



Torpa Small Hydro Power Project

Preliminary Feasibility Report



1.0 INTRODUCTION

1.1 General

The state of Jharkhand almost comprises hilly terrain mostly of Chhotanagpur plateau and 30% of total area (79,714 sq km) is covered with forest. The normal annual rainfall is 1400 mm. These geographical factors provide a number of Small Hydro Power (SHP) potential sites at rapids and waterfalls in the streams and rivers of Jharkhand.

About 80% of villages in the Jharkhand are yet to see electrical power. It is prudential to harness the SHP potential sites for the electrification of its nearby villages.

In view of above, Jharkhand Renewable Energy Development Agency (JREDA) has entrusted MECON LIMITED for preparation of Preliminary Feasibility Report (PFR) for development of Small Hydro Power (SHP) at 22 sites in Jharkhand.

Torpa SHP site is one of 22 SHP sites, located in the south-western part of Jharkhand. It is situated in the Block Torpa of District Ranchi. The Torpa SHP is proposed to utilize Peruaghagh fall in Karo river.

1.2 Benefits of Small Hydro Power

Harnessed energy has become a symbol of growth and instrument for development. Electric power particularly the small hydro power is a renewable, economically attractive, environment friendly, non-polluting and environmentally benign source of energy. Moreover, the Small Hydro Power is submergence free and has short gestation period. These benefits of SHP have now been sufficiently recognised. The need of the project comes from the benefits of SHP and utilization of resources.



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1.3 Aim of report

Development of small hydro projects requires many stages of technical and financial study to determine if a site is technically and economically feasible. The viability of project is very site specific.

PFR is the first stage of work based on which Detailed Survey and Investigation (DSI) is recommended.

The aim of the report is to examine the adequacy for proceeding to the next stage of work; Detailed Survey & Investigation.

1.4 Scope of report

PFR covers the following activities.

- a) Topo sheet study for tentative planning of general layout of project, delineation of drainage area, and for obtaining idea on the access to site.
- b) Site visit for identification of location of the site, preliminary layout of SHP, preliminary assessment of head, duration of water availability in the stream and electrification status of nearby villages.
- c) To examine the adequacy for proceeding to the next stage of development.

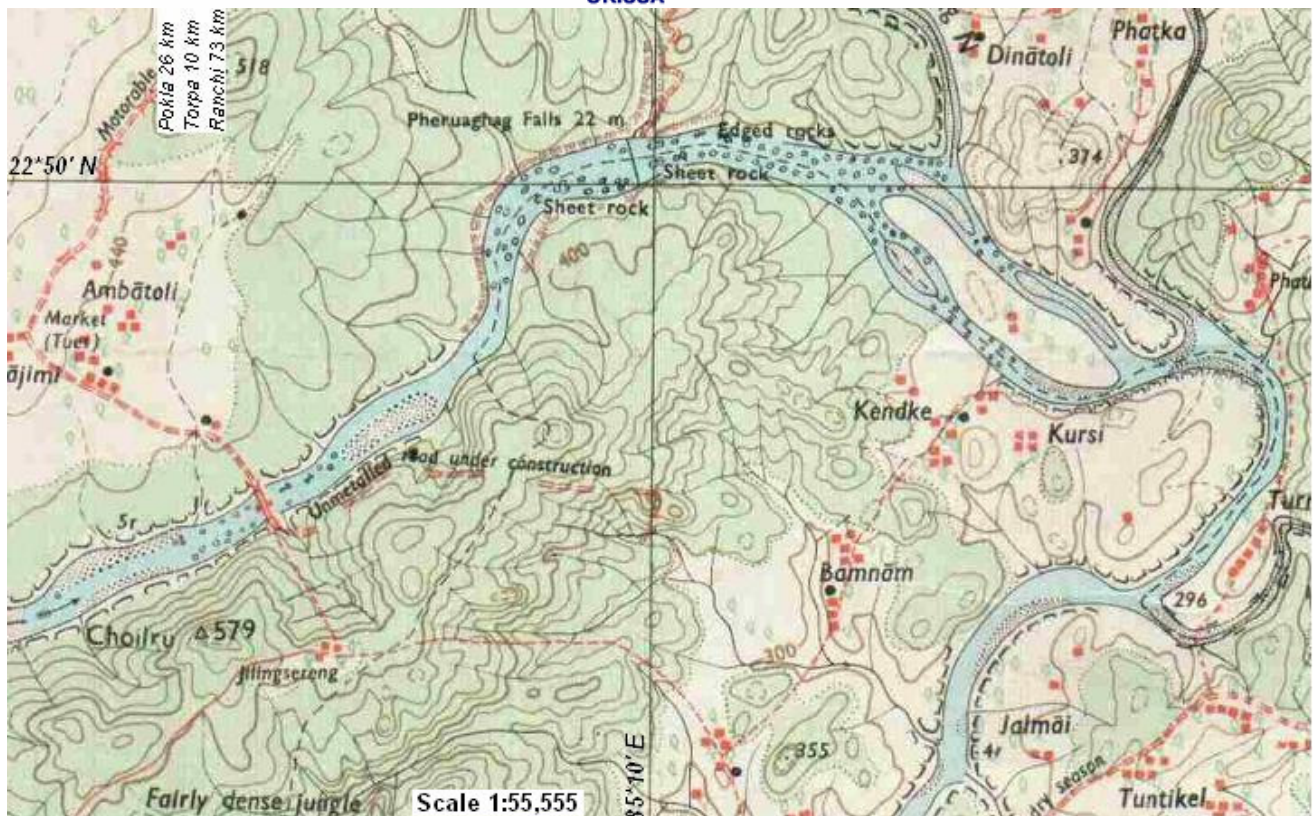


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2.0 INDEX MAP





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3.0 GENERAL INFORMATION

3.1 Location of site

The location of the site is shown in the Index Map. The details of location are as follows.

- a) Village (at power house): Bamnam
- b) Block: Torpa
- c) District: Ranchi
- d) State: Jharkhand
- e) Topo sheet No.: 73 F/1
- f) Latitude: 22°15' N
- g) Longitude: 85°10' E

3.2 Access to site

The access to Torpa SHP site from Ranchi is as follows.

| Approach | | Type of road | Distance (approx) |
|------------------------|------------------------|----------------|-------------------|
| Ranchi | Khunti | State Highway | 35 km |
| Khunti | Torpa | State Highway | 28 km |
| Torpa | Topkara | Metalled road | 6 km |
| Topkara | Lohajimi | Motorable road | 8 km |
| Lohajimi | Bridge over Karo river | Motorable road | 1.5 km |
| Bridge over Karo river | Diversion weir site | No road | 1.5 km |
| Bridge over Karo river | Power house site | Hilly footpath | 4.5 km |

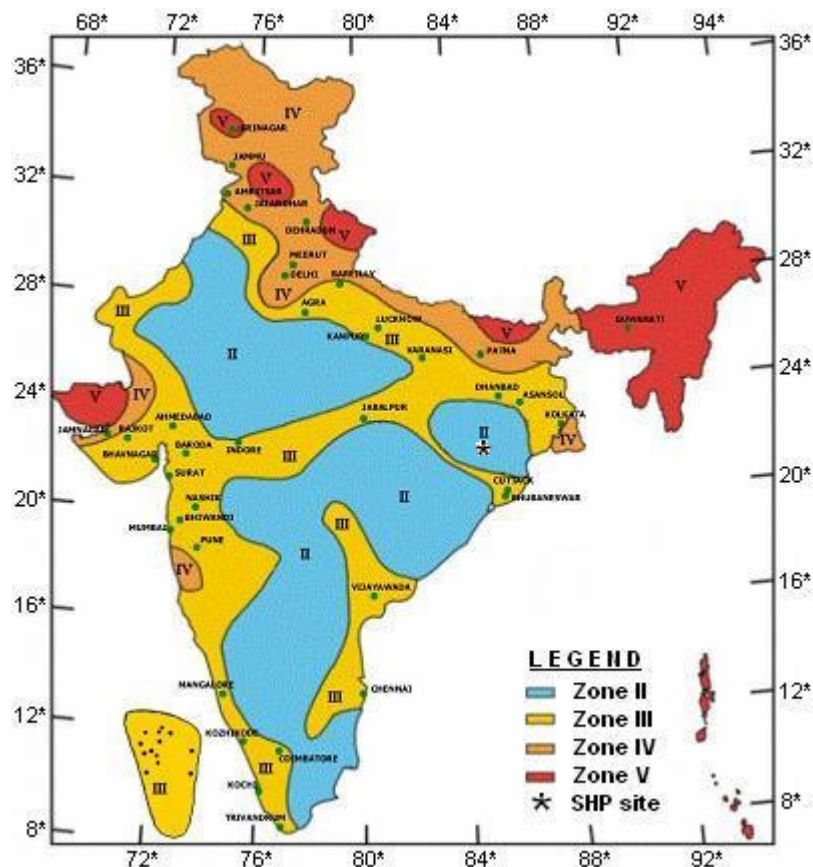
The nearest railway station is at Pokla, which is about 26 km (with about 6 km of Jeepable kutchra road) away from Torpa town. However, the approach to the project site is convenient by road from Ranchi Railway Station, which is about 80 km from the project site. The nearest airport is also at Ranchi.

3.3 Electrification status of nearby villages

There are about 30 villages within a radius of 5 km from the SHP site, having a total about 1500 houses. Presently these villages do not have access to electrical power. The nearest electrified village is at Topkara, which is about 15 km from the project site. The nearest grid is at Kamadara, which is about 42 km away from the project site.

3.4 Geology & Seismicity

The site is located in Chotanagpur plateau, which is composed mainly of Archaic Gneiss and Granite rocks. The rocks are very old, hard and stable. Jharkhand has no moderate to large earthquakes in recent past, only small tremors have occurred in the region. According to the seismic hazard map of India updated by the Bureau of Indian Standards (BIS) in 2000, all of the southern districts of Jharkhand lie in Zone II.





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4.0 HYDROLOGY

4.1 Stream / river

The Torpa SHP will utilize the water from Karo river near Peruaghagh fall.

- a) Stream / river: Karo Nadi
- b) Source: Rain fed
- c) Catchment area: 980 sq km (approx)
- d) River basin: South Koel

4.2 Flow

The daily flow data (Source: NHPC) of Karo river at a bridge (about 4 km from Torpa town on the road to Basia), which is about 20 km from the Peruaghagh fall, is available. Since, only few small streams join to Karo river within this 20 km stretch, these data hold good for the flow of Karo river near Peruaghagh fall. The average monthly flow (m^3/s) has worked out from the daily flow data and is given in the table below.

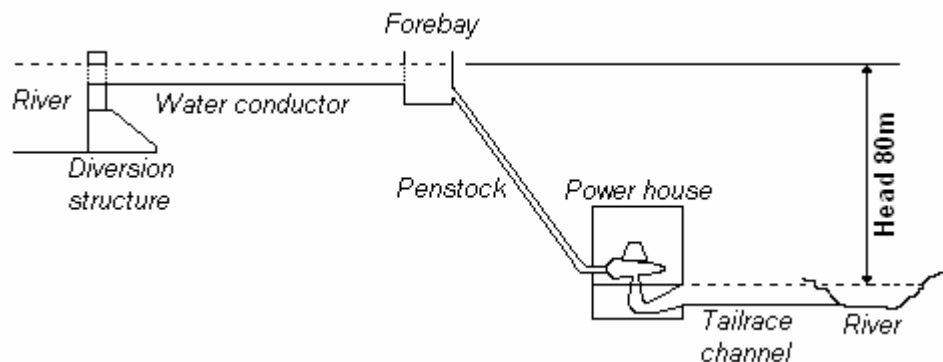
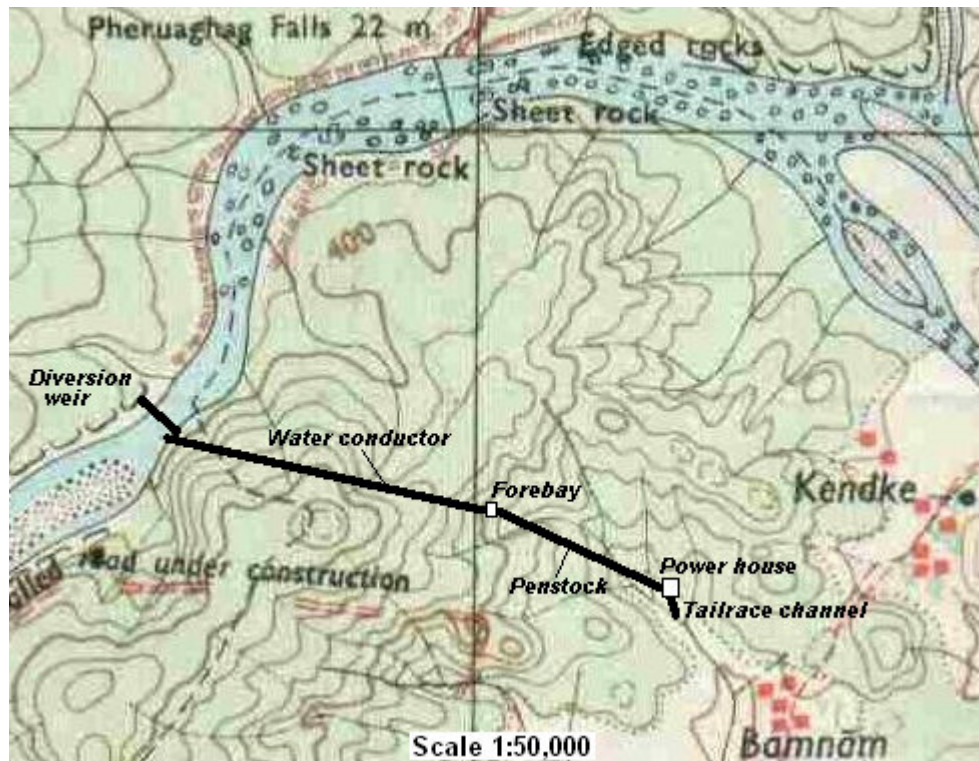
Average Monthly Flow (m^3/s) of Karo river

| Month | 1999 | 2000 | 2001 | 2002 |
|-----------|-------|-----------|-----------|-----------|
| January | | 12.03 | Lean flow | Lean flow |
| February | | Lean flow | Lean flow | Lean flow |
| March | | Lean flow | Lean flow | Lean flow |
| April | | Lean flow | Lean flow | Lean flow |
| May | | Lean flow | Lean flow | |
| June | 8.52 | 11.07 | Lean flow | |
| July | 62.75 | 39.75 | 88.18 | |
| August | 83.08 | 11.07 | 43.25 | |
| September | 95.99 | 73.17 | 24.74 | |
| October | 29.64 | 40.28 | 21.83 | |
| November | 16.06 | Lean flow | Lean flow | |
| December | 12.84 | Lean flow | Lean flow | |

Lean flow is $0.65 \text{ m}^3/\text{s}$ or less.

5.0 PRELIMINARY LAYOUT

The preliminary layout is outlined below in the relevant portion of the Toposheet. During the site visit the head was measured as 80m and is indicated in the schematic sketch.



Schematic sketch



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6.0 POWER POTENTIAL

6.1 Power

The flow for different exceedence times is estimated from the average flow data mentioned in para 4.2 of this report and given in column (2) of the table below. The net head is worked out as 76m, assuming the head loss of 5%, and is shown in column (3). Assuming the overall plant efficiency of 85%, the power potential is worked out and shown in column (4) of the following table.

| (1) % Exceedence Time | (2) Flow (cumec) | (3) Net Head (m) | (4) Power Potential (kW) |
|--------------------------|---------------------|---------------------|-----------------------------|
| 8.33 | 88.25 | 76 | 55926 |
| 16.67 | 48.44 | 76 | 30697 |
| 25.00 | 39.08 | 76 | 24766 |
| 33.33 | 22.23 | 76 | 14087 |
| 41.67 | 11.02 | 76 | 6983 |
| 50.00 | 2.56 | 76 | 1622 |
| 58.33 | 2.35 | 76 | 1489 |
| 66.67 | 1.70 | 76 | 1077 |
| 75.00 | 0.36 | 76 | 228 |
| 83.33 | 0.26 | 76 | 165 |
| 91.67 | 0.16 | 76 | 101 |
| 100.00 | 0.06 | 76 | 38 |

6.2 Conclusion

Keeping in mind that the streams / rivers in Jharkhand is rain fed, Torpa SHP site has a very good potential. Besides, supplying power to nearby 30 villages, it will strengthen the electrical grid. The project will go a long way in developing socio-economic condition of the people.

Preliminarily the project seems feasible and is recommended for carrying out Detailed Survey and Investigation.

The Torpa SHP will utilize a part of potential that is planned for Koel Karo Hydel Project. As such, Torpa SHP can only be considered in case Koel Karo Hydel Project is shelved.