CHAPTER 4

RESULT AND DISCUSSION

Any study pertaining to the environs of the developmental activity must encompass spatial, dynamic and temporal attributes of the environment to obtain comprehensive and reliable result. The simplest way to finding out changes over a period of time is to compare remotely sensed temporal data. However, there are many important consideration which decide the method to be used for environmental monitoring. In the present study remote sensing technique as well as conventional method has been used effectively to assess the natural set-up and to observe some of the key changes in the area. Broadly, remote sensing data has been used for studying land, air and water, three important facts of ecology and environment, other aspects i.e. slope, drainage / surface waterbody / watershed and infrastructure facility have been studied through conventional methods. The details discription of various parameters studied are given below :

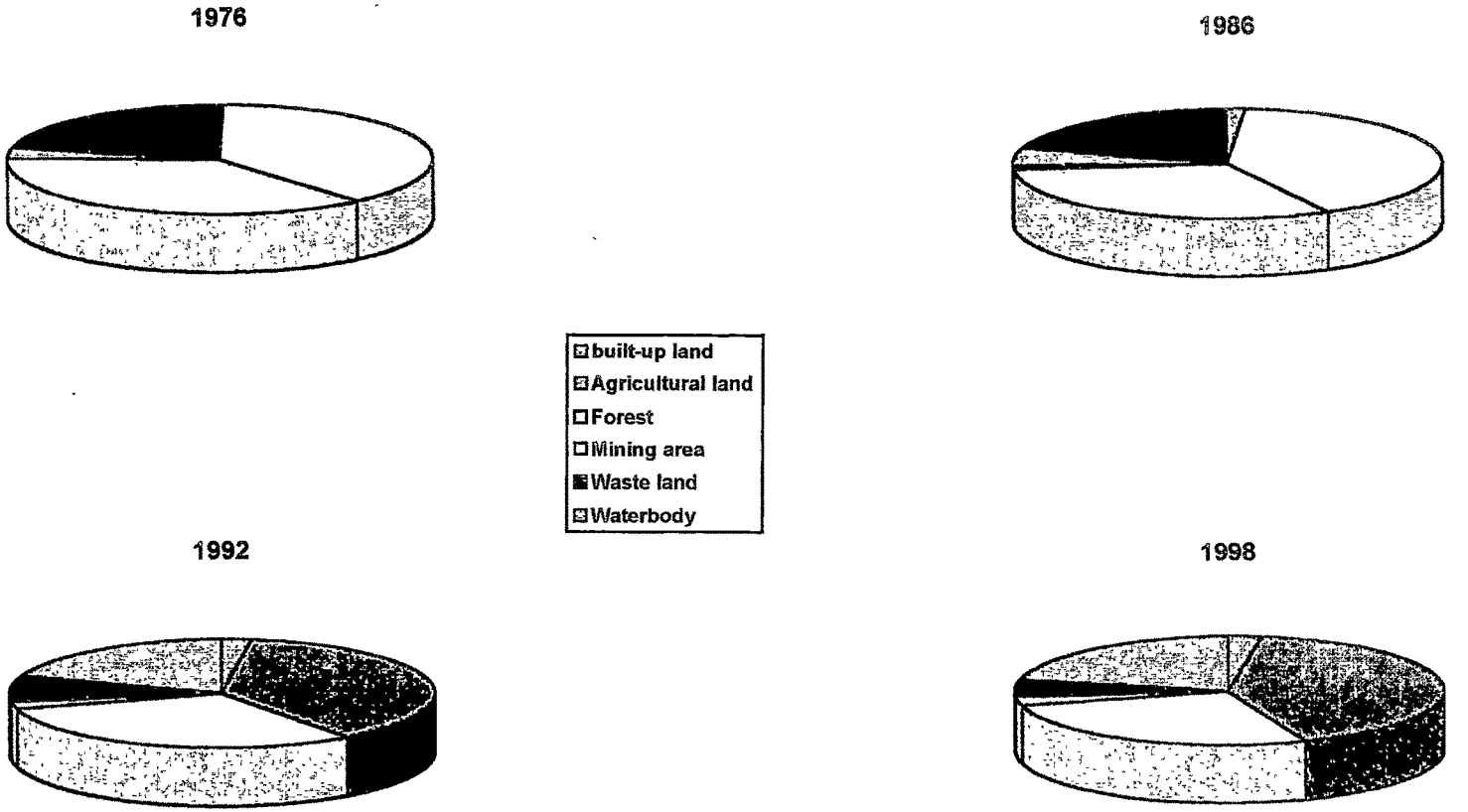
4.1 LAND USE/ LAND COVER

Major landuse/landcover identified in the study area are Built-up land, Agricultural land, Forest, Mining area, Wasteland and Waterbody. The areal extent of different land use categories are presented in Table 4.1 and Fig. 4.1 and 4.2. In general the major area was occupied by agricultural land followed by forest, waterbody, wasteland, built-up land and mining area. The detailed land use/land cover categories are given in Table 4.2 and Fig. 4.3 to 4.6.

Table 4.1 Area Statistics of Major Existing Landuse Categories in Singrauli Coalfields and Surrounding During (1976,1986,1992 and 1998).

Year	CATEGORY	1976		1986		1992		1998	
S No		AREA (Sq.Km)	% OF TOTAL AREA	AREA (Sq.Km)	% OF TOTAL AREA	AREA (Sq.Km)	% OF TOTAL AREA	AREA (Sq Km)	% OF TOTAL AREA
1.	BUILT-UP LAND	2.80	0.19	27.05	1.44	40.79	2.19	45.50	2 42
2.	AGRICULTURAL LAND	728	38.73	768.50	40.88	710.00	37.76	783.00	41.65
3.	FOREST	690.11	36 74	589.07	31.33	576.40	30 66	503.62	26 79
4.	MINING AREA	0.50	0 02	20.68	1.10	39.60	2.10	53.05	2.83
5	WASTELAND	58.90	3.10	94.70	5.04	145.30	7.72	90 39	4.81
6.	WATER BODY	399.69	21.26	380	20.21	367.91	19.57	404.44	21.51
TOTAL		1880.00	100.00	1880.00	100.00	1880.00	100.00	1880.00	100.00

Area of Different Landuse/Landcover Category During the Period 1976,1986,1992 and 1998(In %)



	1976	1986	1992	1998
Built-up Land	0.19	1.44	2.19	2.42
Agricultural Land	38.73	40.88	37.76	41.65
Forest	36.74	31.33	30.66	26.79
Mining Area	0.02	1.1	2.1	2.83
Waste Land	3.1	5.04	7.72	4.81
Waterbody	21.26	20.21	19 57	21.51

Fig. 4·2

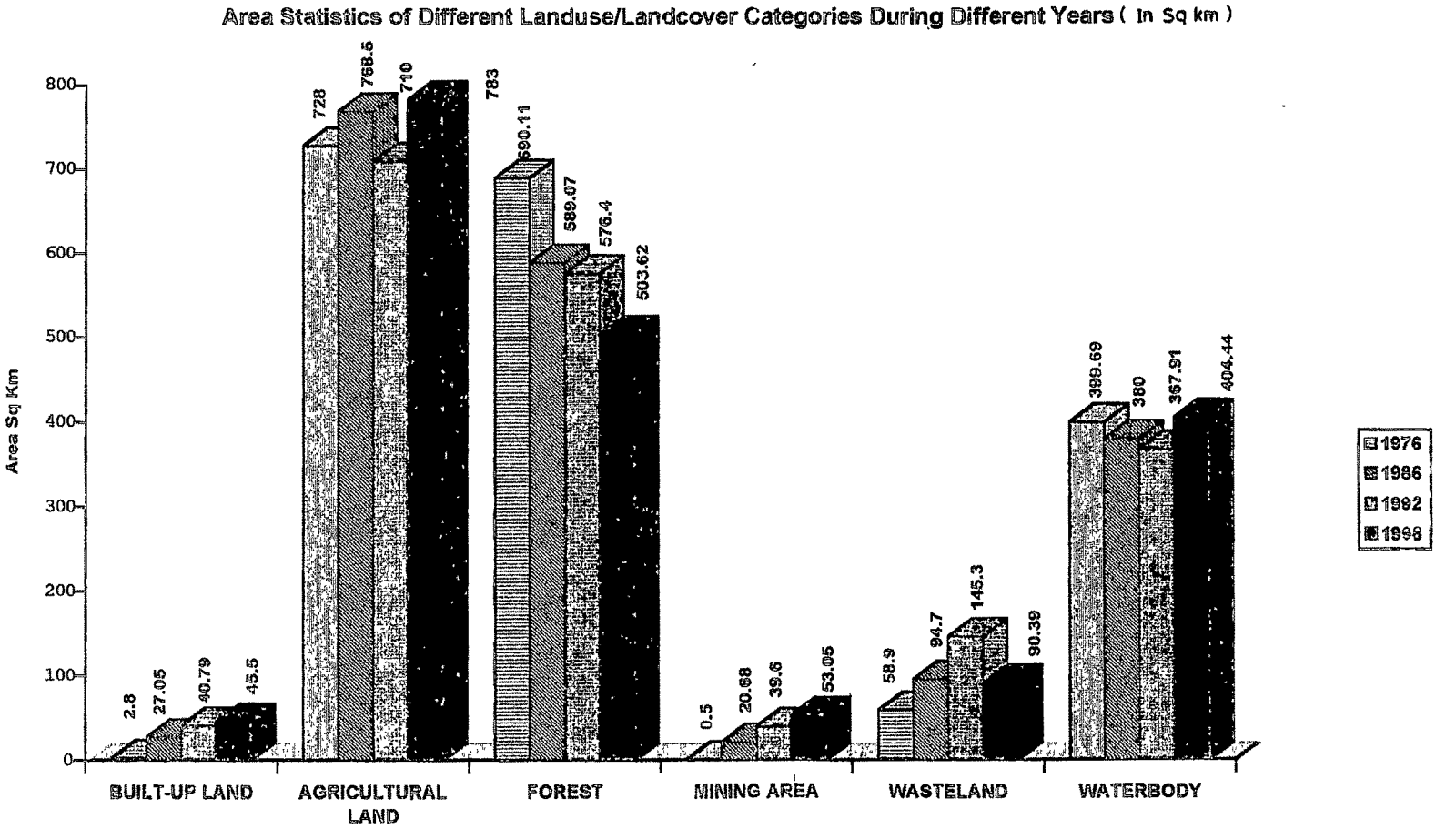

Area Statistics of Different Landuse/Landcover Categories During Different Years (In Sq km)
Area Sq Km
800
700
600
500
400
300
200
100
0
2.8
27.05
40.79
45.5
728
768.5
710
783
680.11
589.07
576.4
503.62
0.5
20.68
39.6
53.05
58.9
94.7
145.3
90.39
399.69
380
357.91
404.44
1976
1986
1992
1998
BUILT-UP LAND
AGRICULTURAL LAND
FOREST
MINING AREA
WASTELAND
WATERBODY
Landuse/Landcover Class

Fig. 4.1

Area under built-up land which includes rural settlement, urban settlement, thermal power plants, coal dump yards was 2.80 sq km in 1976 increased to 32.90 sq km. in 1998 and accounted 0.15% and 1.75% of the total area, respectively during these years. A careful perusal of maps of different years exhibited that the decadal changes (1976-86, 1986-1998) in urban areas were more in comparison to rural area. This can be accentuated by the fact that urban settlements comprising of Northern Coalfield Limited (NCL) townships, National Thermal Power Corporation (NTPC) township, Thermal power plants and marketing centres emerged at a rapid rate on account of cumulative developmental activities in coal and thermal power sector. The public amenities like educational institutions, health centre, communications facilities, markets etc. increased together with un-co-ordinated development of settlements at the fringes of colonies, colliery and power plants due to influx of outsiders for livelihood and other necessities. This resulted into rapid growth in settlement infrastructure and led to ribbon development as seen in Anapara- Renusagar-Kakari-Bina-Marrak and Waidhan-Jayantnagar, Shaktinagar area.

Agricultural land can be noticed on plain land as well as undulating land outside the notified forest area. Some of undulating land within the notified forest and other forest area are also under crop. The agricultural land which was 728 sq km in 1976 increased to 783 sq km in 1998 showing an increase of 2.90% of the total area (1976-1998). However, during 1976-1986 the increase was 2.15 and then a

Table 4.2 Area of Different Landuse/Landcover in Singrauli Coalfields and Surroundings During (1976,1986,1992 and 1998)

S.No	LANDUSE/LAND COVER CLASS	MAP SYM BOL	1976		1986		1992		1998		CHANGE (IN PERCENT)					CHANGE (Sq.Km/Yr)
			AREA Sq.Km	% TOTAL AREA	AREA Sq.Km	% TOTAL AREA	AREA Sq.Km	% TOTAL AREA	AREA Sq.Km	% TOTAL AREA	1976-86	1986-92	1992-98	1986-98	1976-98	
1.	BUILT-UP LAND															
	TOWN/VILLAGE	1	2.80	0.15	16 40	0.87	29.30	1.59	32.90	1.75	+0.72	+0.72	+0 16	+0.88	+30.10	+1.37
	THERMAL POWER PLANT	2	-	-	10.65	0.57	11.00	0.58	11.60	0.62	+0.57	+0.01	+0.04	+0.05	+11.60	+0.08
	COAL DUMP YARD	3	-	-	768.50	40 88	0.49	0.02	1.00	0.52	+2.15	+0.02	+0.03	+0.05	+1.00	+0.04
2.	AGRICULTURAL LAND	4	728.00	38.73	768.50	40.88	710.00	37 76	783.00	41.65	+2.15	(-)3.12	+3.89	+0 77	+55.00	+2.5
3.	FOREST															
	DENSE FOREST	5	593.00	31.54	410.50	21.83	315.20	16.76	302.85	16.11	(-)9.71	(-)5.07	(-)0.65	(-)5.72	-290.15	(-)13.19
	OPEN FOREST	6	95 00	5.10	104.30	5.55	170.50	9.07	92.82	4.94	+0 45	+3.52	(-)4.13	(-)0.61	(-)2 18	(-)0.09
	SCRUB FOREST	7	2.11	0.10	48.60	2.58	60.00	3.20	58.60	3.12	+2.78	+0 62	(-)0.08	+0.54	+56 49	+2.57
	FOREST BLANK	8	-	-	19.67	1.05	20.50	1.09	21.35	1.13	+1.05	+0.04	+0.04	+0.08	+21.35	+0 12
	FOREST PLANTATION	9	-	-	6.00	0 32	10.20	0.54	28.00	1.49	+0.32	+0.22	+0.95	+1.17	+28.00	+1.83
4.	MINING AREA															
	ACTIVE MINE	10	0.50	0.02	5.80	0.31	12.00	0.64	13.83	0.74	+0.29	+0.33	+0.10	+0 43	+13.33	+0 61
	ABANDONDED MINE	11	-	-	-	-	-	-	1.45	0.08	-	-	+0.08	+0 08	+1.45	+1 45
	MINING DUMP	12	-	-	14.58	0 78	21.10	1 12	26.00	1.38	+0.78	+0.34	+0.26	+0.60	+26.00	+0.95
	MINING DUMP WITH PLANTATION (NCL)	13	-	-	0.30	0.01	6.50	0.34	11.77	0.63	+0.01	+0.33	+0.29	+0.62	+11.77	+0.95
5.	WASTE LAND															
	LAND WITH/OR WITHOUT SCRUB	14	57.00	3.00	90.20	4.80	128.60	6.84	78.15	4.16	+1.80	+2.04	(-)2.68	(-)0 64	+21.15	+0.96
	BARREN ROCKY/STONY WASTE	15	1.90	0.10	3.20	0.17	11.50	0.61	4.92	0.26	+0.07	+0.44	(-)0.35	+0.09	+3.02	+0.14
	FLYASH POND	16	-	-	1.30	0.07	5.20	0.27	7.32	0.39	+0.07	+0.21	+0.12	+0.32	+7.32	+0.50
	TANK/ RESERVOIR	17	370.53	19.71	380.00	20.21	367.91	19.57	404.44	21.51	(-)1.05	(-)0.64	+1.94	+1.30	+33.91	+1.54
	TOTAL		1880	100	1880	100	1880	100	1880	100						

decrease of 3.12% of the total area during 1986-1992. This could be substantiated by the fact that in the earlier decade (1976-1986) irrigation facilities and reclamation of wastelands brought other areas to cropland showing an increase in agricultural land. Later i.e. during 1986-1992, coming up of coal mining projects and thermal power projects on agricultural land was the reason behind decrease in the area.

Forest comprising of notified as well as other forest outside notified forest area are localised on hilly and undulating terrain. The forest category identified in the study area are dense forest, open/degraded forest, scrub forest, forest blank and forest plantation. The major area is under Reserved (RF) and Protected forest (PF) and the remaining area falls under other forest area. The total forest area observed in 1976 as 690.11 sq km was reduced to 503.62 sq km in 1998 with decrease in an area of 9.95% area over two decades (1976-1998).

In forests, the dense forest have maximum area followed by open/degraded, scrub forest, forest blank and forest plantation. However, during 1998, forest plantation area slightly increased in comparison to forest blank area. Category-wise, the dense forest has shown decreasing trend and over a span of 22 years (1976-98) the area has decreased by 15.43% of total geographical area. The open forest has shown an increase during 1976 to 1992 and then a sharp decrease during 1998. However a slight increase of 0.16% was

observed during 1976-1998 in this category. The scrub forest, forest blank and forest plantation exhibited increasing trend during 1976-1986, 1986-1992, 1992-1998. The total loss of 186.49 sq. km. forest area within a span of 22 years may be due to human pressure on forest for firewood, as well as coming up of coal mining project in this area.

Most of the mining projects are located in the forest area except some projects which are situated in agricultural and other landuse classes. The total coal mining which was 0.50 sq km in 1976 has increased to 53.05 sq km in 1998 registering growth rate of 2.38 sq km/year. The growth rate during 1976-1986, 1986-1992 and 1992-1998 was 2.01, 3.15, 2.24 sq km/year respectively. The higher growth rate during 1986-1992 may be expected as the expansion of some projects viz. Khadia, Dudhichua, Amlori, Nigahi and Bina came into a bigway. Overall increase in mining area within a span of 22 years (1976-1998) was 2.80% of the total area.

Wastelands have been encountered on plain as well as undulating land. There has been substantial increase in wastelands during 1976-1998. The wastelands which was 3.10% of total area in 1976 increased to 5.04%, 7.72% and 4.81% during 1986, 1992 and 1998 respectively.The decrease in wastelands during 1992-1998 was mainly due to its reclamation for agricultural activities and other uses like township etc.

Waterbodies in the study area included impounded tanks used for agricultural purpose, river, canals and a large reservoir, the Govind Ballabh Pant Reservoir. The area occupied by waterbodies during 1976-1998 has shown a slight positive change being 0.25% of the total area.

4.2 SLOPE

The study area has been classified into seven slope categories (Fig. 4.7) viz nearly level (0-1%), very gently sloping (1-3%), gently sloping (3-5%), moderately sloping (5-10%), strongly sloping (10-15%), moderately steep to steep sloping (15-30%), and very steep sloping (7.35%). Topographically, the area in the south west part around Waidhan is plain to undulating having nearly level to very gently sloping, which is best suited for agricultural activities. The area in the north west part around Singrauli, north east part around Pipri and sourth east part around Nimna is characterised by hills and ridges. These areas fall under gently sloping to moderately steep sloping class. Most of the coal mining areas are localised in strongly sloping to moderately steep sloping area. The steep sloping area occurs along the ridges and occupy very small area around Anuri, Anuradand, Manikara and Mokhana Pahar. The reservoir is surrounded in northern and south eastern side by hills having moderate to strong sloping area. In general, the gradient of slope in the area is towards reservoir.

4.3 DRAINAGE / SURFACE WATERBODY / WATERSHED

The Singrauli coalfield falls in great central water divide of India. The study area lies in the catchment of Son river in lower Ganga basin. The Son river joins river Ganga in the north-eastern part of the study area. Bijul, Laira, Mayar, Kanchan, Ajir, Baran, Mahamar are the tributaries of Rihand river which also join river Son 20 km near Pipri in the north eastern part of the study area. The study area is mainly drained by Rihand river. It is a perrenial river which takes courses from south eastern part in the study area to north-eastern direction. In few parts of the study area the reduced level of the river varies from 2 m to 15 m/km. The Rihand river forming sub-catchment of Son river covers four watersheds namely Upper Bijul, Main lower Rihand, Laira and Deohar (Table 4.3).

The drainage is defined as the area drained by a stream or a river system which constitutes a network of various drainage orders. These are connected in such a manner that the surface runoff originates in the area learning the area in a concentrated flow through a single outlet. The river basin comprises of topographic divides and watersheds which are further divided into mili and micro watersheds (Table 4.3).

Table 4.3 Status of Watersheds in Singrauli Coalfields and Surroundings

Region	Basin	Catch-ment	Sub-catch-ment	Water-shed	Sub-water-shed	Mili Water-shed	Micro Water-shed
2 Flowing into Bay of Bengal	2A Lower Ganga	2A6 Son	2A6D Lower Rihand upto and Including Govind Ballab Pant Reservoir	'2A6D2 Upper Bijul	6 Nos.	9 Nos.	28 Nos.
2	2A	2A6D		2A6D3 Main Lower Rihand	3 Nos.	5 Nos.	11 Nos.
2	2A	2A6D		2A6D4 R.B of Rihand to Confluence with Laira	17 Nos.	27 Nos.	77 Nos.
2	2A	2A6D		2A6D5 L.B Rihand to Confluence with Deohar	14 Nos.	25 Nos.	78 Nos.
Total	1	1	1	4	40	66	194

Three types of drainages according to their pattern and lithology have been observed in the study area (Fig. 4.8). These are (i) Dendritic to sub-dendritic (ii) Sub-Ractangular and (iii) Sub-Parallel.

The dendritic to sub-dentritic drainages have been developed in the north-eastern and south-eastern part of the study area. Dendritic pattern is mainly developed over granite-gneisses belonging to Archaeans. Texture of drainage is moderate and length of drainage developed over granitic country is small showing hard and compact nature of rock.

The sub-rectangular drainage pattern is observed in the north western part of the study area and it is developed over sandstone/phyllite/schist country belonging to Gondwana formation. The drainage texture is coarse and sub-rectangular nature shows its control by joints and fractures.

The sub-parallel drainage have been observed in between Kanchan and Mayar river. The buried material deposited by these rivers and presence of major joints and fault support the streams to flow in narrow course.The sub-parallel drainage are mainly developed because of the formational erosion and physical characteristic of the sub-surface rock which influences the stream to flow sub-parallely to each other.

The drainage pattern signifies a characteristic lithology and landform developed over the surface. In the study area the dendritic to sub-dendritic drainage pattern shows a lithological control over the drainage nature. The length and texture of drainages in granite/genisses terrain shows high run-off and less infiltration in this zone.

Dendritic to sub-dendritic drainage are developed around Govind Ballabh Pant reservoir. Where high slope gradient has resulted into high sediment yield thus siltation to the reservoir.

Sub-rectangular drainage pattern is developed over joints and fractures which are disposed perpendicular to each forming sub-rectangular pattern. These fractures developed in sandstone and phyllite/schists are associated with Singrauli coal mines. The inter-connected and sub-rectangular pattern which shows weaker planes, representing joints and fractures may broaden to the sub-surface fractures by mining activity.

The sub-parallel drainage is developed over shallow buried pediplain in the western part of the study area. These drainages have been oriented parallel to sub-parallel in space. Since, these have been developed over vast pediplains, therefore load of sediments yield due to these drainages is more which are added to Kanchan and Mayar river and ultimately to the reservoir.

There are small/medium to large waterbodies in the study area. Tanks occurs in lowland depressions of plain and valley and located near the settlements mainly used for drinking water purpose. Govind Ballabh Pant reservoir is the only source of water for thermal power generation in Singrauli coalfileds area. This reservoir was constructed in 1962 by Uttar Pradesh Electricity Board (UPEB) accorss Rihand river. At present number of diverse activities are dependent on the water resources of this reservoir.

In major part of the study area villagers collect water from small perennial nalas, tanks is distributed in north western part of the study area. Tube wells have been drilled in most of the villages to meet the requirement of potable water. The villages in south-eastern part of the study area are still problematic in terms of potable water supply.

4.4 HYDROGEOMORPHOLOGY

Hydrogeomorphological map prepared on the basis of geology, geomorphology and structure is presented in Fig. 4.9. Geologically, the area comprises of Archaean granite-gneisses, sandstone Gondwana, phyllte/schist, quartzite of Mahakohsal Super Group and recent alluvium formation.

The Archaean rocks are of igneous origin comprising of matamorphosed granite-gneisses together with sub-ordinate amount of

sediments. These rocks form the basement of all other formations and thereby they are referred as basement complex for fundamental gneisses (*Krishnan*, 1982).

The Gondwana rocks are of fluviatite or locustrine nature and were deposited in series of large river or lake basins, which later sank along through fault admist the ancient rock. These faulting preservation of Gondwana strata have rich coal seams in the country. This formation includes coarse grained sandstone, shale etc.

Rocks of Mahakoshal Super Groups comprise of phyllite, shale, schist, banded haematite quartzite and intruded by basic rocks. These rocks are distributed in north-eastern part of the area and scattered in small patches surrounded by Archaean, granite-gneisses. A major part of these group of rock occupied in Chitrangi tahsil of Sidhi district.

The landforms are analysed on the basis of origin i.e. fluvial, denudational and structural origin.

The alluvial plain and valley fills are the resultant of fluvial process in the north-west and north-east part of the study area. These depositional landforms are formed along the courses of Bijul and Kanchan river by unconsolidated fluvial material brought down by streams coming form the adjacent hills. Thickness of depositional material is deep and soils are well drained supporting high moisture content in these areas. Alluvial plain developed around north-east of

village Garhara, Parsouha, Naugarh have thickness of alluvial ranging from 0.2 m to 0.5 m Valley fills are narrow, irregular and elongated areas in north-west part of the study area around Kolar, South of Garhara and Jarha village.

Denudational landform includes, denudational hill, residual hill, pediplain, buried pediplain shallow, buried pediplain medium and inselberg. These landforms are formed by the natural dynamic process like weathering and erosion. Denudational hill is the most prominent landforms of the study area. These hills are formed on landscape of Gondwana sandstone and Archaean granite-gneisses due to differential erosion and weathering. Minor joints, fractures and lineaments are common on these landforms. This category occurs around Mudwani, Saraswaha Raja Tola, Amjhar, Jogichaura north-south of Nimna and east of Khajuri village.

Residual hills are smaller in size in comparision to denudational hills. These are isolated steep sloped rounded hills of circum-denudation rising abruptly and surrounded by an extensive and nearly level buried pediplains. These hills are of two types (i) Gondwana sandstone and (ii) Archaean granite-gneisses. Residual hill of Gondwana are less resistant as compared to Archaean. This Residual hills occurs around Bihara, Badma, Pipra, Ajani and Kankur villages.

Pediplain are the areas of low lying terrain with gentle slopes (3-5%) found in north eastern part of the study area. Pediplain are formed over

of phyllite/schist rock of Mahakoshal Super Group. Pediplain topography is the result of collision of pediments.

Buried pediplain are formed from the residual hills of Archaean and Gondwana, developed due to their differential erosion and weathering. These landforms are grouped in two categories (i) buried pediplain-shallow formed by phyllite/schist, granite-gneisses, thickness wise ranges between 0.25 to 3.0 m. (ii) buried pediplain-medium formed by sandstone thickness wise ranges from 0.5 to 1.0 m.

The pediplains are less extensive and are controlled by lineaments and fracture while buried pediplain are caused by the residual hills because of the weathering and erosional process.

Inselberg is rocky in nature and formed due to differential weathering and erosion process. These isolated hills are composed of Archaean granite-gneisses and surrounded by buried pediplains. This landform occurs in the south eastern part the area near Sidhi Khurd, north of Jhanjhitola south and south east of Khamharia villages.

The landforms formed due to structural and tectonic activities are classified as structural hill, linear ridge, fault, structural trends, lineament, butte and escarpment.

structural hills formed by structural deformation are distributed over quartzite of Mahakoshal Super Group. Structural hills are extensive, EW trending, arcuate in shape and highly dissected criss crossed form

by numerous lineaments. These structural hills occur in the north-west part of study area around Churki and Lotan villages.

Ridges are smaller in size, linear in pattern, narrow and highly elevated hills formed over quartzite of Archaean Super Group .These ridges occur around Pali, Gangi, Badokar, north-west of Mahuli. Jarha, south-west of Karkoti, Padari and south of Belvadah villages.

NW-SE trending fault is evidenced by the difference in levels of the two geological unit. Along the Fault the northern block Gondwana had gone down with respect to the Archaean. Fault alignned as NW-SE with displacement in Archaean, granite-gneisses. Possibility can be inferred that faulting/fracturing area in surface feature. The structural feature which are arcuate/circular/folded showing structure deformation and the directional trends are NE-SW, EW to NE-SW and NW-SE.

Lineament is a straight or curvilinear surfacial expression of breaks in bedrock. It may be a joint or a fracture or fault. It is named differently as fractures zone, shear zone trendline, tectonic trends, linear fractures, geo-fracture and maga fractures. Three sets of lineaments trends are noticed in the study area which are EW, NE-SW and NW-SE, trends are more common.

Butte are isolated table capped with a protective covering which is essentially horizontal in atitude and have more summit areas than a

mesa. Butte have low relief with steep sides composed of sandstone Gondwana Butte topography occurs around Churideh village.

Escarpment are associated with sandstone Gondwana, Archaean granite-gneisses and quartzite of Mahakoshal Super Group. These escarpment are particularly conspicuous in the area due to presence of vertical cliff of thick granite-gneieses at the base of lateral blankets. The prominent localities where the escarpment are noticed are north of Gorbi, Jhingurdah and Bihara.

Ground water occurs under a wide range of condition in the study area. The potentiality of the aquifers also varies considerably according to slope, topography and nature of aquifer material. The type of openings also ranges from secondary porosity (fractures, joints, faults) in hard rock to primary porosity in loose unconsolidated to semi-consolidated deposits made-up of clay, sand, silt, pebbles and gravels. Hydrogemorphologically, the area has been divided into five zones depending upon the groundwater prospects in different landform units. These five zones are (i) excellent (ii) very good to good (iii) good to moderate (iv) moderate to poor and (v) poor to Nil.These ground water zones are described on the basis of landforms :

Alluvial plains are excellent potential zones consist loose fragmented material i.e. gravel, sand, silt and clay, therefore having high value of

permeability and more chance of downward percolation of surface water.

In valley fill areas, the prospects are mainly dependent upon the thickness of the weathered material, therefore these areas have very good ground water prospects.Ground water occurs in primary porosity within semi to unconsolidated sediments which results in good ground water storage but movement of ground water is very slow. This is the most exploited unit in both shallow and deep level by deep tubewells, handpumps and dugwells.

Denudational hill, residual hill, inselberg, granite-gneissess, covering north-east and south-east part of the study area, made up of unclassified cystalline hard rocks of Archaean Group yield water through fractures, joints and secondary porosity developed in the weathered portion. In this zone surface runoff is high and saturated thickness of weathered material overlain by massive rock does not permit surface water to percolate downward. Infiltration is only through fractures, faults, and lineaments, therefore the ground water prospects in these landforms are poor to nil.

Denudational hill, residual hill developed over sandstone Gondwana bears water in the interconnected primary pores in the formation as well as in the contact planes between shale and sandstone. In these high runoff zones groundwater occur in fractures, joints and in weathered structures in limited extent. These are moderate to poor

potential zones. Groundwater prospects are moderately better in areas of lineament.

Pediplain development over phyllite/schist complex are poor ground water prospect zone. These pediplains are covered with shallow overburden of weathered material brought from the surrounding high relief areas. Phyllite/schist rocks are jointed and secondary porosity is developed in the weathered, sheared and fractured portion. The wells dry up in summer and water level go as deep as 15 m.

Buried pediplain are developed in all major lithological formation. i.e. Archaean, Gondwana and Mahakoshal Super Group. These areas are characterised by very gentle slopes with low drainage density. Groudwater occures in both confined and unconfind condition. Buried pedipain granite-gneisses having shallow overburden (0.25 m) of weathered material with moderate to poor ground water prospect zone. Secondary porosity in this zone is developed due to presence of joints, fractures and lineament.

Gondwana formation particularly the upper part of Barakar sandstone supports development of phreatic aquifers which extends from few metres to 25 m below surface. The coarse grained sandstone allow surface water to infiltrate through inter-connected primary pores therefore, the buried pediplain sandstone-Gondwana, have very good to good and moderate ground water prospect. The variation in water

potential in this lithological formation depends upon the thickness of weathered material. This zone forms groundwater recharge zone as the groundwater flow originates from upper to lower convergence area allowing the water to sustain round the year.

In the north and north eastern part of the study area buried pediplain overlying shallow overburden of weathered material has moderate to poor prospect of groundwater. This unit is most exploited in deep tubewells, handpumps and dugwells.

Linear ridge, structural hills composed of quartzite rocks of Mahakoshal Super Group are characterised by high relief and steep slopes. Since these rocks are compact and metamorphosed of igneous rocks these have poor to nil ground water prospects.

Structural features like faults, fractures, lineament control the lateral and vertical extent of aquifer, therefore these zones support surface water to percolate downward to recharge the aquifers. These are having good to moderate ground water prospects. Butte and escarpments composed of fine grained sandstone and quartzite rocks are impervious in nature. However at places fractures may allow development of deep confined aquifer which are generally poor ground water potential zones.

Geomorphic features control the distribution of runoff and groundwater recharge and structure of geologic formation control the occurrence, movement and quality of groundwater. Primary importance is the occurrence and distribution of aquifer and their relationship with relatively associated impermeable beds which acts as non-leaky to-leaky confining layers and barriers to ground water movement. The geological structures have a marked influence on the lateral and vertical extent of the aquifers. Therefore hydrogeomorphological study is useful to understand the occurrence of porous and permeable zones in the area.

4.5 SOIL

Soil are the most valuable life supporting natural resource as this produce food ,fiber and fodder which are the basis of life existence. For sustained utilisation of soil it is imperative to know its nature, characteristic, extent, quality, capability and suitability for alternative land uses. Information on soil resources is vital input for effective management of coal mining areas where the soil profiles are completely altered especially in opencast mines.

The soil in Singrauli coal region is mainly derived from sandstone, schist, granite-gnieses, quartzite and phyllite. The topography has given rise to different grades of soil from loamy sand to clay. The depth and fertility of these soil largely depends upon elevation differences.

The typifying pedon was analysed to assess the physio-chemical properties like, texture, colour, pH, available water wolding, swelling and sinking, capability and suitability class and land irrigatibility (Table 4.4), (*Piper* 1950 ; *Black* 1965; *Jackson* 1967). The soils were classified as per the soil taxonomy and mapped as association of soil series.

Fifteen soil mapping units were identified out of which five comprise single soil series units, six constitute association of two soil series, two unit form association of three or four soil series and two unit represent mine spoil dump and sink areas (Fig. 4.10). The details of soil series in Singrauli coal region is presented in Table 4.4.

The soils of the area fall in the dark reddish brown, yellowish brown and dark brown soils. The soils developed on level to moderately sloping area are very deep and moderately drained to well drained, while on strongly sloping to steep sloping area, very shallow to shallow and excessively drained soils are formed. By and large clay loam, gravelly clay loam and gravely loam soils are dominant in the area.

Based on grouping of soil mapping units, land capability classification was done for the study area so that suitability of land can be assessed for proper landuses in a sustained manner. The soils that have least limitations and hazards and respond best to management were placed in the highest category. The capability classes as per United States Department of Agriculture (USDA). Classification System are

Table 4.4 Soil Profile in Association with Physiography

S. No	Unit	Member	Character	Colour	Horizon	Slope Class	Geomorphology	Erosion	Land Capability Class	Irrigability Class	Prod-uctivity Potential
1	2	3	4	5	6	7	8	9	10	11	12
1.	Chitrangi	Loamy Skeletal Mixed, Hyperthermic family of Lithic Ustorthents	Very shallow to shallow excessively drained	Dark Brown Slightly acidic	A. Gravelly loam to gravelly clay loam (7 5 YR 4/4D) & (7.5 YR 3/2M) B. Gravelly clay loam, friable slightly sticky, pH.6.5	10-35%	Denudational Hills side slopes	Severe	VIIes	6st	Low
	Manumar	Loamy Skeletal hyperthermic family of Lithic Ustorthents	Very shallow to shallow excessively drained	Dark Brown acidic	A. Brown gravelly loam (7.5) YR 5/4M) gravelly loam. B. Weathered granite-gneisses rapid permeability pH. 6.5	10-35%	Denudational hills	Severe	VIIes	6st	Low
2.	Doi	Fine, mixed, hyperthermic family of Udic Haplustalfs	Very deep Moderately well drained	Yellowish	A. Slightly hard, friable slightly sticky and slightly plastic, (10 YR 6/4D) clay loam surface and silt loam sub-surface B. Clay loam, slightly sticky; pores; fine few roots. C. Film, sticky and plastic; fine few roots.	0-1 & 1.3%	Buried pediplain shallow (granite-gneisses) buried pediplain shallow (sandstone - Gondwana)	Slight to Moderate	II es	2st & 3st	High
	Gervil	Fine mixed, hyperthermic family of Udic Ustocrepts	Very deep, well drained	Dark bown to dark reddish brown	A. Brown (7.5 YR 4/4D) Reddish brown (5 YR 3/4M) clay loam. Slightly hard, friable, slightly sticky. B. Reddish brown (5 YR 4/4M) firm sticky and plastic. C. Dark reddish brown (5 YR 3/4M) gravelly clay loam; 50 to 60% gravels.	0-1% 5-10%	Buried pediplain shallow (granite-gneisses) Buried pediplain shallow phyllite/schist Denudational hills (sand stone - Gondwana)	Severe	IV es	4st	Medium

Cont...2

1	2	3	4	5	6	7	8	9	10	11	12
3.	Sukhan	Fine, mixed hyperthermic family of Udic Uaplustalfs	Very deep well drained	Yellowish brown	A. Light Yellowish brown (10 YE 5/4 M); Clay loam; Slightly hard; Friable, Slightly sticky and slightly plastic, 2 cm wide crackes; pH 6.5. B. Brown (10 YR 4/31 M); Clay, Film sticky, plastic; 2 cm wide cracks; pH 6.5. C. Yellowish brown (10 YR 5/4M); Weathered Parent Material with gravely sandy clay loam	1-5%	Alluvial plain, valley filles, Buried pediplain (granite-gneisses) Buried pediplain (phyllite/schist) Buried pediplain medium (sandstone Gondwana) Buried pediplain shallow (sandstone Gondwana)	Slight to moderate erosion	Illes	3st	Medium
	Kubri	Fine mixed, hyperthermic family of Fluventic Ustocrepts	Very deep modrately well drained	Strong brown to dark brown	A. Strong brown (7.5 YR 5/6 D) dark brown (7.5 YR 4/4 M); clay loam; Slightly hard friable, slightly sticky and slightly plastic; pH 6.3. B Dark brown (7.5 YR 4/4 M); Clay loam firm slightly sticky and slightly plastic pH 6.3. C. Dark brown (7.5 YR 4/4M); slity slay laom; firm sticky and plastic; common fine pores; pH 6.8.	1-5%	Alluvial plain, valley fills Buried pediplain (granite-gneisses) buried pediplain (phyllite/schist) Buried Pediplain-medium (sandstone Gondwana) -do-	Slight to modrate erosion	Il es	2st	High
	Hardiya	Fine mixed hyperthermic family of Udic Ustocrepts	Very deep Moderately well drained	Slightly yellowish brown to yellowish brown	A. Light yellowish brown (10 YR 4/4M); silty clay loam; firm sticky and plastic common fine pores; pH 6.2. B. Yellowish brown (10 YR 5/4 M); firm, sticky and plastic; pH 6.3. C. Brown (10 YR 5/3 M); Clay loam; firm, sticky and plastic pH 6.9.	1-5%	-do-	Slight to moderate	Il es	2st	High

Cont...3

1	2	3	4	5	6	7	8	9	10	11	12
	Dhanaha	Fine, mixed hyperthermic family of Fluventic Ustocrepts	Very deep moderately well drained	Dark brown	A. Brown (10 YR 5/3D); Slightly hard, friable, slightly sticky and slightly plastic. B. Dark brown (10 YR 4/10); slightly clay; firm sticky and slightly plastic pH 5.8. C. Dark brown (10 YR 413M) clay; firm sticky and plastic pH 5.9.	1-5%	-do-	Slight to Moderate erosion	II es	2st	High
4.	Naudiha	Fine loamy, mixed, hyperthermic family of Fluventic Ustochrepts	Very deep well drained	Dark brown	A. Brown (7.5 YR 5/4 D) dark brown (7.5 YR 4/4 M) clay loam, slightly hard, friable slightly sticky; pH 6.1. B. Dark brown (7.5 YR 4/4M) clay loam; sticky and slightly plastic medium pores; pH 6.2. C. Dark brown (7.5 YR 4/4M); clay loamy firm sticky and plastic common fine pores; pH. 6.5.	3-5% 5-10%	Buried pediplain shallow (granite-gneisses) Buried pediplain shallow (sandstone Gondwana)	Severe	IV es	4st	Medium
5.	Kallsalmar	Loamy, skeletal, mixed hyperthermic family of Lithic Ustorthents	Very shallow to shallow Excessively drained	Dark reddish brown Slightly acidic	A. Dark reddish brown (5 YR ¾D). (5 YR 3/3M); gravelley clay loam, moderate, medium, slightly hard, friable, slightly sticky and plastic pH 6.1. B. Dark reddish brown (5 YR 3/3 M); gravelly clay loam; Slightly sticky and plastic; 60 to 70% cource fragments; pH 6.2 C. Hard rock	10-15% 15-35%	Denudational hill (sandstone-Gondwana)	Severe	VII es	6st	Low

Cont.....4

1	2	3	4	5	6	7	8	9	10	11	12
6.	Bhaluwa	Fine mixed hyperthermic family of Fluventic Ustocrepts	Very deep moderately well drained	Yellowish brown to dark yellowish brown	A. Yellowish brown (10 YR 5/4D); dark yellowish brown (10 YR 4/4M) sandy loam Slightly sticky hard, friable; slightly sticky and slightly plastic; pH 7.0. B. Brown (5.5 YR 4/4M) Brown (5.5 YR 4/4M) sandy loam; firm, sticky and slightly plastic; pH 7.2 C. Dark yellowish brown (10 YR 4/4 M); Sandy clay loam; sticky and plastic; pH 7.4.	3-5%	Buried pediplain shallow (sandstone-Gondwana)	Slight to moderate	Illes	3st	Medium
7.	Pori	Fine, mixed hyperthermic family of Udic Haplustalf	Very deep Moderately well drained	Yellowish brown to brown slightly acidic	A. Yellowish brown (10 YR 5/4 M); Clay loam; Slightly hard, friable, slightly sticky and slightly plastic; 2 cm wide cracks; pH 6.5. B. Brown (10 YR 4/3 M); Clay; firml sticky and plastic, fine few ferruginous concretions; pH 6.5. C. Yellowish brown (10 YR 5/4 M); Weathered parent material with gravelly sandy clay loam 58% gravels; pH 6.3.	3-5%	Buried pediplain shallow (granite-gneisses) Buried pediplain shallow (phyllite/schist) Denudational Hill (granite-gneisses)	Slight to moderate	Illes	3st	Medium

Cont....5

1	2	3	4	5	6	7	8	9	10	11	12
	Chouphal	Fine, mixed hyperthermic family of Udic Haplustalf	Very deep well drained	Dark brown to reddish brown	A. Dark brown (7.5 YR 4/4D). B. Reddish brown (5 YR 4/3M), clay loam; slightly hard, friable slightly sticky and slightly plastic. C. Dark reddish brown (5 YR 3/4M); clay; firm, sticky and plastic.	1-3% 5-10%	-do-	Moderate erosion	Illes	3st	Medium
	Barohiya	Fine mixed, hyperthermic family of Udic Haplustalf	Very deep well drained	Yellowish brown to brown	A. Yellowish brown (10 YR 5/4M), clay loam; slightly hard, slightly plastic 3 cm wide cracks pH 6.4. B. Brown (10 YR 4/2M) clay firm sticky and plastic common medium pores pH 6.4. C. Yellowish brown (10 YR 5/4M); weathered parent material with sandy clay loam; pH 6.3.	3-5%	-do-	light to moderate erosion	Il es	3st	Medium
8.	Jogipur	Fine, loamy mixed hyperthermic family of Udic Haplustalfs	Very deep moderately well drained	Yellowish brown to dark yellowish brown	A. Yellowish brown (10 YR 5/4 M); loam slightly hard, friable, sticky and slightly plastic pH. 7.0. B. Yellowish brown (10 YR 5/4 M); clay loam firm sticky and slightly plastic, common medium pores, pH 6.0. C. Dark yellowish brown (10 YR 5/4D); loam, firm sticky and slightly plastic, common fine pores pH 6.6.	0-3%	Buried pediplain shallow (granite-gneisses) Buried pediplain shallow (sandstone-Gondwana)	Slight erosion	Il s	2st	High

Cont. 6

1	2	3	4	5	6	7	8	9	10	11	12
	Chopar	Fine, loamy, mixed hyperthermic family of Udic Haplustalfs	Very deep well drained	Yellowish brown	A. Yellowish brown (10 YR 5/4D); laom, slightly hard, friable, slightly plastic pH 6.5. B. Yellowish brown (10 YR 5/4 M); clay loam firm, sticky and slightly plastic, pH 6.0. C. Yellowish brown (10 YR 5/3 M); clay loam, firm sticky and slightly plastic pH 6.6.	0-3%	Buried Pediplain shallow (granite-gneisses) Buried pediplain shallow (sand stone- Gondwana)	Slight	II e	2st	High
9.	Bari	Fine, loamy, mixed Hyperthermic family of Fluventic Ustochrepts.	Moderately deep moderately well drained	Yellowish brown to Dark brown	A. Yellowish brown (10 YR 5/4 D); dark yellowish brown (10 YR 4/4M); clay loam slightly hard, friable sticky and plastic pH. 5.7. B. Dark brown (10 YR 4/3M), clay laom, firm, sticky and plastic pH 6.3. C. Dark brown (10 YR 3/3 M) sandy loam, very friable; non-sticky and non-plastic pH 6.8.	1-3%	Alluvial plain	Slight to moderate	IVes	3st	Medium
10.	Karaunti	Coarse loamy, mixed, hyperthermic family of Typic Ustorthents	Shallow excessively well drained	Shallow dark brown to strong brown	A. Dark brown (7.5 YR 4/2 D); (6.5 YR 3.2 M); sandy loam soft, firable, slightly sticky, many medium pores B. Dark brown (7.5 YR 3/2 M); sandy loam, friable slightly sticky. C. Strong brown (7.5 YR 5/6 M); gravelly sandy loam; 60 to 70% gravells and then hard rock	15-35%	Dedudational hill (sandstone - Gondwana) Buried pediplain shallow (sandstone - Gondwana)	Severe erosion	VIIes	6st	Low

Cont.....7

1	2	3	4	5	6	7	8	9	10	11	12
11.	Dhatura	Fine, loamy, mixed hyperthermic family of Udic Haplustalfs	Very deep moderately well drained	Brown to dark brown	A. Browm (10 YR 5/3 D and 10 YR 4/3 M); sandy clay loam; slightly hard, friable, slightly plastic, many medium pores, pH 6.6. B. Dark brown (10 YR 3/3 M); sandy clay loam, sticky and slightly plastic pH 6.8. C. Dark brown (10 YR 3/3 M) sandy clay loam, sticky and plastic pH 6.9.	1-5%	Buried pediplain shallow (sandstone-Gondwana) Buried pediplain (granite-gneisses) Denudational hill (sandstone-Gondwana)	Slight to moderate erosion	II es and IIIe	2t and 3t	Medium
	Chikuri	Fine, loamy, mixed hyperthermic family of Udic Haplustalfs	Very deep	Brown	A. Brown (10 YR 5/3 D); sandy clay loam, friable slightly plastic pH 6.6. B. Brown (10 YR 5/2 D); sandy clay loam, sticky and slightly plastic pH 6.5. C. Brown (10 YR 5/2 D); sandy clay loam, sticky and plastic pH 6.4.	1.5%	Buried pediplain shallow (sandstone-Gondwana) Buried pediplain (granite-gneisses) Denudational hill (sandstone-Gondwana)	Slight to moderate erosion	IIes	2t	Medium
12.	Konai	Fine, Montmorillonı -tic, hyperthermic family of Vertic Haplustalfs	Very deep moderately well drained	Brown grayish, brown to Dark yellowish brown	A. Brown (10 YR 5/3 D & 10 YR 4/3 M); clay loam, clightly hard friable, slightly sticky plentiful, fine roots, pH 6.6. B. Dark grayish brown (2.5 YR 4/3 M); clay strong coarse sub-angular block, sticky and plastic, fine few roots, pH 6.7. C. Dark yellowish brown (2.5 4/2 M) clay, strong coarse sub-angular blocks, firm sticky and plastic pH 6.8.	1.3%	-do-	Moderate	IIes	2st	High

Cont.....8

1	2	3	4	5	6	7	8	9	10	11	12
	Anuri	Fine, Montmorilloni -tic, hyperthermic family of Vertic Haplustalfs	Very deep moderately well drained slightly acidic	Light Yellowish brown to brown	A. Light yellowish brown (10 YR 6/4 D); Yellowish brown (10 YR 5/4M); loam, hard frim, sticky and plastic, 2 cm to 5 cm wide crackes, pH 6.2. B. Yellowish brown (10 YR 5/4 M); clay, strong coarse firm, sticky and plastic common fine pores, 2 cm to 5 cm wide crack pH 6.3. C. Brown (10 YR 5/3 M) clay strong coarse sub-angular blocky, firm, very sticky and plastic, pH 6.7.	1-3%	-do-	Moderate	IIes	2st	High
13.	Dhopakar	Fine, loamy, mixed hyperthermic family of Udic Ustocrepts	Very deep well drained	Light Yellowish to dark yellowish	A. Light yellowish (10 YR 6/4 D); sandy, clay loam, slightly hard friable slightly sticky. B. Yellowish brown sandy clay loam, firm sticky and plastic. C. Dark yellowish brown (10 YR 4/4M); gravelly sandy clay loam, Friable slightly sticky 20%.	5-10%	Buried pediplain shallow (granite-gneisses) Buried pediplain shallow (sandstone - Gondwana)	Severe erosion	IVe	4t	Medium
	Bijpur	Fine, loamy, mixed hyperthermic family of Udic Ustocrepts	Very deep well drained	Brown to strong brown	A. Brown (7.5 YR 5/2 D); dark brown (7.5 YR 4/4 M); very frable non-sticky and non-plastic pH 6.1. B. Dark brown loam; non-sticky and non-plastic many medium pores pH 6.2. C. Strong brown (7.5 YR 5/6 M); sandy loam, friable slightly, sticky many medium pores pH 6.3.	5-10%	Buried pediplain shallow (granite-gneisses) Buried pediplain shallow (sandstone - Gondwana) Denudational hills (granite-gneisses) Buried pediplain shallow (phyllite/schist)	Severe erosion	IVes	3st	Medium

Cont.....9

1	2	3	4	5	6	7	8	9	10	11	12
14.	Dupms						The unit represent dumps of mine spoils characterised by soil of varying composition mixed with rock debris etc.				
15.	Sinks						The unit comprises depressional areas representing mine dugouts characterised by miscellaneous soil.				

designated by Roman number I to VIII, class I to IV are cultivable whereas class V to VIII are non-cultivable soils Appendix III. The former have none to few limitations and have the widest range of use and least risk of damage when they are used for different purposes while vice-versa is true for latter.

Based on the risk or problem, the soil capability class was further sub-divided into sub-classes by adding small letter 'e' and 's' indicating problem/risk of erosion and limitations due to stoniness in texture, hardness or shallow depth.

On the criteria mentioned above, capability class I was not found in the study area, while maximum area fall in class IIes (48%) and remaining in class IIe (4%), IIIe (4%), IIIes (8%), IVes (20%) and VIIes (16%).

4.6 INFRASTRUCTURE FACILITY

The basic amenities like education, health, postal services, drinking water and electricity available in the Singrauli area is presented in Table 4.5. The education facility in the form of primary, middle, higher secondary and colleges are available and the maximum number of these facilites were available in Singrauli tahsil followed by Chitrangi, Dudhi and minimum in Ramanujganj tahsil.

Table 4.5 Distribution of Villages where Amenities Exists in Singrauli Coalfields and Surroundings (Based on 1981 and 1991 Census Data)

Name of Amenity	Sidhi District, M.P 1981		Surguja District, M.P. 1981	Sonbhadhra District, U.P 1981	Census Year 1981	Sidhi District, M.P 1991		Surguja District, M.P. 1991	Sonbhadhra District , U.P 1991	Census Year 1991
	Chitrangi	Singrauli	Ramanujgunj	Dudhi	Total	Chitrangi	Singrauli	Ramanujgunj	Dudhi	Total
1	2	3	4	5	6	7	8	9	10	11
EDUCATION	11(P) 1(M) 1(H)	69(P) 47(M) 13(H) 2 (PUC)	1(P)	27(P) 9(M) 5(H) 2 (PUC)	100(P) 57(M) 19(H) 4(PUC)	16(P) 4(M) 1(H)	92(P) 65(M) 18(H) 4(PUC)	1 (P)	34(P) 12(M) 7(H) 3(PUC)	143(P) 81(M) 26(H) 7(PUC)
SUB-TOTAL	13	131	1	43	188	21	179	1	56	257
MEDICAL	1(D) 2(APHC) 2(AY)	2(H) 8(D) 2(HC) 1(FPC) 5(NH)	-	1(H) 1(D) 4(PHC) 2(APHC) 7(FPC)	3(H) 4(APHC) 10(D) 2(AY) 2 (HC) 8 (FPC) 6(NH) 4(PHC)	2 (D) 3 (APHC) 1(FPC) 2(AY)	3(H) 12(D) 3(HC) 3(FPC) 1(TBC) 7(NH)	-	2(H) 3(D) 7(PHC) 5(APHC) 12(FPC)	5(H) 17(D) 3(HC) 16(FPC) 7(NH) 7(PHC) 8(APHC) 2(AY) 1(TBC)
SUB-TOTAL	5	18	-	15	38	8	29	-	29	66
POST & TELE-GRAPH	2(P) 2(PO) 1(P&T)	36(P) 23(PO) 1(P&T)	-	13(P) 9(PO) 1(P&T)	51(P) 34(PO) 3(P&T)	3(P) 7(PO) 1(P&T)	48(P) 52(PO) 3(P&T)	-	18(P) 21(PO) 2(P&T)	69(P) 80(PO) 6(P&T)
SUB-TOTAL	5	60	-	23	88	11	103	-	41	155

Cont....2

1	2	3	4	5	6	7	8	9	10	11
DRINKING WATER *	16	82	1	28	127	22	123	1	37	183
SUB-TOTAL	16	82	1	28	127	22	123	1	37	183
ELECTRI-CITY*	17	122	1	34	174	21	152	1	58	202
SUB-TOTAL	17	122	1	34	174	21	152	1	58	202

*** Number of villages where facility exists.**

Abbreviation Used :

EDUCATION : (P) Primary School, **(M)** Middle School, **(H)** Higher Secondary School, **(PUC)** Post Graduate College. **MEDICAL: (H)** Hośpital, **(HC)** Health Centre, **(APHC)** Additional Public Health Centre, **(D)** Dispensary **(FPC)** Family Planning Centre, **(TBC)** T V Clinic, **(NH)** Nursing Home, **(AY)** Auyurvedic Hospital/Dispensary, **(PHC)** Public Health Centre **POST & TELEGRAPH: (P)** Post Office, **(PO)** Phone, **(P&T)** Post and Telegraph

During 1981 and 1991, these facilities were available in 40.60%, 21.43%, 7.14%, 1.50%, and 64.00%, 36.43%, 11.71% 3.15%, respectively of total villages/towns of the area. Within a decade, the total number of educational institutions increased by 96%. The colleges are located at Singrauli, Waidhan and Renusagar.

The total number of medical facilities in 1991 increased by 73% as compared to 1981 and maximum facilities were observed in Singrauli and Dudhi tahsils and nil in Ramanujganj tahsil. The villages and mining areas are served by dispensaries, health centrers and ayurvedic clinic etc. Good medical facilities are available in hospitals and nursing homes located at Singruali, Waidhan, Vindhyanagar and Renusagar. The only T.B hospital is serving at Singrauli.

The civic amenities like post and telegraph has registered an increase of 75% in 1991 as compared to 1981 and it was maximum in Singrauli followed by Dudhi tahsil and nil in Ramanujganj tahsil. Telegraph facilities are available at tahsil level only.

The drinking water facility in the form of well, tube well, hand pump, tank was available in 127 and 183 villages during 1981 and 1991,respectively. Showing an increase of 44%. The urban and mining areas are well served while villages have to be dependent on river/streams, nalas etc.

Power supply in the form of electricity was available in 174 and 202 villages during 1981 and 1991 respectively and only 16% increase was registered during the decade. The maximum villages were covered in Singruali and Dudhi tahsils and only one village have power in Ramanujganj tahsils. The urban and mining areas are better served than the rural areas.

The area is well connected by Rewa, Renukoot, Mirzapur, Obra and Sonbhadra by metalled road. The mining projects are connected by all season roads. The roads connecting to most of the interior places are unmetalled which are unapproachable during rainy season. The main railway track in the area is Katni-Choupan line of Central Railway which passes in the northern side and connects major coal mining projects viz. Jhingurdah,Gorbi,Jayant,Bina and Kakri.