

IMPACT OF  
PYKARA ULTIMATE STAGE HYDRO ELECTRIC PROJECT (PUSHEP),  
TAMIL NADU,  
ON THE WILDLIFE

*(Report submitted to Ministry of Environment and Forests, Government of India)*

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## **1.0 INTRODUCTION**

The Pykara Hydro Electric Project (PHEP) was implemented in 1932 for tapping the power generation potential of the river Pykara originating from the Nilgiris in the Western ghats. The scheme which was initially conceived as a run-of-river project with 3 units of 6.65 MW was augmented with the construction of a number of regulating storages and dams across the tributaries of the river Pykara. Presently the Pykara hydroelectric project collects water from a total catchment area of 154 km<sup>2</sup> of Pykara, Sandynallah, Naduvattam and Melkedmund and Lone valley streams (tributaries of river Moyar). The Pykara Ultimate Stage Hydro Electric Project (PUSHEP) is proposed to acquire additional capacity of hydro power generation. PUSHEP (Figure 1) involves construction of a separate water conductor system from the enlarged fore-bay and an underground power house. The power house is proposed to have 3 units of 50 MW each operating under a total gross head of 1038.06 m available up to the Maravakkandy regulating storage of Moyar Power House. In 1984-85 the estimated cost of the project was Rs. 70.16 crores. The cost as per 1990-91 estimate is Rs. 136.03 crores. PUSHEP envisages construction of a number of tunnels (head race tunnel, tail race tunnel, access tunnel and ventilation cum cable tunnel), surge shafts, pressure shafts and an underground power house. The longest tunnel, the Tail Race Tunnel (TRT) is 6805 m long. The TRT takes the water from the power house to the Maravakkandy storage (Figure 2).

## **2.0 OBJECTIVES**

The primary objective of the present study is to examine the impact of blasting work requisite for the construction of the TRT on the wildlife of the area (Ref. Letter, Ministry of Environment and Forests, Government of India, No. J-11016/69/82-IA.I dated 8 January 1996). Other environmental aspects of PUSHEP construction activities are also briefly examined in this report.

## **3.0 OBSERVATIONS**

### **3.1 CONSTRUCTION OF TUNNELS (BLASTING WORK IN THE TUNNELS AND ADITS)**

The EIA team visited the blasting sites inside the tunnels (TRT, adit 4 and access tunnel) during the second week of January 1996. In the TRT which is approximately 3.5 X 3.16 m in diameter (as per the information from TNEB officials at the tunnelling site) is completed up to 1057 m length. 51 kg of gelatin is loaded in 57 drill holes of approximately 2 m deep, in varying quantities (Figure 3) for each blast. The explosives in drill holes are detonated in phases with delay of seconds and the average pull of each blast is 1.80 m. The blasting produces no serious sound or vibrations on the earth surface as it is conducted deep inside the tunnel underneath a thick overburden of hard rocks. From a distance, the blast sounds like rifle shots. Daily two blasts are conducted in TRT with an interval of almost 12 hours. The main work after each blast is removal of the debris. More than 13.5 m<sup>3</sup> of debris generated in each blast.

Approximately 430 m of the total length of the Adit 4 is completed on the day of our visit. The tunnel is of 29.6 m<sup>2</sup> cross sectional area. 73.5 kg of gelatin is loaded in 89 drill holes (Figure 4) for each blast and the average pull of each blast is 1.8 - 2.2 m. Approximately 59 m<sup>3</sup> debris is generated from each blast. In the case of access tunnel almost 1365 m of the total 1498 m length has been completed on the day of our visit. In this tunnel presently the blasting is conducted at a depth of nearly 360 m from the earth surface. The tunnel is almost 6.5 m in diameter and of D shape. In this tunnel as per the TNEB sources blasting is conducted only once a day.

### **3.2 IMPACT OF THE PROJECT ON ENVIRONMENT**

#### **3.2.1 Blasts**

The blast produces tremendous sound, flash and vibrations. However, presently as the blasts are conducted deep inside the tunnel with delayed detonation, the thick overburden of hard rocks and soil above the blasting sites considerably dampen the sound and the vibrations. The sound is loud at the mouth of the tunnel, but appears largely muffled to that of rifle shots at a distance outside the tunnel. The TRT is constructed in hard rock area. But in certain areas, the roof is of loose rock and hence concrete and steel supports are erected. The access tunnel and adit 4 are in hard rock area. Perceptible vibrations are not experienced during blasting in the surroundings outside the tunnel at surface level.

The sound and vibrations from the blast may cause mild disruption to the normal activities of wildlife, such as local movements, of animals frequenting the area. However, the frequency of blasts is one or two per day and the sound is more or less muffled because of the hard rock overburden. The blasting process may have impact on the geological make-up / formation in the surroundings, an aspect not included under the purview of the present report.

#### **3.2.2 Dumping of excavated materials**

A large quantity of debris is generated in the process of tunnelling, more than 92000 m<sup>3</sup> from the TRT alone. The disposal of the massive quantity of muck i) occupies a large area, ii) leads to high suspended load in the run off during monsoon and, iii) the dumping yards are aesthetically unpleasant in the overall environmental make-up of the area. TNEB proposes to use the debris for construction activities such as lining of the tunnel and laying of the road. Further, the collector of the Nilgiris has issued an order dated 20/09/1995, to close down the Masinagudi stone quarry, and to use the rough stone materials from the excavated rock of Singara Tunnel Works now dumped at Singara Dumping Yard, Masinagudi for all departmental and Public Works. The use / removal of the debris has to be speeded up so as to reduce the area under debris. The transport and other activities related to further use of the debris involve

labour and vehicle movement. Measures have to be taken to limit the possible environmental effect of labour forces and vehicle movement in and around the dumping yards.

### **3.2.3 Floating population**

Any large scale development project or construction activity will invariably have an inflow of a large number of labourers. TNEB has already constructed office complexes and residential areas for their staff in Masinagudi. These are apart from the few small sheds and shanties near by the tunnel mouths and powerhouses. At least, one road also has come up for the transport of machinery, construction materials and personnels to the site of construction. The direct labour force involved in tunnel work is very few. For example, in the TRT, in one shift, almost 10-12 drillers including foreman and supervisors, and 7 drivers, helpers and loaders are engaged. The tunnelling work, on since 25 January 1991, is run in two shifts. Prior to 23 August 1995, the date on which M/s K C Thapar & Brothers Co undertook the construction, the work was done by different contractors. As per our enquiries approximately two hundred strong work force, which may mean more than 500 people including their family, are engaged in the tunnelling and other construction activities of PUSHEP. A residential area is being built up on the Masinagudi - Singara road, in private land for the employees of Thapar & Brothers Co.

The labour population poses threats to natural ecosystems in various ways such as occupying area to construct sheds or shanties, cutting trees for building activities or for fuel, disturbance to the natural movement of wild animals, and competing with wildlife for the resources by maintaining livestock. As per TNEB records, no cattle is maintained in the labour camps or staff residences. However, a large number of cattle, probably belonging to the Masinagudi, Bokkapuram, Thottalingi and Mavinhalla villages, are found roaming in the surroundings and the reserve forests. To prevent the labour force from collecting fuel wood from the forest areas TNEB is supplying fuel wood free of cost to the contractors since July 1990. The supply is made at the rate of 5 kg/family/day. Total quantity of fuel supplied up to 31 December 1995 is 426 tones costing Rs. 4.3 lakhs. However, we find that a large number of labourers indirectly engaged in construction activities are not covered by this free fuel wood programme. They mostly buy it or collect it on their own from the surrounding forest.

The lodging of personnel such as TNEB employees and employees of the contractors, the nucleus population and skilled labour, leads to increase in number of people engaged in other supporting activities such as trading. Many of the people inhabiting the area, but not directly employed in the project raise and maintain cattle as a source of additional income. The cattle in Masinagudi area, a few thousands in numbers, are mostly of inferior grade and are just dung producing machines. Daily a few trucks of cow dung are transported from Masinagudi area.

#### **3.2.4 Deforestation**

Construction activities of the PUSHEP are mostly underground and hence, direct deforestation is minimal. During our survey of the route of tunnels no serious signs of damage to flora from blasting was observed. SACON team has laid few quadrats on the tunnel route and in the vegetations distant from the route. However, opening up of roads leads to enhanced pressure on the natural vegetation.

PUSHEP According to the TNEB records, since the inception of the PUSHEP up to December 1995 about 4000 trees at a cost of Rs. 2.90 lakhs has been planted. However, no information is available on the success rate of the tree planted. Tree planting programme should be implemented in the project area, construction sites and the species planted should be those which are already present in the various forest types in the environs of PUSHEP.

#### **3.2.5 Vehicle movement**

A large number of vehicles were observed moving on the road to the construction sites. Such vehicle movement will interfere with the animal activities and need to be controlled, especially during the night hours.

#### **3.2.6 Construction of buildings and roads**

The roads to the construction sites such as TRT, access tunnel, Singara power house and adit 4 are being used more frequently, because of the construction activities. A new road is laid from access tunnel and to adit 2 for the exclusive use of TNEB. These roads may lead to opening up of the forest habitat, if the vehicular movement is not strictly controlled.

### **3.3 WILD LIFE IN THE ENVIRONS OF TRT**

#### **3.3.1 Birds**

Nearly 30 species of birds nest in the area around the TRT (table 1). Near the borders of Mudumalai wildlife sanctuary on the south west of the tunnel (Figure 5), the forest is deciduous type, while towards the east of the tunnel the forest is dry scrub. The scrub forest inside the sanctuary towards the Masinagudi side and the environs of TRT is being drastically exploited for fuel wood. More than 25 % people residing in Masinagudi, Bokkapuram and Mavinhalla

depend on the existing scrub jungle for their fuel wood requirements. Most tree species used for fuel wood are the preferred ones for cup nesting and cavity nesting birds. *Anogeissus latifolia* in the scrub jungle is highly preferred by the cavity nesters. This species faces acute threat due to over-exploitation for fuel wood. Hence, the afforestation programme being implemented by TNEB should give preference to species such as *Anogeissus latifolia*, *Ziziphus sp.*, *Bauhinia racemosa* and *Terminalia chebula*.

### **3.3.2 Mammals**

#### **Status of wildlife habitats on the tunnel site (Singara private forest)**

The TRT is located in a Private Forest, namely the Singara Private Forest (SPF) bordering the eastern part of the Mudumalai Wildlife Sanctuary. The location of the tunnel site is dominated by open scrub forests. The terrain is undulating and the top soil is almost overgrazed by livestock. The vegetation is denser in drainage areas, surrounding valleys and inaccessible areas on the hill slopes. These habitats can be referred to "CRITICAL MICRO HABITATS". The low land areas are completely denuded due to heavy demand for pasture and fuel wood from nearby villagers.

The SPF is drained by a few perennial streams (Nerrilakatta), apart from the Singara Flume channel, which is a major attraction for the animals to visit the SPF during the dry season. Another attraction to the animals for visiting the SPF is the occurrence of many natural salt licks on the tunnel route. The availability of abundant browse i.e., trees, shrubs and stragglers in the critical micro habitats such as Uppupallam, located < 1 Km from the tunnel site is a potential foraging site for many wild herbivores. The tunnel site in Singara area offers habitat for the animals in the dry season, during which fire is a serious problem in the Mudumalai Wildlife sanctuary.

#### **Migratory route of animals**

Mega-herbivores such as Elephant, Gaur and medium to large sized carnivores such as Leopard, Wild Dog, Hyaena and Sloth Bear regularly use the SPF to move into the sanctuary and vice versa despite the tunnel works. Elephants, both herds and bulls, cross the SPF right over the tunnel site to get into the eastern part of the sanctuary. A team of scientists attending the bio-diversity meeting at Nilgiris visited the tunnel site on 26th March 1995 and could see nearly 18 elephants freely browsing on stunted trees adjacent to the site. Recent studies on wildlife corridors shows that the habitats between SPF and the Bokkapuram RF in MWLS is a crucial corridor (Figure 6) as far as the elephant population is concerned and since 1985, they regularly use this corridor with out any notable change in the route. No change in their regular migratory route is noted in spite of the construction activities (N. Sivaganeshan Pers. Comm.).

Carnivores such as leopard and hyaena could thrive in areas subjected to mild disturbances. These species do not require specific location and large areas to move between MWLS and RF areas, unlike elephants and Gaur. Moreover, they are nocturnal and may not face any serious threat from the construction of tunnel and related activities. Sloth bear forages in areas with sufficient fleshy fruit bearing plants (eg; *Ziziphus mauritiana*, *Grewia* sp., *Cordia* sp.), which are uncommon around the tunnel site. Hence, this area is not intensely used by the Bear to forage or to move to reserve forest areas. On the other hand, habitat between Mavinhalla RF and foot hills of the SPF is intensely used by it because of the abundance of coffee fruits and many native fleshy fruits. Sloth bear is not known to den in the areas nearby the tunnel sites.

A survey was carried out by Dr. Sivaganeshan to identify the use pattern of dens by Hyaena during breeding season (December to February) in the tunnel route i.e. from SPF to Bokkapuram RF of the MWLS. This year (1996) during the period of survey Hyenas have not started using the dens but signs of their frequent visit (i.e. bones and tracks) were seen in the premises of the den. Presumably, hyaenas are exploring the environment prior to occupation of the dens. No sign of human destruction to these locations, although located midway of the tunnel route was observed.

The only species likely to be affected by the tunnel construction is Gaur (*Bos gaurus*). Gaur is a shy animal and do not tolerate even minimal human disturbances. The construction activities and people may pose serious hindrance to the movement of these animals between MWLS and reserve forest. Their traditional route has been altered because of the recent development of PUSHEP.

Presently Gaurs are using the river Kalhalla, located 2 km from Masinagudi, to enter the reserve forest avoiding the construction areas. However, they do not use it often; instead the foot hill forests closer to Thorapally and Singara RF are being effectively used.

#### **Status of potential habitats in the Singara area**

Although the area is dominated by scrub vegetation, a vast tract of forest comprising open thickets and a few critical micro habitats are distributed in relation to topography and drainage on the tunnel route. Critical micro habitats such as Uppupallam and Kurumbarpallam offer more plant resources than open thickets for wild herbivores especially elephants (Table 2).

#### **Status of wildlife habitats in the Bokkapuram forest**

The tunnel running near the Bokkapuram forest is on the migratory path way of the animals. However, the animals are not using this route mainly because of severe habitat degradation and the prevalent land use pattern. For instance, a

vast tract of revenue land on the migration route, owned by the Nilgiri District Administration was subsequently converted into patta land for weaker section of the society. The habitat is drastically modified into open thickets dominated by weeds and the area is intensely used by livestock and people. Therefore, the tunnel can not be considered a serious threat to wildlife in this area.

#### **4.0 SUMMARY AND RECOMMENDATIONS**

1. Blasting produces no such harsh sound or vibrations on the earth surface that could scare away the major wildlife in the areas, as it is conducted deep inside the tunnel underneath a thick overburden of hard rocks. However, it is advisable to use minimum charges for blasting so that vibrations in the near by areas will be the least. Avoiding blasting at night and early morning when the animals are more active.

2. Restoration of the construction areas should be ensured by levelling, filling of burrow pits and afforestation.

3. Prompt measures have to be taken to use the debris generated by tunnelling and also limit the labour forces and vehicle movement in and around the dumping yards.

4. The labour force should be banned from collecting fuel wood from the surroundings and, fuel wood should be made available to the floating labour already present in the Masinagudi area. Livestock with the laborers should not be encouraged.

5. The afforestation programme being implemented by TNEB should give preference to the project area and construction sites and plant tree species which were present in the area originally. The number of saplings should be considerably increased and success rate of the saplings need to be monitored. Presently, the trees planted are mostly avenue species.

6. During our survey of the route of tunnels no serious signs of damage to flora from blasting was observed. SACON team has laid few quadrats on the tunnel route and in the vegetations distant from the route. Further data is being collected.

7. The tunnel work does not seem to have any effect on the elephant movement between SPF and MWLS and also on the sloth bear and hyena population.

8. The micro habitats need greater protection to ensure browse availability to



wild herbivores. The micro habitats should be completely quarantined from interference from construction laborers.

9. Habitat diversity in the tunnel route of Singara Private Forests needs greater protection from human pressure, particularly from fuel wood collection.

10. An education programme may be implemented for the laborers to make them aware on their possible impact on forest resources and the significance of forests and animals to people.

11. Vehicular traffic needs to be controlled, especially during night hours in the Masinagudi - Singara section. This would ensure free movement of animals across the sanctuary, the private and reserve forest.

12. Further increase of quarters for labourers has to be strictly checked

13. The Singara flume channel water should be kept free from any disturbances.

14. To best of our knowledge no EIA was conducted on the project before the commencement of the work. Hence, an independent agency may be entrusted to monitor the implementation of the environmental safeguards during the construction.

Table 1. Birds nesting in and near the TRT of PUSHEP

	Common name	Scientific name
1	India Robin	<i>Saxicoloides fulicata</i>
2	Magpie Robin	<i>Copsychus saularis</i>
3	Grey Tit	<i>Parus major</i>
4	Chestnutbellied Nuthatch	<i>Sitta castanea</i>
5	Baybacked shrike	<i>Lanius vittatus</i>
6	Spotted Munia	<i>Lonchura punctulata</i>
7	Whitebacked Munia	<i>Lonchura striata</i>
8	Brahminy Myna	<i>Sturnus pagodarum</i>
9	Common Myna	<i>Acridotheres tristis</i>
10	Jungle Myna	<i>Acridotheres fuscus</i>
11	Purple Sunbird	<i>Nectarinia asiatica</i>
12	Purplerumped Sunbird	<i>Nectarinia zeylonica</i>
13	White Eye	<i>Zosterops palpebrosa</i>
14	Redvented Bulbul	<i>Pycnonotus cafer</i>
15	Redwhiskered Bulbul	<i>Pycnonotus jocosus</i>
16	Yelloweyed Babbler	<i>Chrysomma sinensis</i>
17	Whiteheaded Babbler	<i>Turdoides affinis</i>
18	Common Bee-Eater	<i>Merops orientalis</i>
19	Yellowthroated Sparrow	<i>Petronia xanthocollis</i>
20	Southern Tree Pie	<i>Dentrocita frontalis</i>
21	Koel	<i>Eudynamys scolopacea</i>
22	Brainfever bird	<i>Cuculus varius</i>
23	Large green Barbet	<i>Megalaima zeylanica</i>
24	Crimsonbreasted Barbet	<i>Megalaima haemacephala</i>
25	Crimsonthroated Barbet	<i>Megalaima rubricapilla</i>
26	Tailor Bird	<i>Orthotomus sutorius</i>

27	Whitebrowed Fantail Flycatcher	<i>Rhipidura aureola</i>
28	Paradise flycatcher	<i>Terpsiphone paradisi</i>
29	Crested Hawk Eagle	<i>Spizaetus cirrhatus</i>
30	Common Iora	<i>Aegithina tiphia</i>
Source: Gokula V, SACON.		

Table 2 Diversity of critical micro habitats and open thickets				
Area	Diversity index (H')			
	Micro habitats		Open Thickets	
	A	B	A	B
Uppupallam	2.8	1.5	2.2	0.32
Kurumbarpallam	2	1.7	1.4	1.2

A - Total plant species; B - only fleshy fruit plants.  
Source: N. Sivaganesan, SACON

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Figure 1. The location of the Pykara Ultimate Stage Hydroelectric Project (PUSHEP), The Nilgiris, Tamil Nadu (Source: TNEB).

Figure 2. Horizontal and vertical Location of PUSHEP Tunnels (Source: TNEB).

Figure 3. Drilling pattern in TRT ((Source: TNEB)

Figure 4. Drilling pattern in Adit 4 (Source: TNEB)

Figure 5. Area surveyed for vegetation and bird life (Source: SACON)

Figure 6. Wildlife corridors in the area (Source: Desai A , 1995, The home range of elephants and its implications for management of the Mudumalai Wildlife Sanctuary, Tamil Nadu, J. Bombay Nat. History Soc. 88(2):145-156)