

CHAPTER - 1

INTRODUCTION

1.1 GENERAL

The state of Arunachal Pradesh is situated in the north-eastern region of the country and lies between latitudes 26°28' to 29°30' North and longitudes 91°31' to 97°30' East. The state shares international boundaries with China along the snow line in the north, with Bhutan in the west and Myanmar in the south-east. The state shares most of its southern boundary with Assam. The state also shares its boundaries with Nagaland for a small stretch on the southern side. The total geographical area of Arunachal Pradesh is 83743 sq km. The major rivers of the state of Arunachal Pradesh are Subansiri, Siang (or, Dihang), Dibang (or, Sikang), Siyom, Kameng, Lohit and Tirap. These rivers have a huge hydro-potential, which can be tapped to meet the power demands of the country.

As per the studies for the re-assessment of the potential carried out by CEA, Arunachal Pradesh has a probable installed capacity of 66065 MW and hydroelectric potential of the state is estimated at 34,920 MW at 60% load factor. Dibang river system has a probable hydropower potential of about 10152 MW from 12 identified schemes. These schemes are run of river and storage types. Thus, it is extremely important to harness the hydropower potential of Dibang Basin to meet the ever-increasing power demand in the country.

MOEF has accorded clearance for pre-construction activities for Dibang Multipurpose Project as per the provisions of Environmental Impact Assessment (EIA) Notification, 2006 and approved the TOR for EIA. Some of the additional provisions stipulated in the approved TOR were required to be studied. Accordingly, an additional study was undertaken with respect to downstream impacts, Environmental Flow for sustenance of aquatic environment and for downstream uses, impact of flood moderation in the downstream etc. and the present report covers these aspects.

1.2 PROJECT PROFILE

Dibang Multipurpose Project (3000 MW) is being conceived on River Dibang which originates from snow covered southern flank of the Himalayas close to Tibet border at an altitude of more than 5000 m. The river emerges from the hills and enters sloping plain area near Nizamghat (Emewu) in Arunachal Pradesh, from where river flows for a distance of 50 km to meet river Lohit. The total catchment area of Dibang up to the dam site is 11276 sq km which lies entirely in India. The proposed Dibang Multipurpose Project is located in Lower Dibang Valley district of Arunachal Pradesh and its site is found to be a good combination of geological and topographical features for development of hydro-potential and with no submergence of archaeological/other similar structures. The project location map is enclosed as Figure 1.1.

1.3 DIBANG RIVER BASIN

Dibang Multipurpose Project is located on river Dibang. The river originates from the snow covered southern flank of the Himalayas/Trans Himalayas close to the Tibet border at an elevation of more than 5000 m. The river Dibang cuts through deep gorges and difficult terrains in its upper reach through the mountains of the Dibang Valley and Lower Dibang Valley districts of Arunachal Pradesh. The total length of Dibang from its source to its confluence with Lohit river at Sadia in Assam is 195 km. The major tributaries of river Dibang are Mathun, Taloh, Dri, Ithun and Emra. A number of small tributaries i.e. Ahi, Aarii, Ilu, Ashu, Ephi, Deo (Eze) river etc. also join the river. The important feature is that all the tributaries barring Ephi & Deo (Eze) river join Dibang in its hilly catchment. The three major tributaries viz. Tangon, Dri and Mathun are almost equal in size because of which the shape of the Dibang catchment is comparatively wide in its upper reach.

1.3.1 Meteorology

The Dibang basin falls partly in climatic zone I and partly in zone III. Zone I comprises of North and North Eastern part of India including Myanmar, Nepal, Bhutan, Bangladesh and part of Pakistan. Zone No. III comprises of China, Tibet and portion of North and North Eastern part of Arunachal Pradesh. Climate in Zone No. I

is generally tropical monsoon climate. Rainfall generally occurs during June to September under the influence of south-west monsoons, while the months of November to February are the dry periods. Some rainfall is also received during the months of May and October. The climatic Zone No. III can be classified as "Mountain Climate" Mountain slopes exposed to the sun experience burning heat while slopes in shadow may be quite cold.

Two distinct climatic conditions prevail over the entire Dibang Catchment. The upper reach starts from the Indo-Tibet border up to Mayudiya Hill Range and the lower reach starts from Mayudiya Hill range to the confluence of river Lohit. In the upper catchment, rainfall is comparatively less and the region experiences severe cold during winter season. However, weather is quite pleasant during summer season. The lower part maintains tropical climate. Rainfall is very high and the climate remains very humid.

Rainfall

The rainfall in the basin is mainly influenced by the mountain system and occurs mainly under the influence of south-west monsoons, which sets in by the second week of May and continues up to the middle of October. On the basis of the available data, average rainfall in the basin up to the dam site has been estimated to be 4405 mm (Source: Feasibility report CWC 2003). However, the major portion of the rainfall occurs during the period from June to August.

Temperature

As per Prefeasibility report prepared by Brahmaputra Board in March 2002, meteorological observatory center in the Dibang basin is located in Hunli and Elopa. Temperature and Relative humidity data are collected here since 1998. The monthly maximum and minimum temperature and humidity recorded since September 1998 to June 2000. The monthly maximum temperature is observed in the months of May-July, and is around 45°C. The monthly minimum temperature observed is around 2°C, in the months of December-January.

Humidity

The relative humidity in the project area is high throughout the year. However, humidity is slightly lesser during winter months. The relative humidity ranges from a minimum of 19 % in winter months to a maximum of 92 %.

Cloud Cover

Clear or lightly clouded sky is common during the post-monsoon months. During winter season, the morning sky often remains overcast mainly due to lifted fog which gets cleared as the day advances. In the pre-monsoon months sky is generally moderately clouded. Heavily clouded to overcast sky prevails in the monsoon months, when hills and ridges are enveloped in cloud.

Wind

Winds are generally light during the south-west monsoon season. In rest of the year, winds are moderate, becoming strong at times in association with thunder storms. Strong winds down the valleys are experienced. The direction of wind is highly influenced by the local conditions.

Special Weather Phenomena

Thunder storms mainly occur during the months from February to September. The frequency is maximum in April and minimum in the month of December. During pre-monsoon months, thunder storms are often violent and from December to April they are occasionally accompanied by hail. Fog is frequent in the valleys during the winter months.

1.3.2 Geology

The main litho units exposed in the reservoir area are:

- Ithun Formation
- Hunli Formation
- Ultramafics
- Igneous Complex

Ithun Formation

Ithun formation comprises of quartzofeldspathic gneiss, biotite gneiss, amphibolite, calcareous quartzite, carbonate bands and garnetiferous mica schist with kyanite and sillimanite. The general trend of these rocks is NW-SE with northeasterly dips. In the Ithun valley these rock unit forms the core of double plunging antiform with the axis along NW-SE parallel to the course of Ithun river. Biotite gneiss is the prominent rock of Ithun formation. It is fine to medium grained. Gneissosity is moderate to well developed and is defined by alternate micaceous and quartz-feldspar bands. In the Elopa-Annelih section, Ithun formation is repeated due to folding. South of *Mrambon*, it shows an inverted disposition whereas to its north, the sequence is normal. The rocks of Ithun formation are co-relatable with mylonite granite gneiss of Parimountain Formation of Siang group and low grade interbanded sequence of quartzite, chlorite schist and marble of Siyom Group (*N. Srimal et al, 1998*). The rock units belonging to Ithun Formation constitute almost 50% of the reservoir rim.

Hunli Formation

The Hunli Formation consists predominantly of chlorite schist, quartz chlorite schist with green quartzite, phyllite, carbonaceous phyllite and carbonate rocks. All the above mentioned rock units show gradational contact with one another. Near the contact with the Ithun Formation, rocks are quartzitic and gneissic in nature. Characteristically, the quartz chlorite schist with quartzite in the contact zone gradually grades into the gneissic rock of Ithun formation. The rocks of Hunli Formation in Dibang valley are correlatable with near similar sequence of Tuting Meta-volcanics exposed around Tuting in Upper Siang district (*N. Srimal et al., 1998*).

The rocks of Hunli formation are well exposed in Echi-Nala area (South of Angolin), Etalin-Attunli section, at Ashu -Dibang river confluence, Appako-Anelih section and Koroni area.

The rocks exposed in Etalin-Attunli section, Ashu -Dibang confluence and at Koroni area shows an inverted sequence. Whereas the rock unit exposed in Echi-nala-Angolin, Appako-Anelih sections represented a normal sequence. The rocks show gradual steeping in dip amount towards the Diorite-Granodiorite-Granite contact in

Echi-nala. The rock units of Hunli formation contribute almost 30% of the reservoir rim. Incidentally, major landslide zones are located within Hunli formation.

Ultramafics

There are two major bodies of Ultramafics rocks. One is exposed in Myodia area along a synformal core with amphibolite and carbonaceous metapelites sequence, flanking on either side in Dibang valley inferred as the remnants of a tectonic slice (*N. Srimal et al, 1998*). The other occurs between the head of Ithun nala and Amilli village trending N-S and cutting across Ithun and Hunli formation (*Ray and Dutta, 1982*). Besides, there are several small occurrences in the area. Dunite, peridotite and pyroxenite are the dominant rock types.

Igneous Complex

A diorite-granodiorite-granite complex occur as a huge mass of batholithic dimension from Echi-nala to Maliyne and beyond in the Tangon Valley and extends westward along the Emra Valley. In Angolin area the dioritegranodiorite- granite shows sharp contact with biotite gneiss/schist and calcareous quartzite of the Ithun formation in the northern part of the body and its southern contact is faulted one with the Hunli formation. North of Echi-nala these rocks shows sharp contact with the meta-sedimentary rocks. The contact zone is characterized by feldspathisation and assimilation affects. These rocks would be coming almost at the tail end of reservoir.

1.3.3 Seismicity

Regional tectonics and seismic history of the North Eastern Region is highly significant. It constitutes active, unparallel relief, complex geological set up and anomalous crustal structure, which are attributed to the direct collision between Indian plate (Himalaya) and China / Tibet plate in the north and Indo- Burma subduction plate tectonics in the south east. This continent collision and subduction tectonics has developed juxtaposition of three tectonic blocks, viz N.E. projection of Indian shield with Himalayan thrust front, Eastern syntaxis of Mishimi block and the thrust imbricated Indo-Burmese block as well as the intervening Brahmaputra and Surma Valley.

In the Himalayan belt, a few well defined tectono geologic domains extend over a distance of 2500 km from Nanga Parbat in the west to Namcha-Barwa in the east. In the north of Arunachal Himalaya, the southern margin of Eurasian plate is marked by Indus Tsangpo Suture Zone (ITZ). The 15 to 20 km wide Tsangpo ophiolite melange occurs along the Tsangpo river course and extend beyond the Siang fracture and the serpentinites of Mishimi block occurring in association with actinolite tremolite schists as well as crystalline limestone. The diorite-granodiorite complex of Mishimi block is thrust over the frontal metamorphics, consisting of high to low grade metamorphic rocks with serpentinites along the NW Lohit thrust. The metamorphics in turn override the Neogene folded rocks of the Burmese arc by the Mishimi thrust in Noa Dihing Valley.

The highest axial zone of Himalaya is occupied by the Proterozoic crystalline rocks delimited to the south by the Main Central Thrust (MCT). The Neogene granites are common along the contact of the crystallines and the Tethyan sediments. The well-defined Lesser Himalayan belt between MCT and MBT, in all probability, may represent the tectonised northern extension of the Indian shield with both fresh water and marine sediments and orthoquartzitedolomite sequence. South of the MBT, all along the foot hills, occur the folded and thrust belt of Upper Tertiary molassic Siwalik sediments with slices of Gondwana and Eocene rocks at some places. South of the Siwalik belt is the Brahmaputra alluvial plain.

The Meghalaya plateau and Mikir hills consisting mostly of Archean gneissic complex and Proterozoic intercratonic sediments of Shillong Group intruded by Upper Proterozoic granite batholith and basic igneous rocks, represents a positive shield element. This block occupies a crucial position between the Himalaya in the north and North West and Burmese arc in the east and south east. The Dauki fault at the southern margin of the plateau separates it from the Sylhet plain of Surma Basin. Cretaceous Tertiary shelf sediments occur along the southern margin of the plateau. The Upper Assam Valley forms a fore deep for the Himalaya and the Burmese arc.

The Naga Patkoi belt is composed of thick sediments of Eocene flysh, coal bearing Barails, uncomfortably overlain by middle and upper Tertiary rocks consisting of sandstone, clay shale and pebble beds. The ultra basic ophiolites occur along Indo-

Burmese border. The belt of schuppen consists of several thrust slices, viz Haflong thrust, Disang thrust, Margherita thrust, Naga thrust, are some prominent features, which are mostly over thrust with some overlap.

1.3.4 Water Quality

The Dibang river basin has low population density, with low irrigation intensity. In addition, there are no major sources of organic pollution also in the catchment area intercepted till the dam site. The low cropping intensity coupled with low agro-chemicals dosing also means that the potential loading due to agro-chemicals is quite low. The absence of industries implies that there is no pollution loading from this source as well. Thus it can be concluded that there is no major sources of pollution in Dibang river basin.

1.3.5 Flora

The catchment area which has an altitudinal range from 300 m to 5400 m has a very interesting floristic composition representing changes in forest types, typical of the Eastern Himalayas with the change in altitude. The favourable rainfall, temperature and high humidity have caused the vegetation to acquire the general characteristics of the Northern Tropical Semi-Evergreen & North Indian Moist Deciduous Forests.

1.3.6 Fauna

The area around the proposed Dibang Multipurpose Project has fairly rich forest cover. The animal habitat is concentrated on lower slopes and terraces edging to major river system. The animals also adapted according to the riverine environment. Many arthropods such as Coleopterans, arachnids and insects were observed.

1.3.7 Fisheries

There are three categories of fish species based on their occurrence viz.-

Upper reaches: Cold temperature zone 1200 -1400 m.

Middle reaches: Subtropical zone 800 -1200 m.

Lower reaches: warm tropical zone below 800 m.

The catchment area of Dibang river of Dibang Multipurpose Project covers the middle reaches and lower reaches. The observed species in the dam site are

Schizothorax richardsonii, *Tor putitora*, *Tor tor* and *Chagunius chagunio*. Other mentioned common species are found mostly in lower stream that is up to Kundil and these are not migratory in nature. In the upstream of the catchment area except *Chagunius chagunio* and *Garra* spp. no other species was found, probably due to the seasonal behavior.

Four species viz. *Schizothorax richardsonii*, *Tor tor*, *Tor putitora* and *Chagunius chagunio* are migratory in nature for breeding purpose. Three species viz. *Crossocheilus latius latius*, *Garra annandalei* and *Garra gotyla gotyla* are local migratory for feeding purpose.

Tor putitora species starts spawning from the onset of south-west monsoon in mid July which continues till the middle of October in flooded river. The other important migratory species *Tor tor* has a prolonged breeding period commencing from July-August continuing sometimes till November. Their rate of growth is slow, average sizes vary from 35 to 125 mm.

1.4 SOCIO-ECONOMIC PROFILE OF AFFECTED POPULATION

1.4.1 Demographic Characteristics

As per the Census of India, 2001, the Lower Dibang Valley District had a total population of 50,448, about 4.62% of the state's population. The Circles of Roing, Dambuk and Paglam had population 34,627 (68.64% of the district's population), 4,014 (7.96% of the district's population) and 6,429 persons (12.74% of the district's population), respectively in 2001. The village-wise demographic profile in the study area is depicted in **Table 1.1**. There are a total of 23 villages within the study area. The total population in the study area villages is of the order of 12,983 persons (2,356 households). Out of this population, males and females constitute about 52.5% and 47.5% respectively, of the total population. The number of females per 1000 males is about 906. The average family size observed in the study area is about 5.4.

TABLE-1.1
Demographic profile of the study area villages

Village Name	Male Population	Female Population	Total Population	Sex ratio	Average Family size
Roing Circle					
Malek	304	228	532	750	4.9
Kangkong	600	591	1191	985	5.4
Shantipur	298	249	547	836	5.4
Chimri	15	16	31	1067	3.9
Chidu	94	99	193	1053	4.6
Ali Ledo	9	6	15	667	3.8
Sub-Total (A)	1320	1189	2509	901	5.2
Dambuk & Paglam Circles					
Anpum	593	553	1146	933	5.7
Bizari - A	252	267	519	1060	6.5
Bizari - B	420	327	747	779	4.9
Bomjir	435	345	780	793	5.0
Dambuk H.Q.	608	479	1087	788	4.1
Loklung	132	117	249	886	5.3
New Poblung	111	99	210	892	4.7
Paglam	1038	946	1984	911	5.9
Poblung - I	249	225	474	904	6.4
Poblung - II	101	120	221	1188	6.5
Sirang	249	237	486	952	4.2
Tapat	111	117	228	1054	6.5
Tinali	256	220	476	859	6.2
Remi	133	145	278	1090	6.6
Banggo	190	190	380	1000	5.8
Yagpo	91	100	191	1099	6.4
Keba	474	454	928	958	7.7
Sub-Total (B)	5443	4941	10384	908	5.5
Total (A+B)	6763	6130	12893	906	5.4

Source: Census of India, 2001

1.4.2 Caste distribution of population

As per the Census of India, 2001, the population in study area villages of Roing Circle belongs to the Scheduled Tribes category. In Dambuk and Paglam Circles too, as per the Census of India, 2001, the majority of the population in study area villages of belongs to the Scheduled Tribes category.

1.4.3 Educational profile

The educational profile of the population in the study area villages is shown in **Table 1.2**.

TABLE-1.2
Educational profile of the Study Area villages

Village Name	Male Literates	Female Literates	Total Literates	% literate	Total Illiterates	% illiterate
Roing Circle						
Malek	63	21	84	15.8	448	84.2
Kangkong	375	286	661	55.5	530	44.5
Shantipur	163	92	255	46.6	292	53.4
Chimri	3	1	4	12.9	27	87.1
Chidu	53	37	90	46.6	103	53.4
Ali Ledo	1	0	1	6.7	14	93.3
Sub-Total (A)	658	437	1095	43.6	1414	56.4
Dambuk & Paglam Circles						
Anpum	349	174	523	45.6	623	54.4
Bizari – A	124	99	223	43.0	296	57.0
Bizari – B	227	116	343	45.9	404	54.1
Bomjir	211	107	318	40.8	462	59.2
Dambuk H.Q.	452	300	752	69.2	335	30.8
Loklung	70	33	103	41.4	146	58.6
New Poblung	29	15	44	21.0	166	79.0
Paglam	416	212	628	31.7	1356	68.3
Poblung – I	146	79	225	47.5	249	52.5

Poblung – II	68	47	115	52.0	106	48.0
Sirang	90	54	144	29.6	342	70.4
Tapat	66	44	110	48.2	118	51.8
Tinali	72	33	105	22.1	371	77.9
Remi	91	69	160	57.6	118	42.4
Banggo	91	56	147	38.7	233	61.3
Yagpo	52	41	93	48.7	98	51.3
Keba	148	60	208	22.4	720	77.6
Sub-Total (B)	2702	1539	4241	40.8	6143	59.2
Total (A+B)	3360	1976	5336	41.4	7557	58.6

Source: Census of India, 2001

The overall literacy rate in the study area villages is 41.4%. The male and female literacy rates are 49.7% and 32.2% respectively. In village of Ali Ledo, only 6.7% of the population (1 male member of the village) is literate. The percentage of literates in the study area villages of Roing Circle (43.6%) is lower than that of the District (48.3%) and much lower than that of the Circle itself (52.4%), as per the Census of India, 2001.

1.4.4 Occupational profile

The occupational profile of the population in the study area villages is shown in **Table 1.3**. It can be seen that the percentage of working and non-working population is 43.4% and 56.6% respectively.

TABLE 1.3
Occupational profile of the population in study area villages

Village Name	Male Workers	Female Workers	Total Workers	% working	Total Non-workers	% not working
Roing Circle						
Malek	171	131	302	56.8	230	43.2
Kangkong	294	190	484	40.6	707	59.4
Shantipur	148	119	267	48.8	280	51.2

Village Name	Male Workers	Female Workers	Total Workers	% working	Total Non-workers	% not working
Chimri	7	1	8	25.8	23	74.2
Chidu	43	6	49	25.4	144	74.6
Ali Ledo	3	3	6	40.0	9	60.0
Sub-Total (A)	666	450	1116	44.5	1393	55.5
Dambuk & Paglam Circles						
Anpum	299	286	585	51.0	561	49.0
Bizari - A	97	81	178	34.3	341	65.7
Bizari - B	199	133	332	44.4	415	55.6
Bomjir	225	129	354	45.4	426	54.6
Dambuk H.Q.	300	80	380	35.0	707	65.0
Loklung	79	67	146	58.6	103	41.4
New Poblung	52	51	103	49.0	107	51.0
Paglam	463	291	754	38.0	1230	62.0
Poblung - I	99	86	185	39.0	289	61.0
Poblung - II	39	47	86	38.9	135	61.1
Sirang	145	90	235	48.4	251	51.6
Tapat	52	49	101	44.3	127	55.7
Tinali	105	97	202	42.4	274	57.6
Remi	63	70	133	47.8	145	52.2
Banggo	95	93	188	49.5	192	50.5
Yagpo	39	46	85	44.5	106	55.5
Keba	220	181	401	43.2	527	56.8
Sub-Total (B)	2571	1877	4448	42.8	5936	57.2
Total (A+B)	3271	2327	5564	43.2	7329	56.8

Source: Census of India, 2001

The occupational break-up of main workers and marginal workers in study area villages is given in **Tables 1.4 and 1.5**, respectively.

TABLE-1.4
Occupational Break-up of main workers in study area villages

Village Name	Casual Labourer	Agricultural Labourer	Household Workers	Other Workers	Total (Main) Workers
Roing Circle					
Malek	270	2	9	11	292
Kangkong	84	127	7	76	294
Shantipur	2	129	2	32	165
Chimri	5	3	0	0	8
Chidu	33	5	0	10	48
Ali Ledo	6	0	0	0	6
Sub-Total (A)	400	266	18	129	813
Dambuk & Paglam Circles					
Anpum	431	30	3	34	498
Bizari - A	42	0	1	27	70
Bizari - B	82	46	3	82	213
Bomjir	85	210	2	43	340
Dambuk H.Q.	29	15	14	288	346
Loklung	61	20	0	31	112
New Poblung	30	72	1	0	103
Paglam	393	4	8	76	481
Poblung - I	139	14	0	16	169
Poblung - II	59	0	0	15	74
Sirang	78	17	6	134	235
Tapat	85	3	1	10	99
Tinali	200	0	0	2	202
Remi	113	2	0	18	133
Banggo	176	0	0	12	188
Yagpo	72	0	0	8	80
Keba	380	2	5	13	400
Sub-Total (B)	2455	435	44	809	3743

Village Name	Casual Labourer	Agricultural Labourer	Household Workers	Other Workers	Total (Main) Workers
Total (A+B)	2855	701	62	938	4556

TABLE-1.5

Occupational Break-up of marginal workers in study area villages

Village Name	Casual Labourer	Agricultural Labourer	Household Workers	Other Workers	Total (Marginal) Workers
Roing Circle					
Malek	2	7	0	1	10
Kangkong	47	142	1	0	190
Shantipur	2	97	0	3	102
Chimri	0	0	0	0	0
Chidu	0	1	0	0	1
Ali Ledo	0	0	0	0	0
Sub-Total (A)	51	247	1	4	303
Dambuk & Paglam Circles					
Anpum	78	8	0	1	87
Bizari – A	108	0	0	0	108
Bizari – B	68	42	1	8	119
Bomjir	4	10	0	0	14
Dambuk H.Q.	13	5	2	14	34
Loklung	17	17	0	0	34
New Poblung	0	0	0	0	0
Paglam	246	4	3	20	273
Poblung – I	4	10	1	1	16
Poblung – II	12	0	0	0	12
Sirang	0	0	0	0	0
Tapat	2	0	0	0	2
Tinali	0	0	0	0	0
Remi	0	0	0	0	0
Banggo	0	0	0	0	0

Yagpo	1	1	3	0	5
Keba	0	0	0	1	1
Sub-Total (B)	553	97	10	45	705
Total (A+B)	604	344	11	49	1008

It can be seen from **Tables 1.4 and 1.5** that as per Census of India, 2001, the majority of the main and marginal workers work as casual labourers, followed by agricultural labourer.

1.4.5 Electrification

As per 2001 Census, all households in the study area villages in Roing Circle are connected to the electric power supply. In Dambuk and Paglam Circles, however, households of only 7 out of 17 villages (41.2%), viz., Dambuk H.Q., Poblung I & II, Sirang, Tapat, Remi and Yagpo are connected to the electric power supply.

1.4.6 Water supply

As per 2001 Census, study area villages in Roing, Dambuk and Paglam Circles, have drinking water supply. In addition, all study area villages in Roing Circle and 10 out of 17 villages (58.8%) in Dambuk and Paglam Circles have tap water supply. Nine villages have access to other sources of water supply too. It is of interest to note that 5 villages, viz., Anpum, Bizari-A, Bomjir, Loklung and Paglam, receive water supplied from the river.

1.4.7 Recreational facilities

As per the Census of India, 2001, one study area village in Roing Circle has a cinema/ video hall. In comparison, in Dambuk and Paglam Circles, 6 villages have a cinema / video hall. These villages are Anpum, Bizari-A, Dambuk H.Q., Paglam, Tinali and Banggo. In so far as sports facilities are concerned, there are none in the study area villages of Roing Circle. In the study area villages of Dambuk Circle too, there is just one village, viz., Bizari-A, having a Sports Club.

1.4.8 Medical facilities

None of the study area villages in Roing Circle have any medical facilities. Among the study area villages of Dambuk Circle however, 2 villages, viz., Anpum and Bizari-A, have a Primary Health Centre each. 3 villages, viz., Bomjir, Dambuk H.Q. and Paglam have a Primary Health Sub-Centre each. Village Bizari-A has a Primary Health Centre, a Unani Dispensary, a Child Welfare Centre, a Health Centre and a Registered Medical Practitioner as well.

1.4.9 Educational facilities

In 3 of the study area villages in Roing Circle, viz., Malek, Kangkong and Chidu have a Primary School each. The village of Kangkong also has a Middle School.

In 11 of study area villages in Dambuk and Paglam Circles Primary School is observed. Out of these eleven, one village, i.e., Bomjir, has a middle school too, 3 villages, viz., Bizari-A, Dambuk H.Q. and Paglam have in addition to a Primary School, a Middle School as well as a Senior School, one village, i.e., Anpum, has a Middle School and an Adult Literacy Centre, Two villages, viz., Loklung and Banggo, have in addition to a Primary School, an Adult Literacy Centre as well. It should be noted that though the village of Bizari-B does not have any schools, it possesses however, an adult literacy center. On the other hand, 5 villages, viz., Poblung I & II, Tinali, Yagpo and Keba do not have any educational facilities.

1.4.10 Postal and telephonic services

As per the Census of India, 2001, two study area villages in Roing Circle, viz., Shantipur and Chidu, and 5 study area villages in Dambuk and Paglam Circles, viz., Anpum, Bizari-A, Bomjir, Dambuk H.Q. and Paglam, have a Post Office. There are no telephone lines in any of the study area villages coming under Roing Circle. However, 4 villages of Dambuk Circle, viz., Dambuk H.Q., Poblung-II, Sirang and Remi have telephonic connections.

1.4.11 Transport services

As per the Census of India, 2001, all study area villages in Roing Circle have access to bus services. In Dambuk and Paglam Circles, all villages except for two, Tapat and Yagpo, have access to bus services.

1.4.12 Roads

As per the Census of India, 2001, all study area villages in Roing Circle are accessible by paved road. In Dambuk and Paglam Circles, 10 villages are accessible by paved road, 3 villages, viz., Bizari A & B and Paglam, are accessible both by paved road as well as by mud road, 2 villages, viz., Tapat and Yagpo, are accessible only by mud road, and 4 villages, viz., Poblung I & II, Sirang and Remi, are accessible only by foot-path.

1.5 ETHNOGRAPHIC DETAILS

The ethnographic details of the people living in the project area have been collected through a systematic anthropological approach. The approach involved in depth interviews with the people (mainly elders), group discussions and participant observation (which includes observing the way they live, eat, cook etc.). As tribal groups mainly inhabit the proposed area of the project, it is essential to understand the way of their life and their values and philosophy of life to ensure that the impact of the project do not result in a 'cultural shock' for them.

Almost all of the population directly going to be affected by the project is of Idu Mishimi Tribes. The traditions and cultures of this tribe are discussed in the following paragraphs:

The **IDU-MISHMI** is a major sub-tribe of Mishmi group. Their brethren tribes are namely the DIGARU-MISHMI (TARAONS) and the MIJU-MISHMI (KAMANS). They inhabit the Lohit district, Dibang Valley district and Lower Dibang Valley district. They are of mongoloid stock and speak the Tibeto-Burman language.

The Idu Mishmi is one of the two major tribes of the district. The Idu Mishmis can be distinctively identified among other tribal groups of Arunachal Pradesh by their typical hairstyle, distinctive costumes and artistic patterns embedded on their clothes.

People of sober nature, they still maintain deep-rooted aesthetic values in their day-to-day life with great pride and honour. All pervading goddess Nani-Intaya is the sole creator of the universe for the Idus. The Idus have their distinct dialect, which falls

under the Tibeto-Burman group of languages. Traditionally, Idus believe in animism. They worship several benevolent and malevolent spirits. Nani-Intaya and Masello Zino are worshipped as creators of mankind and universe as a whole.

Mythological characters like SINE-RU a first IGU (Idu Priest) still holds high place and reverence in the minds of the people. The prints of his palm on the huge rocks at Athu Popu near Keyala Pass in Dibang Valley district on China border, is supreme and holy shrine.

The major festivals of the Idus are 'Reh' and 'Ke-meh-ha'. Reh festival is held during the month of February. It is an occasion for people to relax, enjoy, dance, eat and drink. The Idus are expert craftsman. The Idu women, in particular, are very good weavers. Their great aesthetic sense is well reflected in the exquisite designs created on the clothes produced on handlooms. The Idu men are well apt in making beautiful basketry items of bamboo and cane.

Well-developed civilization dated back in the pages of history can be found in the region. Remnants of 10th Century AD found at Bhismanagar, Chidu & Chimari villages in the lower belt of the district prove that the Idus coexisted with great harmony with the people of plains and adjoining states.

Migration: Apparently the Idu-Mishmis migrated towards the south to present habitat from Tibet through Dibang and Lohit Valleys. Some of the prominent migration points from the Tibet indicated by the ancestors are – (i) ANDIKU - the direction towards North-Pole Star, (ii) ASE-ALE - the course of Lohit river and, (iii) INNI LON PON - the region where the first rays of the sun falls. There are about seventy-six clans. Some clan counts their genealogy up-to about twenty-eight generations

Birth Ceremony: Idus believe that to have pregnancy is a great blessing of the Divine mother "INNI MASELO ZINU AYA" or Sun Goddess. After pregnancy is noticed, two cocks are tamed as sacrificial bird to offer their blood to beneficent and maleficent spirits at the time of birth ceremony for the welfare of newborn. During pregnancy the couple follow some taboos. They should not utter any abnormal outcries of birds and animals or imitate the activities of handicap persons, or kill

snakes, or offer any kind of articles for burial in the grave, since the exercise of above activities is supposed to lead to deformation of the child at the time of delivery. Food and rice beer is stocked before three to two months ahead for consumption during taboo days. On delivery of the child, the father puts a bunch of shrubs at the entrance gate of the house and goes to jungle to collect the elephant grass EPONTON and RONTHEPA, a creeper of thorn species. He places them over the entrance of the room for protection of evil spirit and for welfare of the child. A well versed in hymn and experienced priest is invited to perform A-TA-YE- a ritual ceremony. He propitiates the INNI MASELO and other beneficent and maleficent spirits of parent and grant-father and mother of the child and appeases them with the blood of sacred cock and water adulterated with rice beer. The members present on the occasion are entertained with food and drink and they abstain from doing hard work for one night. The name of child is decided within five days. Main taboo remains for six to nine days. The parent including members of the house should not do any hard work like cutting with axe, digging of earth, killing of wild animals, touching of poison or irritating objects. Purification of taboo called ANGI ATHON NU is held again one day within the period in between six to nine days with the help of priest. Ritual ceremony is performed as that of A-TA-YE. On this day food and drink are prepared on large scale for entertaining the invitees.

Marriage Ceremony: The Idu-Mishmi society is patriarchal and patrilineal. The property is inherited by the son from the father. The Idu-Mishmis used to practice polygamy, but incestuous marriage is prohibited. Marriage is done through most preferably by negotiation or arranged marriage locally called “Ahelaa”.

Construction of House: An Idu-Mishmi house is a long one like a bus, rectangular size raised above two feet from the ground and supported on wooden posts usually accommodates a joint family. Bamboo, cane, wood and leaves of toku and straws are used for construction.

The front is an extension of roof with ground floor to keep the domesticated animal and next to it is a small veranda/corridor made of bamboo or plank for stepping up from the ladder to enter into house. A house may have a number of rooms with partitioned as per strength of the family members. There is a straight corridor/passage. Each room has a hearth and is used for both cooking and

sleeping. The serial allocation of room consists of male room, which is called AGRAH. There may be passages in between two rooms for latrine and husking of paddy. Each room has one window towards the poultry yard and pigsty under the house.

Cultivation and Food Habits: The Idu-Mishmi practice both terrace and wet rice cultivation. Rice, Maize and Millet are the staple food of the Idu–Mishmis. Sweet potato and different kinds of Arum and vegetable are the usual crops. Their main meal is taken twice a day. They are fond of fish and meat. They preserve food by smoking and drying over the fireplace. The home brewed rice beer (YU) is quite popular.

Education: Modern education had a late start among the Idu Mishmis as they didn't have early contact with the British colonizers. But educational institutions and literacy have multiplied rapidly since independence.

Economy: Idus are expert in handicraft and weaving. The man makes basketry items out of cane, bamboo for household. The women weave cloth with different design on both ETOWE (coat) & THUWE (shirt). Many Idus purchase tractors and other machinery equipments for cultivation of cash crops like ginger, mustard seed and other cultivation of fruits (orange, pineapple, pears etc.), tea, paddy etc.

Many literate men and women have joined government jobs, while others also undertake contract/supply works in various departments for earning their livelihood.

Death Ceremony: To die at the old age is treated as normal death but if it is accidental or premature, past acts of the deceased are supposed to have indirect effect. When a person is dead the entire village undergoes taboo for five days for male and four days for female. During period of taboo, one does not undertake any new construction work, agricultural activities.

1.4 OUTLINE OF THE REPORT

The report is presented in seven chapters as listed below:

Chapter-2 summarizes the details of the Dibang Multipurpose project.

Chapter-3 outlines the methodology adopted for conducting the study. The information has been collected using both primary and the secondary data sources.

Chapter-4 presents information on hydrological aspects of the Dibang Multipurpose project. The chapter also covers the findings of water quality monitoring conducted for two seasons as a part of the study.

Chapter-5 presents the aquatic ecological aspects of environment. The study is based on collection of data from primary as well as secondary data sources. As a part of the basin study, detailed ecological survey was conducted for two seasons. The findings of the aquatic ecological survey were analysed and ecological characteristics of the study area have been covered in this Chapter.

Chapter-6 describes the anticipated impacts on water environment including water availability, water quality and aquatic ecology including riverine fisheries as a result of commissioning of the proposed project. An attempt has been made to forecast future environmental conditions quantitatively to the extent possible. But for certain parameters, which cannot be quantified, qualitative assessment has been done so that planners and decision-makers are aware of their existence as well as their possible implications.

Chapter-7 presents the Environmental Flows to be released for sustaining the riverine ecology.

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