PRE-FEASIBILITY REPORT

Amanat Barrage Project

At Panki Palamau District, Jharkhand State

Submitted to:

The Ministry of Environment Forest & Climate Change,

New Delhi

April 2018

Submitted by:

झारखण्ड सरकार
Department of
Water Resources

Executive Engineer, Auranga Construction Division

Panki, Medininagar,Jharkhand

Table of Contents

Table of Table

Table of Figure

1. INTRODUCTION AND PROJECT BACKGROUND

1.1 INTRODUCTION

The proposed scheme envisages construction of barrage on Amanat river at Panki block in Palamau District providing Irrigation facility for 26990 ha of lands. The location of proposed Barrage is at Latitude 24^0 03'6'' N and Longitude 84^0 29'45''E. The area is chronically drought prone falls within the range of retreating southwest monsoon, hence the rainfalls is very scanty and capricious in distribution. The average annual rainfall of the area is 1244.22 mm of which major portion (86.5%)is received during months of June to September. The common crops that are grown are Paddy, Wheat, Barley . The length of right main canal is 90.00 km and length of distribution system is 57.95 km. Major occupation of the people is agriculture. The farmers entirely depend upon rain water for their agricultural operations. The rainfall is irregular and unseasonal on account of which the yields vary drastically. Hence, based on the above facts, there is a need of the scheme which could benefit more to above stated Drought Affected areas and would also improve the Irrigation potential and Socio-Economic conditions of the Palamau districts.

1.2 BACKGROUND

The State of Jharkhand, carved out from the State of Bihar in the year 2000, is spread over an area of about 79,700 square kilometre (skm) . The total population of Palamau district as per the 2011 census is 19,39,869 persons with urban population of 2,26,003 persons and the rural population of 17,13,866 persons. The Palamau Districts of Jharkhand State are the worst drought prone and distressed areas in our country. There is tremendous shortage of drinking water, as these are fluoride affected areas. Fluoride and Nitrate concentration above permissible limit in patches. To redress this situation, the Government of Jharkhand have taken up the Amanat barrage Irrigation Scheme for alleviating the misery of these drought prone areas to provide the irrigation facility to about 26990 Ha of land Palamau district.

The original project report was submitted to C.W.C. in 1973 for Rs. 41.67 crore and this has been approved by planning commission Govt. of India after technical examination by C.W.C. New Delhi. The project was administratively approved by Govt. Of Bihar vide irrigation Department letter no. 3842 dated 18.10.74. The preliminary works like construction of buildings approach road and survey works were done partially. Due to increase in cost of labour and materials, the project estimate was first revised in 1982 for a sum of Rs.125.40 crore and sent to C.W.C. New Delhi for technical examination and approval by the planning commission. The planning commission in his letter no. 2(128)/831 and C.A.D dated 15th September ,1983 approved the first revised estimate and directed the state .Government to include construction of the project in the seventh five year plan. But due to paucity of fund only preliminary work has been done. The project was further revised in the year 2000 on SOR reveling at the time

and the revised project was submitted to C.W.C for Rs. 914.29 crore but nothing to be done. After creation of Jharkhand as a new state in the year 2000, the Govt of Jharkhand,WRD restarted the project in the year 2001-02. The work of Amanat Barrage right main canal have been started and the work is in progress.

The economy of Jharkhand is mainly driven by agriculture. About 61% of the population is rural. The economy of the state is predominantly agrarian; agriculture contributes major share of the state's income and employs majority of the work force. Since agriculture is the main activity and it has close links with the development in other sectors for overall economic progress of the state, achieving faster agricultural growth is imperative.

Thus, there is an urgent need for increasing food and fibre production to meet the demands of increasing population as well as for providing rural employment.

1.3 NEED OF THE PROJECT

The district of Palamau is chronically drought prone and falls within the range of retreating southwest monsoon. Hence the rainfall is very scanty and capricious in distribution. The average annual rainfall of the area is 1244.4 mm of which major portion (86.5%) is received during the months of June to September. Rainfall in this area is erratic besides being inadequate. The extent to which agriculture is the district is dependent on the rainfall will be evident from the fact that the net area sown in the year 1966-67 which was a year of drought was only 4.16 lakhs acres against 8.60 lakhs in the year 1965-66,out of 16.42 lakhs acres of cultivable area. Even in other years the cropped area is much less than the available cultivable area. Recurring drought has cause failure of crops almost every other year and has dampened the interest and enthusiasm of the local cultivators.

In view of the above, this district is drought prone and backward. It is necessary to provide drinking water on priority basis and irrigation facilities. The scheme shall improve the living conditions by improving groundwater scenario and clean drinking water to the people in the three districts, agricultural output and the per-capita income of the people of the region.

1.4 LOCATION & CONNECTIVITY

The nearest railway station is "Daltonganj" at a distance of 55 km. The nearest airport is Birsa Munda Airport, Ranchi, Jharkhand at a distance of 177 km. Palamau is one of the twenty-four districts of Jharkhand state, India. It was formed in 1892. The administrative headquarter of the district is Daltonganj, situated on the Koel River. The district lies between 23°50' and 24°8'north latitude and between 83°55' and 84°30' east longitude. It is bordered on the north by Sone River & Bihar and on the east by the Chatra and Hazaribagh districts, on the south by Latehar District and on the west by Garhwa District.

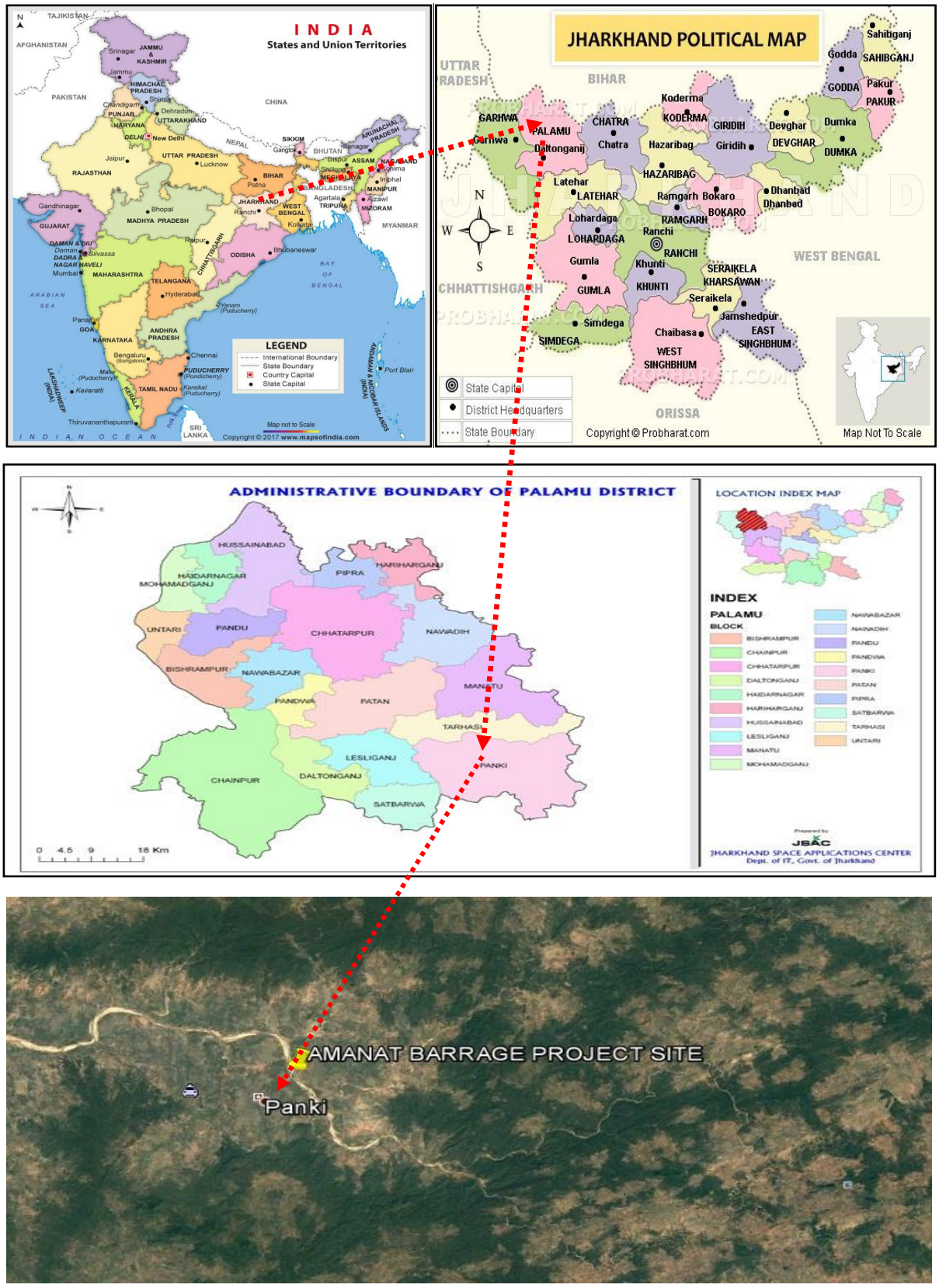


Figure 1-1: Location of the Project Site

2. PROJECT DESCRIPTION

The Amanat barrage project envisages construction of Barrage on Amanat River in Panki of the Palamau district of Jharkhand state. The proposed site is located about 55 Km from Daltonganj railway station. The location of proposed Barrage is at Latitude 24^0 03'6'' N and Longitude 84^0 29'45''E. It is proposed to provide irrigation facility to about 26990 Ha. of land in drought prone area of Palamau District. The area is chronically drought prone falls within the range of retreating southwest monsoon, hence the rainfalls is very scanty and capricious in distribution. The average annual rainfall of the area is 1244.22 mm of which major portion (86.5%) is received during months of June to September. The common crops that are grown are Paddy, Wheat, and Barley. Palamau district is drought prone and backward. Major occupation of the people is agriculture. The farmers entirely depend upon rain water for their agricultural operations. The rainfall is irregular and unseasonal on account of which the yields vary drastically. Hence, based on the above facts, there is a need of the scheme which could benefit more to above stated Drought Affected areas and would also improve the Irrigation potential and Socio-Economic conditions of the Palamau district.

The area under submergence would be 76.89 Ha. There are Four villages coming under submergence namely (1) Chandanpur, (2) Nuru and (3) Lukua (4) Karma. The Project has been proposed for irrigation & drinking water for Panki, Tarhasi, Patan and Manatu Villages of Palamau District. Gross Command Area (GCA) for this project is estimated as 30266 Hectare. Culturable Command Area (CCA) of this project estimated as 29660 Hectare.

The total length of barrage is 203.25 m long with 8 nos. of Spillway bays and 3 nos. of Under Sluice bays type gates. The length of head regulator is 21.75m with 3 number of span having length of each span is 5.25 m.

The Department of Science & Technology through National Committee on Environmental Planning and Coordination (NCPEC) had examined and cleared the project with some safeguards point vide letter U.C No. 3/1/78-HCT/ENV dated 24.1.1979 attached in Annexure I. Based on this EC Water Resource Department of Jharkhand has started the construction work. The barrage and gates is almost completed. 32 km of main canal has been completed and 10 km of main canal is incomplete due to lack of forest clearance (10 km of main canal passes through forest area) .The estimated time of project completion is 60 Months. The total cost of the project was estimated Rs. 34110.91 lakhs and their B.C. ratio is 2.66.

2.1 SALIENT FEATURES

Table 2-1 Salient Features of Amanat Barrage at Panki

GENERAL FEATURES	
Place	Panki
Location	Latitude 24°03’ 6”N ,Longitude 84°29’45”E

Catchment Area	1108.50 Sq km
Maximum Flood Discharge	4705.20 Cumec
Average Rainfall	1244.4 mm
G.C.A	30266 Ha
C.C.A	26990 Ha
BARRAGE	
Bearing Of the Barrage	53°30’
Length of the Barrage	203.25 M
No. of Spillway bays	8 Nos.
No. of Under Sluice bays	3 Nos.
Clear Opening	16 M
No. of Gates	11 Nos.
Pond Level	274.39 M Fringe Line
H.F.L.	275.30M
Slope of the River	1 in 538
Sill Level of Spillway bays	269.90 M
Sill Level of under Sluice bays	268.90 M
Top Of Guide Bandh	276.50 M
Top Of Deck Slab Level	276.50 M
Submergence Area	76.89 Ha
HEAD REGULATOR	
Length of the Head Regulator	21.75 m
No. of Span	3 Nos.
Length of Each Span	5.25 M
Sill Level	271.90 M
Width of Road	12.00 M
INLET REGULATOR	
Length of the Head Regulator	21.75 M
No. of Span	3 Nos.
Length of Each Span	5.25 M
CANAL PARTICULARS	
Discharge	51 Cumecs
Bed Level of the canal at the off take point	270.73 M
F.S.L. of the canal	274.08 M
Alignment Slope	1: 4000
Side Slope	1:5:1
Type of the canal	Lined
Bed Width	3.86 M
Length of the canal (1st Phase)	41.32 Km/ 136.55 R.D
Total	132.90 Km.

2.2 CANAL NETWORK

The canal network is proposed from Amanat Barrage Reservoir. The details of reservoirs and canal network are provided in **Table 2.2**

Table 2-2: Table Details of Reservoirs and Canals

Sl. No.	Name Of Distributary	Length(m)	Compound Area(Ha)
1	Tandwa Minor	27.20	565.60
2	Sonpurwa Minor	33.00	866.60
3	Bajalpur Minor	58.20	434.70
4	Majwgawan - Sub -Disty	64.20	2450.00
5	Bansanur Minor	71.00	77.10
6	Tarhassi - Sub- Disty	76.10	2128.70
7	Bishunpur Minor	83.70	1500.80
8	Delha Minor	88.00	1213.80
9	Ashohar Minor	92.00	77.10
10	Siki - Sub -Disty	108.40	11368.70
11	Barkurwa -Disty	121.20	6384.00
Total		**823.00**	**26990.00**

2.3 INDEX MAP

The canal network from reservoirs for Amanat Barrage project of command area 26990 Ha are shown the Index map. The alignment of canal network is finalised based on the analysis of alternatives duly considering techno-economic feasibility.

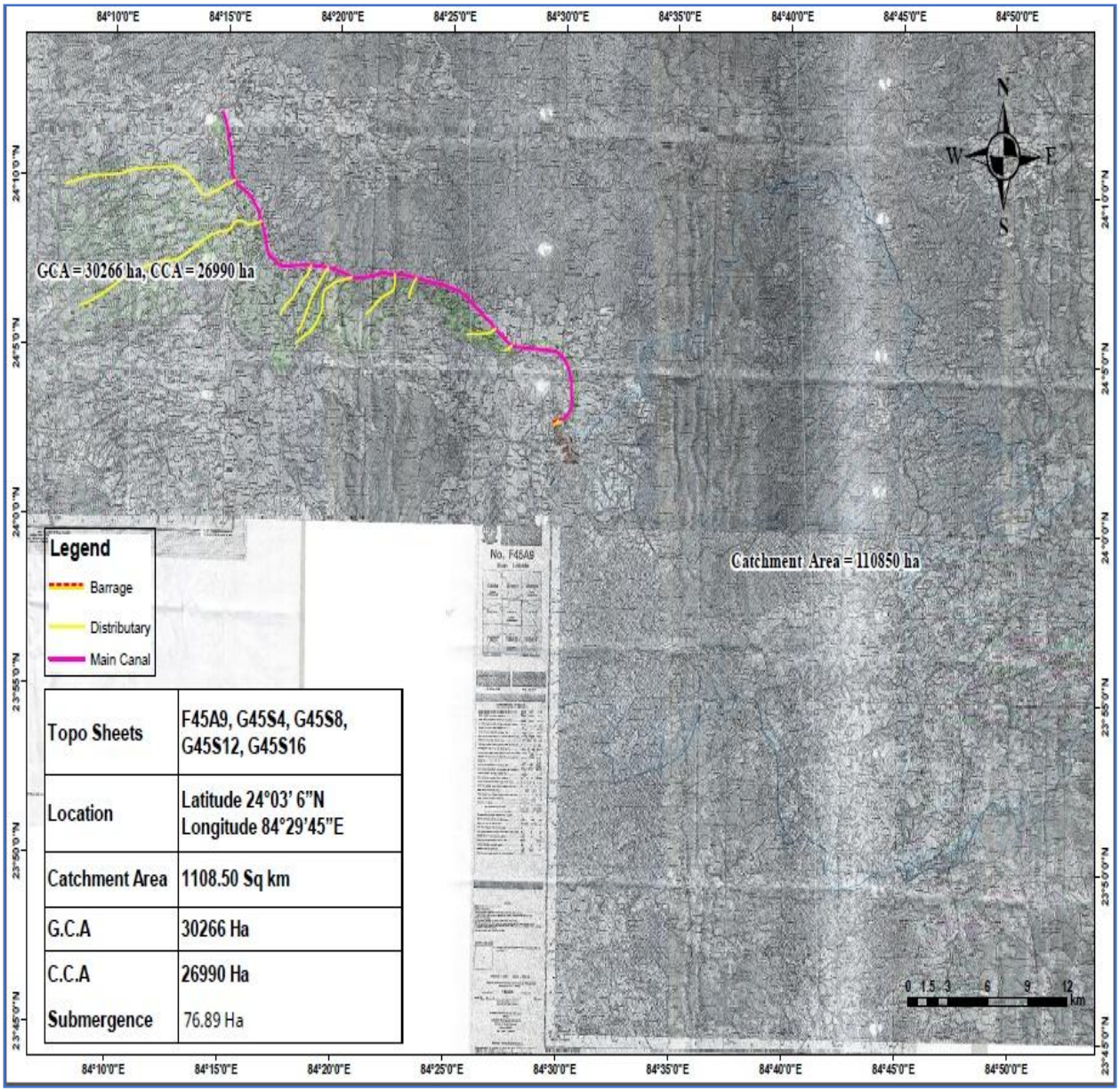


Figure 2-1: Amanat Barrage Project Index Map

2.4 LAND REQUIREMENT

The land required for canal network is 609.039 ha out of which the forest land is 127.85 Ha and non forest land is 481.189 Ha . Village wise breakup of land requirement is detailed in Table 2.3 The Land shall be acquired as per Right to Fair compensation and Transparency in Land Acquisition Rehabilitation and Resettlement acts of State and Central governments. The breakup is given in Table 2-3

Table 2-3-Land Acquisition Detail

Village wise breakup			
Sl. No.	**Village**	**Forest Land(Ha.)**	**Non-Forest Land (Ha.)**
1	Karma	0	7.972
2	Gargaon	0	5.722
3	Ambawar	0	6.884
4	Hama	0	9.745
5	Chandrapura	0	15.107
6	Kaiwhua	0	45.12
7	Nuru	0	12.95
8	Lukwa	0	16.317
9	Haldi	0	24.682
10	Haldi Minahi	0	16.949
11	Gongo	0	10.992
12	Kapurfhuta	0	3.092
13	khera	0	11.376
14	Binayka	0	1.161
15	Udaypura	0	16.932
16	Gulalpur	0	5.471
17	Selari	0	5.953
18	Bagla	0	5.54
19	Chatarpur	0	14.253
20	Tandwa	0	4.488
21	Pashar	0	3.335
22	Kasmar	0	3.634
23	Baliyari	0	2.881
24	Sonpura	0	1.473
25	Dhobdiha	0	2.501
26	Nawa	0	4.803
27	Kichdiya	0	5.399
28	Dundu	0	6.309
29	Sildiliya Khurd	6.51	0
30	Sildiliya Kala	2.39	3.693
31	Gorwatand	10.8	2.424
32	Manjhgawan	0	3.011
33	Bajalpur	8.22	8.1
34	Pancharukhiya	7.85	0
35	Lalgar	3.53	9.118
36	Dhuma	15.38	0
37	Sewati	5.91	11.441
38	Saraidih	6.87	4.342
39	Gogda	0	2.2
40	Tirondha	0	2.553

Village wise breakup			
Sl. No.	**Village**	**Forest Land(Ha.)**	**Non-Forest Land (Ha.)**
41	Chilhoi	3.85	3.267
42	Bhalugari	7.61	0
43	Tariyan	8.18	5.774
44	Sonpurwa	5.69	11.509
45	Kanaudi	8.54	0
46	Boradah	7.2	12.14
47	Jagodih	0	6.997
48	Angra	0	10.101
49	Kararkala	0.49	10.59
50	Chetma	12.9	15.107
51	Imlikhas	5.93	14.249
52	Panchkheriya	0	17.08
53	Sutha	0	2.347
54	Aaredan	0	5.791
55	Pandaypura	0	1.163
56	Hura/ Barseta	0	2.614
57	Kumhawa	0	2.088
58	Basdewa	0	0.757
59	Dharo	0	0.979
60	Mathfhurhi	0	0.319
61	Barhakuwa	0	0.546
62	Bendanikhurd	0	1.542
63	Tarhasi	0	1.153
64	Mahri	0	3.598
65	Arka	0	1.611
66	Nawadin	0	1.341
67	Misirpatra	0	2.4
68	Borkoma	0	1.291
69	Delha	0	0.125
70	Baghi	0	0.374
71	Nawadin 1	0	1.174
72	Bisunpura	0	1.93
73	Bhalogari	0	0.992
74	Mathpurhi	0	1.655
75	Teldiha	0	0.992
76	Haraiya	0	0.508
77	Kalapahad	0	0.417
78	Khamhi	0	1.448
79	Dandai	0	1.052
80	Sahdeva	0	0.741
81	Loinga	0	3.545
82	Angra 1	0	3.059

Village wise breakup			
Sl. No.	Village	Forest Land(Ha.)	Non-Forest Land (Ha.)
83	Rajhara	0	4.298
84	Dhangaon	0	0.393
85	Kamalkediya	0	1.983
86	Bharatpur	0	2.226
Total		127.85	481.189

2.5 RAW MATERIAL REQUIREMENT

The construction materials mainly including cement, sand, coarse aggregates, revetment stones, reinforcement steel and structural steel are required for water conductor system, Main canals, CM & CD structures and distributory network system. The construction material to the extent mentioned below will be procured from respective sources to the work sites.

Table 2-4: Detail of Material

Material	Quantity
Cement	77754.33 MT
Stone Metal	54996.21 cubic mtr
Stone Chips	129773.88 cubic mtr
Sand	155923.28 cubic mtr
Boulder	202775.17 cubic mtr

2.6 MANPOWER REQUIREMENT

As the course of the project is long involving different components in various locations, no centralized congregation or influx of people is expected. Locally available manpower shall be utilized in the nearest place of work.

6123 labour will get employment during construction work of project. Unskilled, Semi-Skilled & Skilled personnel will be deployed along the entire stretch of the project. The labours can be hired from the surrounding areas of the canal network ,if available, in order to avoid large scale congregation of outside labour.

At any point of time and place the number of people on the work site shall not be more than 300. The people will be spread over the entire stretch of the canal network area.

2.7 WATER REQUIREMENT

The total quantity of water required during construction period is 2796 KLD (2300 KLD for construction purpose and 496 KLD for domestic purpose). Water requirement during construction stage will be met from surface water.

2.8 ENERGY REQUIREMENT

Power requirement during construction phase is 200 KVA. Power to various lift points is to be availed from the JSEB authorities.

2.9 GENERATION OF SOLID AND LIQUID WASTE

The municipal solid waste generated during construction will be about 980 kg/day considering the entire project and it will be managed &handled in accordance with Solid Waste Management Rules, 2016.

During the project construction stage, 397 KLD of waste water will be generated from the labour colonies. The toilets in labour colonies will be provided with mobile STP. Labours will not be stationed in one place throughout the construction phase; therefore, it will be planned in a phase wise manner as per the demand.

2.10 GENERATION OF MUCK

A large quantity of muck is likely to be generated as the result of excavation of canals and construction of structures. The excavated soil and rubble will be utilized for revetment, embankment and aggregates for concrete and for filling of low lying areas and for greenbelt development. The generated muck shall be used for production of coarse aggregates and manufactured sand which can be used as fine aggregates in concrete work.

2.11 RESOURCE OPTIMIZATION/RECYCLING AND REUSE

Resource Optimization / recycling and reuse are envisaged in this project. The excavated muck comprising of soil, pebbles, rubbles and boulders obtained from the excavation of canal network and construction of tunnels and structures etc. will be utilized for revetment, embankment and aggregates for concrete if found suitable and filling of low lying areas and for green belt development. Mainly the manufactured sand produced from excavated muck shall be used for concrete works instead of natural sand.

2.12 FACILITIES AT PROJECT SITE

Proper site services such as First Aid, Canteen / Rest Shelter, Drinking Water will be provided to the construction workers. Various facilities to be provided during construction and operation of the project are as follows:

1. Electricity will be provided by transmission lines and standby DG sets.
2. Potable drinking water will be provided to the workers by tankers during construction.
3. To provide the first aid for any sort of injuries encountered during the operation, one first aid room will be provided. First aid kit and sufficient stock of material / medicines needed for first aid shall be provided as per requirement.
4. For women workers arrangement for a crèche will be made as per the requirement.
5. Necessary arrangement will be made for conducting refresher course as laid down in vocational training rules to upgrade skills of the persons involved in the project.
6. Construction workers engaged in areas of the project will be provided with LPG/Kerosene for cooking purpose to prevent possible tree felling for firewood.

2.13 CONSTRUCTION SCHEDULE

The canal network and structures such as super passages, aqueducts, drops, bridges etc. is planned to complete in 60 months from the date of signing agreement.

2.14 PROJECT COST ESTIMATE

The estimate project cost is 34110.91 lacs. Net expenditure has been incurred by WRD till date is **24728.12 lakhs,** the breakup is at below.

Sl. No.	Major Head Minor Head sub Head	Up to Date Expenditure up to 2015-2016
1	A- Preliminary	5262821
2	B- Land	70892078
3	C- Work	998977093
4	D- Regulator	555116
5	F- C.D. Work	748079722
6	G- Bridge	191274113
7	K- Building	8410692
8	L- Earth Work	246778785
9	M- Plantation	3541
10	O- Miscellaneous	16629638
11	P- Maintenance	12871769

Sl. No.	Major Head Minor Head sub Head	Up to Date Expenditure up to 2015-2016
12	Q- S.P.L. T & P	1861463
13	R- Communication	1753430
14	III- T &P	1220387
15	Suspence	168241679
Total Expenditure		**2472812327**
Deduct R,R.		**0**
Net Expenditure		**2472812327**

3. ANALYSIS OF ALTERNATIVES

The consideration of alternatives is one of the more proactive sides of project assessment enhancing the project design through examining options instead of only focusing on the more defensive task of reducing adverse impacts of a single design. This calls for the systematic comparison of feasible alternatives for the proposed project site, technology and operational alternatives. Two alternative site has been consider for this project, one is Auranga dam whose coordinate are $23^0$53’29.83”N and $84^0$14’27.42’’E and other is Amanat Barrage site whose coordinate are 24^0 03'6'' N and Longitude 84^0 29'45''E,both has been shown in Figure 3.1 . The alignment of canal network is finalised based on the analysis of alternatives duly considering techno-economic feasibility

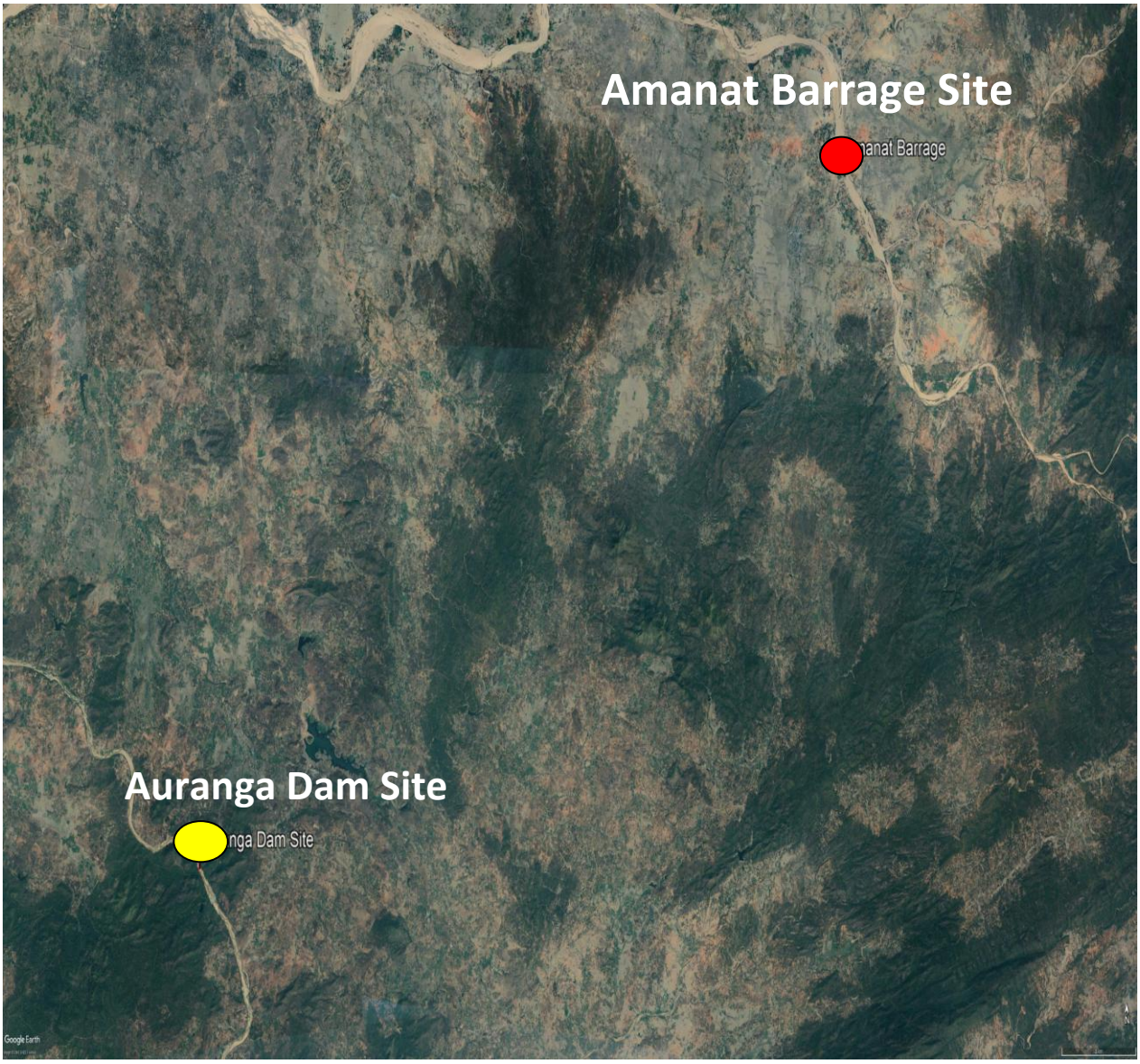


Figure 3-1: Alternative Ananlysis study for Amanat Barrage Project

4. ENVIRONMENTAL AND SOCIAL ASPECTS

4.1 PHYSICAL FEATURE

The average elevation of Palamau district is about 222.0 MT above the mean sea level. The hills in the district are widely scattered. There are also low land in Northern and Western part of the district which is suitable for agricultural purposes. The district lies between 23.20^0 and 24.40^0 north latitude and 83.22^0 and 85.00^0 east longitude. Palamau district is surrounded by the districts of Rohtas and Aurangabad of the state of Bihar in the north, by the districts of Gumla and Lohardaga in the south; Garhwa district and parts of Chhattisgarh state in the west and districts of Chatra and Ranchi of the Jharkhand State and Gaya district of the Bihar state in the east. The district comprises three natural divisions. East neuile pargana of Palamau and Tori having characteristics of Chhotanagpur plateau. Belawarja pargana (long strip of broken hills) extends from Mirjapur dist. of U.P. on west to Koel on east. Japla lying on the bank of river sone.

The district comprises 3 categories of hills

1.Crystalline and metamorphic rocks-Rise up to attitude of 3,000 feet.
2.Sandstones-Constitutes the long range of Koel of from 200 to 300 feet to some as 900 feet.
3.Crystalline Rocks-Comprise the parts of plateau on the south. Important hills Kotam south of Garu police station and Kumandih.
Source- http://www.censusindia.gov.in/2011census/dchb/2013_PART_B_DCHB_PALAMU.pdf

4.2 TOPOGRAPHY

In Palamau district, hills are wildly scattered in south but the north is plain. The general slope of the district is from south & north. Geologically the hill area are made of metamorphic rocks with sandstone ,conglomerates and lava capping having thick mantle of laterite at some places. Alluvium is found in lower parts. The topography of Palamau district is characterized by highly rugged landscape with green forest all over the area, The elevation of the hill ranges in southern part of the district varies from 360- 1110 m above msl. The master slope of the area in general tends towards north and east.

Source- http://www.censusindia.gov.in/2011census/dchb/2013_PART_B_DCHB_PALAMU.pdf

4.3 CLIMATIC CONDITION

The climate of this district is on the whole dry and bracing. The year can be divided in to three main seasons, the winter season from November to February, the summer season is from March to May and Monsoon season from June to September; October is a transitional month

between Monsoon and Winter seasons. From the onset of the Monsoon by the middle of June, rainfall rapidly increases reaching its peak in August. The annual variation of rainfall is not much. December and January are the coolest months. By March temperature begin to rise steadily. In May and early part of June the maximum temperature can be as high as 47^0C on individual days. Humidity is generally normal in this district, except in Monsoon months.

Source- http://www.censusindia.gov.in/2011census/dchb/2013_PART_B_DCHB_PALAMU.pdf

Table 4-1: Meteorological data of Daltonganj IMD station for last 20 years

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Record high °C (°F)	33.6 (92.5)	36.1 (97)	40.6 (105.1)	43.5 (110.3)	47.6 (117.7)	45.9 (114.6)	42.1 (107.8)	40.0 (104)	39.5 (103.1)	39.8 (103.6)	36.3 (97.3)	31.3 (88.3)	47.6 (117.7)
Average high °C (°F)	24.7 (76.5)	27.2 (81)	33.5 (92.3)	38.8 (101.8)	40.9 (105.6)	38.5 (101.3)	33.2 (91.8)	32.5 (90.5)	32.7 (90.9)	32.1 (89.8)	29.2 (84.6)	25.5 (77.9)	32.4 (90.33)
Daily mean °C (°F)	16.7 (62.1)	19.4 (66.9)	24.6 (76.3)	30.2 (86.4)	33.1 (91.6)	32.7 (90.9)	29.2 (84.6)	28.8 (83.8)	28.4 (83.1)	26.1 (79)	21.8 (71.2)	17.4 (63.3)	25.7 (78.27)
Average low °C (°F)	8.7 (47.7)	11.6 (52.9)	15.7 (60.3)	21.5 (70.7)	25.3 (77.5)	26.8 (80.2)	25.2 (77.4)	24.9 (76.8)	24.0 (75.2)	20.1 (68.2)	14.3 (57.7)	9.4 (48.9)	18.96 (66.13)
Record low °C (°F)	2.2 (36)	1.3 (34.3)	7.7 (45.9)	14.4 (57.9)	18.2 (64.8)	19.9 (67.8)	21.1 (70)	21.7 (71.1)	18.2 (64.8)	13.0 (55.4)	6.8 (44.2)	1.8 (35.2)	1.3 (34.3)
Precipitation mm (inches)	12 (0.47)	29 (1.14)	14 (0.55)	20 (0.79)	34 (1.34)	158 (6.22)	356 (14.02)	290 (11.42)	206 (8.11)	66 (2.6)	9 (0.35)	11 (0.43)	1,205 (47.44)
Avg. rainy days	1.9	2.9	1.8	1.7	3.6	8.3	18.7	17.1	12.8	4.4	0.8	1.2	75.2
% Humidity	65	56	44	37	39	58	78	80	77	69	67	67	61.4

4.4 MINES AND MINERALS

The district is rich in mines minerals. Limestone is found at many places in the district. Coal and Bauxite deposits are found in the hills of the district. Deposits of Iron in the form of Magnetite are also found.

4.5 LAND USE PATTERN

Palamau lies partially under the rain shadow area and often haunted by drought. Although yearly average rainfall is sufficient for agriculture work but unequal distribution of seasonal rain affects the main crops badly. During summer season water level of the district goes down and large number of villages have to face scarcity of water. Due to drought number of agricultural labour migrates every year to nearby district of other state for employment and livelihood. Recently due to development work of the Govt. and minor & major irrigational work, agricultural work has developed to a large extent. Rice is the main staple food of the district and it is chiefly grown. Maize and wheat are other notable crops. Sugarcane, Oilseeds, Pulses and

vegetables are also grown in the district. Seed collection of Sal, Mahua, Semal and other forest produce like Lac, Kendu leaves, etc is a source of livelihood for many persons in the district.

4.6 SEISMICITY AND EARTHQUAKE

As per Bureau of Indian standards [IS-1893- part -1: 2002], the study area falls under seismic zone III. However, there is no record of earthquake reported in the region.

4.7 GEOLOGY

The geological formation of the Palamau district comprise mainly rocks of Archaean, Vindhyan and Gondwana ages, the last cut by dykes of Decan trap age. The Archaean rocks include both schists of Dharwar age and gneisses and granites. The schists, mainly horn-blendic and biotitic, are the oldest rocks of the area and occur as parallel and lenticular bands in the peisses. The schists ase intruded by epidiorites, amphibolites, and gneisses.Garnetiferoussillimanite-graphite-schists similar to the Khondalites, also occur near Daitonganj .Smaller patches of these rock are found in the manner of inclusions in the most prevalent and the biotite ad silihmaniteschists are rare. Calc-silicate rocks and crystalline lime stones of Dhanwar age are largely developed in certain areas. Geologically of the district is yet unexplored except the areas around Daltonganj, the coal fields and other economic deposits such as those of graphite, dolomite ,iron ore bauxite ,limestone and clays etc

Source- http://www.censusindia.gov.in/2011census/dchb/2013_PART_B_DCHB_PALAMU.pdf

4.8 DRAINAGE

The drainage of the district is mainly controlled by the river North Koel and its tributaries viz Auranga and Amnanat. The Koel, Auranga and Amanat have the upper reaches characteristic by high bank and rocky beds while the lower reaches by sandy beds The general line of drain is from south to north towards river Son.

The Amanat originates on the Hazaribagh plateau, and then forms the southern boundary of Lawalong Wildlife Sanctuary, in simaria police station area of Chatra district. Thereafter, it flows almost due west through palamau district till it joins the North Koel River 8km north of daltonganj. It flows through a rich, well cultivated valley and is the principal drainage channelof the east of the Palamau district

Source- http://www.censusindia.gov.in/2011census/dchb/2013_PART_B_DCHB_PALAMU.pdf

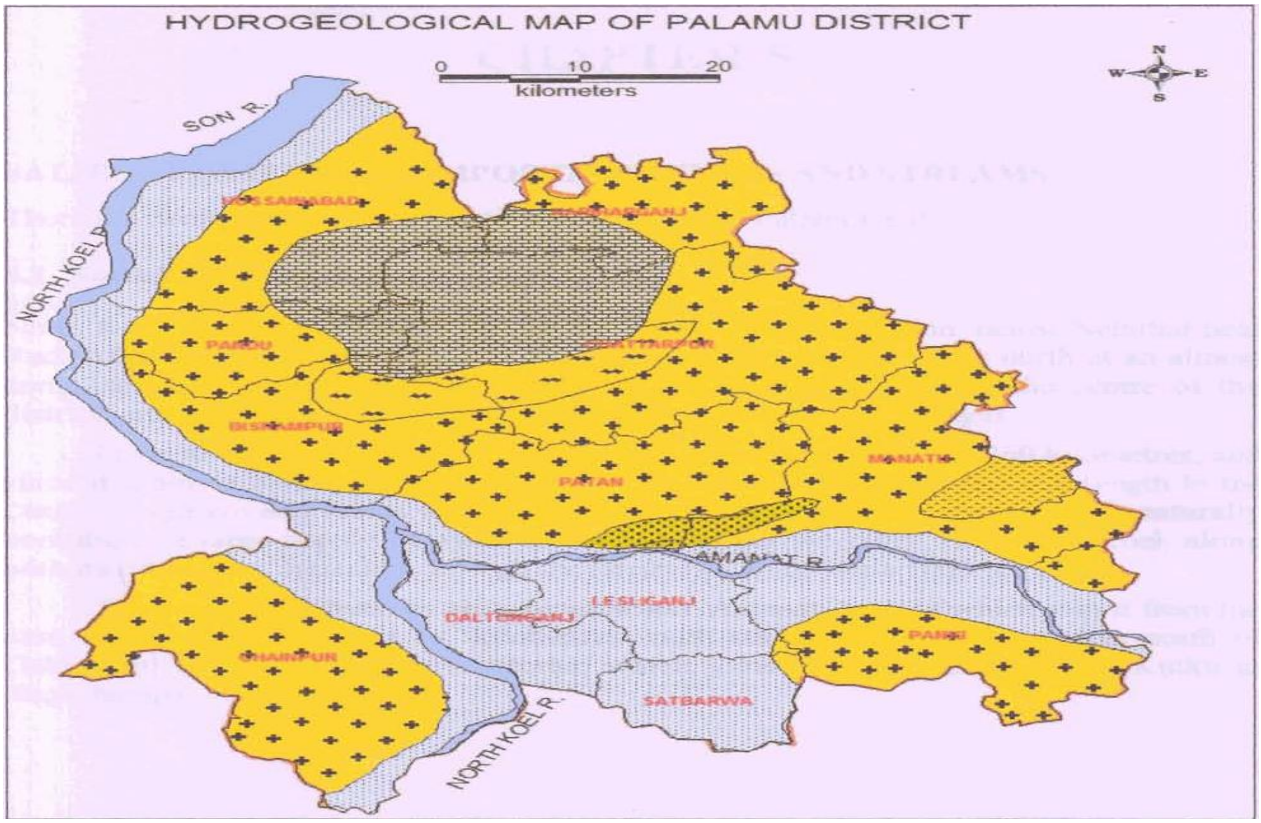
4.9 RIVER SYSTEM

The river Koel and its tributaries the Auranga and Amanat are the principal rivers in the district. The river bed of Koel is rocky for small lenth from the north of its meeting with Auranga after which it is sandy. In summer it is generally dry. The river Auranga originates near sohida and

flows in north west direction. After that it joins the river Koizi. The river Amanat rises in Hazaribagh and flows in western direction to join Koel.

4.10 HYDROGEOLOGY

The district is covered by three major geological formations viz, the Precambrian crystallines, the vindhyans and the gondwanas. Besides, the tertiary laterite , alluvium also cover part of the district .The alluvium cover of considerable thickness occurs in the northern part of the district along the son and north koel rivers. Ground water occurs mostly under phreatic condition in all the lithological units and locally under semi confined and confined condition



LITHOLOGY	AGE GROUP	HYDROGEOLOGICAL CONDITION	SYMBOL	GROUNDWATER POTENTIAL
Recent alluvium overlying weathered granite gneiss	Quaternary	Alteration of Sand, Silt & Clay. Ground water under unconfined conditions.		Moderate with a discharge of 10 - 15 LPS
Sandstone, Shale, Coal seams, Boulder beds	Gondvana Supper Group	Groundwater restricted to Weathered Zone Occurs under Semi - Consolidated conditions		Moderate with a discharge of 5 - 10 LPS
Limestone	Vindhyan Supper Group	Groundwater under semi Confined conditions within fractured joints and cavities		Moderate to High with a dischage of 10 - 15 LPS
Pegmatites, Dolomites	Archeians	Groundwater within Fractures zones and Weathered Residium		Poor to Moderate with a discharge of 5 LPS
Chhotanagpur granite gneiss complex	Archeians	Groundwater within Weathered mantle and within secondary porosity zone of the consolidated part.		Moderate to High with a dischage of 10 - 15 LPS
Older Metamorphies - Mica Schist Hornblends Schist, Graphite Schist	Archeians	Groundwater restricted to Weathered Unconsolidated Zone.		Poor to Moderate with a discharge of 5 LPS

Figure 4-1: Hydrological map of Palamau district

4.11 PROCESS OF DEPOSITION OF SAND/SEDIMENTS IN THE RIVERS OF THE DISTRICT

There are some important factors which are responsible for the process of sedimentation in the river basin. There are the stage of river development(the infant,youth ,mature or old stage), lithology and structures of the upstream region or provenance from where sediments eroded/migrated/travelled, geomorphology and gradient of provenance ,anthropogenic activities such as mining, industrialization mega engineering projects such as Dam also affects the process of sedimentation and the thickness of the sequence is determined by the depth of the stream channel during flood stage and is related to the size of river itself. The deposition in e river bed is more pronounced during rainy season although the quantum of deposition varies from stream to stream depending upon numbers of factors such as catchment area, lithology of the area, discharge, river profile and geomorphology of the river course. The annual deposition of sediments is almost even to two to three meters. It is noticed that during rainy season whole of the pits so excavated is completely filled up by the sand.

4.12 FLORA AND FAUNA

In Palamau district forests are abundantly found. Forests are the source of revenue and meet peoples demand for timber, firewood, fodder, etc. Many of the villages of this district lies in thick forest areas. The main forest products consist of the following species:- Sal Buchnania, Acacia, Adina, Cocholopermum, Cedrela, Batea, Somecarpus, Terminalia, 10 Soynida, Bosenocellia and Bassia. The extensive forest is abode of so many types of wild animals. In the thick forests wild animals like Leopard, Hyena, Jackal, Fox, Deer, Boar, Rabbit, Monkey and Beer are found. Elephants are sometimes seen in the hills of Garu.

Source- http://www.censusindia.gov.in/2011census/dchb/2013_PART_B_DCHB_PALAMU.pdf

4.13 DEMOGRAPHIC PROFILE

In 2011, Palamau had population of 1,939,869 of which male and female were 1,006,302 and 933,567 respectively. This gives it a ranking of 243rd in India (out of a total of 640). The district has a population density of 381 inhabitants per square kilometre (990/sq mi). Its population growth rate over the decade 2001-2011 was 25.94%. Palamau has a sex ratio of 929 females for every 1000 males, and a literacy rate of 65.5%.

Source- http://www.censusindia.gov.in/2011census/dchb/2013_PART_B_DCHB_PALAMU.pdf

4.14 ADMINISTRATIVE SET UP

The district of Palamau lies in the north-west part of the state of Jharkhand. It contains 3 subdivisions, viz., Daltonganj, Hussainabad and Chhatarpur and three statutory towns i.e. Hussainabad (NP), Bishrampur (NP) and Medininagar (Daltonganj) (Nagar Parishad) and there are six census towns are Satgawan alias Hariharganj, Sundna, Baratola, Rerma, Chainpur, and Shahpur. There are 20 Development C.D. Blocks and 1870 villages in the district. Palamau is spreading over an area of 5246.8sq.km lies between North latitude 23^0 20' to $24^0$40' and East longitudes $83^0$22' to 85^0 00' with it's headquarter at Daltonganj.

Source- http://www.censusindia.gov.in/2011census/dchb/2013_PART_B_DCHB_PALAMU.pdf

4.15 INDUSTRIALIZATION

As the district is rich in minerals, so commercial exploitation of minerals are done here. The important minerals being commercially exploited are Limestone and Bauxite. Though this district is rich in minerals, it is devoid of any heavy industry . There is a cement factory at Japala. There exists only tiny and cottage industries like Bidi making and Lacer ware. For preparation and sale of stone chips there are numerous small units spread all over the district. There is one caustic soda factory at Rehla in the district. There is no agriculture based industry in public or private sector in the district, though it is true that more than 80% of the population depend on agriculture.

4.16 COMMUNICATION

Road communication of this district is not at par with the other districts of the state. There is no National Highways in this district. Following are the important Roads in the district:-

1. Daltonganj – Ranchi – Road- The road runs from Daltonganj through Latehar and Chandwa to Ranchi covering 155 kms.

2. Daltonganj –Aurangabad- road- This road runs through Chhaterpur and Harihergani and covers to 70 kms. Grand tank road is only 25 kms. Away from within the district.

3. Chandwa – Balumath- Chatra – road- this road runs through Balumath for 36 km in the district and joins Dhovi on the G.T.road.

4. Rehla-Godarmana-Road- This road passes Garhwa and Ranka and extend up to 57 kms in the district up to Madhya Pradesh border

4.17 TRADE AND COMMERCE

The topographical position of Palamau in the State of Jharkhand has a special significance. Besides, being a border district of the State it adjoins some districts in the States of Bihar and Chhatisgarh. With the improvement in the communication system the trade and commerce of

Palamau district has expanded considerably. Coal, Cement, Lac, Timber, Bamboo, Ghee, Bone hides and Kendu leaf are the major items exported from the district whereas Rice, Gram, Wheat, Arhar, Yarn, Salt, Clothes, Tobacoo, Medicines, Spices, Sugar and Kerosene oil are extensively imported in the district.

Source- http://www.censusindia.gov.in/2011census/dchb/2013_PART_B_DCHB_PALAMU.pdf

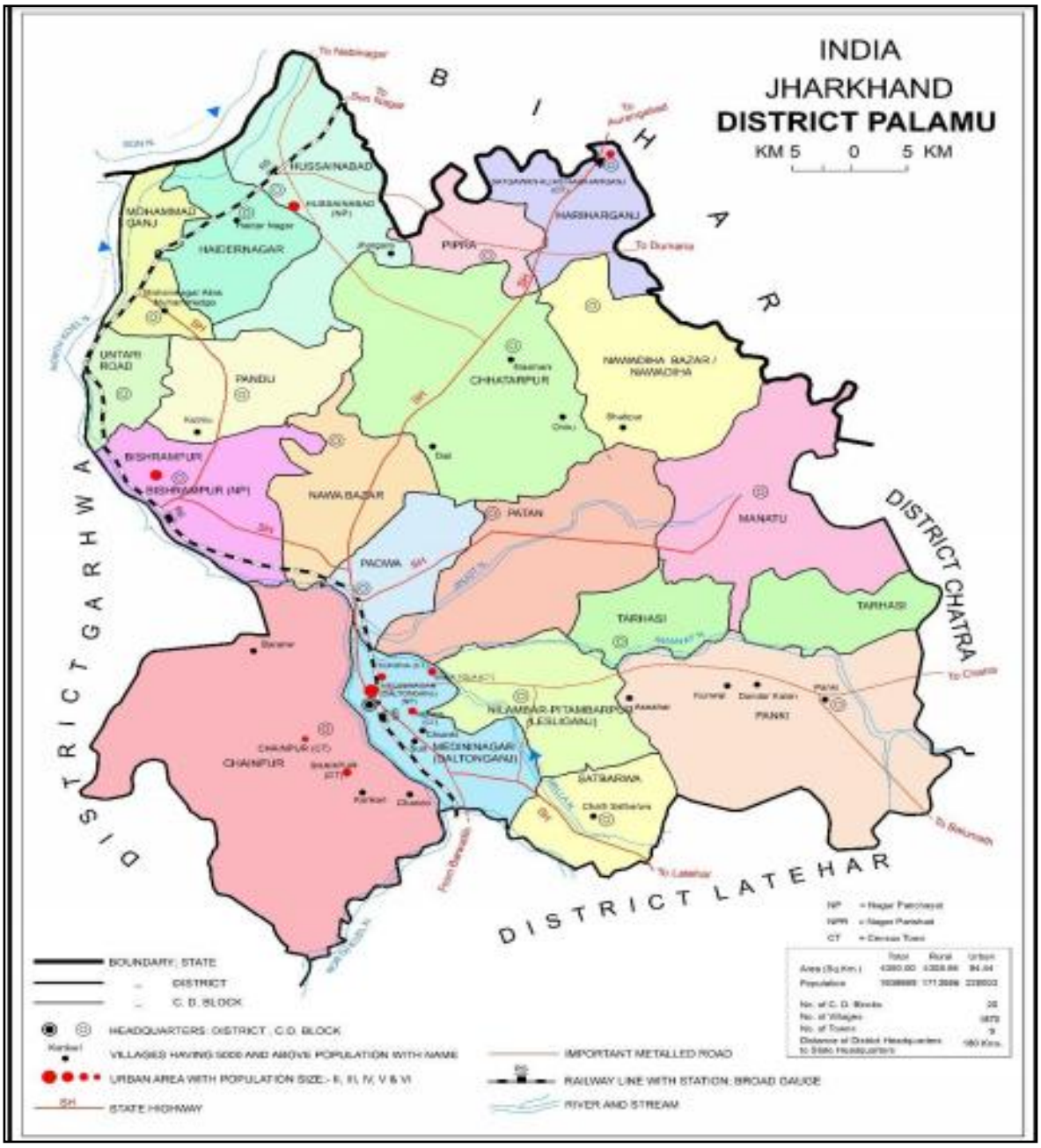


Figure 4-2-District Map of Palamau district

5. PROJECT BENEFITS

Apart from irrigation, other benefits are also envisaged as follows:

- **Indigenous Production**

The project leads to enhancement of indigenous food grain production.

- **Export Possibility**

This project may ultimately lead to export of excess food grains.

- **Domestic / Export Markets**

The project produce will have favourable impact on domestic and export markets.

- **Employment Generation**

The implementation of Irrigation scheme will create employment opportunities in the project area. The employment is associated with improved farming practices as well as the construction of the irrigation scheme. There will be no permanent employment but more than 6123 labour will get employment during construction work in the project. The area is drought prone and hence this will improve the financial position of farmers and labourers as well it will add in stabilization of national economy

- **Industrial development**

Establishment of agro and ancillary industries are also envisaged, which would give rise to employment to the local people.

- **Additional infrastructure**

Proposed Project does not involve any additional infrastructure for Industrial area, residential area, green belt, social infrastructure etc. Project involves only infrastructure which are required for irrigated agriculture and R&R of PAFs.

6. ANALYSIS OF PROPOSAL

The canal network is proposed to irrigate the through gravity, then downstream areas of about 26990 Ha of Palamau districts.

The importance of irrigation is to increase agricultural output and employment. The proposed project is expected to provide employment in different activities such as construction, transportation and plantation activities during construction phase and subsequently in agro - and other industries. There will be no permanent employment but more than 6123 labour will get employment during construction work in the project. The area is drought prone and hence this will improve the financial position of farmers and labourers as well it will add in stabilization of national economy. The people will be spread over the entire canal network area. The cost of the project is Rs. 34110.91 lakhs.

Benefits without and with project has been calculated and detailed in **Table 6.1**. The Benefit - Cost Ratio works out to be 2.66 and detailed calculation has been provided in **Table 6.2**.

Table 6-1: Parameters for Evaluation of Benefit

Nature of Proposal			
SL. No.	**Parameters**	**Medium & major irrigation, hydro electric, large mining & other misc. Projects.**	**Benefit in monetary terms**
1	Increase in productivity attributable to the specifit project	Net post project. Benefit as per i- Rs. 5168.59 lacs Net post project. Benefit as per ii- (-) Rs.174.708 lacs Total benefit in one year Rs. 4993.882 lacs Project is Designed for fifty years Benefit taken for twenty years only =20*4993.882 = Rs. 99877.64 lacs	Rs. 99877.64 lacs
2	Benefits to economy		Nil
3	No. of population benefited	Around one lacs residing in the ares and nearby village get benefitted by the canal	Nil

Nature of Proposal			
SL. No.	**Parameters**	**Medium & major irrigation, hydro electric, large mining & other misc. Projects.**	**Benefit in monetary terms**
4	Employment potential	Direct employment of local labours From this project @ 15% of the project cost i.e 341110.91*0.15	Rs. 5116.64 lacs
5	Cost of acquisition of facillty on non- forest land wherever feasible	NA	Nil
6	Loss of (a) Agriculture & (b) Animal husbandry production due to diversion of forest land	There is no animal husbandry activity.	Nil
7	Cost of rehabilitating the displaced persons as different from compensatory amounts given for displacement.	There is no displacement in the proposed area.	Nil
8	Cost of supply of free Fuel- wood to workers residing in or near forest area during the period of construction.	worker are fully paid in cash there will be no facility of free supply of fuel wood to the workers during the construction period	Nil

Total direct and indirect benefit from the project is = 99877.64 lacs +5116.64 lacs

=104994.28 lacs

Balance benefit cost ratio = Total benefit from the project / Total cost of the project

$$= \frac{104994.28 \text{ lacs}}{39350.92 \text{ lacs}} = 2.66$$

As the B.C. ratio is more than 1.00 the project is justified.

Table 6-2: Parameters for Evaluation of Loss of Forest

SL. No.	Parameters	Medium & major irrigation, hydro electric, large mining & other misc. Projects.	Losses of forest in monetary terms
1	Loss of value of timber, fuel wood and minor forest produce on an annual basic, including loss of man-hours per annum of people who derived livelihood and wages from the harvest of these commoditities.	There is no population in the proposed portion of canal and nearby village who are deriving their livelihood wages from the forest	Nil
2	Loss of anomal husbandry productivity, including loss of fudder	As the forest is the nature of open forest. There are no animal husbandry taking place in the purposed area. I here is no loss of animal husbandry productivity and fodder.	Nil
3	Cost of human resettlement	There are no settlement in the proposed portion of the canal	Nil
4	Loss of public facilities and administrative infrastructure (Road , Building , Schools, dispensaries, electric lines, etc.)	There is no Building , School, dispensaries, electric line, the proposed portion of canal.	Nil
5	Environmental losses: (soil erosion , effect, on hydrological cycle, wildlife habitat, microclimate upsetting ecological balance	Densit of vegetation =0.3 Cost of 0.3 density forest for 127.85 ha. @ Rs. 38.022 lacs = Rs. 4861.1127 lacs	Rs. 4861.11 lacs
6	Suffering to oustees	There is no settlement in the proposed portion , so there is no suffering oustees.	Nil

Total loss of forest in monetary terms :-Rs. 4861.11 lacs

Cost of project :-Rs 34110.91 lacs

Land Development @ Rs. 7012/ Hac.

On 20% of C.C.A =7012*0.20*26990= Rs. 378.50 lacs

Rs. 39350.92 lacs.

Annexure I

ANNEXURE-II

APPENDE 2.4.10.5.2

ANEXURE

Department of Science & Technology.

NATIONAL COMMITTEE OF ENVIRONMENTAL PLANNING

The project has been examined to the NCPEC on the basis of details available as well as the report of the expert Team that visited the project site the Environmental Approval Committee has cleared this project provided that the following safeguards are effectively implemented :-

All project activities like establishment of colony, sites, labour camp. approach roads to the dam site borrow pits should be confined to the right bank of the Auranga river i.e. In the area between Daltonganj Ranchi Road and the Auranga river. The left bank of the river adjoining the Tiger Project area should not be disturbed. Use of any of the existing roads of the sand should not be permitted for construction operation It is clear that these safeguards. Where discussed be the expert team bearing the visit and are acceptable to the project authorities.

1- No. Human settlements should be allowed to remain on left bank of Auranga Dam. This would ensure that the buffer zone adjoing the lake would provide free access to the water for wild life.

2- The impact of submergence caused by Auranga Dam has been considered along with the submergence to be caused by Kutku dam.

3- North Koel River for which infrastructure development has already been completed. Kutku Dam will submerge a large chunk of forest in the core as well as buffer area of Project Tiger. This desirable there fore, that water impoundment of the Kutku dam and the forest periphery should be included in the Palamau National Park.

21-7-08

4- No reserve forest area should be rehabilisation should be released for rehabilisation and other purposes in view of the loss of forest due to submergencs Intensive social forestry should also be under taken to off-set the loss of forests in submergencs

5- Compensatory a forestation should be undertaken by the forest department to off-set the loss of forest by submergencs At least 2000 acres of irrigated plantation should be raised in the command area and alone channel Banks for which adequate water should be provided by the irrigation department.

6- A census of wild life should be under taken by state forest hole frequented by a large number of animals. A small contour channel about 2 m. wide and 2 m. deep. from the reservoir area. This channel would feed & series of permanent small tanks with certain bunds within the National Park which son be directed by the forest department. This would ensure perennial water supply and would contain the same with the area It may also help the growth of evergreen species and render the forest less deciduous in summer. The submersion contours should be clearly démarcated & the vegetation on two or three sand island in the reservoir above the FRL. should at the cleared so that they may be developed as brieds sanctities.

7- The health hazards like incidence of Malaria have not been considered Adequate provision should there fore be made for anti-malaria measures.

8- Fuel depots should be set up by the forest department provide fuel wood free of cost. to the labour force, so that indiscriminate feling of trees may be prevented Adequate provision in the project estimates should be made to meet this cost.

9- Anti - poaching measures should be strictly enforces by the project cost, for effective enforcement of these measures.

26/7/08

कार्यपालक अभियन्ता
सोनभद्र सिंचाई प्रमण्डल
रॉबर्ट्सगंज, सोनभद्र

10- A monitoring group should be by the State Govt in consultation with the NCEPC so that the suggested safeguards are implement effectively and follow of action taken as envier necessary

11- It is also suggested that participation of project tiger authorities in the monitory group should be insured

These safeguards are in addition to these suggested by the Project Tiger Authorities

Sd/-

(Dr. S. Maudgal) 21.1.10

Member Seretary, Environment

Appraisal Committee

Department of Agriculture (Sri S.P. Srivastava, I.G.F.)

Krisi Bhawan, Dr. Rajendra Pd. Road, New Delhi.

Department of Science and Technology U.C. No. 3/1/78-HCT/ENV.

Dt. 24.1.1979