Detailed Project Report for

Elephant Rehabilitation Centre, Kottoor, Kerala

Department of Forests and Wildlife,

Government of Kerala

Submitted to Central Zoo Authority

Executive Summary

The Elephant Rehabilitation Centre (ERC) in Kottoor, Thiruvananthapuram, Kerala was established in the year 2008 by the Department of Forests and Wildlife of the Government of Kerala to rescue, rehabilitate and protect captive and free ranging elephants, and orphan calves. With the advent of time, the facility has grown to accommodate 17 elephants. The Centre is receiving more and more elephants which need rehabilitation and care. However, the present state of the ERC has limitations of facilities that need to be addressed to cater to the emerging needs and to elevate it to a higher level.

The enclosures in the ERC are at present not designed to provide the best quality near natural environment to its inhabitants. The ERC lacks a kraal that can cater to its demands anda full-fledged veterinary facility except for the services of a Forest Veterinary Officer.The delicate matter of management of orphan calves also has huge scope for improvement.The facilities for fodder and feed storage and its management are also inadequate at present.The ERC also has scope for providing a post-mortem and cremation facility not only for its inhabitants, but also for the entire elephant population of the region.

There are also very few amenities that are available to people who visit ERC and importantly, no mechanism to pass on the message of the need for environmental conservation to visitors. Due to the absence of modern infrastructure, the application of current global best practices in elephant management are also fairly limited in ERC.

Besides these infrastructural limitations, the ERC also has opportunities for improvement in the matter of training of personnel, research environment, e-governance initiatives, contingency management and disaster preparedness.

The ERC does not have an assured year round source of water that can meet its demands.The lack of a sewage treatment facility and solid

waste management mechanism also needs addressing when the present and future needs of ERC are taken into account.

For addressing these deficiencies, this project aims to tackle the weaknessin a comprehensive manner by proposing to create state-of-the-art infrastructural facilities for elephant rehabilitation so that ERC can emerge as a model in this domain. Each aspect of the ERC has been analysed with an 'elephant first approach' and by adopting the best practices from around the world after careful study and modification as required for local conditions and elephant behaviour.

The project primarily aims to create near natural environment in the enclosures that can enable the elephants to return to their natural behaviour by expanding the number of enclosures and by creating highly enriched enclosures. The barriers, water supply arrangements, feed supply arrangements etc. are all designed with this approach in mind. In addition, it is also proposed to create an all-inclusive veterinary hospital that will function 24x7 in the ERC. Further, the project tackles the absence of a kraal. It is also proposed to have specialised facilities for orphan care in ERC. The research activities that can contribute to elephant conservation will get a boost with the creation of the Research, Training and Skill Development Centre in ERC as mooted in the project and this in turn can lead to better management of elephants in the country by way of better training in the proposed training facility. The project also addresses other aspects such as the creation of a post-mortem and cremation facility, arrangement for assured water supply, sewage treatment plant, fodder management programme, solid waste management mechanism, residential facility for staff and mahouts etc. to provide 360^0 coverage for the needs of ERC. The project also aims to improve the facilities available for people visiting the ERC as well as for increasing the capacity of ERC to spread the message of environmental conservation. The complete implementation of this project will see the emergence of an ERC which will have two distinct zones, namely, The Education and Interpretation Zone, and Restricted Zone segregated from each other by a compound wall of 2m height. The general visitors to the ERC

would not be permitted to visit theRestricted Zone. On the other hand, the Education and Interpretation Zone, where they are permitted, would have facilities such as Elephant Natural History Museum, Interpretation Centre, Video Room, Cafeteria etc.

Apart from infrastructural aspects, the project addresses the issue of training of personnel and adoption of a wide-ranging e-governance initiative. The proposal suggests mechanisms to tackle various contingency situations that may arise in the course of functioning of ERC and steps required for disaster management. The number of posts that need to be created to cater to the emergent demands of ERC are also included as a part of this proposal.

The budgetary analysis of this proposal is included in chapter 10 which projects a demand of Rupees 112.14crores, which will be met by the funds provided by the Government of Kerala. The ActionPlan for operationalizing this proposal in two phases is given in Chapter 11.

Table of Contents

PART-I

1. Introduction

1.1 History of the ERC

The Elephant Rehabilitation Centre (ERC), at Kottoor near Kappukad, Thiruvananthapuram, Kerala is located in the forest area of Mannoorkara Village, Kattakkada Taluk in Thiruvananthapuram district of Kerala. It functions over 56 hectares of forest land in the fringes of the reserve forest falling inAgasthyavanam Biological Park Range of Thiruvananthapuram Wildlife Division.

The ERC was established in the year 2008. The ERC initially had three elephants of different age groups when it started. Later,orphan calves from the wild, captive elephants from zoos and elephants from other camps under the Department of Forestsand Wildlife, Kerala,were added to the stock as per the directions ofPrincipal Chief Conservator of Forests (Wildlife) and Chief Wildlife Warden, Kerala (PCCF and CWW, Kerala).Present strength of elephants in ERC is as follows:

Table 1: Strength of Elephants in ERC

Serial No.	Name	Age (as of 2018)	Male/Female
1	Moni	72	M
2	Jayasree	46	F
3	Rajkumar	41	M (Makhana)
4	Ammu	17.5	F

5	Minna	17	F
6	Unnikrishnan	9	M
7	Agasthyan	10	M
8	Sundari	8	F
9	Rana	5.5	M
10	Raja	5.5	M
11	Podichi	4	F
12	Arjun	2	M
13	Poorna	1.5	F
14	Manu	1	M
15	Maya	1	F
16	Soman	76	M
17	Baby Elephant (Unnamed)	0.5	F

Today, the ERC has grown to occupy a prime position in the minds of nature lovers. Many Veterinary trainees, Range Forest Officer trainees, students of wildlife biology,enthusiasts of nature and forests etc.visit the ERC individually as well as in groups. Apart from seeing the scenic beauty of the adjacent forests and the Neyyar dam reservoirs, they

are exposed tothe elements of daily routine of elephants such as elephant bathing, community feeding etc. from a stipulated distance in ERC as the elephants roam freely.

A minor visitor accommodation facility is also available in the ERC, so that those who require stay can stay in the ERC for a day or two. There is also a small cafeteria within ERC.

1.2 Physical features of the area

a) Topography and geology

Presently, the ERC is functioning over 56 hectares of forest land. It is proposed that an area of over 176 hectares be separately designated for the purpose of ERC.The terrain around this area is undulating with elevation ranging from 92 m to 205 m.

The broad region where ERC lies in is in the tropical climatic zone. In this broad region, the dominant rock type is Precambrian metamorphic rock belonging to the Khondalite group. Charnockite is also exposed at different locations. Magnetite-quartzite is also seen in this tract. The underlying rock is principally gneiss. The gneiss has undergone lateritic decomposition due to heavy rainfall.

b) Soil

The major types of soil encountered in this tract are laterite soil with presence of clay, loam, gravelly clay, gravelly loam etc.

c) Flora and fauna

Tropical Evergreen and Mixed Deciduous Forests predominantly cover this tract

d) Climate

This tract experiences tropical climate where the mean summer temperature is 35^0 C. The winter temperature is around 16^0 C.

e) Rainfall

Annualaverage rainfall from South-West monsoon between May and July, and North-West monsoon between October and November is about 2800 mm

f) Seasons

Typical monsoonal type climate of this tract as is found on the western side of the Western Ghats translates to good rainfall in summersalong with mild winters.

1.3 Present approach of ERC

The ERC being in its early stage has adopted a basic approach of providing bare essentials required for a conservation facility for elephants. It originated as a centre for rehabilitating orphans, captive elephants, and free ranging elephants captured from conflict areas. A sharper approach that focuses on the free ranging of elephants near to nature is adopted by ERC. Althoughthis facility has performed an important role in the rehabilitation regime for elephants of the state, the facilities need a transformation to become a state-of-the-art elephant rehabilitation centre which can be the model for elephant conservation and a repository of elephant information.

1.4 Present layoutof ERC

The detailed drawing of the present layout is given in Chapter 4 of the report. However, a brief description of the same is given here for a quick broad understanding of the layout.

As the visitors enter through the main gate of the ERC, there is a small ticket counter immediately followed by an information centre, both of which are in good condition. Moving further ahead, the road forks into two. The main road lies straight ahead, on which further down lies the children's park. The road to the right leads to housing facilities and offices

on either side of the road. There is also an ERC canteen on the right side of this road immediately after the housing facilities.

The dormitories are also located on the right side branch of the road. Further down the road, there is a store and kitchen, which prepares the food supplied for the elephants in the Centre.

Further south, along the main road, Orchid café can be seen on the left side and beyond it, the vista of the Neyyar reservoir opens up.

Immediately before the Orchid café, both branches of the main road join together and at this point, the toilet blocks and the elephant feeding area are located. Adjacent to that the Range Office is located. Further, beyond the right branch of the main road and also on the northern side of the children's park, the elephant enclosures are located.

1.5 Demography of the area surrounding ERC

The ERC Kottoor is located in the reserve forest land in Mannoorkara Village of Kattakkada Taluk of Thiruvananthapuram District, Kerala.

A summary of the demographic attributes of Mannoorkara Village where ERC is situated is as follows:

Table 2: Demographic attributes of Mannoorkara village

Particulars	Total	Male	Female
Population	18343	8682	9661
Child (0-6)	1872	956	916

Schedule Caste	1632	801	831
Schedule Tribe	1477	705	772
Literacy	0.8932	0.9192	0.8702
Total No. of Houses	4793	-	-
Total Workers	6864	5037	1827
Main Worker	4799	138668	0
Marginal Worker	2065	1255	810

1.6 Legal status of the land

Trivandrum district has a reserve forest area of 49510 hectares and vested forest area of 353.4 hectares. Among this, the ERC at Kottoor is situated at present in a reserved forest area of 56 hectares, which is proposed to be expanded to 176 hectares.

1.7 Sources of pollution in ERC

The sources of pollution in the ERC Campus are negligible. The activities related to elephant conservation, and the visitors to the ERC generate very little volume of waste. These are managed at the sites of generation itself as it is almost entirely biodegradable. The only other source of pollution is the exhaust gases from the vehicles inside the

campus. But this gas is removed by the large vegetative cover in the campus through sequestration.

2. Appraisal of the present arrangement and constraints

2.1 Animal section

Elephant Rehabilitation Centre, Kappukad, Kottoor spreads over an area of 56 hectares and at present has 17 elephants which include calves, sub-adults and adults of both sexes. These elephants aged between two-and-half months and 73 years are brought from several parts of the state. All the elephants are maintained in enclosures measuring from 1 acre to 2.47 acres, with roofed tethering sheds within each enclosure. The enclosures are provided with natural flooring with shade and are surrounded by elephant protection trenches. 30 elephants can be accommodated in the centre at a time and they are looked after by a team of mahouts, forest administrators and professionals. At present, though there are facilities for keeping the elephants free from chains, all the elephants except the calves are kept chained in separate enclosures for the major part of the day. The musth elephants are chained throughout their musth period.

An appraisal of the facilities for elephants in ERC reveals that they meet only the basic needs.The environment enrichment in these enclosures are minimal. The individual enclosures can be uplifted to group enclosures accommodating around 5 elephants after studying the social traits and behaviour of the elephants. The enclosure needs to be developed by providing natural environment to the elephants.

2.2 Veterinary section

The centre has a Forest Veterinary Officer, but does not have proper veterinary facilities. There are neither basic laboratory facilities nor any facility to control elephants in an emergency situation.

2.3 Store and feed supply section

All elephants are stall fed with fodder and concentrates, and are provided with restricted grazing or browsing opportunity in the forest. The

elephants are fed with cooked rice or wheat, horse gram,ragi, turmeric powder, salt, mineral mixture and jaggery made in to spheres. The fodder and feed storage facility at the ERC has to be improved. It is required to improve these facilities for diversificationof feed, improvementof diet, and to secure the feed against contamination etc.

2.4 Sanitation section

Waste management facilities including, sufficient numbers of toilet facilities are found wanting in ERC.A more scientific waste disposal system for dung and fodder wastealso needs to be developed.

2.5 Maintenance section

At present, there is no section or department exclusively dedicated for the maintenance of ERC. All maintenance works are presently done by contractors who are outsourced by the Forest Department.

2.6 Security section

Number of guards and Securities provided by the forest department is only four and that is not sufficient for the smooth functioning of the ERC.

2.7 Water supply section

The water required for the centre is collected from a well within the ERC and from the lake, which is 250 m away from ERC. The water from the lake is used for bathing and drinking purpose for elephants while the well-water is the source of drinking water for the residents. The elephants are free to drink as much water as they need.Elephants are regularly bathed as per Kerala Captive Elephant (Management and Maintenance) Rules, 2012. Though the Neyyar reservoir is nearby, water level recedes during summer and hence uninterrupted supply of water in ERC is a challenge. An effective water management system is to be evolved

to meet the water requirements for all the present and future needs of elephants as well as for other purposes in the ERC.

2.8 Disposal of solid waste and liquid waste-sewerage

In the ERC, natural waste products are generated by elephants on a daily basis. Otherwastes that are generated also need to be managed scientifically. At present, solid waste is merely dumped into pits. Hence, a proper waste management system has to be developed.

2.9 Visitor's amenities, lawns and gardens (Landscape section)

Veterinary trainees, Range Forest Officer trainees, students of wildlife biology,enthusiasts of nature and forests etc. visitingthe centre do not have proper facilities including for staying. The arrangements for food and refreshments for them are at a functional level.

The entrance of the ERC along with the ticket counter is in good condition, but requires a facelift. A children's park is located next to the elephant feeding area hence has to be relocated. The canteen, which is located in the campus needs improvement and can be used as an in-house canteen for the staff. The lack of parking facility in ERC also has to be addressed and resolved.The dearth of gardens and lawns affects the general landscape of ERC. The absence of a cloakroom is also an inconvenience.

2.10 Kraal/nursery

There is no Kraal in ERC at present. There is a temporary arrangement called 'paddock' with barricades which can accommodate 3 to 4 baby elephants. It also acts as a nursery for the elephants. The baby elephants that were separated from their herd were cared for by the forest department here and were attended to round the clock by experienced mahouts.

2.11 Animal collection plan

At present, the animal collection is as per the orders issued by PCCF andCWW, Kerala under the following circumstances:

- Captive elephants subjected to cruelty and seized under orders of Courts or competent officers
- Injured/diseased elephants
- Orphan elephant calves
- Free ranging elephants captured from conflict areas
- Any other captive and wild elephant requiring rescue and rehabilitation

2.12 General administration of ERC

The ERC is at present administered by the Department of Forestsand Wildlife, Government of Kerala. The number of staff in the ERC will have to be increased with more senior officers for proper management of the facility.

2.13 Research

Currently, no research activities regarding elephant conservation and management are done in the centre.

2.14 Conservation breeding

There is no breeding facility at the centre for captive elephants.

2.15 Education and awareness

At present, adequate facilities are not there for making the elephant enthusiasts visiting the centre aware of the importance of conservation of forest and forest life, the importance of elephants and their behaviour, etc. The interpretation centre is not equipped towards this end. Therefore, the facilities don't have the potential to provide favourable conditions for studying and offering education about elephants.

2.16 Other aspects requiring attention

In addition to the above-mentioned aspects, the ERC lacks proper /modern facilities for the following as well:

- Orphan calf management
- Quarantine facilities
- Post-mortem and cremation facilities for dead elephants
- Storage of fodder and feed ingredients
- Bathing of elephants
- Training facilities for staff members and other stakeholders
- Quarters for staff members and mahouts

There is a need to comprehensively uplift the ERC at the level of infrastructure and the practices associated with elephant management to convert it into a state-of-the-art facility.

PART-II

3. Future objectives- vision, mission and strategy

3.1 Vision of ERC

The vision of ERC is to provide required amenities to house, treat and nurture captive/ sick/ injured/ orphaned/ rescued elephants including calves and aged captive ones as well as elephants in conflict areas in near natural environment with facility for free roaming and foraging. The centre will also act as a place for public awareness, training mahouts and other stakeholders in captive elephant management, research and education.

3.2 Mission of ERC

- To be a rehabilitation centre for old/injured/orphans of captive and free ranging elephants and elephants in conflict areas.
- To be an education centre for public awareness regarding conservation of elephants and their importance in conservation of nature.
- To preserve the history of human-elephant relationship interlinked with culture and civilization
- To conduct functional study and research on elephants of various ages to understand their behaviour, social life, breeding, feeding etc. through collaborative research with Universities, Institutes, Hospitals or Centres of expertise in wildlife.

3.3 Strategy of ERC

- Provide near natural habitat for the elephants and to provide additional facilities to ensure their comfort and safety, which include the provision of a fully equipped veterinary clinic.

- Provision for adequate research on elephant management issues and planning public education and awareness programs to ensure their conservation.
- Planning of an elephant dung and waste recycling units to ensure an eco-friendly and healthy environment.

3.4 Objectives of ERC

- Provide near natural environment for the elephants in captivity aided with other necessary living conditions
- Provide adequate free ranging space to enable elephants to walk, bathe and forage in wilderness as well as socialize and mingle as herds/groups, under the care of mahouts / managers
- Provide state- of- the- art in-house Veterinary care and treatment to facilitate recovery of ailing elephants.
- To provide waste management and recycling facility in the Centre to get rid of elephant dung, other biodegradable and non-bio degradable wastes making the centre Zero Waste.
- To facilitate research, both veterinary and behavioural, supporting elephant management and welfare
- To establish training, skill development and management centre for mahouts and elephant keepers
- To provide facility for dissemination of information about the significance of environmental conservation and the historic role of elephants in culture and civilisation

4. Future action plan

4.1 Existing animal collection plan

At present, there are 17 Elephants in the ERC. These Elephants were brought to ERC from different camps under Kerala Forests and Wildlife Department, Trivandrum Zoological Park and a few were admitted as orphan calves. The following tabular form shows the current population, name, age and other details of the Elephants in the ERC:

Table 3: Details of Elephants in ERC

Sl. No	Name	Age	Sex	Places from where the Elephants were brought to ERC	
				Area	Range
1	Moni	72	M	Aryankavu	
2	Jayasree	46	F	Reserve Forest	Kodanadu
3	Rajkumar	41	M(Makhana)	Zoological Garden	Trivandrum
4	Ammu	17.5	F	Nalkolli Forest Area	Bathery
5	Minna	17	F	Pooyamkutty	Kuttampuzha
6	Unnikrishnan	9	M	Koduvakkadu	Manthuruthy
7	Agasthyan	10	M	Manthookki mala	Paruthipally
8	Sundari	8	F	Anchukuttyvayal	Muthanga
9	Rana	5.5	M	Odakolly	Kanhangad

10	Raja	5.5	M	Kottoor	ABP
11	Podichi	4	F	Podiyakala Tribal Settlement	Peppara
12	Arjun	2	M	Pambanthodu tribal settlement	Mannarkkadu
13	Poorna	1.5	F	Kattikuzhy	Kanayar
14	Manu	1	M	Akampadam Forest Station	Edavanna
15	Maya	1	F	Sholayar Forest Station	Agali
16	Soman	76	M	Thekkuthodu	Konni
17	Baby Elephant (unnamed)	0.5	F	Chinnakkanal	Chinnakkanal

4.2 Proposed Collection Plan

The proposed plan is for rehabilitating 50 Elephants in the Centre. The Centre expects to receive Elephants in the following ways:

- Captive elephants which require rehabilitation due to various reasons.
- Captive elephants seized in connection with offences relating to cruelty to elephants.
- Abandoned calves obtained from the wild.
- Elephants causing frequent Human-Elephant conflict.
- Captive Elephant owners including Devaswoms (Temple Trusts) can avail the facility at ERC for treatment of the Elephants and to managemusth period of the elephant without tethering

4.3 Description of the layout plan of the ERC

Under the new layout plan (detailed drawings separately included), prior to the entrance there would be a facility for parking vehicles provided on both sides of the road and a community hall cum interpretation centre on the left (existing building modified). At the gate there would be a ticket counter on the left side as part of an elaborate entrance plaza.

Past the gate the ERC is divided into two separate zones:

I. An**Education and Interpretation Zone** composed of an Entrance Plaza, a Research, Training and Skill Development Centre, an Elephant Museum, an Administrative Building, a Paper Manufacturing Unit, cottages for accommodation and a cafeteria.

II. A **Restricted Zone (Elephant Zone)** composed of elephant enclosures, elephant feeding area, elephant veterinary clinic, orphan calf area, musth elephant holding area and all other service facilities for elephant care.

Education and Interpretation Zone:

On entry to the ERC past the gate, there would be a Research, Training and Skill Development Centreon the left side of the road and the existing cottages on the right side which would provide accommodation forveterinary students, nature enthusiasts etc. To the north-west of the Research, Training and Skill Development Centre, a central administrative building would be located. To the east of the Research, Training and Skill Development Centre, an Elephant Museum would be located. To the north of the Elephant Museum, an elephant dung based Paper Manufacturing Unit would be located and to the south-east of the Museum, a 11KV electrical substation would be located.

To the south-west of the central assembly area, a children's park would be located. An elephant kitchen and store would be provided to the south of theChildren's Park.At the western end of the elephant kitchen, a single block of mahout bachelor accommodation would be located. To the north of the mahout bachelor accommodation an effluent treatment plant would be located.A mahout rest area would be located to the south west of the elephant kitchen area.

On the left of the road that goes south from the central assembly area, a dedicated area for parking service vehicles of the ERC would be allotted. To the south of the parking area for service vehicles, a cafeteria would be located.

To the south west of the stay facilities,would be located a residential area consisting of two hostel blocks for gents and ladies with a dining area, staff and officers' quarters, and four blocks of family mahout accommodation area on the eastern side.

A 2 m high compound wall would separate the Education and Interpretation Zone from the Restricted Zone which houses the elephant enclosures.

Restricted Zone (Elephant Zone):

A fully equipped and modern elephant veterinary hospital would be located with a trench around the hospital compoundon the south of office quarters. The hospital block would be a two storied building with its upper floor functioning as a diagnostic lab.

To the East of the veterinary clinic would be a holding area of almost 1.27 acre and to the south west of the holding area, a quarantine facility would be located.

To the east of holding area is the Neyyar Reservoir. Check dams would be built at two neck points of the reservoir to build a bathing area for the elephants.

To the north of the central administrative building, a calf elephant enclosure (Enclosure No.-1)and to the north of the elephant museum, a group enclosure (Enclosure No.2) would be located.

To the north of calf elephant enclosure (Enclosure No.-1) a pond would be developed by constructingearthen check dams,exploiting the low lying contours of the area.

The road from the museum leads to an individual enclosure (Enclosure No.-3). Adjacently, to the west of the individual enclosure (Enclosure No.-3) would be a group enclosure (Enclosure No.-7).

To the south-west of the group enclosure (Enclosure No.-7) would be an individual enclosure (Enclosure No.-8). To the north of the individual enclosure (Enclosure No.-8) would be a group enclosure (Enclosure No.-9). To the north-east of the group enclosure (Enclosure No.-9) i.e., on the right side of the service road would be a group enclosure (Enclosure No.-11) and an individual enclosure (Enclosure No.-10).

To the east of Group Enclosure No.-7 would be located an Individual Enclosure (Enclosure No.-4).To the east of Individual Enclosure (Enclosure No.-4) would be a Group Enclosure (Enclosure No.-5).At the northern side of Group Enclosure (Enclosure No.-5) would be located an Individual Enclosure (Enclosure-6).

The road along Group Enclosure No-11, would be developed along the western boundary of the project area, further northwards leading to the next set of enclosures. This northward road would go around the central peak. The next set of 12 Enclosures from No.12 to No.-23 would be located on the sides of this road.At the western end of the 12 enclosures, a musth management enclosure is located.

A separate artificial water body would be built adjacent to Enclosure No.-15, utilizing the low lying contour of the area. To the north of Enclosure No.-18, a dedicated dung recycling unit would be located.

At the northern end of the project area, a crematorium would be located. This crematorium would be serviced by the existing public road that lies adjacent to it.

4.4 Parking arrangement

Sufficient parking arrangements are provided in the proposal for visitors outside the centre. Also additional parking facilities have been provided inside the campus for the service vehicles in the proposal.

4.5 Museum in the ERC

- **Concept of the museum**

The Elephant Natural History Museum shall provide a comprehensive insight into all aspects of elephants, including their role in culture, religion, history, their anatomical peculiarities, man-elephant interaction, evolution, their wild habitat etc. thereby enabling spreading of the message of environmental conservation in general and the need for elephant conservation in particular.

The Museum shall employ a combination of storyboards, actual displays and latest technologies to help visitors develop a deeper understanding about Elephants.

The display area of the museum would be 4144 square feet (385 square metres). The total area of the museum would be 15753 square feet (1464 square metres).

- **Design approach**

The basic idea behind the design is to integrate the structure with the striking natural surroundings. The main focus is towards interpenetrating exterior and interior exhibition spaces and strong emphasis on harmony between man and nature. The spaces in the museum are being zoned in such a way, to amuse and to educate the

visitors by taking them through a journey which explains and exhibits the following evidences and records on elephants:

- History
- Life style and behaviour
- Interaction with humans
- Cultural and religious significance

Illustrative photos of proposed exhibits in ERC Museum

- Mythological stories

4.6 Elephant enclosures

The most critical components in the design and implementation of the ERC are the elephant enclosures. The ERC is expected to cater to a population of 50 elephants in the fullness of time. The thought process behind the designof enclosures is in tune with the Central Zoo Authority regulations as well as by adopting the best practices from around the world. All out efforts have been taken to design enclosures which help the elephants mimic their natural environment as far as possible. In addition, the global best practices that help positive reinforcement of elephant

behaviour, designs that increase browsing time etc. have been generously incorporated in each enclosure.

Within the ERC, the elephant enclosures would be located in those places where the terrain is favourable, accessible by road, and where mahout and medical attention are readily available.

Since a walkthrough through the thought process behind the specific design aspects of the enclosures wouldn't be out of place, it is enunciated as below:

The first critical question that emerges in the design of enclosures is the area requirement for each elephant. Detailed analysis of the literature pertaining to the subject and after extensive consultation with elephant experts and, the Central Zoo Authority Regulations that govern the matter, the approximate area required for the wellbeing of an elephant in its enclosure can reasonably be concluded to be over half an acre. The Central Zoo Authority regulations also require that 2-10 Elephants be kept together in each enclosure. Keeping view of the aforementioned conditions, the locations of each enclosure has been finalised as depicted in the layout. The shape of these enclosures have been adjusted according to various local factors such as terrain, vegetation, presence of large geomorphic features etc. falling within that particular enclosure. The above mentioned design methodology built into the location system of enclosures ensures adequacy of quality and quantity of space for each enclosure, that would translate to the wellbeing of elephants.

Rendering this thought process into the spatial framework of the ERC terrain has been done consequent to survey of the entire region that is being considered fit for locating enclosures. Total Station Survey of the area has provided a clear picture of the terrain enabling elimination of unsuitable areas. After such refinement, considering the scale and extent of area required for 50 elephants, the enclosures had to be spread across the geography of the area under consideration. Generally, locations with relatively smoother terrains have been identified to enable free movement of

elephants. Each of these locations have been verified for suitability from the perspective for ease of living for elephants, minimal removal of trees, maximising the potential for wildlife studies and ensuring availability of water and other resources.

Another factor that has been addressed is the segregation of available enclosure space into group enclosures and single enclosures. Elephants are gregarious animals that are known to have complex social structures. They engage with each other and the near natural habitat offered by ERC wouldmimic nature and present these opportunities of socialisation to the elephants. Most elephants currently in the facility are captive elephants and experts in behavioural aspects of captive elephants suggest that occasional isolation of these elephants in individual enclosures may be required for safety purposes.

Yet another factor that merits consideration is the larger proportion of male elephants among elephants in captivity. Since male elephants require special consideration in the musth period, there would be a separate portion in each enclosure that can be cordoned off to separate individual elephants if required. In addition to that, there would be dedicated facility for musth management.

Grouping elephants is a complex task which can be done only after careful study of the nature of each elephant. The various permutations and combinations of elephants that are possible prospects for grouping have to be critically analysed by addressing the needs of each elephant and the nature of each elephant by bringing together the various stakeholders such as experts and mahouts. Once such a group of elephants are identified for admission to a group enclosure, the group enclosures can be put to full utilisation. In view of the total proposed number of elephants being 50 and the presence of only 17elephants at present in the facility, all these enclosures need not be created at once and they can be created in a staggered manner.

Once the number of enclosures and the pattern of location is established unequivocally, it becomes pertinent to address the design aspects of each enclosure. Stepping into the finer aspects of the design of the enclosure, the boundaries of the enclosure have been proposed to be a combination of the best of current techniques that are being used across the world. There are various techniques that are used in the design of enclosures for elephants. The first technique is the trenching method which in common parlance is called a Ha-ha trench. These trenches shall have a turfed recline from the enclosure side and a sharp vertical face towards the outer side. This design allows uninterrupted view of those designated viewing enclosures for visiting elephant enthusiasts while ensuring safety and security. These trenches also allow the elephant to clamber out in case they happen to descent into the trench. Another technique that is currently in use is the steel cable fencing method where steel cables are passed through metal channels and beams to cordon off the enclosure. A third and commonly used method is that of solar fencing. Yet another alternative that is available for enclosure fencing is the broad-gauge rail fencing which has been implemented in various regions with considerable success.

While the Ha-ha trenches are the best solution that ensures visibility and safety, in order to minimise the disturbance to the area and vegetation by virtue of enclosure construction, a combination of boundaries using ha-ha trenching, broad-gauge rail fencing, steel cable fencing and solar fencing are proposed.

At present the area already has trenches that surround the enclosures. In the proposed layout, these trenches are retained as far as possible after ensuring that they conform to the safety requirements (Depth <1.75m and width >3m). In addition, for each enclosure, wherever there would be a directviewof the elephants, it is proposed to have Ha-ha trenches. The other boundaries of few enclosures would have a combination of broad-gauge rail fencing on the inner side and solar fencing on the outer side. Broad-gauge rail fencingwill be implemented using broad-gauge rail for the vertical members and metre gauge rail for the horizontal members. One

ofthe most common problems that is encountered when broad-gauge rail fencing is attempted is the non-availability of rails. To overcome this hurdle, it is proposed that the fencing will be implemented using I-sections and tubular sections of equivalent strength in case of non-availability.

In those enclosures where rail fencing is not being implemented, the enclosures would be constructed using steel cable fencing. Horizontal steel cables would pass through steel columns. They would be anchored to the earth at their ends and the steel columns would be buttressed from the outside.

The solar fencing however, would cover the periphery continuously in all areas where broad-gauge rail fencing or steel cable fencing is present. The solar fencing (Pulsating 8000v @3.5 Joules with failsafe alarm system) is kept as an additional safety measure. The presence of this combination fencing maybe blocked from the view by growing trees, bushes and bamboo with thick foliage all along the outer periphery of the solar fence in order to improve the aesthetics. It would also confer the additional advantage of creating intrigue in the mindas one traverses from one enclosure to arrive at the next enclosure.

Other options were also considered in comparison with the proposed techniques for fencing of enclosures. However, the present combination was chosen in view of safety, strength, cost, reliability, aesthetics and success history of implementation. The enclosures themselves shall be gated (With gate height >3m) and protected so as to allow controlled access by means of foot as well as by vehicle into the enclosure. Vehicular access into the enclosure is of supreme importance to enable regular and easy supply of food for the elephants. Those points on the outer periphery of the enclosure from which elephant researchers are allowed to study elephants may be protected by a railing of low height in order to avoid accidental slippage into the Ha-ha trench. There are certain portions of boundaries of certain enclosures that are adjacent to rock formations/steep gradients which are inaccessible and impervious to

elephant movement. It is proposed to retain such natural terrain intact to act as natural barriers for the enclosure. The details of each of these aspects of enclosures are shown in the proposed layout.

In addition to all of the above, the trenching of the enclosures may require extra soil stabilisation due to the varied nature of the soils found in the area. In those enclosures where the Ha-ha trenches cut through unstable or skeletal or unconsolidated or rocky soils, minimal additional stabilisation using geo textiles or retaining walls may be required. Also, in order to conserve the trees that may fall directly in line of the Ha-ha trenches alignment, the trenching can be adjusted so as to leave the trees undisturbed. For those trees that need extra support, geotextile based supporting mechanism may also be provided. It may also be noted that there would be drainage facility in all trenches to prevent accumulation of water that can breed mosquitoes.

After the design aspects of the boundary are settled, the attention would naturally turn to the design aspects within the enclosure. It is vital for elephants to have a covered resting place within the enclosure where they can relax while the mahout and other caregivers can attend to the needs of the elephants. For this purpose, the enclosure shall have a roofed holding area. The size of the holding area shall be 9 m x 6 m for each elephant as per the guidelines prescribed in Kerala Captive Elephant (Management and Maintenance) Rules, 2012. In view of the height of the elephants and the heights which can be accessed by an elephant using its trunk, the roof of the holding area shall be at a height greater than 7m. The holding area would have underground electrical connections and underground piped water supply. It would also have water troughs for making drinking water available to the elephants. The holding area shall have sand/mud based flooring made of natural or manufactured sand with cemented area at the hind portion to facilitate drainage and easy removal of dung. Sand would help to maintain the health of the elephant's foot and skin while ensuring adequate percolation and drainage of liquids. The sand shall be filled from a depth not less than 2 m from the surface.There shall

also be provision for tethering the elephant in the holding area itself. More specifically, the tethering facility shall provide for tethering both the front and hind legs of the elephant. Captive elephants are brought up in different conditions and exhibit a wide spectrum of unpredictable behaviour when untethered in a new area. Therefore, as a general principle, semi-permanent tethering can be considered in the beginning as a practice where the elephants are tethered only at night and they are allowed to roam freely in the day time. However, the tethering practices need to be modified to suit the individual needs and circumstances of each elephant.

In addition to all of the above design aspects, each enclosure would have a number of elephant ***environment enrichment mechanisms****such as tree stumps, log piles and objects like large rubber tyres, balls. A facility would also be there for hanging food items for the elephants from tall trees or roof of the holding area (using open bottom barrels etc.) and for hiding food items in the log piles/rubber tyres which would act as positive reinforcement for elephants and increase the feeding browse time. There would also be mechanisms for regular feed/fodder supply and water supply which will increase browse time as shown in illustrative photos. The best techniques for environment enrichment have been selected after carefully studying the best practices in Kolner Zoo (Cologne Zoo), Germany;Arignar Anna Zoological Park, Chennai etc.*

Illustrative photos of proposed environment enrichment in enclosures

Structure for hiding 'treats' within the enclosure. (Illustrative photo)

Structures (holes) for hiding 'treats' within the enclosure. (Illustrative photo)

Frontal view of feed supply mechanism which requires elephants to browse for food. (Illustrative photo)

Back room view of feed supply mechanism which requires elephants to browse for food. (Illustrative photo)

Open bottom barrel for browsing and feeding(Illustrative photo)

Thick rope hung in elephant enclosure(Illustrative photo)

Piles of sand and logs in the elephant enclosure(Illustrative photo)

Logs and ropes in the elephant enclosure(Illustrative photo)

Images
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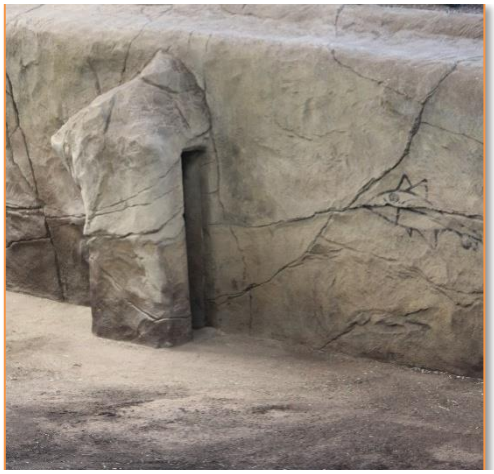
The enclosures are placed in the densely vegetated area of the site along the streams with free roaming areas. Generally, there will be natural substrate to help develop natural behaviour.

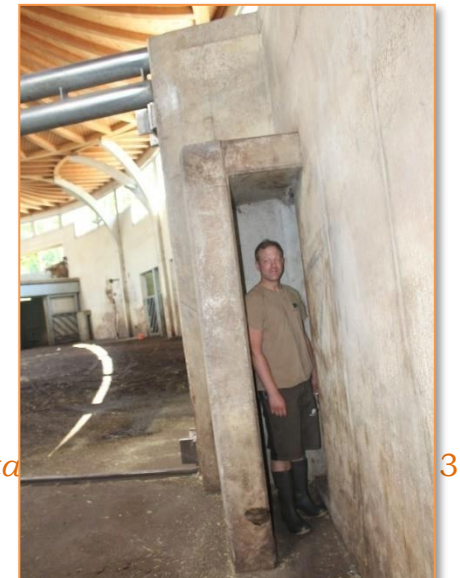
The tendency for bull elephants in the wild is to roam away from the herd. For this, the suggested plan is to organize separate enclosures for them.

The enclosures are dug into a sloping site, to minimize the building's physical impact in the landscape. The circulation path is designed such that elephants are free to room in their habitat and, visiting veterinary students and others move along a restricted path. This gives more safety while ensuring more freedom to the elephants.

The enclosures are also designed with a view to ensure safety of the Mahouts and handlers who enter the enclosure. Two mechanisms are proposed for achieving the same, namely a gap between the rail fencing posts that will allow a human to pass through and a concrete structure that will allow a human to escape from the reach of an elephant. These mechanisms are deployed in the enclosures according to specific conditions in each. Illustrative photo of the second type of escape mechanism is shown below:



Illustrative photo of concrete structure acting as an escape mechanism



Illustrative photo of concrete structure acting as an escape mechanism

Images
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The enclosures are designed with the above thought process and these enclosures will be operationalized in a manner as below:

I. Grouping of present inhabitants

For social groups to be developed among the present inhabitants, behaviour of each elephant is to be studied and recorded by observing each individual closely so that social compatibility as well as dominance and aggression among the elephants present in the centre is known. The centre would provide an opportunity for each elephant to exercise and interact socially with other elephants. Sub-adult males (six years and above) may be housed alone, but not in complete isolation (opportunities for tactile, olfactory, visual, and/or auditory interaction with other elephants would be provided). A behavioural profile will be maintained for each individual elephant of the centre and updated regularly. Staff members will be made aware of each animal's social compatibility and the dominance hierarchies in the herd. Observing the above points, social groups comprising 4-5 females and calves will be formed. Adult and sub-adult males compatible to each group will be identified. Behaviour of the adults above 45 years towards each younger inhabitant will be closely observed. Behaviour of each calf will also be observed and recorded, and viable group formation will be done. All the above observations will be recorded. Mahouts of each elephant in the group will be directed to allow each female elephant free movement with chain inside the enclosure, and increasing the time of such free movement gradually. Eventually each

female elephant will be trained in such a way that elephants in each group can be kept together with minimum or no chains inside the enclosure and obeying the commands of the mahout without any compulsion. The groups of elephants will be tethered during night hours and for this purpose there would be a shelter in a single block with separation within shelter using chains.

The sub-adult and adult male elephants would be housed near the group enclosures of the females after observing the compatibility so that each of them would develop closer relationships and would have opportunities for tactile, olfactory, visual, and/or auditory interaction with each other.

II. Upgrading of existing enclosures

The existing enclosures would be given the following facilities:

The trenches around the enclosures would be remodelled in such a way that the elephants would not get injured on accidental fall by making the inside of the trench have a gentle slope and the outside boundary vertical. The outside wall would be strengthened so that the elephants would not be able to damage the trench-wall with tusks. The enclosures would be provided with raised feeding areas and water troughs. Different feeding methods would be developed so that elephants would be encouraged to search for their food. Elephant friendly toys would be provided to break monotony. Enclosure would be landscaped with plants and trees suitable for the area. Showers and near-natural ponds which can be used for bathing by Elephants would be provided. In addition, rubbing posts, different substrates like sand, mud, soil and grass would be used in the enclosure. An undulating landscape would be developed. Outside of the trench would be given a protection with crash-guard/fall proof fencing.

III. New enclosures would be dealt with in the following manner:

Each elephant would be given a minimum of 0.5 acres of floor space inside the enclosure. The enclosure would have natural substrates with grass, soil, mud and sand. The terrain would be undulating in nature retaining the original topography. Trees would be planted to provide shade inside the enclosure. The trees would be provided with tree guards and protection around the trees. In the group enclosures for female elephants and calves, additional shelters would be provided apart from the night shelters. Each enclosure would have showers, pond, raised feeding areas besides facilities to keep feed in different ways, 2-3 water troughs, facilities to keep treats and feeds in a concealed manner to develop inquisitive behaviour etc. would be present. Rubbing posts, toys – big tyres, balls, logs of wood etc. would also be present

All the pipes inside the enclosure would be installed in a concealed manner with its regulators at the animal keeper area. Each enclosure would have a separate animal keeper area. Each enclosure would be having safety measures like foaming equipment, high speed water jets and concealed path ways to escape from the enclosure in case of emergency. Animal keeper area would have facility to keep the instruments of the mahouts and facility to observe the elephants, and recording the behaviour and activities of elephants. Each enclosure would be provided with waste collection tools such as arbanas, gloves, spade etc.

It is proposed to have total of 24 enclosures comprising of nine group enclosures, 15 individual enclosures and dedicated enclosures for calves and musth management. All the enclosures would be under CCTV surveillance with a centralised observation facility.

IV. Musth Kraal

There will be a Musth Kraal that ensures safety to elephants in the musth period. Size of the Kraal would be 7.6 x 7.6 x 7.6 m with roofing. Water trough with concealed pipe connection and points to connect hose pipe of suitable size would be provided

V. Orphan calf area

The orphaned calves brought to the ERC are aged between few days to 2 years. These calves require 24-hour special care since most of them are weak due to disease or injury. These calves are highly stressed because of the separation from their herd. Due to these reasons, elephant calf rearing requires special attention. They should be reared under highly hygienic conditions with care and attention of the animal keepers throughout their calf-hood. The calf rearing area will be a separate facility which provides nutritious food hygienically. During calf-hood social behaviour has to be developed which would help in group formation among unrelated calves and juveniles.

The orphan calf area would have a dedicated kitchen, facility for animal keepers to stay with the calves, storage facility for food, medicines and equipment. The area would have an examination facility for calves. The area would be under CCTV surveillance for observation and studying the behaviour of elephant calves.

Night shelter units for calves and their keepers to stay together would be provided adjacent to the orphan calf area. A dry hygienic area with soft bedding would be provided inside the housing unit for orphan calves to sleep and rest. There would be a common paddock outside, with facility to individually hold any calves if needed. But opportunities for tactile, olfactory, visual, and/or auditory interaction with other elephant calves would be maintained. The paddock would have grass as its substrate. For environmental enrichment of the orphan calf area, and to avoid stereotypic behaviour, toys like balls, small tyres, lightweight logs of different sizes and shallow ponds would be provided. There would be separate quarantine area for calves away from the orphan calf area.

VI. Fencing

The enclosures would have trenches at the viewable perimeter. Other parts of the perimeter would be covered by broad gauge rail

fencing/steel cable fencing with an additional safe guard measure in the form of solar fencing. Other varieties of fencing such as Concrete Pole fencing etc. may also be shown in ERC for demonstrative and academic purposes.

4.7 Housing for staff and students

Accommodation facility has been provided for the staff and the students visiting the facility. The buildings for the housing colony are located along a sloped terrain. Two blocks of Men's hostel and Ladies hostel and a 2 storeyed building would be provided with separate dining hall for Training Centre accommodation. A block of 2 storeyed building would be provided for staff quarters with each block consists of 8 dwelling units. Another single block would be provided for officers' quarters, which consists of 4 dwelling units. Present accommodation facilities for the visitors would be upgraded.

Total number of mahouts in ERC would be around 100. Accommodation would be provided for around 80 mahouts. Among this, 40 would be given bachelors accommodation and another 40 would be given family accommodation. Total number of family blocks will be 4 and each family block building would have 8 dwelling units. Of this, 4 dwelling units will be in the ground floor and another 4 will be in the first floor. Among these, it is proposed to construct 3 of them in the first phase.

4.8 Veterinary Hospital

Captive elephant treatment in India requires improvement, especially in the use of modern diagnostic aids to ensure speedy and correct diagnosis. There is also lack of proper protocol in the management and treatment of diseases. Though Kerala is the state with the highest number of captive elephants in India, there are no hospitals for Elephants. The proposed Elephant Veterinary hospital at ERC would be a permanent fully equipped veterinary facility with the required infrastructure and human resource. Elephant Veterinary facilities are available under organizations in Thailand, and non-dedicated facilities in Zoos and

National parks in Africa, Europe and America. However typical behavioural traits of each elephant sub-species demand a closer and sensitive approach inspired from similar facilities across the world. To address this sensitivity, a meeting was conducted in Thrissur in the site for the Puthur Zoological Park with experienced veterinarians in elephant veterinary care from all over Kerala. Various facilities available at similar centres across the world were discussed and its relevance and applicability in ERC taking into account the behaviour of Indian Elephants. The inputs obtained from the team of veterinarians and the available literature on captive and wild animals were studied to design the hospital infrastructure of ERC.

The features of the veterinary hospital in ERC would be as follows:

- Facilities for veterinarians and para-veterinarians and other staff members to stay during night hours
- Examination yard and surgical yard
- Equipment's for chemical and physical control
- Advanced equipment's for diagnosis and treatment
- Mobile units with facility to conduct basic treatment, basic diagnostic tests, tranquilization, physical control, sample collection and storage etc.
- Record keeping unit
- Vehicle parking area
- Kitchen for inpatients
- Laboratory
- Kraal
- Specialised orphan care facility
- Triage facility
- Quarantine facility
- Breeding area and calving facility
- Storage facility for feed and fodder

The veterinary hospital in ERC would have the following medicines available:

- Tranquilizing Drugs
- Reviving Drug
- Antibiotics
- Anti-Inflammatory Drugs (Non-Steroidal)
- Respiratory Stimulants
- Steroids
- I/V Fluids
- Calcium Borogluconate
- Liver Stimulants
- Vitamin Injections
- Polyvalent Anti-venom
- Anti-Histamines
- Antacids
- Anti-Septic Ointment
- Antiseptic Lotions
- Anti-Zymotic Drugs
- Herbal Preparations
- Digestive Stimulants
- Antiviral Drugs
- Tetanus Toxoid
- Anti-Rabies Vaccine

4.9 Waste management unit

ERC willgenerate huge quantity of solid waste in future. The source of solid waste in ERC would be elephant dung. So an effective solid waste management system is necessary for the proper functioning of ERC. The system shall ensure minimum non-organic waste generation.Green protocol will be strictly followed to reduce the plastic consumption

The major source of solid waste, elephant dung will be recycled and used for making eco-friendly paper and also used as an alternative to coir pith. In the future, another alternative for disposing solid waste apart from elephant dungsetting up a biogas plant can be considered which will also help generate fuel for ERC.

4.10 Research Centre

Research, Training and Skill Development Centreis provided inside the Elephant Rehabilitation Centre to facilitate sharing of information, experiences and scientific knowledge to develop better skill among professionals and animal handlers.It is also intended to establish research network with various institutions and organizations. It would also impart training to mahouts as well as elephant owners in various disciplinesrelated to management and upkeep of elephants. The Centre is designed with an intent to promote research on both veterinary care and behavioural aspects of the elephant.

The following facilities will be provided in the Research Centre

- Dormitory for the accommodation of trainees
- Guest accommodation
- Classrooms
- Conference hall
- Audio-visual centre
- Lab and equipment
- Logistics for research activities
- Library
- Tele Conferencing

4.11 Post-mortem unit and crematorium

The formal post-mortem and cremation facilities for elephants are absent in Kerala. So ERC needs to provide this facility for elephants in the Centre as well as for the elephants outside the Centre.The centre would

have a dedicated and isolated post mortem unit and an adjoining cremation facility.

The features of the post mortem unit shall be the following:

- Isolated location away from all other areas of ERC with a distance of over 2 kmfrom the nearest other ERC component
- Isolation using high walls and trees
- Rail facility for moving elephant carcass inside the post mortem area to facilitate easy movement of body parts
- Crane and hoist facility
- Post-mortem area
- Testing equipment- sample collection facility/sterilization of equipment with storage facility of equipment
- Artificial daylight matching lighting
- Dedicated water tank and power supply
- Crematorium
- Low maintenance crematorium
- 0% smoke and odour emission
- Residue collection and residue burial facility

4.12 Fodder management

After careful analysis of elephant fodder requirement and demand projection for future, it is estimated that the proposed facility would require 10.5 Tonnes of Green Grass fodder and 4.5 Tonnes of Tree Fodder. In order to ensure adequate supply of fodder as per projected demand, the following activities are proposed to be undertaken.

- Fodder diversification and inclusion of Napier CO-3 grass as green fodder
- Cultivation within facility (Details of area for cultivation given in layout map)
- Fodder supply contracts

- Assisted cultivation through local agencies

4.13 Sewage Treatment Plant

In the proposed layout of ERC, a single centralized effluent treatment plant is proposed for the entirety of effluents generated in ERC. The effluents from Hostel and Quarters, Elephant kitchen, Cafeteria, Administration block, Museum, Training and Research Institute will be collected in a treatment plant.Major portion (70%) of effluent generated will be sullage, with least organic content. It will be subjected to treatments such as sedimentation and fine filtration. This facility will serve as the ETP(Effluent Treatment Plant) and it will be located at the lowest point of the residential area. Treated sullage is given for total reuse for non-contact applications such as floor washing, vehicle washing, gardening etc. Also it is allowed to percolate and to recharge ground water. The sewage will be treated through a process known asActivated Sludge Process (ASP). Though many otheraerobic treatment methods are available, ASP is the best for ERC because of the following reasons:

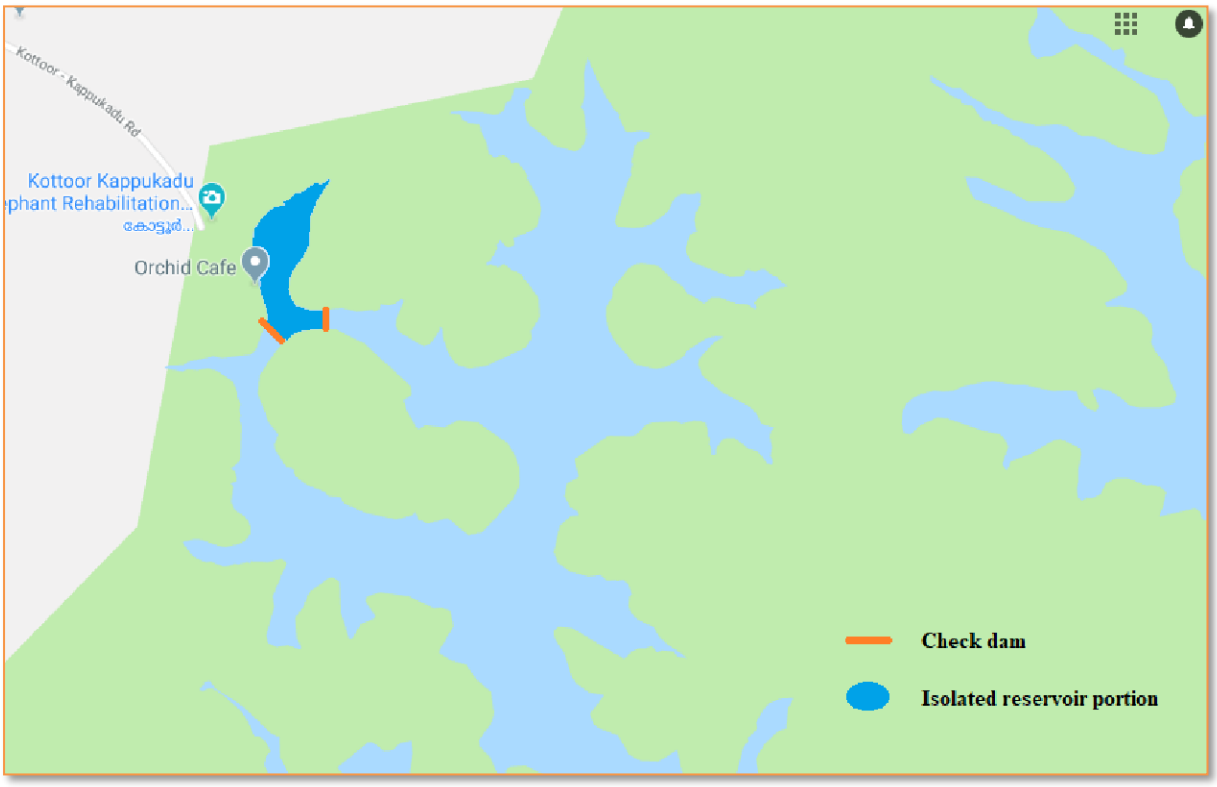
- Time-tested, established and proven technology worldwide
- Ease of operations
- No use of patented machines, equipment or consumables, thereby eliminating difficulty in long-term operations
- Limited space utilisation
- Improved aesthetics

4.14 Rainwater harvesting system

Total projected future water demand for the centre per day is around 4,20,000 litres. ERC is drawing water for its present needs from the North-West part of Neyyar reservoir which is adjacent to the Centre. But in summer seasons, water level in this part of the reservoir recedes rapidly and may not be sufficient to meet the projected future demand. Hence it is proposed to make suitable arrangements to collect the rain water available in monsoon season and to make use of the same in the summer season. Water required for the dry months spanning from

February to May is approximately 500 lakh litres and the same can be collected and stored this way.

It is proposed to isolate the North-West portion of the reservoir by constructing earth dams in the reservoir in the neck portions (Highlighted in red colour in the figure given below) and to store the monsoon flow in the same.



The average area of the isolated portion is nearly 1.50 Hectares. A storage of nearly 600 lakhs (including evaporation allowances) will be created in this portion by raising water depth up to 4 meters by constructing earthen check dams within the reservoir. The proposed top level of check dam is approx.: +94m.

A rain water recharging pond will also be constructed on the northern side of ERC. The proposed location for the pond is surrounded by raised land on three sides and a rubber plantation on the west side. A natural water course is flowing across this land in East-West direction. An excavated pond of size 125m x 125m x 4m proposed in this area will be recharged by diverting the natural water course through the same. The

side slopes of the pond are proposed to be stabilized using geo textile membranes. This pond would not only provide required water storage, but would also recharge water table in the locality and would provide sufficient ground water in future.

5. Personnel planning

5.1 Introduction

The future of ERC hinges on having the right people in the right jobs. A committed and well trained workforce will be the backbone of such an institution. At present there are various categories of personnel engaged in the facility. As the ERC elevates itself to the next level, higher specialisation and trainings will become necessary to attend to the emerging needs.

Most of the staff engaged in the ERC at present did not join their duties with any specific skill or knowledge for doing specific tasks. Most of the job profiles like security, clerks, cleaners, sanitation workers etc. at present in the ERC are also of a generalist nature and don't need any specialised skill. They can acquire experience working over years.

The mahouts on the other hand are key specialised positions in ERC. They need adequate training and skill to manage and handle the elephants. The mahouts will be trained under experienced faculty makingthe mahouts and guards fit for doing their tasks

In future, the Research, Training and Skill Development Centre of ERC can identify specialised training needs of each category of staff and develop modules to impart training for them. This skilling effort need not be restricted to the ERC alone, but can rather be developed into and open course where applicants from all over the world can get trained. This would be a great opportunity for ERC to acquire information and knowledge from across the globe by learning and sharing the accumulated wisdom on elephants.

The ERC is at present administered by the Department of Forests and Wildlife, Government of Kerala. This can continue in future as well with the forest department providing and ensuring the proper functioning of key aspects of the ERC while fully or partially outsourcing various sub-activities of ERC such as running restaurants, feed supply etc.

The proposed staffing pattern of ERC has been modelled taking into account the needs of the future and the operationalisation plan with the arrival of new facilities such as museums, feed management etc. These numbers provide a basic framework and the personnel numbers can be altered in future in accordance with the demands raised by the attributes of various elephants arriving in the facility as well as by the growth and development of the centre.

5.2 Existing Staffing Pattern in ERC

Table 4: Present staffing pattern in ERC

Serial No	Designation	No
1	Wildlife Warden	1
2	Range Forest Officer	1
3	Deputy Range Forest Officer	1
4	Section Forest Officer	1
5	Beat Forest Officer	1
6	Clerk	1
7	Mahouts	32
8	Cleaners	7
9	Driver	2
10	Guide	6
11	Security	2
12	Plumber	1

13	Electrician	1
14	Boating workers	5
15	Canteen workers	5
	Total	**67**

5.3 Proposed Staffing Pattern in the ERC

Table 5: Proposed staffing pattern for ERC

Serial No	Designation	No
1	Director	1
2	Assistant Director	1
3	Office Manager	1
4	Accountant	1
5	Office Assistant	4
6	Scientist	1
7	Education Officer	1
8	Computer Operator	2
9	Cleaning and Maintenance Staff	33
10	Security	19
11	Last Grade Staff	6
12	Attendant	9
13	Curator	1
14	Assistant Curator	1
15	Section Forest Officer	2
16	Beat Forest Officer	3

17	Mahouts	50
18	Assistant Mahouts	50
19	Caretaker	4
20	Cook	4
21	Assistant Cook	9
22	Veterinary Doctor	2
23	Para Veterinarian	3
24	Lab Assistant	1
25	Plumber	2
26	Electrician	1
27	Gardener	3
	Total	**215**

6. Disaster management plan

6.1 Hazards

Kerala State is vulnerable to a multitude of hazards and is categorized as a multi-hazard prone state. The state experiences various kinds of disasters of recurrent nature which result in loss of life, livelihood and property (public and private), and disruption of economic activity, besides causing immense misery and hardship to the affected population. Some of these hazards pose a threat to ERC as well.

The state experiences heavy rainfall and flood during the southwest monsoon, with subsequent damage to life and property. Drought conditions have also become more frequent during the pre-monsoon period and at times with the failure of southwest monsoon and /or northeast monsoon. Incidences of biological disasters such as epidemics, pest attack are also on the rise. All these threats can affect ERC.

While disasters cannot be completely avoided, the vulnerability of ERC to various hazards can be sustainably and substantially reduced by planned prevention, mitigation and preparedness measures. The new approach emanates from the conviction that disaster mitigation and preparedness is built into the design and development of ERC.

6.2 Disaster risk mitigation and management

As far as mitigation of disasters are concerned, fire is the highest priority risk factor and fire hazard prevention and mitigation measures will be present in every building. For forest fires in the adjacent area, usual fire prevention methods such as fire line tracing and removal of debris in surrounding areas will have to be periodically carried out.

Drought and water scarcity prevention can be carried out in ERC as the ERC has two dedicated ponds apart from the waters of the adjacent Neyyar reservoir. However, monitoring the water levels in these facilities is important to realise the onset of drought.

The elephants in the ERC are housed in enclosures that have redundancy in their boundary. Not only is there a broad-gauge rail fencing, there is also a solar fence that surrounds the enclosures. In case of any emergency that destroys the enclosure boundary, the contingency plan listed in next chapter will be operationalised.

For the staff and visitors in the ERC, open spaces and meeting points will be clearly demarcated so that people can assemble in case of an emergency.

There will be sufficient food stock and water for elephants in the ERC so that in case of emergency, the elephants are not starved.

Post-disaster events such as reconstruction and rehabilitation will have to be carried out after assessing the extent and nature of damage due to the disaster.

In addition to all of the above, training of staff and periodic mock drills involving staff, visitors and local people will be carried out in the ERC to have the best response against disasters.

7. Contingency plan

There are various contingency scenarios envisaged during the functioning of ERC. Each of these contingency situations have been analysed and responses are prepared for the same. The staff of ERC will be trained for these responses as a standard operating procedure.

7.1 Animals rescued from wild

Animals rescued from the wild will be bought to the ERC by the forest department officials.Sufficient quarantine facilities will be available for these animals in the ERC to take care of such an event according to the proposed design. Such animals will be later shifted to empty enclosures or released into the wild, depending on the animal and its condition.

7.2 Escape of animals from enclosures

For managing issues arising from animal escapes, a special team will be constituted under the leadership of the Rehabilitation Centre Superintendent (Range Forest Officer). The team will include a Veterinary Officer and three trained and experienced Animal Keepers. The team will be equipped with the latest tranquilizing devices and restraint equipment. Another team consisting of the Rehabilitation Centre Curator, Security staff and police officers will be formed to carry out the emergency evacuation as per the approved procedures.

Mock exercises will be carried out at regular intervals so that the teams will be prepared to handle contingencies at short notice.

Necessary equipment like diesel generator, portable electric saws, axes, shovels, bill hooks, water tankers, diesel pumping sets, ropes, spot lights, emergency lamps, siren, loudspeakers/megaphones, chains, nuts and bolts, batteries and saw blades will be procured immediately on commencement of ERC. This equipment will be inspected periodically to ensure that they function properly.

In addition to the above arrangements, the ERC will also have a perimeter solar/steel cable fence that will prevent elephants from moving out of the ERC campus.

7.3 Monkey, cattle and dog menace

There are a few free ranging monkeys in the forests adjacent to the ERC. But they don't create any disturbance to the elephants, visitors or to the staff members other than living in their natural habitat. Sometimes presence of stray dogs has been noted inside the ERC. All entrance and exit points of ERC will have cattle entry prevention facilities as well.

7.4 Arrangement of food in case of strike

A part of the total fodder will be cultivated inside the ERC premises. In addition to it, there will be a one-day storage possibility of food (sugarcane and grass) and 2 to 3-days storage facility for fodder. Provision for storing concentrates for preparing feed for 10 -15 days will be available in ERC. Fire wood will also be kept in reserve.

7.5 Snake bite

To manage emergencies like snake bites, 15 – 20 vials of polyvalent anti-venom will be kept at the Rehabilitation Centre Hospital at all times. Besides, there are hospitals nearby that are in a position to manage escalation of any such medical emergencies.

7.6 Visitors getting injured

A small facility inside the ERC Campus is available to give first aid for anyone who gets injured or hurt under various conditions. But this system is not up to the mark at present and it will be improved with in the ERC. The nearest hospital is at Kottoor. In case of serious injury, they could get treatment in this hospital.

7.7 Fighting among animals

Every enclosure will be provided with an isolation area. In case of infighting among animals, they can be segregated to this area. A team consisting of the Superintendent, Veterinary Officer and three trained Animal Keepers, who are equipped with tranquilizing and restraint equipment, will be ready at all times to meet emergencies that might arise from such infighting. Equipment such as foaming equipment, electrical prods, high speed water jets etc. will be available in ERC.

7.8 Epidemics

Disinfecting tyre dips will be enforced at the campus entrance, and all visitors to the Rehabilitation Centre premises will be required to go through a disinfecting foot dip to help reduce the risk of contamination.Whenever an epidemic is reported in the district, sufficient preventive measures will be taken in the Centre. The State Animal Husbandry Department will be approached for full technical and physical help to deal with all disease related emergencies. Vaccinations will be provided to animals wherever possible to keep them immune to diseases outbreak.The entry of unauthorised vehicles will be strictly prohibited into the Rehabilitation Centre.

7.9 Breakdown of power supply etc.

A diesel generator is proposed to be installed in the Rehabilitation Centre premises to help in emergencies, and a separate portable generator will be provided in the Veterinary Clinic for managing emergencies. Electricity connection will be made available to all enclosures and service roads through an underground cable system.

7.10 Free ranging animals/ feral animal menace

There are a few animals that can roam in the ERC for at least part of the day as they roam from adjacent forests into ERC territory. It includes Gaur,Deer, Pig, Monkeys, Peacock etc. But they don't create any kind of disturbances to the visitors or else to the staff.

8. Capacity building Plan

The ERC will have a dedicated research and training facility within the campus itself. The learnings from the research centre coupled with latest information on the best practices in elephant rehabilitation will be made a part of the working practice of ERC. Once the facility develops into its proposed final shape, other learning and sharing opportunities with similar institutions across the world is a possibility. These opportunities will have to be explored proactively so that there is mutual exchange of personnel and training. The trainings that are conducted in the ERC will be open for participants from all over the world so that this process happens in a natural fashion.

Within the country itself, the inter-institution cooperation can be strengthened by exchange of information with similarly placed zoos and rehabilitation centres and by sending personnel from ERC to those institutions to learn their best practices.

With institutional mechanisms to systematise the available information and make it available for further research and training, the capacity building, and interaction with other institutions will strengthen in the fullness of time.

Training courses are proposed for the staff of ERC as follows:

I. Induction training for mahouts
II. Refresher training for mahouts on a half yearly basis
III. Induction training for other staff on elephant rehabilitation
IV. Refresher training for other staff on elephant rehabilitation on a yearly basis
V. Theme based training on various aspects of ERC such as feeding, behavioural aspects, international best practices etc. which will be conducted yearly with an annual training calendar

VI. Specialised training for veterinary staff in other institutions within India and abroad

VII. Mahout training course for mahouts who will be engaged outside of ERC

The specific subjects for each training will be decided as per the need from time to time.

9. E-governance

E-governance initiatives are key to the functioning of the revamped ERC. The routine functioning of ERC will generate vast volumes of data once the data collection systems are in place. This data will be made available to the Research, Training and Skill Development Centre as much as possible on a real time basis. The data collection and accumulation is expected to happen through a software based system which will also function as a management information system which will enable better decision making in the day to day functioning of ERC.

Since elephants show varied behavioural patterns and are prone to injuries, abscesses, foot problems, open wounds, etc., they require frequent maintenance of records. Maintenance of records is a very important component of elephant management. The records can be of different kinds, starting from simple observation to complex medical and behavioural analysis. The details available in these records can play a vital role in managing both elephants and their handlers.

The following records will be maintained in the e-governance system:

- Animal Body Measurements (Individual Register)
- Animal Photographs
- Health Reports of Blood /Urine Analysis Reports
- Disease and Treatment Record
- Vaccination Records
- Feed Record
- Ration/Diet Chart
- Work Schedule Records
- Movement Register Schedule Records
- Elephant Data Book
- Record of Ivory
- Stock Registers of Various Items
- Daily Reporting Register for Individual Elephants

- Breeding Register
- Sample Collection Register
- Tranquilization Register
- Register of Tranquilising Drugs

Training mahouts / handlers to observe behaviour of related and un-related elephants when they are together being a pre-requisite for the system which will in turn help in managing the animals better, while providing a database for research.

Micro-chipping all elephants with appropriate micro-chips that can provide all recordswill be completed in ERC. This will ensure that data-keeping becomes a less cumbersome process. Thereafter, all the elephants will have a unique ID that contains all their records.Further, DNA finger printing of all elephants will be done.

Also, the entire centre has to be under CCTV coverage so that all the activities can be monitored and recorded for future reference. Thermal imaging sensors can be installed at night time near the elephant enclosures.

The e-governance system can be further expanded to include the management of feed supply and visitor management (e-ticketing etc.) so as to have a comprehensive approach to managing all affairs of the ERC through a single interface.

10. Budgeting

10.1 Broad budget analysis for implementing the plan

A cost estimate of the developmental programmes to be taken up in ERC during the plan period is given below:

Table 6: Cost estimate for developmental programmes

(Rs in Lakhs)

Sl. No	Item of Work	Total Cost
1	Boundary Fencing	23,71,95,000
2	Enclosure Fencing	25,00,00,000
3	Veterinary Clinic (Equipment and Accessories)	4,17,00,000
4	Tethering Shed	4,98,75,607
5	Research, Training and Skill Development Centre(Equipment and Facilities)	3,00,00,000
6	Building Civil Works* *(Details in 10.2, Pg 67)*	28,44,40,040
7	Renovation of Existing Buildings	1,50,00,000

8	Water Conservation(Pond+Check-dam)	5,00,00,000
9	Electrical	5,00,00,000
10	Plumbing	75,00,000
11	Bio Gas Plant	1,07,00,000
12	Sewage Treatment Plant	50,00,000
13	Landscaping and Afforestation	3,00,00,000
14	Developing Materials for Museum and Materials for Interpretation	4,00,00,000
15	Cafeteria(Accessories, Furnishing and Equipment)	1,00,00,000
16	Miscellaneous	1,00,00,000
	Total	**1,12,14,10,647**

10.2 Construction and development

A cost estimate of the construction and development activities to be taken up in ERC during the plan period is given below:

Table 7: Cost estimate for construction and development

(Rs in Lakhs)

Buildings	Area (m2)	Area (sqft)	Cost
Cafeteria (Single Storey)	398.32	4287	98,61,196
Veterinary (Double Storey)	990	10656	2,45,09,400
Museum (Single Storey)	1492.43	16064	3,69,48,045
Research And Training (Double Storey)	1242	13369	3,07,48,157
Administrative Building	356	3832	88,13,481
Entrance Plaza (Single Storey)	185	1991	4580039
Men's Hostel (Single Storey)	454	4890	1,12,48,329
Ladies Hostel(Single Storey)	157	1690	38,86,844
Dining Hall(Hostel)	135.66	1460	33,58,531
Staff Quarters 1 (Two Storey)	524.38	5644	1,29,82,060
Staff Quarters 2 (Two Storey)	935	10064	2,31,47,766

Staff Quarters 3 (Two Storey)	417	4489	1,03,23,656
Mahout Accommodation Bachelors (Double Storey)	833	8966	2,06,22,556
Mahout Accommodation Family 1 (Two Storey)	407.04	4381	1,00,77,077
Mahout Accommodation Family 2 (Two Storey)	407.04	4381	1,00,77,077
Mahout Accommodation Family 3 (Two Storey)	407.04	4381	1,00,77,077
Mahout Accommodation Family 4 (Two Storey)	407.04	4381	1,00,77,077
Kraal (16 Nos.)	1225	13185	3,29,64,443
Crematorium (Single)	262.3	2823	8470113
Elephant Kitchen and Store	188.05	2024	3643472
Total Cost			***28,44,40,040***

10.3 Day to day maintenance

The tentative cost on account of staff that the ERC will incur in its day to day functioning is as below:

Table 8: Cost on account of staff for the First Five Years

(Rs in Lakhs)

Category		Grade-1 staff	Grade-2 Staff	Grade-3 Staff	Grade-4 Staff	Skilled Mazdoor	Mazdoor	
Year 1	Number	4	4	6	15	45	35	
	Rate/month	1.25	0.8	0.35	0.2	0.18	0.15	
	Cost	60	38.4	25.2	36	97.2	63	320
Year 2	Number	4	4	7	20	55	40	
	Rate/month	1.35	0.85	0.4	0.22	0.19	0.16	
	Cost	64.8	40.8	33.6	52.8	125	76.8	394
Year 3	Number	4	4	8	25	65	45	
	Rate/month	1.45	0.9	0.45	0.25	0.2	0.17	
	Cost	69.6	43.2	43.2	75	156	91.8	479
Year 4	Number	4	4	9	30	80	50	
	Rate/month	1.6	0.95	0.5	0.27	0.22	0.18	
	Cost	76.8	45.6	54	97.2	211	108	593

Year 5	Number	4	4	9	32	100	52	
	Rate/month	1.75	1	0.55	0.3	0.25	0.19	
	Cost	84	48	59.4	115.2	300	119	725

The tentative maintenance cost for elephants that ERC will incur in its day to day functioning is as below:

Table 9: Maintenance Cost of Elephants for first Five Years

(Rs in Lakhs)

Category of Elephant		**Adult**	**Sub-adult**	**Calf Elephants**	
Year-1	Number	5	5	10	
	Rate/Month	1	0.6	0.3	
	Cost	60	36	36	132
Year-2	Number	8	8	10	
	Rate/Month	1.05	0.65	0.32	
	Cost	100.8	62.4	38.4	202
Year-3	Number	15	12	10	
	Rate/Month	1.1	0.7	0.35	
	Cost	198	100.8	42	341

Category of Elephant		Adult	Sub-adult	Calf Elephants	
Year-4	Number	25	15	10	
	Rate/Month	1.15	0.75	0.38	
	Cost	345	135	45.6	526
Year-5	Number	30	20	10	
	Rate/Month	1.2	0.8	0.4	
	Cost	432	192	48	672

The tentative total maintenance cost that ERC will incur in its day to day functioning is as below:

Table 10: Cost of maintenance of the Centre for first Five Years

(Rs in Lakhs)

Sl. No	Particulars	Year-1	Year-2	Year-3	Year-4	Year-5
1	Staff Cost	319.8	394	478.8	592.8	725.2
2	Elephant Maintenance Cost	132	201.6	340.8	525.6	622
3	Electricity	5	7	10	13	15
4	Vehicle Maintenance Cost	20	25	30	35	40
5	Procurement of Implements for Elephants	10	12	15	17	20
6	Building Maintenance	20	22	25	28	30
7	Uniforms and other provisions	10	12	14	17	20

8	Cost of running cafeteria etc.	100	150	225	340	510
9	Training and related expenses	30	35	40	45	50
10	Other expenses	20	25	30	35	40
	Total	***666.8***	***883.6***	***1208.6***	***1648.4***	***2072.2***

10.4 Resources

ERC nees to generate income to meet its day to day expenses like maintenance works, fodder requirements of elephants, increasing operating cost of museums particularly speaking, costs of conservation, documentation, exhibition, maintenance, renovation of gallery etc., fuel needed for cooking and running machines like paper recycling unit, generator, Sewage Treatment Plan etc. Income in the ERC will potentially be generated from the following major sources.

- Entry Fee and Parking Revenues
- Museum and Cafeteria Revenues
- Training, Veterinary and Cremation Revenues

A tentative statement of expected revenue for ERC is as below:

Table 11: Statement of Income of the Centre for the first Five Years

(Amount in Rupees)

Sl. No	Source of Income	Year-1			Year-2		
		Number	Rate	Amount	Number	Rate	Amount
1	Entry fee to Elephant Museum	100000	50	5000000	150000	50	7500000
2	Vehicle Parking Fee	20000	20	400000	30000	20	600000
3	Income from cafeteria	75000	100	7500000	112500	120	13500000
4	Income from Training	500	1000	500000	600	1000	600000
5	Income from	5	100000	500000	10	100000	100000

	Sponsorship						0
6	Total			13900000			23200000
7	Grant from Central/State Government			52780000			65160000
8	**Grand Total**			**66680000**			**88360000**
Sl. No	**Source of Income**	**Year-3**			**Year-4**		
		Number	Rate	Amount	Number	Rate	Amount
1	Entry fee to Elephant Museum	200000	100	20000000	250000	100	25000000
2	Vehicle Parking Fee	40000	30	1200000	50000	30	1500000
3	Income from cafeteria	150000	140	21000000	187500	150	28125000
4	Income from Training	720	2000	1440000	840	2000	1680000
5	Income from Sponsorship	20	200000	4000000	25	200000	5000000
6	Total			47640000			61305000
7	Grant from Central/State			732200			103535

	Government			00			000
8	**Grand Total**			**120860 000**			**164840 000**

Sl. No	**Source of Income**	**Year-5**		
		Number	Rate	Amount
1	Entry fee to Elephant Museum	300000	150	45000000
2	Vehicle Parking Fee	60000	50	3000000
3	Income from cafeteria	225000	175	39375000
4	Income from Training	960	2500	2400000
5	Income from Sponsorship	30	250000	7500000
6	Total			97275000
7	Grant from Central/State Government			109941000
8	**Grand Total**			**207216000**

PART-III

11. Management Plan (Budget)

11.1 Phasing out of Developmental Programmes

The State Government has committed to provide the fund for the development of ERC the works are targeted to be completed in 2 years starting from October 2018 to September 2020.

Table 12: Phasing out of the Developmental Programmes

Sl. No	Item of work	October 2018to September 2019	October 2019 to September 2020	Total Cost
1	Boundary Fencing	94878000	142317000	23,71,95,000
2	Enclosure Fencing	100000000	150000000	25,00,00,000
3	Veterinary Clinic (Equipment)	16680000	25020000	4,17,00,000
4	Tethering Shed	19950243	29925364	4,98,75,607
5	Research, Training and Skill Development Centre(Equipment and Facilities)	12000000	18000000	3,00,00,000
6	Building Civil Works	113776016	170664024	28,44,40,040

7	Renovation Of Existing Buildings	6000000	9000000	1,50,00,000
8	Water Conservation(Pond +Check-dam)	20000000	30000000	5,00,00,000
9	Electrical	20000000	30000000	5,00,00,000
10	Plumbing	3000000	4500000	75,00,000
11	Bio Gas Plant	4280000	6420000	1,07,00,000
12	Sewage Treatment Plant	2000000	3000000	50,00,000
13	Landscaping And Afforestation	12000000	18000000	3,00,00,000
14	Developing Materials for Museum and Materials for Interpretation	16000000	24000000	4,00,00,000
15	Cafeteria(Accessories And Equipment)	4000000	6000000	1,00,00,000
16	Miscellaneous	4000000	6000000	1,00,00,000
	Total	**448564259**	**672846388**	**1,12,14,10,647**

12. Annexures

12.1 List of tables