

## **Guidelines for the preparation of the Master Plan of zoos**

Master plan of a zoo should be a comprehensive document giving a detailed road map for 20 years with a provision of review every 10 years regarding development, improvement and upgradation of the facilities and infrastructure available at the zoo and building up of the capacity for carrying out all the operations forming part of the zoo management with greater efficiency. The development of the master plan of a zoo involves following steps:-

- (i) Define the mission, vision and the conservation message of the zoo through a detailed process of consultation.
- (ii) Thoroughly inventory and evaluate the existing infrastructure, facilities, resources and services available at the zoo and analyse the same to identify the areas of strength and weaknesses in order of priority.
- (iii) Draft a development brief and identify the priority needs and development project imperatives to address these needs.
- (iv) Use of the project imperatives for developing an implementable action plan along with estimated costs. Try to match the developed action plan and the projected costs with the available resources and if necessary keep on repeating the process till optimal relationship among all the components of the master plan i.e. a happy marriage between the needs, opportunities, constraints, risks and rewards is achieved. The concept finally selected along with summary of other studies listed above should be submitted to the zoo operator and the Central Zoo Authority for their concurrence and approval.
- (v) Once the concept plan is approved by the concerned authorities a comprehensive master plan for the zoo should be developed in the prescribed format annexed at Annexure – I to these guidelines.

Priority areas to be given special attention during preparation of the master plan

1. Achieve the highest standards of housing and upkeep for zoo animals with a view to establish self sustaining populations of genetically and behaviourally viable animals adopting latest skills of behavioural enrichment and genetic management.
2. Planned breeding of endangered species through provision of off the exhibit breeding enclosures of requisite specification in adequate number to accommodate the viable breeding population of endangered species.
3. Availability of requisite expertise for upkeep and healthcare of the animals of concerned species for its long-term survival.

4. Thematic display of animals in nature emersing exhibits equipped with feeding and housing facilities congenial to the species specific behaviour of the animals housed therein.
5. To assess the carrying capacity of the zoo in respect of visitors having due regard to space availability and the welfare of the animals particularly the impact through noise pollution and physical disturbance by visitors and thereby appropriate measures to limit the number of visitors within the carrying capacity.
6. Planning the visitor circulation in the zoo in such a manner that the visitors get unobstructed view of wild animals in a pollution free and natural environment.
7. Development of appropriate signage s and interpretation facilities that can help the visitors in understanding the ecological linkages of nature and developing an empathy for wildlife.
8. Efficient waste disposal system and sanitation practices for maintaining hygienic and clean environment in the zoo.
9. Design and maintain appropriate public facilities and civic amenities upto the desired standards.
10. Develop elaborate and effective management plans to deal with unforeseen contingencies and natural disasters and high influx of visitors on particular days.

#### Tools for preparation and effective implementation of master plan

##### (a) Identification of the mission for the zoo

Under the Indian conditions the appropriate mission for the zoo could be:-

- I. Compliment the national efforts in conservation of wildlife through planned coordinated conservation breeding of endangered wild animal species of the region.
- II. Develop amongst visitors an empathy for wild animals and motivate them to support the cause of conservation of wildlife.
- III. Develop amongst the visitors an understanding about the ecological linkages with the life supporting processes of nature and the need for keeping them intact by adopting sustainable life styles and living in harmony with nature.
- IV. Enhancing the role of zoos in conservation of wildlife through collaborative research aiming at attaining management skills for *in-situ* population and carrying out advocacy for protecting the wild animals and their natural habitats.
- V. To act as Rescue Centre by receiving and keeping orphaned , seized, rescued, injured wild animals subject to availability of appropriate housing for the same.

(b) Identification of the vision for the zoo

Public should view the zoos as:-

- I. Scientific institutions engaged in animal welfare and conservation of wildlife
- II. Centres of knowledge on effective techniques for maintaining healthy ambience and pollution free environment.

(c) Conservation Message to be imparted to the zoo visitors

- I. Work for conservation of wildlife and its habitat.
- II. Adopt sustainable life styles and live in harmony with nature.
- III. Contain the consumptive use of natural resources within sustainable limits through reuse, recycling and refusal.

Thematic display of animals

Grouping or sequencing the animal displays for achieving any or more than one of the following objectives leads to thematic display of animals:-

- I. Facilitate the visitors to understand the biology and behaviour of the species displayed.
- II. Facilitate the visitors to understand the geographical habitat range of various species and the linkages between the long-term survival of the species with conservation of their natural habitat.
- III. Highlight the mythological and cultural significance of various species of wild animals.
- IV. Apprise the visitors of the composite and complex nature of different ecosystems.
- V. Provide the visitors an absorbing and rewarding experience at the zoo.

The themes generally adopted are:

1. Traditional Themes:-

- (a) zoo-geographic – Continent wise or region wise display
- (b) Taxonomic – Class, family and genera wise display
- (c) Behavioural – Nocturnal, aquatic, burrowing, arboreal
- (d) Mixture of the above – Based on popularity

2. Recent Concepts ---

Simulation/ replication of *in-situ* sites e. g. Chilka lake, Annamallai hills, Western Ghats, Aravalli Hills, Kanha meadow , Sunderban wetlands , Indian deserts , Gir forests, Shiwalik Foothills, etc.

Bio-geographic grouping - High mountain fauna, riverine fauna, Mangrove fauna etc.  
Eco-system display - Nilgiri fauna, Desert fauna, Wetland fauna, etc.

Replication of *in-situ* site and eco- system display require greater technological expertise and involves high costs but are more aesthetic and absorbing. Zoo-geographic and taxonomic displays are easier to implement but often fail due to non availability of animals to replenish the dead animals stock.

Adoption of a particular theme should be done taking into consideration the available space , species held in collection of the individual zoo / possibility of procurement from other zoos and the financial resources and technical expertise available with the zoo . Having adopted a particular theme , zoo should strictly follow it . Any deviations from the theme would result in paranoic displays sending wrong conservation message and convert the zoo into a unplanned wild animal display facility.

Adopting themes based on local / regional animals suited to the local climate have greater chances of success . Highly endangered species should normally not be made part of thematic displays.

Under the present state of management of zoos taxonomic displays with few specialized display on bio-geographic/ ecosystem themes shall be a practical approach.

### Visitor circulation plan

Traditionally the zoos have extensive network of roads . As all the roads are inter connected , there is every likelihood of the visitors getting disoriented and moving haphazardly in all directions. It is desirable that the zoo should have only one main approach road to take the visitors to the zoo animal display areas. The main road should be connected to various animal exhibits with loop roads and subloop roads of lesser width and specifications on the basis of hierarchy (importance) assigned to each road . The loop roads and subloop roads should intersect the main road at prominent junction points, where appropriate signage indicating the directions of prominent animal exhibits and visitor facilities should be available.

Due safeguards should be taken so that visitor road does not pass through the area adjoining the animal feeding cells , feeding kraals , animal service areas, service road and off the exhibit areas .

If required , zoo could fix different timings for visitors viewing specific animal facilities.

All civic amenities and visitor facilities should preferably be located by the side of main road only.

### Animal collection plan

Every zoo shall take a strategic review of the species of animals and their number to be housed in the zoo for preparation of appropriate animal collection plan, with reference to:-

- (a) Space available to each species / animal and the space actually required for housing all the animals of all the species held in its stock , as per prescribed norms.
- (b) Past and present performance of the zoo in upkeep , healthcare including the congeniality of the local climate for upkeep of the species .
- (c) Records of births and deaths of the animals of each species and the survival of the young ones.
- (d) Cost of upkeep and healthcare of each species .
- (e) Adopted theme of the zoo and the relevance of the species in the thematic display.
- (f) Species identified for planned conservation breeding by the zoo.
- (g) Species with surplus number of animals which are available with other zoos.

Following should be the guiding principles for finalizing the collection plans for different categories of zoos in Indian conditions

#### I. Large Zoo (National Collection)

Wild animal species of the area/ locality/ ecosystem the zoo is part of (around 30% of the total species displayed); representative wild animal species of region (North, South, West, Central, East or North-east) the zoo is part of depending upon suitability to the climatic condition (around 30%), representative wild animal species of the nation which are comfortable in the climate of the zoo (around 30%) and not more than 10% exotic wild animal species.

II. Medium Zoo (Regional Collection)

Wild animal species of the area/ locality/ ecosystem the zoo is part of (around 40% of total species displayed); representative wild animal species of the region the zoo is part of (around 40%) and not more than 10% selected species of nation and exotics each.

III. Small Zoo (Local Collection)

Wild animal species of the area/locality/ ecosystem the zoo is part of (around 60%), re representative wild animal species which are comfortable in the climate from the region (20%), nation (10%) and exotics (10%).

IV. Mini Zoo (Local common wild animal collection)

Few identified common wild animal species of the area/locality/ecosystem the zoo is part of, may be 1-2 common exotics wild animal species.

V. Rescue Centre

Identified problem wild animal species and orphaned, infirm captive animals not fit for display of the area/ locality/ ecosystem the Rescue Centre is part of:-

- (i) All rescued sick or injured wild animals should be rehabilitated back in wild or in regular lifetime care facility/zoo/rescue centre within 30 days of treatment/ healing depending upon the condition/ suitability of the individuals.
- (ii) All seized wild animals should also be rehabilitated back in wild or in regular lifetime care facility/ zoo/ rescue centre depending upon the condition/ suitability of the individuals with 30 days of the seizure after getting permission of the court dealing with the case.
- (iii) All rescued/ abandoned young wild animal should only be reared in nurseries attached to the Veterinary facilities/ hospitals of the recognized zoos/ rescue centres.

V. Specialized Zoo

Exclusive (Reptile/ Snake/ rodent/ bird/nocturnal/ aquatic park and aquarium etc.) specialized zoo may decide housing animals of one step above level i. e. small of region, medium of nation, large of international level in its collection plan.

2. On the basis of the result of the review as mentioned above , list out the species and the number of animals of each species that are necessary for planned thematic display and conservation breeding in the zoo .

3. With a view to enhance the conservation role of the zoo , some of the glamorous mega specie may have to be excluded from the list to accommodate the animal of endangered species and designing of outstanding exhibits .

Taking into consideration the out come of detailed analysis as mentioned above, draw out the final list of the species and the number of animals of each species to be housed in the zoo . Fewer species with viable population are always preferable to a collection of larger number of species with non viable numbers.

#### Master Layout plan for the zoo

Master layout plan is a detailed landscape map of the existing zoo site in a scale of 1:1000 to 1:5000 depending on the area of the zoo. All the existing facilities and infrastructure and the locations of the proposed developmental activities in animal display area , conservation breeding area , rescue centre area , visitor circulation routes , animal upkeep and healthcare facilities including animals' quarantine facilities and isolation wards , visitor education facilities and civic amenities , service roads , administrative blocks , entry plaza , car parking should be clearly indicated on the map. Allocation of land for each activity should be made available having due regard to the provisions made under "Recognition of Zoo Rules" in particular to the Sub rule 11.

#### Disaster and crisis management plan

Every zoo should prepare a detailed plan to deal with crisis in management, arising out of natural disasters like cyclone , flood, drought and earth quake or accidental happenings like fire , animal escapes, out break of diseases, etc. The crisis sometimes may also arise out of vandalism by unruly visitors, strike by the staff , stoppage of supply of water , power and animal feed due to circumstances beyond the control of the zoo management.

The plan would comprise of:-

- I. Assessment of the degree of subjectivity of the zoo to each type of crisis and list out the crisis which are encountered at the zoo more frequently.
- II. (a) List out necessary equipments to deal with crisis like diesel generators, portable saws, axes, shovels, bill hooks, water tankers, diesel pumping sets, ropes, spot lights, emergency lamps, siren, hooter, loud speaker, tarpaulin, chains, nuts and bolts and acquire and stock the same.  
(b) List and keep a stock of consumables like diesel, petrol, LPG, kerosene, lubricants, fuelwood, batteries, saw blades etc.
- III. Prepare a line of command for dealing with the crisis and a support contingency plan in case the line of command does not prove effective for some reason.
- IV. Train all concerned to deal with the situation through periodic mock drills. It should be ensured that all equipments are fully functional and effective at all times.
- V. Network and coordinate with specialized agencies like fire fighting units of the State Government / Union Territories and upgrade the equipments and rationalize the operations on the basis of their inputs.
- VI. Be on lookout for new potential crisis and develop the strategy to meet the same like bird flu, anthrax, retaliatory killing of wild animals etc.

### Management Plan

Every zoo should prepare a management plan listing out the activities to be taken up by the zoo for implementing the master plan over next 5 years indicating realistic costs of executing the identified activities and financial year wise targets both physical and financial including anticipated source of funding.

Detailed strategy for achieving the target should also be explained in explicit and elaborate manners.

### **VI Dimensions and size of animal enclosures**

The land area to be given to any animal exhibit enclosure should be decided having due regard to the maximum number of animals that can be displayed in the animal enclosures. Sambar, Spotted deer, Swamp deer, Sangai and some other ungulates can live in large social groups. Enclosures for such species can easily be designed for displaying 15-20 animals. However, the maximum number of animals that can be displayed in a single enclosure of Chinkara, Chowsingha and Barking deer and similar species should not exceed 5-7.



The area of the enclosure should have adequate land space for facilitating the animals to have free movement and exercise , adequate area to rest in shade and bask in the sun and have safe refuge from dominant animals and express their natural, social and reproductive behaviour.

The animal exhibit enclosures should not be given geometrical shapes , as the presence of corners is not congenial to smooth and unrestricted movement of animals. Enclosures with greater depth facilitate the animals to keep a safe distance from the visitors and are always preferable.

The dimensions and the area of any enclosure should be decided having due regard to various factors mentioned above and the topography and naturalistic features of site identified for construction of the enclosure . However, indicative sizes for the enclosures , both feeding cells and outdoor s of important wild animal species are given in Annexure IIA and IIB respectively to these guidelines. The indicative sizes for outdoors are minimum, zoo operator should always try to provide for larger and bigger outdoor to the extent possible.

The area of the outdoor enclosures for herbivore s safari and carnivore safari should not be less than 30 hectares and 20 hectares respectively . Mini zoos being operated as Deer Parks and displaying mega species should not be of less than five hectares .

#### Display of animals in nature immersing enclosures

- (1) Landscape around every animal exhibit / enclosure should comprise of plantations of appropriate tree and shrub species of adequate extent and such shape that the enclosure should not be visible to the visitors form any place other than the animal viewing areas.
- (2) All the hard exteriors of the enclosure i.e. the enclosure barrier and the frontage of the feeding cells , feeding kraals should be effectively camouflaged through planting of bamboo , dwarf tree species and shrubs.
- (3) Planting of appropriate trees and shrubs should be done around the animal viewing areas to break up the visitors into small viewing groups.
- (4) Visitors should be made to move through the green landscape around the enclosure for reasonable distances .

- (5) Planting, appropriate trees species should be done in the enclosure to ensure that entire animal enclosure is not visible to the visitors from any of the viewing points. The animal should be seen to the visitors in near natural settings.

Making the animal enclosures safe for animals, animal keepers and the visitors

(a) Enclosure Barrier

Barrier of every enclosure should be of a design, dimension and material that can effectively contain the animals housed within the enclosure and safeguard against any animal escaping from the enclosure. Due care should also be taken to ensure that the shutters and doors fitted in the enclosure, kraal and feeding cell are of such material and design that these can not be broken / opened by the animals housed in the enclosure. The barriers of all the enclosures, except the animal viewing area could comprise of natural cliffs (if any), wall, glass, power fence or chain-link fence, etc. of prescribed dimensions. However, in animal exhibit enclosures, provision of a moat could be made in the animal viewing area, to facilitate the visitors in having an unobstructed view of the animals without getting close to them. Wet moats shall normally not be used as enclosure barrier for the viewing area except in case of water loving animals. The total land area under moat should not exceed 20% of the land area of the enclosure. The indicative design type and dimensions of enclosure barrier are given in Appendix III to these guidelines.

(b) Other safeguards :

- (i) Due care should be taken to ensure that no power line / power cable passes over any animal enclosure.
- (ii) Enclosure barrier should be erected / constructed at a safe distance from such trees that can aid the animals to escape from the enclosure or damage the enclosure barrier.
- (iii) Where walls are used as enclosure barriers, due care should be taken to plaster the same with such proportion of cement mix that the plaster does not wither away leaving gaps that could be used by the animal as holds for escaping out of the enclosure.
- (iv) Live wire overhangs or chainlink should be used to prevent the animals from escaping out of the enclosure.
- (v) Water pipelines and sanitary fittings should be fixed within the enclosure in such a manner that the same can not be used by the animal as aid to escape from the enclosures.

- (vi) Adequately deep foundation to be provided for enclosure barrier housing the burrowing species.
- (vii) Attention should be given to different barrier materials, fixtures, shutters etc. to see that they are safe and can not be broken or cause injuries to animals.

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## Specialised Animal Displays

### 1. Walk Through Animal Enclosures

- (i) The area open to access by visitors should be clearly delineated and demarcated in such a manner that animals are not impacted by the presence of visitors and that animals are not in a position to injure the visitors.
- (ii) Visitors should be allowed to enter the walk through animal enclosure in controlled groups under proper supervision. Visitors must be adequately informed about the dos' and don'ts, while in the enclosure.
- (iii) All walk through exhibits should have double entry gates and double exit gates to safeguard against any animal from escaping out of the enclosure.
- (iv) Every visitor should be made to walk through a disinfectant footbath before entering the walk through enclosure.
- (v) The carrying capacity of the visitors in the walk through enclosure should be clearly defined and at no point of time the visitor number should exceed the same.

### 2. Drive Through Enclosures (Safaries)

- (i) Entry and exit to every drive through enclosure should be through a system of double gates. There should be sufficient space in between the two gates, to allow the gates to be securely locked at the front and the rear of every vehicle that enters the drive through enclosure.
- (ii) The gates for drive through enclosure should be so designed and located that the person operating the gates can see and ensure that no animal is standing near the gate at that time when the gate is being opened for the vehicle getting into the enclosure.
- (iii) Arrangement should be in place to ensure that the two gates provided under the double gate entry and exit system do not open simultaneously. The 2<sup>nd</sup> gate should open when the first gate has been securely locked.
- (iv) Design of the double gates should be such that the same can be operated conveniently by one person only.
- (v) Visitors should be allowed to enter in the enclosure of large cats and Bears only in closed top vehicle and the windows and glasses of the vehicle should be kept securely locked during the period the vehicle remains in the drive through enclosure.
- (vi) Supervisory staff accompanying the vehicle should be armed with appropriate weapons and communication equipment and should be authorized to use the same effectively, if required to do so, to save the visitor from attack by the animals.

- (vii) Trained personnel shall be suitably positioned over the entire drive through enclosure, on appropriately designed watch towers to keep a watch on the movement of vehicles, the animals and intruders, if any and to provide necessary guidance to gate staff, the vehicle drivers and the animal keepers in carrying out the jobs assigned to them safely and effectively.
- (viii) A rescue vehicle capable of affecting recovery of the vehicles from the drive through enclosure should always be available at the command of supervisory staff as long as there are any vehicles within the drive through enclosures.
- (ix) The layout of roads in the drive through enclosure should be such that the visitors can be shown all the highlights of the enclosure without disturbing the animals in their withdrawal areas.

### 3. Composite Animal Enclosure

Composite animal enclosures by and large are quite attractive and are quite in vogue these days. The zoo operators, while designing any composite enclosure shall take due care to ensure that :

- (a) Species housed in composite enclosure are compatible in nature.
- (b) There is no competition between the species for utilization of space, food and natural resources.
- (c) The species do not inter-breed.

### 4. Elephant Enclosures

The elephants being voracious eaters and producers of extraordinary amount of solid wastes can not be maintained aesthetically in the display enclosures. Presence of 'mahaouts and chara cutters' makes the issue of aesthetic display further complicated. It would therefore be desirable to leave elephants in display enclosure for limited period of 6 to 8 hours. For rest of the time, the elephants should be kept in elephant houses of appropriate designs in off the display areas at isolated places. Elephants can be loosely chained with spikeless chains for their own safety. However, suitable padding should also be provided on their legs to safeguard against injuries being caused on account of chaining.

## **VII Environmental Enrichment**

Any wild animal living free in nature carries out wide range of activities viz foraging, exploration, territorial patrolling, marking territorial boundaries,

avoiding predators, wallowing, climbing, burrowing and seeking mates etc. Its social behaviour includes parenting, courtship and other interactive activities viz. chasing each other and indulging in mock fights. All these activities involve constant alertness of visual, olfactory and auditory stimuli. Even during the inactivity period in wild, the animals are involved in setting up and construction of secure refuges such as nests, burrows, dens, searching tree holes etc.

Under the zoo environment, the environmental complexity is missing and the animal has to make little effort for getting its food and security. The availability of space for movement and other physical activities like digging, burrowing or nesting, is also limited and the animals can no longer express their natural behaviour. Lack of stimuli to take up any physical activity (absence of hunger and insecurity) and continued stress due to non-fulfilment of natural behaviour leads to development of aberrant / stereotypic behaviour in the animals, which make them look pathetic.

There is no denying the fact that it is neither feasible nor practical to simulate the conditions of wild in the zoo, still the zoo operators can provide the zoo animals ample opportunities to express their natural behaviour through imaginative enclosure designing and planned enrichment. The technical help of behavioural biologists may be obtained in developing the appropriate enrichment plan for the wild animals.

Important components of Environmental Enrichment of animal enclosures are briefly summarized below :

Behavioural Enrichment :

- (i) Keep animals in compatible social groups. Provide adequate three dimensional space for exercising the normal movement behaviour patterns i.e. walking, flying and climbing.
- (ii) Provide suitable substrate to facilitate the animals to satisfy their digging, burrowing and exploratory instincts.
- (iii) Provide suitable trees, shrubs and bushes in the enclosures to provide the animals opportunities for climbing, swinging, feeding, clawing, playing, rubbing the antlers, etc. Trees take substantial time in growing to required sizes, during the interim period, appropriately sized logs/ branches of trees could be used to meet the behavioural needs of the animals. There should be provision of alternative enclosures for the ungulates living in larger social groups, bears and primates so that the animals could be shifted from one enclosure to the other to facilitate recovery of vegetation.

- (iv) Burrows/ dens could also be constructed to facilitate the animals to hibernate or to take shelter during extreme weather conditions.
- (v) Plant grass and reeds to provide cover area for the animals.
- (vi) Fix mud pots, tree hollows, bamboo baskets to meet nesting and egg laying by birds.

Remarks :

Use of nylon ropes, tyres, and swings should normally be avoided because these do not add to the over all aesthetics and natural environment of the enclosure. These should be used as last resort , when functional requirement of animal can not be met with natural enrichment materials.