kathalu
04	Mikania scandens	Nag
05	Piper betel	Pan
06	Paederia scandens	Bhedai lata

Palms

Sl. No.	Botanical Name	Local Name
01	Areca catechu	Tamol
02	Cocus nucifera	Narikal
03	Licuala peltata	Jeng
04	Livistona jenkensiana	Tokou

Canes

Sl. No.	Botanical Name	Local Name
01	Calamus erectus	Raidang
02	Calamus Tenuis	Jati bet

Orchids

Sl. No.	Botanical Name	Local Name
01	Venda roxburghii	Kapau phool
02	Venda teres	Bhatau phool

Vegetables grown in the area

Sl. No.	Botanical Name	Local Name
01	Amorphophallus campanulatus	Ol kachu
02	Abelmoschus esculentus	Bhendi
03	Banincasa hispida	Chal komora
04	Brassica campestris	Sariah
05	B. alba	Boga sariah
06	B. oleracea varjuncea	Lai
07	B. oleracea var capitata	Bondha kabi
08	B. caulocarpa	Ol kabi
09	B. gongylodes oleracea	Phool kabi
10	Cucurbita maxima	Ranga lao

Sl. No.	Botanical Name	Local Name
11	Cucumis sativam	Tiauh
12	Carica papaya	Amita
13	Dioscorea alata	Kath alu
14	Dancus carota	Gajar
15	Dolichos lablab	Urohi
16	Ipomea batata	Ranga alu
17	Lycopersium esculantum	Bilahi
18	Luffa acutangula	Jika
19	Luffa cylindrica	Bhol
20	Lageraria valgaris	Jati lao
21	Moringa oleifera	Sajina
22	Mautha arveusis	Pudina
23	Murraya koeningi	Narasingha
24	Momordica charantia	Kerela
25	Momordica cochinchineusis	Bhat kerela
26	Musa paradisica	Kach kal
27	Musa sapientum	Kal
28	Paedaria foetida	Bhedai lata
29	Phaseolus radiata	Mati mah
30	Phaseolus vulgaris	French bean
31	Raphanus sativum	Mula
32	Spinacea oleracea	Paleng sak
33	Solanum tuberosum	Alu
34	Solanum melongera	Begena
35	Vigna catjung	Dangbodi

Medicinal Plants

Sl. No.	Botanical Name	Local Name
01	Adhatoda vasica	Basak
02	Aegle marmelos	Bael
03	Aloe vera	Sal kunwari
04	Alstonia scholaris	Satiana

Sl. No.	Botanical Name	Local Name
05	Anona reticulata	Atlos
06	Averrhoa carambola	Kardoi
07	Azadiracta indica	Neem
07	Bryophyllum calycinum	Dupar tenga
08	Cassia fistula	Sonaru
09	Centella asiatica	Bar manimuni
10	Clitoria tenata	Aparajita
11	Cynodon daclylon	Dubari
12	Datura stramonium	Boga dhatura
13	Dillenia indica	Outenga
14	Eugenia jambolana	Kala jamu
15	Euphorbia hirta	Dudh ban
16	Ficus glomerata	Dimaru
17	Ficus religiosa	Ahot goch
18	Garcinia pedunculata	Bor thekera
19	Lawsonia inermis	Jetooka
20	Leucus linifolia	Boga doron
21	Mimosa pudica	Lajuki lata
22	Michelia champaka	Champa
23	Murraya koenigi	Narasingha
24	Musa sapientum	Bhim kol
25	Ocimum gratissimum	Ram tulosi
26	Ocimum sanctum	Krishna tulosi
27	Phyllanthus emblica	Amlakhi
28	Punica granatum	Dalim
29	Solanum indicum	Tita bhekuri
30	Spondius mangiferce	Amora
31	Tamarindus indica	Teteli
32	Terminalia chebula	Silikha
33	Venda teres	Bhatau phool
34	Venda roxburghii	Kapau phool
35	Zingiber officinales	Ada

FAUNA

The observation on the animal communities within the study area have shown a wide diversity of species composition from lower to higher taxa. The survey reveals that a number of species of animals are present within the area. These animals are the representatives of Protozoans, Rotifers, Mollusca, Arthropods, Fishes, Amphibia, Reptiles, Birds and Mammals. This shows that the area is having a good number of animal species.

A number of species of butterfly are seen wandering over the bushes within the study area. These delicate and fragile animals are very much sensitive to environmental changes due to pollution. The species diversity and respective population however suggests that the area is free from harmful pollutants that can adversely affect the butterfly population. It can be concluded that the 10 km area surrounding the Tikak Extension OCP area is still a conducive habitat for number of animal species and no visible environmental impact is noticed during the study period. There are no rare or endangered animal species in the study area.

CORE ZONE RESULTS

Only a few faunal species were spotted in the core zone area, which are listed below-

Mammalian Species

Sl. No.	Scientific Name	Common Name	Schedule
01	Capra domesticus	Goat	--
02	Rattus rattus	House Rat	V
03	Mus musculus	Home Mouse	V
04	Funambulus pennanti	Squirrel	IV
05	Cannomys badius	Bamboo Rat	V
06	Herpestis edwardsi	Mongoose	IV
07	Bos domesticus	Cow	--
08	Canis familiarisis	Dog	--
09	Felis catus, F. domesticus	Cat	--

Bird species

Sl. No.	Scientific Name	Common Name	Schedule
01	Grus grus	Common crane	IV
02	Dinopium javanese	Three-toed woodpecker	IV
03	Pycnonotus jocorus	Red whiskered bulbul	IV
04	Pycnonotus cafer bengalensis	Red vented bulbul	IV
05	Corvus splendens	House crow	V
06	Eudunamys scalopacea	Koel/ Kuli	IV
07	Acridotheres tristis	Common myna	IV
08	Streptopelia chinensis	Spotted Dove	IV
09	Psittacula columbodies	Parrot	IV

Reptilian species

Sl. No.	Scientific Name	Common Name	Schedule
01	Calotes versicolour	Garden lizard	--
02	Ptyas mucosus	Common Rat snake	II
03	Varanus sp.	Monitor lizard	II

BUFFER ZONE RESULTS

Survey in the buffer zone was carried out in an area covering radial distance of 10 kms around the project site and included forests, rivers, natural streams as well as pond of the nearby villages. The results have been compiled based on actual sightings during the survey as well as the feedbacks received from the local residents.

The various species of fauna found in the buffer zone area are listed below-

Aquatic Invertebrates

Sl. No.	Name
01	Eugelina
02	Prarmoecium
03	Volvox

Aquatic Porifera and Others

Sl. No.	Name
01	Brachionus
02	Hydra
03	Keratella

Mollusca

Sl. No.	Name
01	Aclina
02	Amnicola sp.
03	Hydrobia
04	Pleurocera

Crustaceans

Sl. No.	Name
01	Cypris
02	Diaptamous
03	Daphnia
04	Eubranchipus
05	Palaemonetes

Megalopa and Neuroptora

Sl. No.	Name
01	Dytiscids
02	Hydropholids
03	Philopotamus
04	Dragon fly nymphs

Water Bugs

Sl. No.	Name
01	Belostoma
02	Notonecta
03	Ranatra

Beetles

Sl. No.	Name
01	Dytiscus
02	Hydrocanthus

Miscellaneous

Sl. No.	Name
01	Anopheles larvae
02	Brachecentrus
03	Culex larvae
04	Triaenodes
05	Palemon malcumsoni

Other Invertebrates in the area

Sl. No.	Scientific Name	Common Name
Annelids		
01	Lampito mauritii	Earthworm
02	Drawida calebi	Earthworm
03	Hirudinaria granulose	Leech
Arthropods		
01	Apis mellificia	Honey bee
02	Anax junius	Dragon fly
03	Bacillus rossii	Grass hopper
04	Araneus epeira disdematus	Garden spider
05	Julus terrestris	Common millipede
06	Scolopendra sp.	Common centipedes
07	Odontoermes sp.	Termites
08	Oecanthes niveus	Tree cricket
09	Scorpio swammerdani	Indian scorpion

Fish species in the area

Sl. No.	Scientific Name	Common Name
01	Natopterus notopterus	Kanduli
02	Esomus danricus	Doricana
03	Rasbora daniconius	Doricana
04	Puntius chola	Puthi
05	Puntius conchonius	Puthi
06	Labeo rohita	Rohu
07	Cirrhina mrigala	Mirka
08	Clarius batrachus	Magur
09	Channa punctatus	Goroi
10	Channa gasua	Cheng
11	Monopterus cuchia	Kuchia
12	Anabas testudineus	Koi
13	Mastacembalus armatus	Bami
14	Heteropneustes fossilis	Singi

Bird species in the area

Sl. No.	Scientific Name	Common Name	Schedule
01	Ardeela grayii	Pond heron	IV
02	Grus grus	Common crane	IV
03	Apus affinis	House swift	IV
04	Halcyon smyrnensis	White breasted kingfisher	IV
05	Dinopium javanese	Three-toed woodpecker	IV
06	Gecinulus grantia	Pale-headed woodpecker	IV
07	Pycnonotus jocorus	Red whiskered bulbul	IV
08	Pycnonotus cafer bengalensis	Red vented bulbul	IV
09	Corvus splendens	House crow	V
10	Corvus macrohynchos	Jungle crow	IV

11	Eudunamys scalopacea	Koel/ Kuli	IV
12	Acridotheres tristis	Common myna	IV
13	Acridotheres fuscus	Jungle myna	IV
14	Passer domesticus	House sparrow	IV
15	Tito alba	Barn owl	IV
16	Columbia livia	Blue pigeon	IV
17	Orthotomus sutorius	Common Tailorbird	IV
18	Streptopelia chinensis	Spotted Dove	IV
19	Gallus domesticus	Fowl	IV
20	Psittacula columbodies	Parrot	IV
21	Milvus migrans	Common pariah kite	IV

Reptilian species in the area

Sl. No.	Scientific Name	Common Name	Schedule
01	Hemidactylus flaviviridis	Common house lizard	--
02	Calotes versicolour	Garden lizard	--
03	Tropidontus sp.	Pond snake	II
04	Python molurus	Indian python	I (P II)
05	Typhlina bramima	Common blind snake	IV
06	Ptyas mucosus	Common Rat snake	II
07	Naja naja	Indian Cobra	II
08	Varanus sp.	Monitor lizard	I (P II)

Mammalian species in the area

Sl. No.	Scientific Name	Common Name	Schedule
01	Capra domesticus	Goat	--
02	Cynopterus sphinx	Short nosed Fruit Bat	V
03	Rattus rattus	House Rat	V
04	Mus musculus	Home Mouse	V
05	Funambulus pennanti	Squirrel	IV
06	Cannomys badius	Bamboo Rat	V
07	Canis aureus	Jackal	II
08	Herpestis edwardsi	Mongoose	IV

09	Oryctolagus cuniculus	Rabbit	--
10	Elephas indica	Elephant	I (P I)
11	Vulpes bengalensis	Indian fox	II
12	Bos domesticus	Cow	--
13	Canis familiarisis	Dog	--
14	Felis catus, F. domesticus	Cat	--

Butterfly species in the study area

Sl. No.	Scientific Name	Common Name
01	Euploea core	Common crow
02	Eurena hecabe	Common grass yellow
03	Amblypodia anita	Leaf blue
04	Castalius rosimon	Common picrrot
05	Neptis hylas	Common sailor
06	Papilio polytes	Common marmon
07	Ypthima huebneri	Common fourring
08	Zizeeria maha	Pale grass blue

3.9 DEMOGRAPHIC AND SOCIO-ECONOMIC SCENARIO

CORE ZONE

The Core Zone of Tikak Extension OCP does not have any human habitation. Hence Socio-economic survey of Tikak Extension OCP Core Zone is not applicable.

BUFFER ZONE

Socio-economic survey of the study area was carried out in the Buffer Zone only. The villages covered in the study are as follows-

Sl. No.	Location Name	Approximate distance from project boundary	Direction from project area
01	Bisagaon	6.5 km	NE
02	Monglang	7 km	N
03	Sipegaon	3 km	N
04	Namdang Bansbari	4.5 km	NE
05	Malankangaon	2.5 km	E

Demographic Profile of the Sampled Households

The population and settlement pattern in the Tikak mining area has undergone rapid changes in recent years. From estimation the population in this region is around 45,000 in the year 2001. Population has grown significantly in some villages like Tikak, Baragolai, Makum Pather etc., probably due to increase of mining and industrial activities and subsequent influx of mining labours and others.

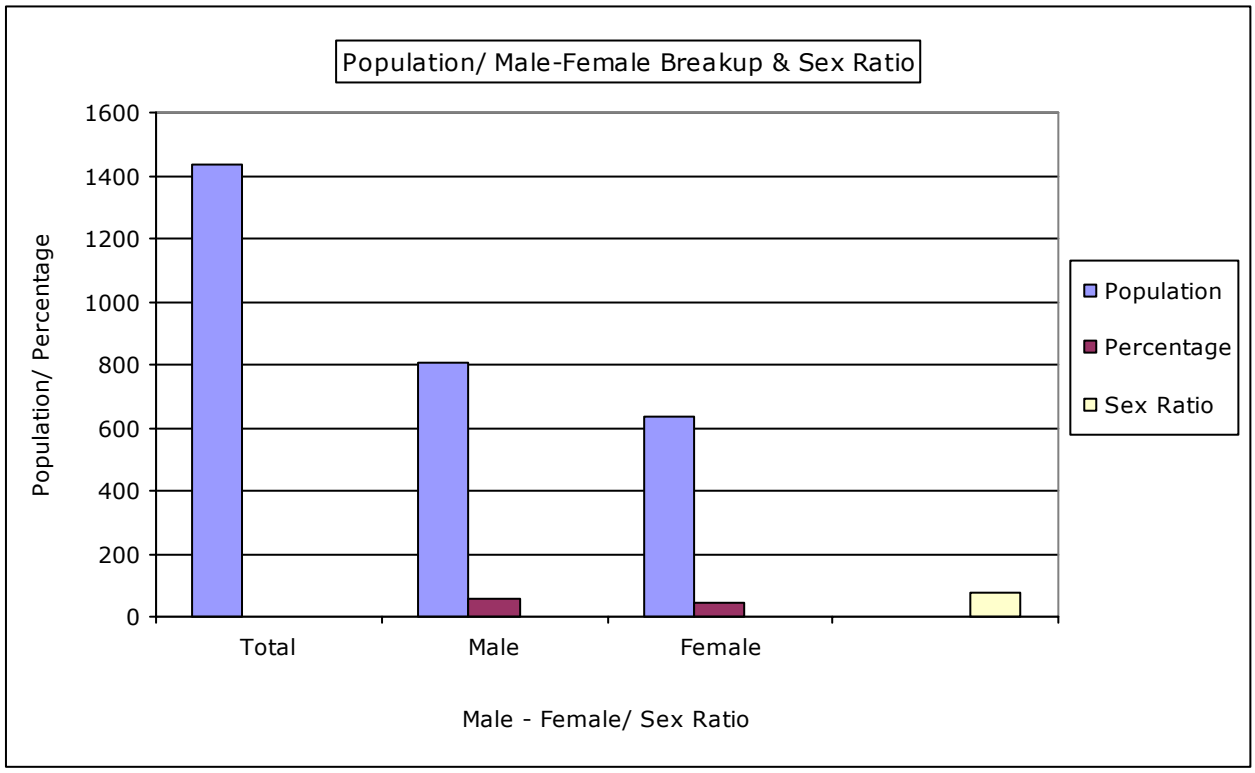
Age-wise Distribution

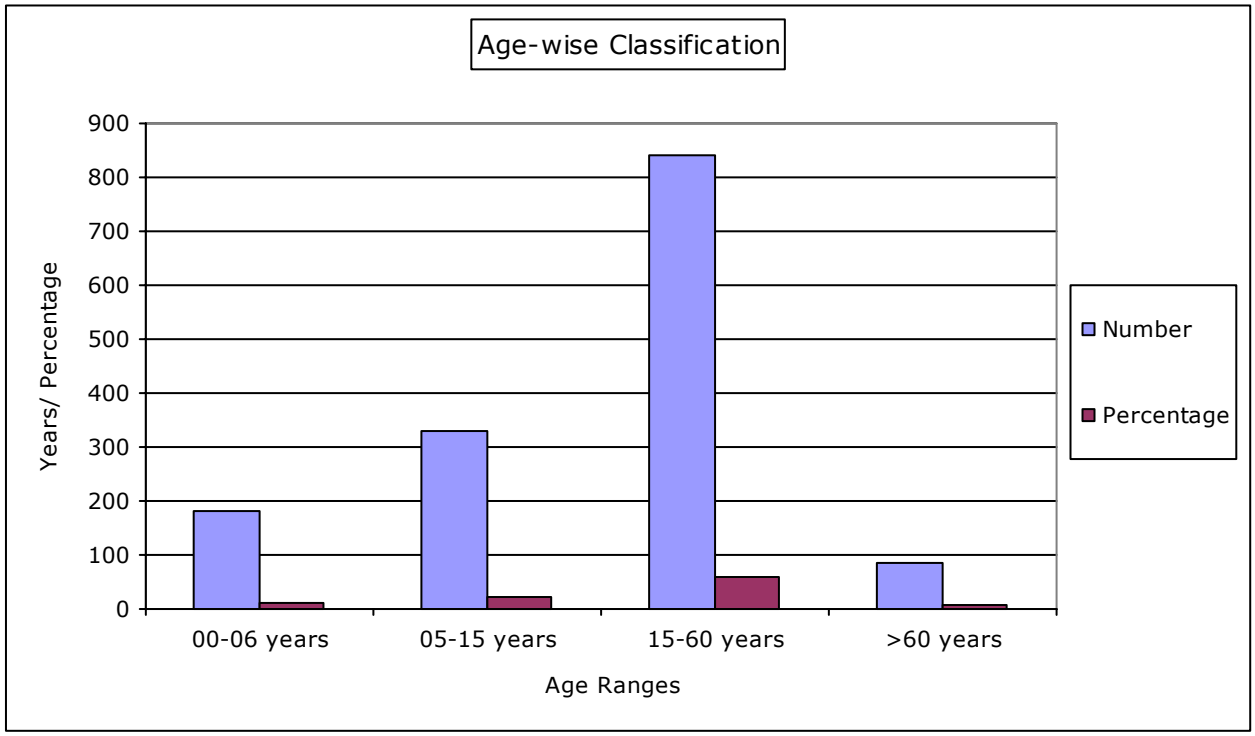
Total 250 households within the study area were surveyed in this work covering a population of 1438 with 805 male members and 633 female members. The sex ratio is 78.63 (per 100 males). The age-wise classifications of the family members of the sampled households are as follows-

a) 00 – 06 years = 182 (12.66% of the total)
[103 male children, 79 female children]

b) 15 – 60 years = 842 (58.55% of the total)

c) Above 60 years = 85 (5.91% 0f the total)


Population/ Male-Female Breakup & Sex Ratio
1600
1400
1200
1000
800
600
400
200
0
Population/ Percentage
Total
Male
Female
Male - Female/ Sex Ratio
Population
Percentage
Sex Ratio


Age-wise Classification
900
800
700
600
500
400
300
200
100
0
Years/ Percentage
00-06 years
05-15 years
15-60 years
>60 years
Age Ranges
Number
Percentage

Family Structure

The average family size in the area is 5.75 with a range of 4.1 to 7.1 persons per family. The survey also revealed high percentage of nuclear families. In this area around 36% of the families are attached to joint families and the rest are individual families. Like any other developing urban and semi-urban areas of our country, the increasing trend of nuclear families is a significant social aspect of the study area.

S.C. and S.T. Population

As per the survey, the S.C. population in the study area accounts for 10.8 percent, while S.T. population percentage is around 19.6. However, population concentration of these two categories varies from village to village. Villages like Mulung, Pengna and Rathduba etc. are almost completely inhabited by S.T. people while some villages such as Kolpara gaon, Sipe gaon, Long gaon etc. are inhabited by S.C. people.

The caste-wise distribution of the 250 households studied in this work is as follows-

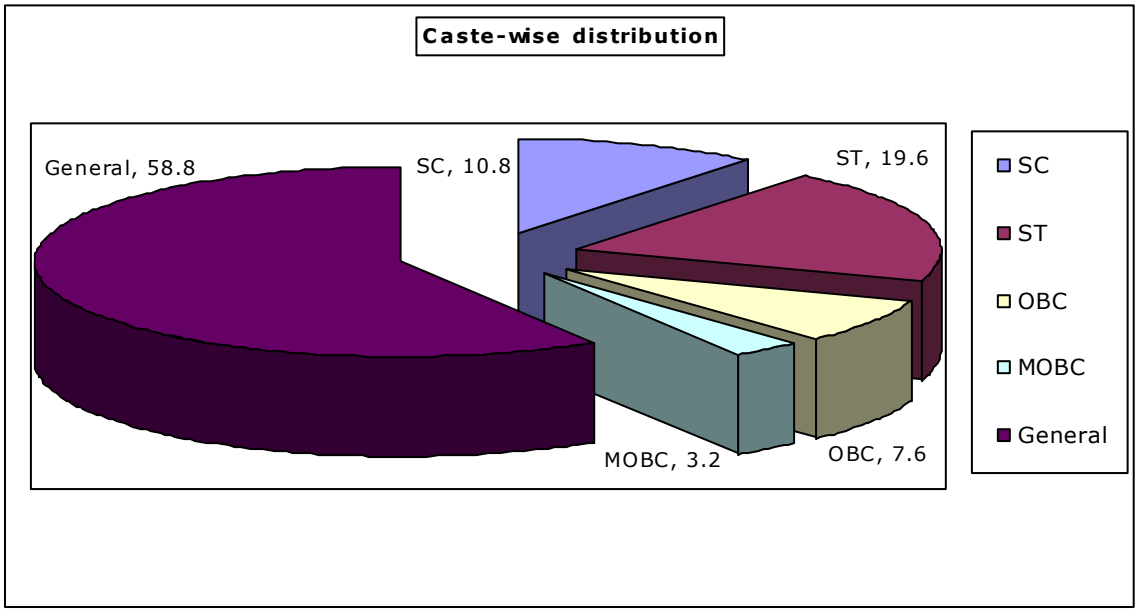
Sl. No.	Category	No. of Households (Families)	Percentage of the total
01	S.C.	27	10.8
02	S.T.	49	19.6
03	OBC	19	7.6
04	MOBC	8	3.2
05	General	147	58.8
06	Total	250	100.00

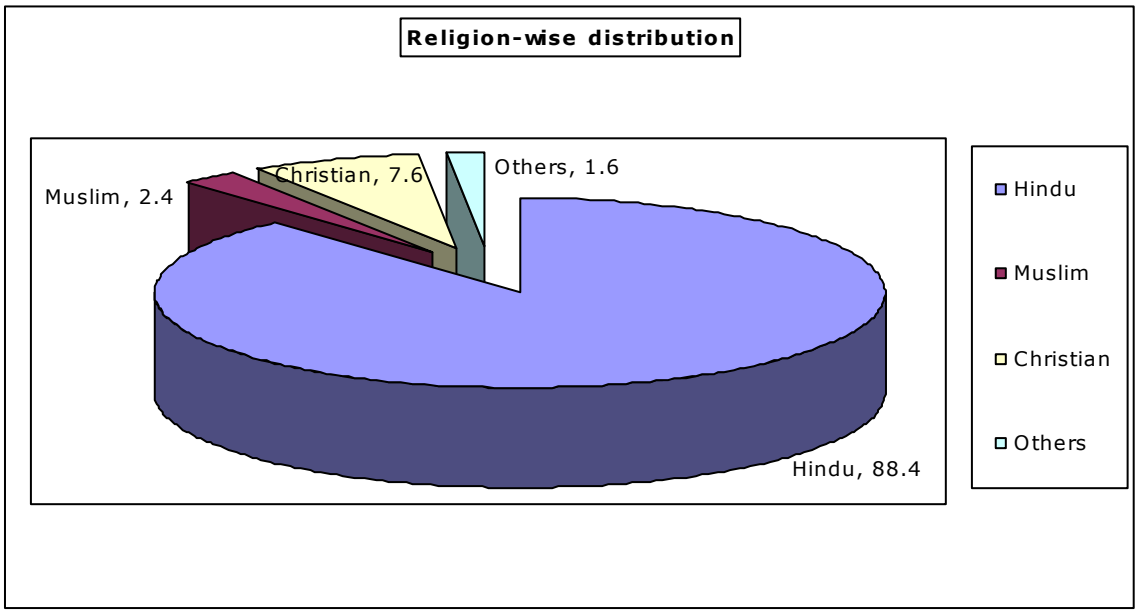
Religious Structure

Survey of the 250 households show that, Hinduism is the dominant religion in this area. Out of the 250 households, 221 households (88.4%) belong to the Hindus, 6 (2.4%) belong to the Muslims, 19 (7.6%) belong to the Christians and the rest of the families practiced other religions.

Religion-wise distribution of the sampled households is as follows-

Sl. No.	Religion	No. of Households (Families)	Percentage of the total
01	Hindu	221	88.4
02	Muslim	6	2.4
03	Christian	19	7.6
04	Others	4	1.6
05	Total	250	100

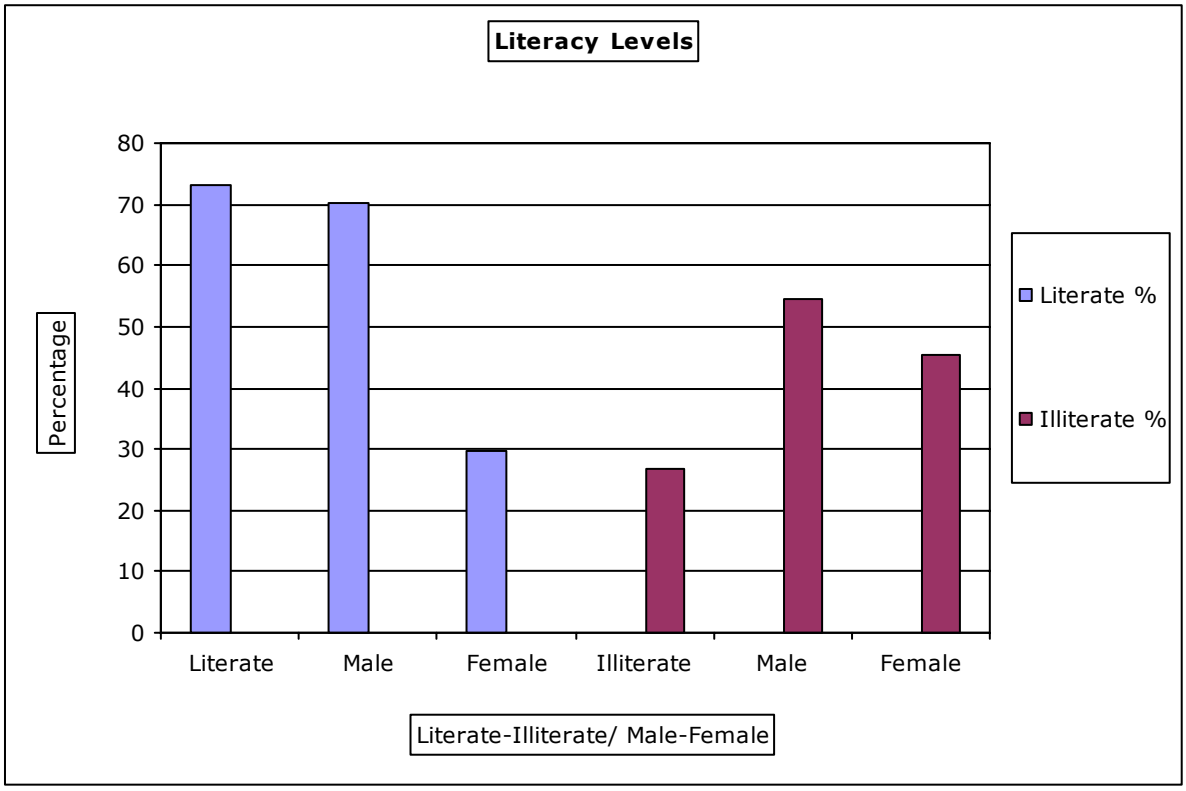




Literacy Level

Literacy level in the study area as per the survey is 73.09% of which 70.31 % are male and the rest 29.69% are female. This shows that literacy level among women is low compared to men. The literacy level is given in table 3.03 and depicted in fig. 3.05.

Sl. No.	Parameter	Number	Percentage
01	Population	1438	100
02	Literates	1051	73.09
	Male	739	70.31
	Female	312	29.69
03	Illiterate	387	26.91
	Male	211	54.52
	Female	176	45.48



Economic Status

The sample survey shows that 37.34% of the populations are main workers and the rest 62.66% are non-workers. Out of the 37.34% of main workers, there are 32.55% are male and 4.79% are female. This indicates low female involvement among main workers.

Out of 62.66% of non-workers, 22.83% are male and rest, 39.83% are female.

Workforce Pattern

Workforce pattern data of the samples households is as follows-

Sl. No.	Parameters	Numbers	Percentage
01	Main workers	537	100.00
02	Cultivators	209	38.92
03	Agricultural Labourers	16	2.98
04	Household Industries/ Business	48	8.94
05	Other Workers	264	49.16

Distribution of Annual Income

The 250 households surveyed have the following distribution of annual incomes-

Sl. No.	Annual Income Range	Number of Households	Percentage
01	< Rs. 15,000.00	138	55.2
02	Rs. 15,000.00 – Rs. 30,000.00	89	35.6
03	Rs. 30,000.00 – Rs. 60,000.00	10	4.0
04	Rs. 60,000.00 – Rs. 80,000.00	9	3.6
05	> Rs. 80,000.00	4	1.6
06	Total	250	100

Health status

The survey with respect to occurrence of various diseases and illnesses among the sampled households reveals that out of the total population of 1438 in the 250 sample households, 941 (65.44%) persons were found to have suffered from various diseases. The rest i.e. 497 (34.56%) persons did not have any disease.

The major ailments from which the people suffered during the last five years in the sampled households are-

1. Gastro-enteritis : 695 persons (73.85% of the total suffering from diseases)
2. Enteric fever : 494 persons (52.49% of the total suffering from diseases)
3. Viral fever : 488 persons (51.86% of the total suffering from diseases)
4. Malaria fever : 476 persons (50.58% of the total suffering from diseases)

Report of medical camp organized by Central Hospital, Margarita for periodical Health Checkup.

Periodical Medical Camp Health Check up within 5 k. m. radius of coal mining activities are being conducted by central Hospital Margherita as well as in collaboration with Coal India Mahila Samaj and Rotary Club Margherita. One Medical Camp was organised on 4th February, 2006 at Hajang Basti, 3 kms from Ledo. It is to inform you that in the said Camp more than 500 patients were examined and given free medicines. In the said Camp we have not come across any patient having any coal mine related diseases.The main complaints for which people came were diarrhea, worms, B. P. etc. Though we had planned another medical camp at Makum Killa Village in June/ July but the Camp could not be conducted due to serve heat wave conditions and occurance of Malarial epidemic which prevented doctors and paramedics to organize the camp. CIL is proposing to hold Medical Camp in the same Location during November/ December.

It is also to inform that in those Camps only patients Serial No, Name, Age, Sex and Address (Vill.) were eniptred in a register and we did not record the details as per the

Proforma sent by Pollution Control Board of Assam. We assure that in futre Medical Camps the format given by State Pollution Control Board shall be duly filled in and sent as desired.

The photocopy of list of patients examined in the Medical Camp held on 4th February 06 is enclosed as reference (Annexure- I).

Central Hospital Margherita is conducting periodical medical examination of employees to diagnose any work related and other diseases as per statutory requirement of mines Act. In course of such periodical check- up of our workmen we have not found any evidence of work related disease.

We would also like to inform you that NEC has adopted villages namely Mulang Basti and Malugaon Located near Tilak and Tirap Mines where the residents are provided free medical check- up, investigationsand medicines free of cost and have not come across any local related diseases in these two villages.

Sanitation Status

The sanitation status of the sample households is generally unsatisfactory due to unhygienic house structure, unsafe drinking water sources and improper way of disposal of waste. This has resulted in a lower health status for the people of the surveyed households. Drainage system is practically non-existant and people normally depend on the natural drainage channels for getting rid of the stormwater accumulation as well as of the domestic wastewater. No regular system of collection of solid wastes and their disposal is in operation.

Drinking Water Sources

Most of the families in the surveyed households do not have access to piped water supply and have to depend on traditional sources of water for their drinking and other water needs. The different sources of water used by the sampled households are as follows-

1. Tube wells : 81 families (32.4%)
2. Ring wells : 108 families (43.33%)
3. Ponds : 25 families (10%)
4. Supplied water: 36 families (14.4%)

Awareness among the people regarding Environmental Pollution

The survey reveals that only about 47% of the total sample households are aware of the potential pollution problems of the mining projects. However, the people are poorly informed about the causes and the impacts of environmental pollution and they do not have much knowledge about the measures to be taken in case of sudden enhancement of the pollution level due to some accident or otherwise.

3.10 REQUIREMENT OF LAND

Head wise requirement of land

Sl. No.	Particulars	Land requirement
1	Mining	72.00
2	Mine Periphery including haul roads, power supply arrangements etc.	35.00
3	External dump	85.00
4	Office, workshop, Stores & Repair facilities, coal stock yard etc.	00.00
5	Colony	00.00
	Total	192.00