

Model Disaster Management Plan
for
Zoological Parks of India

by - R. Hemanth Kumar
I.F.S.
M.B.A. (Australia)



Published by :
Kanpur Zoological Park
Kanpur



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केन्द्रीय चिड़ियाघर प्राधिकरण
Central Zoo Authority

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December 2009

*K. Praveen Rao
Director,
Kanpur Zoological Park
Kanpur, U.P.*

The Views expressed in the document do not necessarily represent those of central Zoo Authority.

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Foreword

The author of **Model Disaster Management Plan for Indian Zoological Parks**, **Sri R. Hemanth Kumar**, is known to me from his earlier position as Southern Regional Wildlife Officer when he was based in Chennai some years ago. He had been deputed as Director to Kanpur Zoo and recently submitted several very thought-provoking articles on man management in the zoo. While corresponding I came to know he had been asked by CZA Member Secretary Dr. Brij Raj Sharma to draft a disaster management plan for Indian zoos. I was delighted because for decades Zoo Outreach Organization, my own base, had collected articles on Disaster Management from zoos around the world and made them available to zoo personnel in India and later, throughout South Asia. We hoped that zoos would create their own disaster management protocols.

In June 2009 in ZOOS' PRINT Magazine I highlighted vital information on emergent disasters, such as extreme weather events resulting in floods, drought, etc. brought about by climate change, itself a global crisis. Likewise, emerging diseases such as SARS or bird flu, H1N1 or swine flu and the like, have been linked with extreme weather events as well as the tremendous increase in international trade of wildlife and wildlife products, international tourism, etc. Terrorism is not always political but can be emotional or psychological terrorism when it occurs in a zoo. The city zoo is a community's soft-spot : zoos have been attacked in wars such as in Kabul, Afghanistan and Baghdad, Iraq, and are easy targets at any time. Emotional or psychological terrorism, -- visitors climbing up into big cat or elephant enclosures and jumping in a suicide bid, is demoralizing to a zoo and city. Animal rights terrorists have been known to attack the very animals they claim to be protecting.

After learning about Hemanth Kumar's assignment to create a DMP for Indian Zoos, I made inquiries. There is no DMP for any zoo or animal facility in any South Asian zoo except for a couple in India. A small number of South East Asian zoos have systematic plans. There are elaborate disaster management protocols in many zoos in USA, UK and EAZA but, apparently, not all their zoos have them. Other developing regions zoos' do not have systematic plans, despite the fact that they are even more susceptible to some crises than western zoos. India is very fortunate now to have this well researched Manual or Guide to follow on this important topic. There is little doubt that legislation will follow concerning this topic as well. The author has done an excellent job and covered nearly all bases; even some of the very current topics as mentioned above, have been covered in an Appendix.

Indian Zoos' Model plan begins by defining disasters and enumerating some which

have been faced by zoos. Steps in establishing basic components of a well-rounded disaster management plan have been reviewed in some detail, such as building an emergency team (*before* an emergency occurs!), conducting hazard analyses, performing capability assessments and creating a vital records preservation programme. Natural disasters are discussed, including types of natural disasters as well as the specific problems, team member and equipment requirement which go with each. Fire and explosions, Civil Disturbance procedures include methods for evacuating visitors and staff among other requirements. There is a chapter on animal disease emergencies and the importance of early warning and early reaction. Disease surveillance and pest control are essential to prevention and recognition of potential epidemics. Pests abound in zoos ... free-flying birds, free ranging monkeys, cats and dogs which slip in attracted by the smell of raw meat are all possible vectors for disease as well as the ubiquitous rats, mice and insects. The author has included a comprehensive list of commonly occurring diseases which attack wild animals and the all important zoo sanitation and hygiene. Animal escapes are much feared disasters in a zoo and surely find their place in the manual with a substantial section concerning the design of enclosures so as to prevent escapes and procedures that must be followed if an escape does occur.

Perhaps this is the first Disaster Management Plan ever written for the Zoos of a whole country. Zoos in different countries vary quite a lot as do zoos within a single country. The author has done a good job in selection of points to cover in a wide range of potential crises, and also in selection of response, stocking of necessary items and many other aspects. As zoos in India use this manual they may find other points, response and equipment useful, and this can be added over time. This volume is a “first response” to disasters in Zoos in a whole country and it is an excellent beginning.

Twenty-first Century Crisis has been selected as the training theme of the 10th Annual conference of SAZARC, the South Asian Zoo Association for Regional Cooperation. If CZA and the Author will permit, we will use this excellent manual in our training and have each country refer it as they design a disaster response protocol for Zoos in their own country. I congratulate CZA and the Author for this outstanding contribution to making Zoos safer for people and for animals.

**Sally Walker, Director,
ZOO & SAZARC**

Preface

Thousands of people visit the Zoological Parks in India every day. The zoos host a large number of animals with sizable staff working in them. The Zoos must always be well prepared for dealing with emergency situations.

Some of the emergency situations that the zoo may have to face are :

- Escapes of Zoo animals
- Natural disorders like fire
- Outbreak of Epidemic diseases
- Curfew etc situations

Meticulous prior planning with adequate finance is needed for preparedness to face such exigencies in the interest of the Zoo animals, its property, as well as public safety.

Invariably such contingency plans come into action only in the aftermath of emergency situations but preparedness is crucial in successful control and mitigation of the emergency situations. Though occurrence of such natural and manmade emergencies is certain, they won't occur frequently, yet, when they do, the zoo has to cope with them.

Thus, every zoo should develop its own Disaster Management Plan for dealing with potential disasters. The plan should have the following :

1. Chain of command in the team.
2. Members of the team.
3. Plan should have clearly written instructions, applicable to each employee, available to each employee and known by each.
4. Each employee should know exactly what his/her role during a disaster. He should be clear about the issues like to whom he should report and how to report.
5. The possibility of disaster should alert the emergency team to come into operation in an orderly and planned manner. This may include evacuation of visitors or animals either prior to or after a disaster has occurred.
6. All the new construction and renovation in the Zoo should be sturdy and with ability to withstand effect of earthquakes or other major disaster.
7. Alternative power and water supply should be well planned. This is necessary for disaster mitigation.
8. Nonperishable items of diet sufficient for at least 15 days should be maintained in stock. This for dealing with situations like curfew, other items of personal use and

animal needs should also be kept in stock including equipments and emergency tools. [**Personal needs** – water, food, first aid, lantern, battery, torches, rain/ winter clothing, stoves. And **animal needs** – generator, chainsaws, plastic sheets, nets, nylons, strapping, sandbags, capturing equipments, tranquilizing drugs and veterinary supplies.]

9. Attempts should be made to develop voluntary teams to support during emergency and to work with the emergency team. Such volunteers should have an instruction handbook to function and report. Voluntary Organizations should also be involved in such contingency plan operations
10. Close links should be established with district as well as state disaster management authorities.

I sincerely hope that this small attempt will make the Zoological Parks, a better and secure place for the visitors as well as the inmates of the zoo, by organizing its staff and its resources in a better manner. However, the success of the endeavor will purely dependent on wholehearted participation of the staff of the zoo.

The idea for making such plan came into my mind while I was working as Director, Kanpur Zoological Park, Kanpur. By that time Disaster management Act came into force, which made it mandatory for having a mechanism for disaster identification, mitigation, and recovery. Keeping it in mind I prepared a Red Hand Book for the Kanpur Zoological Park and submitted it to Mr. B. R. Sharma, member Secretary, Central Zoo Authority. He is so generous in granting small research grant to Kanpur Zoo for the preparation of Model Disaster Management Plan, without his consistent cooperation I might not have prepared this document, for which I am thankful to him and CZA.

While preparing the plan I borrowed some ideas from the plan prepared by the emergency division of Michigan Department of State Police. I sincerely express by thanks to them too.

Consistent backing and support given by my peers like Sri DNS Suman PCCF U.P., Sri BK Patnaik PCCF (Wildlife) U.P., Sri Pawan Kumar, Secretary Forests and Sri Mohammad Ahsan APCCF also helped me in finalizing this endeavor.

My wholehearted thanks to Ms. Sally Walker for meticulously going through this document and for giving her valuable suggestions and making corrections wherever necessary.

I am thankful to Mr. K. Praveen Rao, the present Director Kanpur Zoological Park, Kanpur for arranging brain storming exercise of the managers of the important zoological parks of India on the plan prepared by me and for bringing this document into the book form. I owe my sincere thanks to Mr. Ananth Swamy CCF & Director, Arignar Anna Zoological Park, Chennai, Dr. A.K. Patnaik, Director, Nandan Kanan Biological Park, Bhubneswar, Orissa, Mr. K. Bhoopal Reddy, CCF & Director, Nehru Zoological Park, Hyderabad, Mr. D. N. Singh, Director, National Zoological Park, New Dehi, Mr. Sanjay Pathak, Silviculturist, Southern Region, Kanpur, U.P., Mr. Paramanand, Asst Silviculturist, Southern Region, Kanpur, Mr. Sidhanshu Rai, Lecturer CSJM University, Kanpur U.P. who participated the brain storming exercise and have given their valuable suggestions.

Last but not the least I sincerely express my gratitude to all of my friends, former colleagues at Kanpur Zoo, my friends from the zoo fraternity, and especially to the members of my family, without their consistent support I wouldn't have finalized this endeavor.

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Office of the Kanpur Zoological Park



White Peacock





Cubs of Himalayan Black Bears

What are Disasters ?

*"Monotony is the law of nature.
Look at the monotonous manner in which the sun rises.
The monotony of necessary occupation is
exhilarating and life giving."*

- Mahatma Gandhi

*" Men often become what they believe themselves to be.
If I believe I cannot do something,
it makes me incapable of doing it.
But when I believe I can, then I acquire the
ability to do it even if I didn't have it in the beginning."*

- Mahatma Gandhi

Chapter I What are Disasters?

Definition

The meaning of the word disaster differs according to person, culture and time. The following definition of natural disaster is from the "International Agreed Glossary of Basic Terms Related to Disaster Management (1992), UN-DHA, IDNDR, Geneva: "Situation or event, which overwhelms local capacity, necessitating a request to national or international level for external assistance."

Disasters are defined by different people in different ways some of the definitions are as stated below :

1. **The American Red Cross** defines a Disaster as follows :

“A disaster is an occurrence such as hurricane, tornado, storm, flood, high water, wind-driven water, tidal wave, earthquake, drought, blizzard, pestilence, famine, fire, explosion, volcanic eruption, building collapse, transportation wreck, or other situation that causes human suffering or creates human needs that the victims cannot alleviate without assistance”

2. **Disaster:** An emergency event that occurs with little or no warning, causing more destruction or disruption of operations than the museum can correct by application of its own ordinary resources. Disaster Preparedness: Possessing in advance the capability of taking the immediate action or actions necessary to cope with a disaster in order to prevent its occurrence or to minimize its impact."

(John Hunter, Preparing a Museum Disaster Plan (National Park Service, Omaha, NB1980), p. 1)

3. Disasters are extreme events, which result in widespread social disruption, trauma, property damage and loss of life

4. Sec 2 (d) of “The Disaster management Act, 2005” defines disaster as

"Disaster" means a catastrophe, mishap, calamity or grave occurrence affecting any area, arising from natural or man made causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of, property, or

damage to, or degradation of, environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area.

(e) "Disaster management" means a continuous and integrated process of planning, organizing, coordinating and implementing measures which are necessary or expedient for—

- (i) Prevention of danger or threat of any Disaster.
- (ii) Mitigation or reduction of risk of any Disaster or its severity or consequences.
- (iii) Capacity-building.
- (iv) Preparedness to deal with any Disaster.
- (v) Prompt response to any threatening Disaster situation or Disaster.
- (vi) Assessing the severity or magnitude of effects of any Disaster.
- (vii) Evacuation, rescue and relief.
- (viii) Rehabilitation and reconstruction.
- (ix) "Preparedness" means the state of readiness to deal with a threatening Disaster situation or Disaster and the effects thereof.

Disaster Management definitions -

Preparedness means being ready to handle disasters and emergencies. Risk assessments, disaster planning, adequate supplies, trained staff, and community partnerships all contribute to disaster preparedness.

Mitigation is the process of preventing or minimizing the losses and damages that emergencies can cause.

Response involves actions taken to deal with a disaster or emergency. Response is about the emergency itself, as well as the problems it creates.

Recovery means restoring services, facilities, programs, collections, and infrastructure.

Why should Zoos Plan for Emergencies ?
&
Zoos' preparations for dealing with Disasters.....

" Think the unthinkable, and then plan for it."

- Sigmund Freud

*"If you are thinking a year ahead, Sow Seed;
If you are thinking ten years ahead, Plant a Tree;
If you are thinking a hundred years ahead, Educate the People."*

Kaun Tzu, Chinese poet, 500 B. C.

*"The future is not some places we are going to, but one we are creating,
The pathways to it are not found, but made,
The making of those pathways changes the both
the maker and the destination. "*

The Australian commission for the future (1995)

"Become the change that you are asking for"

- Mahatma Gandhi

*"Change occurs when one becomes what one is,
not when one tries to become what one is not"*

- Arnold R. Beisser

Chapter-II *Why Should Zoos Plan for Emergencies?*

Introduction

A disaster management plan describes, in detail, an organization's policy and procedures for coping with exigencies. These policies and procedures define how the organization would protect the people and its property. Developing the plan is the process of assigning emergency related tasks to individuals in the organization, and outlining protective actions to be taken.

Why Should Zoos Plan for Emergencies ?

Time and again history has shown that a well thought out, coordinated response helps prevent personal injury, property damage, and lessens the resulting confusion. When the zoo plans how it will respond to an emergency threatening its operations, it is more likely to survive the incident and also reduce damage. During a large-scale disaster, local response agencies may be overwhelmed and unable to immediately respond to the zoo's requirements. Employees and zoo visitors alike will need to know what to do to protect themselves during an emergency.

Basic Emergency Planning Concepts

Listed below are the basic concepts involved in emergency management planning :

There has to be a overall in-charge in the zoo for giving direction and getting the plan prepared and implemented

The members of the team are to be identified meticulously

Control room and media centers will help in coordinated approach to the disaster and in the dissemination of information

Establish adequate communication and warning capabilities

Establish adequate evacuation procedures

Establish damage assessment capabilities

Some of the emergency situations that the Zoos may face are :

Natural/ Manmade Disorders like Fire.

Escape of Zoo animals.

Animal diseases.

Natural disaster like floods, mud slides, earthquakes .

Civil disturbances etc .

Extreme visitor behaviour.

A brief introductory note on the preparation of Disaster management plan-

Zoological parks of India are susceptible to a number of hazards like floods, cyclones, earthquakes, landslides, fires etc of natural origin and fire, epidemics, animal escapes, civil disturbances etc of man made origin. These hazards are bound to take place and every zoo is vulnerable for these hazards. Hazard is a rare or extreme natural or human made event that threatens to adversely affect human life, property or activity to the extent of causing disaster. But if the institution has capability/ capacity to deal with these hazards the consequences of the disaster will be minimized. Hazard takes the turn of a disaster if the institution lacks capacity/ capability. Capacity/capability is the resource or ability to cope with a threat or resist the adverse impact of a disaster. The interrelation between hazard, vulnerability and capability is shown below :

$$\text{Hazard} \times \text{Vulnerability} \text{ --"Capability/Capacity" = DISASTER}$$

Therefore hazard, vulnerability and capability analysis is the most important part of the plan as the entire planning process will be based on its outcome. Any error in identifying magnitude and projected impact leads to an erroneous plan.

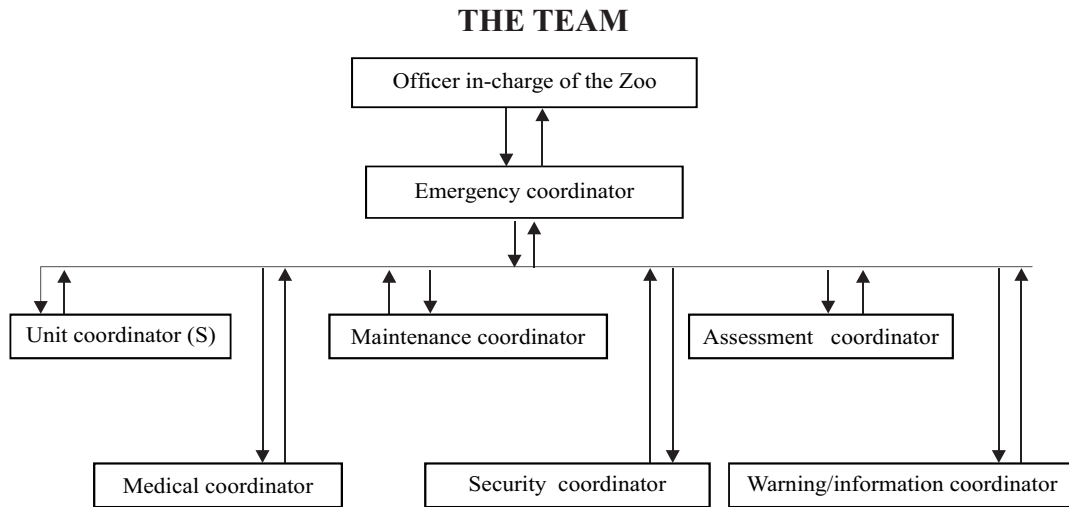
Pre-disaster planning should be an integral part of the preparedness that leads towards a holistic approach to disaster management. A disaster management plan focusing on hazard, risk, vulnerability, and resource assessment improves the level of response following an exigency. With this background, the zoological parks of India employ hundreds of people with varied experiences. It's the duty of the In-charge of the zoo to get best out of them, and to use the human, material, and natural resources in a most effective manner during emergencies. Involving the staff right from the planning process stage to implementation stage to disaster assessment stage will be a good recipe for success.

It's very important that while conjuring up of the DMP, the manager of the zoo should look into the issues such as: the team he has with him and their capabilities; the facilities that are available to him; and the possible disasters/ hazards that he may have to face?

When once these issues are identified the manager of the zoo can advance with the preparation of DMP for his/her zoological park.

A brief note on the planning process is as follows, which can be taken as indicative :

Step 1: Building the Emergency Team



The Team

The size of an organization's emergency team will depend upon the size of the organization, what resources are available, and what tasks are required. Team members are to be actively involved in planning and implementation stages. There are several reasons why a team concept is best for achieving the best results.

Teamwork :

- Ensures all necessary issues are presented.
- Reinforces staff acceptance of the plan.
- Decreases the work load for team participants.
- Increases staff awareness of the plan.

The members of the team -

(A) In-charge/ Director of the Zoo

The role of in-charge/director of the Zoo is vital before and during exigencies. He will be the one who is responsible for imparting training to people in the different protective actions before actual emergency occurs. He has to make decisions on protective actions, operations and expenditures. He will have to receive information and recommendations from the emergency coordinators and take appropriate decisions

The in-charge/ director's primary responsibilities are :

- Getting the plan prepared and approving it
- Identifying the people and assigning tasks to them.
- Deciding and implementing protective actions so that the consequences of the disaster are minimized.

Allowing the use of internal resources of the zoo whenever it is required to do so and arranging necessary logistics .

Arranging the finances for implementing the plan .

(B) Emergency Coordinator

The role of emergency coordinator is very vital in ensuring the smooth implementation of the emergency preparedness plan, for it the person who has been identified should

possess a thorough knowledge and understanding of the zoo's layout and its functioning.

Hold a responsible position within the organization with an authority to summon resources and personnel during exigencies.

Possess leadership qualities and have the ability to operate under stressful conditions.

The main responsibilities of the emergency coordinator are :

Maintaining a current disaster management plan and testing it on regular basis.

Ensuring that all members of different teams are well-trained in dealing with exigencies.

Coordinating the functioning of different teams that are involved in crisis management.

Notifying local authorities of an emergency or disaster situation.

Ensuring that vital records are identified and protected.

Making arrangements for logistics, emergency housing and feeding for personnel involved in emergency operations.

Making provisions for food and water requirements of Zoo animals.

Organizing and maintaining control room with adequate communication facilities.

Implementing decisions and directives from the In charge of the zoo/ Director.

The Emergency Coordinator for the Zoo can be Assistant conservator of forests and he can be assisted by Chowkidars, Office staff, Gardeners etc.

(C) Unit Coordinator(s)

The zoological parks can be divided into different units (sections) for administrative convenience in dealing with the exigencies.

The persons in charge of these sections will act as the unit coordinators and they will be responsible for :

- Participating in the plan review meetings and giving their inputs.
- Training the people working under them.
- Conducting mock drills.
- Taking in protective actions within their jurisdiction before an actual emergency occurs.
- Identifying and ensuring protection of vital things under their jurisdiction.
- Mobilizing resources and personnel.
- Ensuring that stranded zoo visitors are taken safely to the designated shelter/ evacuation areas.
- Ensuring that the electricity points are shut down during emergencies.
- Helping in the proper movement of people and vehicles.

The people selected to be unit coordinators should have the following qualifications:

- Possess knowledge and understanding of the operation of their work unit.
- Hold a responsible position within the organization with an authority to summon resources and personnel during exigencies in their respective units.
- Possess leadership qualities and have the ability to operate under stressful conditions.

The Unit Coordinators for the Zoo can be foresters and they can be assisted by Chowkidars, Gardeners, Animal Keepers, Laborers who are working in their sections.

(D) Warning/ Information Coordinator

Whenever a disaster occurs within the zoological park the first and foremost thing to be done is intimating different coordinators of the zoo about the occurrence of disaster (can be done through blustering of an alarm/ making public announcements/ wireless messages/ cell phones etc), communicating about the disaster with the local authorities like police/ fire departments and providing information about the disaster to the print and electronic media, etc.

Warning/ Information Coordinator's Primary responsibilities are :

- Ensuring that protective actions are publicized for all employees.
- Participating in emergency plan review meetings.
- Training the people working under them.
- Establishing a media centre and making arrangements for logging the messages.
- Maintaining communication equipment like wireless sets, fax machines, telephone lines etc.
- Receiving and disseminating information about the disaster.

Communicating with the local police/fire departments for assistance.
Requesting the district administration for vehicles/ personnel.
Preparing press notes after consulting assessment coordinator and submitting them to the officer in charge of the zoo for press release.
Conducting media tours whenever possible.

The information coordinator is responsible for developing news releases, answering media questions, ensuring that protective actions are publicized for all employees, etc. He should be comfortable working with the media and have a clear understanding of management's priorities.

Warning/Information coordinator for the Zoo can be Forest Range officer, who can understand the priorities of the zoo; he can be assisted by Stenographer, Head Clerk, and orderly etc.

(E) Assessment Coordinator

Assessing of the extent of losses due to disaster is very important for sharing the information with Government, departmental officers, local authorities, press etc. For it every zoological park must have a mechanism for collecting and verifying information about the disaster.

The information thus collected can be used for :

- Preparing press releases.
- Evaluating response efforts and preparedness of the zoo personnel in dealing with disasters.
- Assessing further training needs of the personnel.
- Knowing about the lacunae in the plan prepared.
- Improved future crisis management efforts etc.

Assessment Coordinator's Primary responsibilities are :

Participating in emergency plan review meetings.
Training the people working under him.
Collecting and compiling information on disaster situation.
Maintaining a written record of all events that occur including actions taken, decisions made and by whom, personnel involved, costs incurred etc.
Reporting verified damage information to the officer in charge of the zoo.
Assisting with the preparation of reports like after-action report.

Assessment Coordinator for the Zoo can be Forest range officer and he can be assisted by L.D.C and an orderly.

(F) Maintenance Coordinator

Crisis deepens when the men are ready but not the materials and mechanical systems, hence the maintenance of these systems is very important.

The maintenance coordinator will be responsible for smooth functioning of all mechanical and utility systems of the zoo and in shutting down of the electrical systems during exigencies. He will also be responsible for maintaining adequate spares, removing of fallen trees, debris etc and in erecting of barricades etc.

Maintenance Coordinator's Primary responsibilities are :

Participating in emergency plan review meetings.

Proper maintenance of cages, squeeze cages, fire extinguishers, tube wells, electrical supply points, Tractor, Trolleys, welding machines, earth moving equipment, shovels, axes, cutters, blades, ropes, ladders and spare parts of different mechanical devices etc.

Training the people working under them.

Putting up of barricades for the control of traffic.

Getting the fallen trees, poles, debris of the buildings etc cleared off.

Inspecting the damaged areas with his team and giving recommendations for entry/ reuse etc.

Maintenance Coordinator for the Zoo can be Curator and he will be assisted by carpenter, massion, electrician, tube well operator, ticket checkers etc.

(G) Medical Coordinator

The medical coordinator is responsible for providing immediate care to injured persons/ injured Zoo animals, as well as the collecting and compiling of health and medical-related disaster information.

Emergency Medical Coordinator's Primary responsibilities are :

Participating in site emergency plan review meetings.

Ensuring that emergency medical care/ first aid is provided to injured persons and animals.

Maintaining adequate quantities of medicines.

Collecting and compiling health/medical disaster information for the Assessment Coordinator.

Coordinating ambulance calling and pick-up, medical assistance etc.

Medical Coordinator for the Zoo can be Veterinary Doctor.

(H) Security Coordinator

He will be responsible for coordinating safe removal of stranded people, controlling the movement of vehicles, checking the unauthorized entry of people, catching/ caging/ netting/ tranquilizing of animals that have escaped their houses as early as possible.

Security Coordinator's Primary responsibilities are :

- Participating in emergency plan meetings.
- Providing training and conducting of mock drills.
- Ensuring that all wire meshes, chain link fences, walls, double doors, shutters etc are in good condition and getting them repaired immediately.
- Ensuring that the trapping materials are in good working condition and are available as per requirement.
- Periodic checking for breached boundary walls.
- Lopping and cutting of trees that might pose danger.
- Controlling the movement of people and vehicles.
- Preventing unauthorized entry.
- Assisting with the care and handling of injured persons.
- Assisting with fire suppression, if necessary etc.

Security Coordinator for the Zoo can be Head keeper

Step - 2 Conducting a Hazard Analysis

Purpose

The purpose of conducting hazard analysis is to determine the hazards that the zoo is most vulnerable. The disaster management plan becomes more realistic if we can determine the possible hazards that the zoo might have to face.

For example, if the zoo is not in a flood plain, why should time be spent on developing procedures for a flood ?

Starting Point

Researching the old news papers, gathering information from the old records of the zoo, and speaking to the zoo personnel gives insights to the zoo in charge. Occurrence of disasters increases if the zoo is in flood plains/ earthquake zones/ fault zones/ coastal regions/ fire prone areas etc. For dealing with such particular situations one must be well prepared.

Considerations

Look at emergencies that have occurred or may occur in the zoo. Consider the geographic location of the zoo (it is important for preparing for exigencies like floods, mud slides etc). Consider the construction of buildings esp. if the zoo is in earthquake zone.

Also look at the problems like Trees, which are dangerously placed, which may cause serious damage, to the animal enclosures there by increase the chances of escape of animals, and to the property and lives of the visitors and that of Zoo staff.

Hazard Analysis Worksheet

List any other possible hazards that the Zoo might face under the first column labeled “Hazards”. Cross off any hazards that are not possible. Using a scale of 1 to 3 estimate the possibility of each listed hazard.

1. Unlikely or low possibility.
2. Maybe or average possibility.
3. Likely or high possibility.

In the next three columns labeled, “Employee Impact,” “Property Impact,” and “Economic Impact” use a 1 to 3 scale. Using the 1 to 3-scale estimate the possible impact of each hazard on the employees, property and business. Use a worse case scenario to estimate the probable impact.

- 1. Low impact**
- 2. Moderate impact**
- 3. High impact**

After factoring each impact area, total the row for each hazard. Using the totals, prioritize the hazards to determine which hazards to plan for first. Depending on the needs and resources of the organization, complete the low priorities as possible, or not at all.

Upon prioritizing the possible impacts, the major threats to the Zoo are in the following order :

Hazards	Possibility	Employee Impact	Property Impact	Economic Impact	Total Impact
Fire	3	1	3	3	10
Bomb Threat	1	3	3	3	10
Civil Unrest	1	1	3	3	8
Escape of Animals from enclosures	1	3	1	3	8
Animal diseases	3	3	3	3	12

1. Animal diseases -- (12 points)
2. Fire -- (10 points)
3. Bomb Threat -- (10 points)
4. Civil Unrest -- (08 points)
5. Escape of Animals from enclosures -- (08 points)

Step 3 : Performing a Capability Assessment

Purpose

By assessing an organization's ability to respond to an emergency situation, the planning team can determine what resources are already available with them and what resources may be needed.

There are four areas that should be assessed: *Employee skills, Equipment, Local response capability and Facilities.*

Employee Skills

The Zoo management should identify skills possessed by its employees that can be used during emergency situations. Once the employees are identified it is better that they are asked for their participation in the emergency operations.

The Zoo in-charge should have knowledge about the skills of his employees and he must have their contact numbers. The information about the skills of employees can be in the form of a table as given below :

Employees Name	Skill	Phone Number
	Animal Handler (carnivore)	
	Animal Handler (herbivores)	
	Animal Handler (Birds)	
	Animal Handler (crocodile)	
	Animal Handler (monkeys)	
	Snake Catcher	
	Good climber of the trees	
	Who can make good knots	
	Good swimmer	
	Good at public relations	
	Good at communication	
	Trained in first-aid	
	Good fire fighter	

and the list goes on.....

In order to tone up the skills of the employees the management should organize workshops/trainings etc. on continuous basis.

Equipment

Survey the zoo for equipment resources that may be needed to respond to the hazards and make a list of the equipment that the zoo possesses. Once the list is prepared the zoo management can make budgetary provision for replacing of the old, worn out equipment, and can obtain non-existent equipment.

The zoo in- charge has to prepare the basis equipment needed by the zoo for dealing with different kinds of emergencies. It will be much useful if different lists are prepared for different emergency situations.

Two such examples are given below for dealing with animal escapes :

Captive animals	Minimal requirement	Highly recommended but not required	What your Zoo has ?
Large carnivores	Nets, pole syringes, snare, Projectile guns and darts, blow dart equipment, crates, squeeze cages etc.		
Small carnivores	Nets, gloves, pole syringes, snare, crates, blow dart equipment, crates, squeeze cage ec.		
Hoofed stock	Projectile guns and darts, blow dart equipment, crates etc.	Custom designed squeeze cages	
Elephants	Elephant hook, projectile guns and darts, chins	Elephant crush	
Small mammals (e.g. primates).	Nets, gloves, pole syringe, snares, plastic tubes, blow dart equipment, crates, squeeze cage		
Large primates like chimps, orangutans etc.	Nets, gloves, pole syringe, projectile guns and darts, blow dart equipment		
Birds	Nets, gloves, towels, pole syringe		
Reptiles	Nets, gloves, snares, plastic shield, bags, plastic tubs, snake tong, snake hook etc.	Squeeze cages	

For warning people about the emergencies :

Minimal requirement	Highly recommended but not required	What your Zoo has ?
Alarm systems		
Public address system		
Radio communication (walkie talkie)		

Similarly, the equipment list can be prepared for floods, fire, earthquakes, animal diseases, explosion in the zoo etc. situations.

Local Response Capability

The zoo emergency team should identify what resources the local response agencies have with them and how they can help the zoo in controlling of crisis. In order to respond effectively, the team should work with the local fire, police, and emergency medical services and district administration.

While formulating the plan, think about the following issues :

Familiarity of the police/fire departments with the geography, location and facilities of the zoo.

How much they can help the zoo administration in the control of exigencies.

List of the hospitals with their phone numbers that are providing ambulance services.

Information about the availability of vehicles etc. with different departments etc.

The zoos must have information on different local response capabilities so that the Zoo can contact them during emergencies. The information can be in the form as described below :

Equipment and Vehicles :

Equipment/ Vehicle Type and its number	Department	Address	Telephone Number
Gypsy	- --Department		
Jeep	- --Department		
Jeep	- --Department		
Jeep	- --Department		
Gypsy	- --Department		
Car	- --Department		
Car	- --Department		
Mini Bus	- --Department		
Mini Bus	- --Department		
Water Tanker	- --Department		
Tractor Trolley	- --Department		
Earth moving equipment	- --Department		
Ambulance services			

and the list goes on....

Expertise and Services :

Specialty Service	Address	Contact Person	Telephone Number
Volunteers			
First aid			

and the list goes on....

Local Response Capabilities :

Name of the department	Name of the officer in-charge	Contact Number		
		Office	Fax	Cell
Closest Police Station				
Closest Fire Station				
Closest Government hospital				

and the list goes on....

Facilities

The zoos must have the basis facilities like control room, media centre and evacuation areas for effectively dealing with the emergency situations in the zoo. A brief description on these facilities is given below :

(a) Control Center

For effectively dealing with the exigencies the zoos must have a mechanism for good internal and external communication links. Good internal communication links help in ensuring that the orders are passed on to the emergency teams working with in the zoo and getting feed backs from them; where as good external communication links help in getting necessary help from the police, fire, medical, home guards etc.

For it the zoo must have a control room with adequate space, supplies, communication equipment like phone, fax, computer, walkie-talkies etc. The in-charge of the zoo coordinates from this location.

(b) Media Center

Decision for establishment of the media centre depends upon the severity of the exigency, if the intensity of the crisis is less no need for establishment of media centre. The queries of the media in such case can be addressed through telephone/ press releases. But if the intensity of damage is very high then media centre must be established. In such conditions as discussed earlier information coordinator is responsible for- establishing the media center and preparing news releases.

The media centre thus established should have adequate workplace for the information coordinator (and his team) and for media. The media centre must have telephone/ fax numbers of the print and electronic media with it.

The information can be maintained in the following tables :

Media contact list

Radio

Address	Contact Person	Telephone/Fax Number
All India Radio		
F. M. Channels		
•Radio Mirchi etc.		

Television

Name of the Channel	Contact Person	Telephone/Fax Number

Newspaper

Name of the Paper	Frequency of Publication (daily/weekly/fortnightly/monthly)	Contact Person	Telephone Number

(c) Evacuation Assembly Areas

To account for the well being of all employees and zoo visitors, an area must be designated for people to meet when evacuation is necessary. It may be necessary to have two evacuation assembly areas: one onsite, and the second offsite. At the evacuation assembly area(s), unit coordinators should determine whether everyone has evacuated the zoo safely or not. Unit coordinators should then report to the control room with any information regarding individuals who were not accounted for at the assembly area etc.

Step 4 : Creating a Vital Record Preservation Program

Purpose

Every organization possesses records containing information, which is valuable to the organization. The type of information differs depending upon the function of the organization and its size and complexity. For some organizations, the information contained in their records is its single most valuable asset for example records pertaining to Accounts, Animal Records etc. Some records may be valuable due to legal requirements, historic value, or operational value. Possible vital records include personnel records, fiscal records, animal records etc.

The purpose of a vital records preservation program is to protect the essential

information contained in the organization's records from loss or destruction. By identifying these records and protecting them, the organization will be better able to survive an event. This activity is usually considered a pre-disaster function; that is, once an emergency occurs, it is often difficult to save records not already properly protected.

Considerations

Three basic questions must be answered in developing a Vital Records Preservation Program :

1. What information is vital to the operation of the organization ?
2. Which records contain that vital information ?
3. How can those records be best protected ?

Protection Methods

It is important to remember that not all records will be on paper. Some may exist only in a computer database, disks, tapes, drawings, videotapes etc.

Basically there are three ways to protect vital records :

Store or move the records to a different location.

Store in vaults, safes, or other types of protective devices.

Duplicate the records and store in a different location.

The method (s) chosen will depend upon the type of record involved, its value to the operation of the organization, and the size, type and complexity of the organization. Make provisions for preserving those records that, for whatever reason, cannot be duplicated, stored or dispersed elsewhere.

Some of the vital records of the zoological parks and prescribed method for storing them are as given below :

Records related to	Type of Record	Location	Preservation Method	Responsible Person
Fiscal management	Budget data/ Monthly Accounts	Zoo in-charge office	Record are scanned and written on CDs	Accountant
Personnel	Employee Info. Personnel Database	Zoo in-charge office	Duplicated Copied stored in Fireproof box / records are scanned and written on CDs	Head Clerk / Establishment clerk
Inventory	Animal records	Zoo Hospital	Duplicated (hard disk of computer)	Zoo vet. / Stenographer

Resource List

A resource list provides a single point of reference for available public and private sector resources within, as well as outside of the Zoo community. This list should contain those resources that the organization may need during an emergency situation or disaster. These resources include, but are not limited to equipment, supplies, professional services, communication services, key officials, etc. It is always useful to list the resources by general categories as outlined below for easy reference. Developing a list of resources will definitely help the authorities in emergency operations and disaster recovery.

Key official contact list :

Name/Title of Official	Telephone Numbers		
	Office	Home	Cell
Secretary Forests			
Special Secretary			
Principal, Chief Conservator of Forests			
Chief Wildlife Warden			
State Zoo Authority			
Member Secretary CZA			
Commissioner			
Inspector General of Police			
Deputy Inspector General of Police			
District Magistrate			
Senior Superintendent of Police			
Superintendent of Police			
M.D./In-charge electrical supply units			
In-charge water supply units			
In-charge, Home Guards			
Local senior forest official like conservator of forests			
Police Circle Inspector, nearest police station			
In-charge Fire Services, nearest fire station			
Divisional Forest Officer			
In-charge of the nearest Zoological Parks			
Zoo friends club			

and the list goes on...

List of experts in the field of Wildlife :

Experts in the field of Wildlife	Telephone Numbers		
	Office	Home	Cell
• Reptile expert			
• Monkey catchers			
• Carnivore experts			
• Herbivore experts			
• Other experts			
Veterinary Doctors			
• Dr.			
• Dr.			
• Dr.			
• Dr.			
• Dr.			

and the list goes on...

Transporters list

Name of the Transporter	Telephone Numbers		
	Office	Home	Cell

Suppliers (food & medicine)

Supply	Address	Contact Person	Telephone Number
Tranquilizing equipment			
Tranquilizers like Yhombine, Xylazine Ketamine etc.			
Meat			
Vegetables			
Fruits			
Medicines			
Dry ration			
Fodder			

and the list goes on.....



*Dealing with Natural disasters like -
- floods, earthquakes, mud/land slides etc...*

Water impounding the enclosures of the zoological parks of India during rainy season/floods is not something uncommon. It happened in Mysore Zoo, Nandankanan Zoo (during super cyclone) and can happen anywhere and everywhere, as the rain patterns are changing and geographical location of some of our zoos is making them vulnerable for the natural disasters like floods, mud slides, earthquakes etc.

The flooded water, poor sanitation, contaminated food and water, proliferation of vectors with in the zoo and spread of diseases are manly responsible for serious losses to the zoo by the way of loss of valuable genetic materials and increases concerns of animal diseases transmitting to humans (zoonotic diseases).

So let us be prepared for dealing with such exigencies

Chapter III Natural Disasters

- floods, earthquakes, mud/land slides etc.

Floods

India is the worst flood-affected country in the world. About 40 million hectares or nearly one eighth of India's geographical area is flood-prone. Flood is an exigency for the Zoos which are in:

- (a) Flood-prone areas of the country.
- (b) The coastal areas which receive huge amounts of rain during cyclones/ super cyclones.
- (c) Tsunami-affected areas (like the Zoos in the Andamans and those in coastal areas)
- (d) The foothills &
- (e) Areas not in floodplains but nevertheless vulnerable to the changing pattern of rainfall (less rainy days with maximum downpour).



Figure I : Gushing waters from an enclosure

These zoos must have a contingency plan for dealing with exigency associated with flooding. Every such zoo should have a foolproof planning process for effectively dealing with the flood situation. Some of the points to be considered while formulating the planning process are :

Examine all possible impacts of floods/mudslides/cyclones :

For dealing with the flood situations, the zoo administrators should have knowledge about -

Historical information on the flood situation of the area.

Information on drainage, geography and the quantum of rainfall received by the area that might lead to flood situation.



Figure II: An enclosure under deluge

Critical factors to be considered during the planning process are :

I. Quantity and quality of water supply

The most serious consequence of flooding is large-scale contamination of drinking water. Water-borne diseases usually associated with poor hygiene and sanitation, can affect a large

portion of the Zoo population. Under such conditions the proper storage of water is of great importance, as poorly stored supplies may become contaminated and also act as breeding grounds for vectors. During floods there is an every chance that the potable water gets contamination from the sewage systems. So providing for safe drinking water for zoo animals in case of flood is very much needed.

Some of the potential causes of drinking water contamination during floods are :

Contamination of surface source due to carcass near the source.

Excessive increase in turbidity making water difficult to purify.

Contamination of groundwater with sewer water.

During floods the contingency team should consider the following :

During floods the zoos should access drinking water only from reliable and clean sources.

The water should be evaluated in order to eliminate risk of water-borne infection and poisoning.

That water suspected of contamination shouldn't be used for consumption.

What should be done ?

Identify alternative sources of water which can be tapped during emergencies. Water must be tested as soon as possible after calamity; Ensure sufficient vessels for water storage.

Mobilization and deployment of water tankers.

Microbial contamination of potable water during floods is of great concern to the safety of animals and chlorine disinfection is relatively cheap, effective and usually readily available.

The zoos should have water quality field testing kits, which should be capable of testing residual chlorine and bacteriological quality of the water.

II. Food Sanitation

Food Safety refers to the wholesome condition of food such that its consumption does not result in food-borne illness.

Food-borne illness may result from the irritation of the alimentary canal as a result of rapid bacterial multiplication, or from the production of toxins by pathogens (food poisoning) or as a result of the impact of chemical or physical substances in the body or introduced through the consumption of contaminated food.

The risk to food safety may result from direct contamination from floodwater, or indirect contamination from poor storage of food that can lead to the proliferation of micro-organisms, some of which produce toxins. Improperly stored food can also serve as a habitat and source of food for vectors, e.g. flies and rodents.

The various aspects of food safety management in a flood situation should encompass all processes related to storage, processing, preparation, handling and distribution of food.

The contingency plan should anticipate the vulnerability of food system of the zoo to risks of contamination due to flooding and it should take measures to curtail those risks. Proper planning should allow for the measurement of risks, the maintenance of surveillance, and for planning for remedial action.

What should be done ?

Clean and sanitize food and food-contact surfaces to eliminate pathogens as much as possible

The utensils/food cans used should be thoroughly sanitized between usage,

Food storage areas should be clean

Food items should be stored above ground in water proof containers

Storage should allow sufficient ventilation and sunlight

Personal cleanliness of food handlers is very important

Contaminated and decaying food material shouldn't be given to the animals

Contaminated and decaying food material should be properly disposed off preferably by burying/ burning rather than open dumping

Make provision for the safe transfer of food

During transportation, ensure protection of food from the elements of nature

Most efficient mode of transport should be identified and made available for food transfer

Ensure thorough sanitation of food store

Ensure availability of adequate volumes of safe drinking water.

II. Waste disposal and maintenance of good hygiene

For protecting the health of zoo inmates it is vital that the zoo manager must maintain good sanitary conditions in the zoo after flooding. A good contingency plan will help the managers to assess the affected area in an effort to insure that the health of zoo animals is not compromised.



Figure III : Dead animals - a potent health threat to inmates of the Zoo

This assessment should include among other areas, considerations for maintaining good sanitary and hygienic conditions with specific reference to water supply, excreta disposal and solid waste management. The following represents elements that should be considered when undertaking contingency-planning for sanitary and hygiene conditions following a flood event.

In the case of floods it is important to ensure proper water quality in an effort to prevent the spread of diseases, which include diarrhoeal diseases, parasitic infections, as well as epidemics such as cholera, all of which can affect animal health. Raw sewage contains a large number of disease-causing pathogens which might include: Hepatitis viruses, Salmonella spp, pathogenic bacteria such as Leptospira spp, pathogenic protozoa such as Entamoeba, and other parasitic organisms such as Ascaris and hookworms. Illnesses can be transmitted by these micro-organisms through an oral fecal route, directly or through water, food, or hands of zoo keepers/animal handlers contaminated with excreta. Also playing an active role in this process are vectors such as insects, rodents etc.

The important relationship between improper solid waste disposal and the cases of vector-borne diseases cannot be overstated. Therefore it is important that arrangements be in place to collect and dispose of solid wastes of the animals. In emergency situations solid waste management in the zoo becomes an arduous task as at that time the zoo managers have to deal not only with solid wastes of the zoo animals but also with detritus like dead animals, fallen trees, and debris from the damaged buildings etc.

IV. Vector control

Vectors carry disease-producing micro-organisms from one host to another. These potential disease carriers are capable of rapidly reproducing and dispersing within favorable environments. Floods often provide conditions for proliferation and in particular, a variety of species of flies and mosquitoes pose the greatest threat for vector-borne diseases. Vectors of significance include mosquitoes, flies, rats and mice, cockroaches, ticks, fleas, lice and mites etc, it is important to note that a disaster such as a flood does not cause new diseases. However, altering the environment may predispose a particular area to increases in the transmission of diseases already present and introduction from another area. the prevalence

This increase in of a particular disease may be due to the following :

- Creation of new breeding sites.
- Disruption of on-going vector control programmes.
- Presence of poor sanitary conditions.
- Feecal and urine contamination.
- Increase in the number of vector and/or disease host species.
- Increase in vector and human contact.



Figure IV : Water filled areas--potent areas as breeding grounds for vectors and a possible escape route

What should be done ?

The increased risk of transmission of vector-borne diseases following a flooding of the area must be viewed very seriously and requires surveillance mechanisms in place. A good surveillance mechanism helps save the lives of animals of the zoo. The surveillance teams should conduct studies on vectors, sanitation and hygiene, safety of food, water-quality, and on epidemiological aspects. Measures for the establishment of simple and rapid monitoring and response systems are recommended.

Knowledge of the areas prone to flooding will assist the assessment teams in rapidly locating areas that are likely to develop stagnant pools of water and will act as breeding grounds for insects.

Monitoring of waste collection areas and food preparation areas is important to ensure that such facilities are properly managed given that they can provide a food source for rodents, mosquitoes etc.

V. Other aspects of flood management

The zoo managers should follow the following measures for dealing with floods in their institutions.

- Develop some highland areas in those enclosures which have a history of inundation.
- Water outlets must be cleaned of leaves, mud, etc. just before and during the rainy season, so that gushing water will do no harm to the zoo infrastructure or deluge the zoo premises. The zoo administrators can think of making structural rearrangements like having sluice gates in their boundary walls, so that water leaves the premises without damaging the zoo infrastructure and zoo animals.
- The zoos in the foothills can think of having diversion canals, so that water will not enter the zoo premises.
- The most important aspect is that the zoo should have a rapid response team equipped with required equipment.

VI. The team (rapid response team)

(A) Officer in-charge

The director/administrator of the zoo, being the head of the institution is responsible for overseeing all aspects of preparing for and responding to an emergency situation. He will be making decisions on operations, protective actions, and gives overall guidance to the

members of the team. He will be receiving information and recommendations from the emergency coordinators and other advisors, and then makes the necessary decisions.

The Director's primary responsibilities are :

- Getting the emergency plan prepared and accepting it,
- Appointing personnel to perform emergency tasks,
- Deciding what protective actions should be taken for emergency situations,
- Authorizing the use of zoo's infrastructure,
- Liaisoning with local district authorities in cases of exigency for getting necessary help.

(B) Emergency Coordinator

A person who

- Possesses a thorough knowledge and understanding of the zoo layout and operation.
- Holds a responsible position within the organization with the authority to implement protective measures and commit resources and personnel.
- Possesses leadership qualities and has the ability to operate under stressful conditions.
- Possesses a rudimentary knowledge of the basic concepts of emergency management, should be designated as emergency coordinator.

He will be responsible for following the flood emergency plan and ensuring that all members are trained and knowledgeable in performing their tasks before an emergency occurs. During an actual flood situation, the site coordinator does not necessarily make the decisions concerning protective actions, but coordinates the implementation of the flood emergency plan. The emergency coordinator should be capable of taking immediate, on-the-spot decisions, if required.

The Emergency Coordinator's primary responsibilities are :

- Maintaining updated flood emergency plan and testing it on a regular basis.
- Training and activating personnel to perform emergency tasks.
- Organizing and maintaining control center with adequate communications capability.
- Ensuring that vital records are identified and protected.

- Implementing protective actions.
- Implementing decisions and directives of the officer in charge of the zoo.
- Making provisions for food and water requirements of Zoo animals.

The Emergency Coordinator for the Zoo can be Assistant Conservator of Forests and he will be assisted by Office Staff, Chowkidars, Gardeners etc.

(C) Unit Coordinator(s)

Person(s)

- With knowledge and understanding of the site layout, and a thorough knowledge of the operation of their work unit.
- Holding a responsible position within their work unit with the authority to direct and commit resources and personnel.
- Possessing leadership qualities and have the ability to operate under stressful conditions, should be designated as unit coordinators of the zoo.

The zoo, depending on its area can have any number of unit coordinators. The designated persons will be responsible for carrying out instructions of the flood emergency plan within their jurisdiction and liaising with the Emergency coordinator.

Unit Coordinator's primary responsibilities are :

Participating in emergency plan review meetings.

Training personnel in their respective jurisdictions.

Identifying, before an emergency, vital things that need protection.

Ensuring that all persons have taken the appropriate protective actions.

Coordinating shut-down of electrical connections, etc. during exigencies.

Helping in the smooth movement of people and vehicles.

Assisting Assessment Coordinator in the assessment of losses due to disaster.

Opening of sluice gates and getting the water outlets cleaned before and during rainy season.

Providing safe drinking water and sanitized food to animals.

Taking measures for the speedy disposal of solid and liquid wastes.

Helping the maintenance staff in repairing of the damaged enclosures.

Helping in the capture/ trapping of escaped animals.

The Unit Coordinators for the Zoo can be foresters who can be assisted by chowkidars, gardeners, animal keepers, laborers who are working in their respective beats.

(D) Warning/Communications Coordinator

The warning/communications coordinator is responsible for maintaining communication equipment, such as walkie-talkies and telephone systems, etc. The warning/communications coordinator maintains a log of the different messages or information coming into and leaving the zoo during an emergency. He will be responsible for activating the primary warning system within the zoo, such as starting an alarm, making public announcement etc.

Communication Coordinator's Primary responsibilities are :

Participating in emergency plan review meetings.

Maintaining communications system between control center and various work units on-site, as well as local authorities such as police/ fire /revenue departments.

Maintaining of telephone logs.

Receiving and disseminating information about the flood situation that has occurred, or is imminent.

Activating the on-site warning if necessary.

Establishing communications links between control center and media center.

Warning/communications coordinator for the Zoo can be Forest Range Officer and will be assisted by Stenographer, Head Clerk, and orderly.

(E) Assessment Coordinator

The Assessment Coordinator will be responsible for collecting, verifying and displaying statistical information about the floods to other team members, as well as to the local authorities like police and fire department. He should maintain a record or diary of events and decisions made during the floods.

Assessment Coordinator's Primary responsibilities shall be :

Participating in emergency plan review meetings.

Collecting and compiling information on previous floods and rainfall data of the area.

Maintaining a written record of all events that occur including actions taken, decisions made and by whom, personnel involved, costs incurred etc.

Reporting verified damage information to the director for release to media and for sharing information with the local authorities.

Assisting with the preparation of other reports as necessary, including a post-action report.

Emergency Assessment Coordinator for the Zoo can be Forest Range Officer he can be assisted by L.D.C and an orderly.

(F) Information Coordinator

The Information Coordinator is responsible for developing news releases, answering media questions, and ensuring that protective actions are publicized. He should be comfortable working with the media and have a clear understanding of management's priorities.

Emergency Information Coordinator's Primary responsibilities shall be :

Participating in emergency plan review and updates.

Obtaining verified flood-related information.

Preparing and issuing news releases to the media

Establishing Media Center (if necessary) during disaster to coordinate emergency information and brief the media.

Conducting media tours whenever possible.

Emergency Information Coordinator for the Zoo can be the Forest Range Officer and will be assisted by L.D.C and an orderly.

(G) Maintenance Coordinator

The maintenance coordinator is responsible for controlling site mechanical systems and ensuring that they are shut down properly during the floods.

Maintenance Coordinator's Primary responsibilities shall be :

Participating in emergency plan meetings.

Maintaining procedures for controlling systems, such as electrical supply points, tube wells, cages, tractor, trolleys, squeeze cages, fire extinguishers and their spare parts etc.

Training personnel working under him.

Providing emergency repair and power services as necessary.

Erecting barricades and other traffic and access control devices as necessary.

Providing for debris clearance and site clean up as necessary.

Providing damage inspection and site re-entry recommendations.

Replenishing, repairing and/or replacing emergency equipment.

Emergency Maintenance Coordinator for the Zoo can be Curator and he will be assisted by carpenter, mason, electrician, tube well operator, ticket checkers etc.



Figure V : Water inlets/ outlets - require proper maintenance

(H) Medical Coordinator

The Medical Coordinator will be responsible for providing immediate care to injured zoo animals, capturing the escaped animals, as well as collecting and compiling health and medical-related disaster information.

Medical Coordinator's Primary responsibilities shall be :

- Participating in emergency plan review meetings
- Ensuring that medical care is provided to injured animals
- Ensuring that the escaped animals are caught
- Collecting and compiling health and medical disaster information for the Assessment Coordinator.
- Coordinating the disease surveillance mechanism of the zoo etc.

Medical Coordinators for the Zoo can be the Veterinary Doctor

(I) Security Coordinator

The Security Coordinator is responsible for controlling the movement of people and vehicles, and preventing unauthorized entry into the zoo.

Security Coordinator's Primary responsibilities shall be :

- Participating in emergency plan review meetings.
- Controlling the movement and preventing unauthorized entry of people and vehicles.
- Assisting with fire suppression, if necessary.
- Directing media representatives to the Media Center.

Emergency Security Coordinator for the Zoo can be a Head Keeper.

Equipment needed during floods :

Item	Essentially Needed	Needed	What the Zoo has got with it ?
Flashlight/ Torch lights and spare batteries	✓		
Rubber boots	✓		
Drinking water bottles	✓		
First aid kit	✓		
Protective gloves	✓		
Helmet	✓		
Measuring tape	✓		
Disposable masks	✓		
Sealing tape and string	✓		
Residual chlorine/chlorine tablets and pH testing equipment	✓		
Shovels	✓		
Pick axe	✓		
Generator with sufficient fuel	✓		
Water quality field testing kits	✓		
Tranquilizing gun with drugs	✓		
Welding machine with sufficient welding rods	✓		
Ropes and nets	✓		
Cages	✓		
Sufficient larvicide's, insecticides and their delivery systems	✓		
Construction and repair material like Cement, iron rods, sand etc.	✓		
Sand bags	✓		
Gas cutters		✓	
Earth moving equipment		✓	

and the list goes on..

Critical Decisions to be made in a Flood situation :

Indicator	Decision
Water Supply	
1. Total interruption of the normal system	Establish alternative Water source
2. Poor Water Quality at source	Initiate chlorination
3. Poor drinking water quality	Recommend chlorination/boiling
Sewage Disposal	
Total interruption of the normal system/interruption	Provide alternative methods of sewage disposal
Solid Waste Disposal	
Inadequate collection/removal and dumping site	Obtain equipment for a) debris removal b) reconditioning of dump & c) garbage collection
Food Hygiene	
Frequent inspections	Provide additional personnel for food hygiene inspections
Corpses	
Large number of corpses	Initiate mass burials
Mosquitoes	
Increase in vector population and breeding sites	Initiate Spraying and larval control
Determination of the biological life cycle and familiarity of personnel to insecticide	Select best spraying time and larvicide application
Sensitivity of mosquitoes, availability, cost	Select appropriate insecticide
Other Pests	
Increase in number of poisonous snakes	Stock the snake venom serum

(Source: Assessing Needs in the Health Sector after Floods and Hurricanes, Technical Paper No. 11, Pan American Health Organization (PAHO), 1987)

Web resources :

For **Flood** related information

www.cwc.nic.in website of the Central Water Commission of India, (CWC) of India.

<http://wrmin.nic.in> website of the Ministry of Water Resources, GoI.

www.imd.ernet.in Indian Meteorological Department (IMD) provides all India weather report, end of monsoon season report, weather charts, satellite images, rainfall maps, earthquake reports and severe weather warnings.

www.ndmindia.nic.in Natural Disaster Management India. Provides current news on Flood, Drought and Cyclones, Weather Links from NIC and weather conditions/temperatures on Indian Ocean (www.weather.nic.in).

www.nih.ernet.in India National Institute of Hydrology perform tasks such as Ground water zone mapping, Flood plain mapping, land use, salinity, sedimentation, Soil erosion, water-logging etc.

For **Cyclone** related information

www.imd.ernet.in Indian Meteorological Department (IMD) provides all India weather report, end of monsoon season report, weather charts, satellite images, rainfall maps, earthquake reports and severe weather warnings. IMD provides cyclone warnings from the Area Cyclone Warning Centres (ACWCs) It has developed the necessary infrastructure to originate and disseminate the cyclone warnings at appropriate levels. It has made operational a satellite based communication system called Cyclone Warning Dissemination System for direct dissemination of cyclone warnings to the cyclone prone coastal areas.

www.ndmindia.nic.in Natural Disaster Management India. Provides current news on Flood, Drought and Cyclones, Weather Links from NIC and weather conditions/temperatures on Indian Ocean (www.weather.nic.in).

www.bmtpc.org/disaster.htm In order to bridge the gap between research and development and large scale application of new building material technologies, the erstwhile Ministry of Urban Development, Government of India, had established the Building Materials and Technology Promotion Council in July 1990.

www.gsdma.org/cycpre.htm Link to Cyclone preparedness on the Gujarat State Disaster Management Authority website. The Government of Gujarat (GOG) established the Gujarat State Disaster Management Authority to co-ordinate the comprehensive earthquake recovery program.

www.osdma.org website of Orissa State Disaster Mitigation Authority. The Government of Orissa established the Orissa State Disaster Management Authority to co-ordinate the comprehensive Orissa Super Cyclone recovery program. Visit the section 'Safety Tips' for cyclones and other hazards.

www.tropmet.res.in The IITM functions as a national centre for basic and applied research in monsoon meteorology of the tropics in general with special reference to monsoon meteorology of India and neighbourhood. Its primary functions are to promote, guide and conduct research in the field of meteorology in all its aspects.

www.colorado.edu/hazards is an excellent site having a comprehensive coverage of disaster-related information organized in an easy to read way.

www.wmo.ch World Meteorological Organization is an intergovernmental organization with a membership of 187 Member States and Territories. WMO is a specialized agency of the United Nations for meteorology (weather and climate), operational hydrology and related geophysical sciences.

For Tsunami related information

<http://ioc.unesco.org/itsu/> IOC/UNESCO International Coordination group for the Tsunami Warning System in the Pacific (ICG/ITSU), Paris, France

<http://quake.usgs.gov/tsunami/> Tsunamis and Earthquakes, USGS, USA

www.asc-india.org Amateur Seismic Centre is a comprehensive website carrying details of state wise seismicity for the country. This also has extensive reports on various past Earthquakes/ Tsunamis.

<http://www.prh.noaa.gov/pr/itic/> International Tsunami Information Center, Honolulu, Hawaii

<http://www.tsunami.org/> Pacific Tsunami Museum site. Includes answers to frequently asked questions, links, and information related to Pacific Ocean tsunamis.

(Source: www.nmdindia.nic.in)

Mud / Landslides

Incidences of mud/land slides are very frequent in

- *Western Himalayas (Uttar Pradesh, Himachal Pradesh and Jammu & Kashmir) incidence of landslides is very high to high*
- *Eastern & N.E Himalayas (West Bengal, Sikkim and Arunachal Pradesh) incidence of landslides is high*
- *Naga-Arakan Mountain belt (Nagaland, Manipur, Mizoram and Tripura) incidence of landslides is high*
- *Western Ghats including Nilgiris (Maharashtra, Goa, Karnataka, Kerala & Tamil Nadu) incidence of landslides is high to moderate*
- *Plateau margins in the Peninsular India and Meghalaya in the NE India*

The zoological parks of these areas are highly vulnerable to mud and land slides.

Occurrence of land slides depend upon factors like thickness of the soil, slope, landform, relative relief, drainage, rainfall, geology of the area etc. The zoological parks of these vulnerable areas should be prepared for exigencies rising due to landslides. A contingency plan so prepared can be in the lines of flood contingency plan.

Web resources:

On landslides and mudslides information can be sought from the following web addresses

<http://www.csre.iitb.ac.in/rn/resume/landslide/lsl.htm> Landslide Information System - Center of Studies in Resource Engineering IIT Mumbai.

<http://landslides.usgs.gov> USGS National Landslide Hazards Program (NLHP)

<http://www.fema.gov/hazards/landslides/landslif.shtm> Federal Emergency Management Agency FEMA, USA is tasked with responding to, planning for, recovering from and mitigating against disasters.

<http://ilrg.gndci.pg.cnr.it/> The International Landslide Research Group (ILRG) is an informal group of individuals concerned about mass earth movement and interested in sharing information on landslide research.

(Source: www.ndmindia.nic.in)

Earthquakes

The issue of seismic hazard in India has been addressed by scientists as early as 1956 when a 3 zone (Severe, Moderate, Minor hazard) Seismic Zoning map of India was produced. This map was based on a broad concept of earthquake distribution and geotectonics. The severe hazard zones are roughly confined to plate boundary regions i.e. the Himalayan Frontal Arc in the north, the Chaman fault region in the north west and the Indo-Burma border region in the north east. The lower hazard zone is confined to Indian shield region in the south and the moderate hazard zone confined to the transitional zone in between the two. Since then, many versions of the seismic zoning map of India have been brought out. The Bureau of Indian Standards which is the official agency for publishing seismic hazard maps and codes in India, produced a six zone map in 1962, a seven zone map in 1966, and a five zone map in 1970 / 1984 which is currently valid

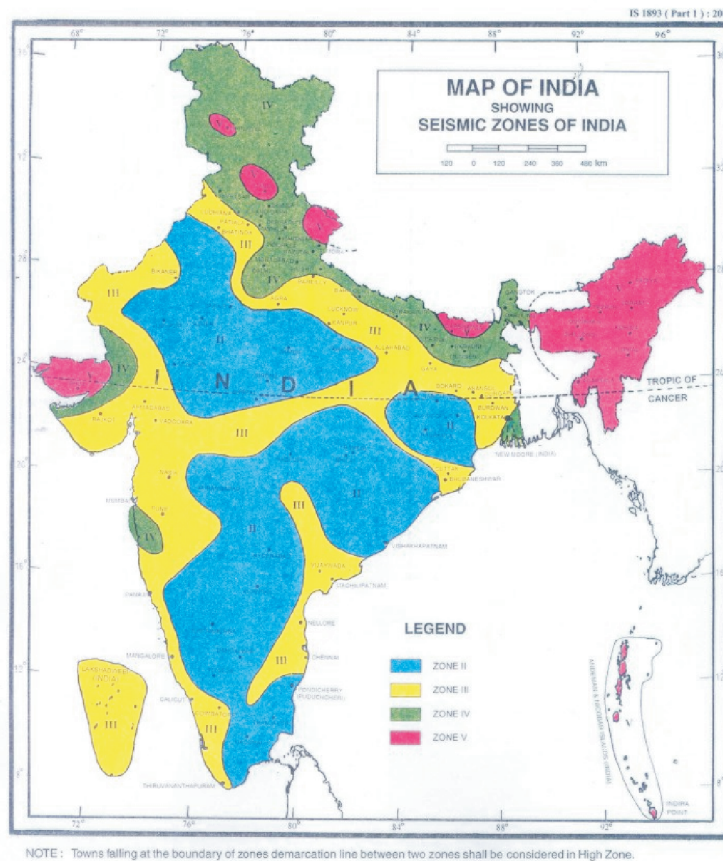
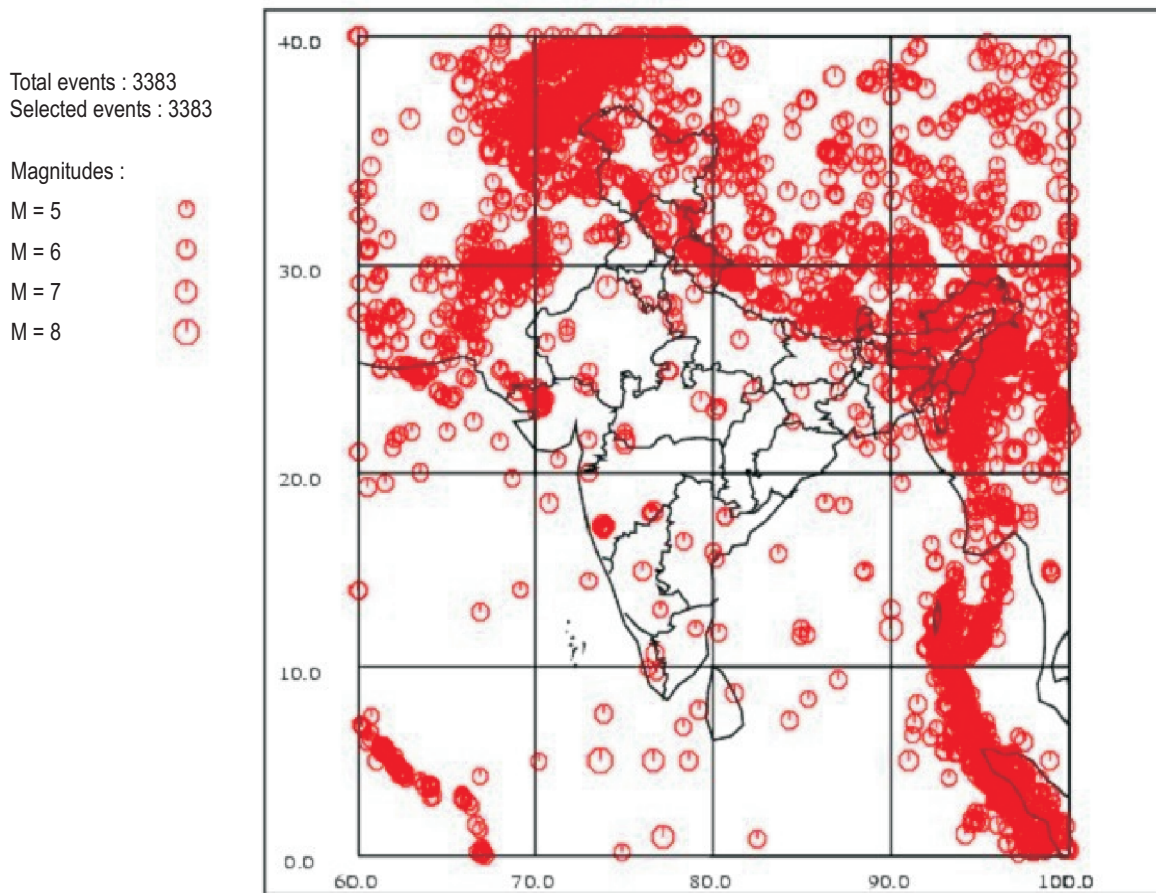


Figure showing the Seismic Zones of India. The country is divided into four seismic Zones – II, III, IV and V (Source: IS1893 (Part 1): 2002) as appeared in

www.ndmindia.nic.in

PLOT OF EARTHQUAKES (M>=5.0) FROM IMD CATALOGUE FOR THE PERIOD FROM 1800 TO SEPT. 2001



Source: www.ndmindia.nic.in

The above map shows that for the period from 1800 to 2001 different areas of India faced earthquakes of different magnitudes, which makes the zoological parks in these parts of the country vulnerable for such natural disasters, hence they should be prepared well for facing this exigency. The exigency plan so prepared can be along the lines of flood contingency plan.

The buildings of the zoological parks should be built on the lines of technology developed by the institutions like HUDCO, Building Materials and Technology Promotion Council (BMTPC), the premium institutions working on developing earthquake resistant building technologies. This will definitely help us in saving the lives of our animals under display in the events disasters.

For further information on earthquakes the zoo authorities can consult the following web addresses :

Web resources on Earthquakes :

www.nicee.org: Website of The National Information Center of Earthquake Engineering (NICEE) hosted at Indian Institute of Technology Kanpur (IITK) is intended to collect and maintain information resources on Earthquake Engineering and make these available to the interested professionals, researchers, academicians and others with a view to mitigate earthquake disasters in India. The host also gives IITK-BMTPC Earthquake Tips.

www.imd.ernet.in/section/seismo/static/welcome.htm Earthquake Information – India Meteorological Department, India. IMD detects and locates earthquakes and evaluates seismicity in different parts of the country.

www.bmtpc.org In order to bridge the gap between research and development and large scale application of new building material technologies, the erstwhile Ministry of Urban Development, Government of India, had established the Building Materials And Technology Promotion Council in July 1990.

www.earthquake.usgs.gov Source for science about the Earth, its natural and living resources, natural hazards, and the environment.

www.neic.cr.usgs.gov National Earthquake Information Center (NEIC) - World Data Centre for Seismology Earthquake information and observation station: The site hosts one of the most comprehensive systems.

www.quake.wr.usgs.gov Earthquake Reporting Service : U.S. Geological Survey and UC Berkeley service for earthquake reporting. Earthquake basics and educational material; geological and historical information; links to professional and amateur organizations; online access to earthquake data. Current research activities and results in seismology, crystal structure and deformation, geology and borehole physics. for more

www.asc-india.org Amateur Seismic Centre is a comprehensive website carrying details of state wise seismicity for the country. This also has extensive reports on various past earthquakes with rare photographs and maps.

(Source: www.ndmindid.nic.in)

Dealing with Fire & Explosions.....

Dealing with Fire & Explosions.....

Fire - an accidental or intentional incident if unchecked takes the turn of a disaster in Zoological Parks. Not many Indian examples where major fire taking its toll in the Zoological Parks, but it can happen anywhere and everywhere.

An example of such an event that killed scores of (more than 100 exotic animals) zoo animals happened in Tri-State Zoological Park at Western Maryland U.S. on 30th March 2006. So let us be prepared for such an eventuality.

Chapter IV Fire and Explosion Procedures

Introduction

The threat of fire and explosion exists at every wooded place. Fire and explosion can be accidental (such as short circuit or by the accidental fire caused by a thrown cigarette by the Zoo visitor) and at times can be intentional (by the Zoo visitor/ anti-social elements).

Fires are most devastating when they occur in zoos with large concentrations of people and near to the animal enclosures. Heat, smoke, and flying or falling debris may cause injury or loss of life to persons and inmates of the zoo, at or near to the accident site. Structural damage or collapse may occur if a fire or explosion is strong enough.

Vital records may be damaged or destroyed by the fire or by water from overhead sprinkler systems. Essential operations may be disrupted for a long period of time as facilities are to be repaired or reconstructed.

The following three things must be present at the same time in order to produce fire :

- Enough oxygen to sustain combustion
- Enough heat to raise the material to its ignition temperature
- Some sort of fuel or combustible material.

During Fire it is very important that the stranded visitors should be evacuated to a safe area. As the zoo is visited largely by women and children, evacuating them to safe areas is imminent, as panic may result in further injuries if people attempt to evacuate in a disorganized manner.

Considering this, the plan below primarily emphasizes the evacuation of stranded people from the accident site.

Plan for dealing with Fire accidents

Notifying and Warning

Whoever comes across Fire or explosion within the premises of the zoo he or she should notify the zoo authorities

The warning may be by siren, ringing bell, horn etc.

The first person who spots a fire should activate the alarm system and contact the authorities.

General Response

Regarding People

The Director will fully activate the control center.

Zoo personnel should evacuate visitors, especially women and children, from the fire area to the evacuation assembly area upon hearing the alarm.

Small or isolated fires should be immediately extinguished.

Unit Coordinators will check their work areas to ensure that all persons have taken the appropriate action.

Unit Coordinators will account for their personnel at the evacuation assembly area and report this information to the Emergency Coordinator.

The Emergency Coordinator will authorize reentry into the site or facility after consulting the fire personnel.

Regarding Zoo animals

Fire lines should be cut near the animal enclosures

Adequate supply of water for sprinkling on the animals and for dousing the fire should be made available

Measures should be taken that the crowns of the trees of the animal enclosures do not catch fire. It is very necessary in the zoos where there is a great deal of vegetation. As a precautionary measure lopping of trees should be done at regular intervals

Unit Coordinators will check their work areas to ensure that all animal keepers have taken appropriate action.

Checklist of Different Coordinators

Activate the control center.

Determine the extent of the fire and its effect on zoo visitors and on the animals of the zoo.

Determine what staff and personnel should do during interim period.

Authorize the use of zoo's resources by emergency teams of the zoo and local agencies.

Coordinate with the local authorities.

Augment personnel and resources as necessary.

Emergency Coordinator Checklist

Ensure that the Fire Department has been informed.

Ensure that the fire alarm system has been activated.

Determine the extent of the fire.

Activate the Disaster management plan.

Coordinate with maintenance personnel of the electricity department for shutting down the electricity supply.

Unit Coordinator Checklist

Notify persons of the need to evacuate.

Ensure that vital records are preserved.

Coordinate shutdown procedures as necessary.

Direct persons to the assembly area located.

Coordinate people in dousing of fires.

Determine the extent of the fire or explosion and report this information to the Emergency Coordinator.

Assessment Coordinator Checklist

- If necessary, evacuate stranded people to the evacuation assembly area.
- Maintain a written record of all events that occurred during the fire, including actions taken, decisions made and by whom, personnel involved, costs etc.
- Collect and compile damage information.
- Verify and report damage information to the Information Coordinator.
- Prepare an after-action report.

Warning/Communications Coordinator Checklist

- Activate the fire alarm system, if applicable.
- Maintain a primary and alternate communications system between the control room, the various work units onsite, and local emergency authorities like police, fire and medical departments.
- If necessary, evacuate stranded people to the evacuation assembly area.
- Notify key officials as necessary.
- Log messages received by and dispatched from the control room.
- Establish communications links between the control room and media center.

Information Coordinator Checklist

- Obtain verified information about the fire damage.
- Prepare and issue news releases.
- Establish a Media Center (if necessary).
- Conduct media tours of the fire or explosion scene (if possible).

Medical Coordinator Checklist

- Ensure that emergency medical care is provided to injured persons.
- Coordinate offsite medical assistance, ambulance calling/pickup etc.
- Collect and compile fire/explosion-related health and medical information for the Assessment Coordinator.

Maintenance Coordinator Checklist

- Shut down electricity lines or systems as necessary.
- If necessary, evacuate stranded people to the evacuation assembly area.
- Erect barricades and other traffic and access control devices to regulate movement of men and vehicles.
- Re-entry recommendations are given after consulting fire personnel.
- Provide emergency repair services.
- Assist with debris clearance.
- Provide auxiliary power and lighting, if necessary.
- Start-up systems like electricity when appropriate.
- Replenish, repair or replace emergency equipment..

Security Coordinator Checklist

Direct fire personnel to the fire scene.

Control the movement of people and vehicles.

Maintain access lanes for emergency vehicles and personnel.

Prevent unauthorized entry into the hazardous area, control room and media Center (if established).

Assist with fire suppression as necessary.

Assist with the care and handling of injured persons as necessary.

Direct media representatives to the Media Center, if established.

Equipment required for dealing with fire :

Items	Essentially needed	Needed	What the Zoo has with it ?
Rubber boots	✓		
Drinking water bottles	✓		
First aid kit	✓		
Protective gloves	✓		
Helmet	✓		
Measuring tapes	✓		
Shovels	✓		
Pick axe	✓		
Tranquilizing gun with drugs	✓		
Welding machine with sufficient welding rods	✓		
Ropes and nets	✓		
Cages	✓		
Construction and repair materials like Cement, iron rods, sand etc.	✓		
Gas cutters		✓	
Earth-moving equipment		✓	
Fire proof dress		✓	
Goggles	✓		

and the list goes on....

Civil Disturbance Procedures

Zoological Parks are subjected to different kinds of disturbances—vandalism / external threats (war/ terrorist attacks).

There are many examples where in the zoo animals and zoo property are subjected to vandalism. According to Sally Walker most of the zoo visitors are casual visitors, in holiday mood and many of them consider visiting zoos to be for recreation, they try to receive pleasures from teasing the animals and from their unruly behaviour (vandalism).

There are instances where in the zoological parks like, Kabul Zoo, Baghdad Zoo were attacked, and there is an every possibility that for fomenting trouble or for the reasons of attracting media attention attacks can take place on our Zoological parks.

So we have to be ready for facing such eventualities... ..

Chapter V Civil Disturbance Procedures

Introduction

Demonstrations, riots, looting, curfew and other forms of civil disturbance can threaten the supply of food to the zoo animals and at times for the safe evacuation of zoo guests and the zoo staff. Evacuation or other protective measures may be required to protect people in those extreme cases where violence may result in injury or loss of life or loss of zoo property.

Property damage resulting from civil disturbance is often extensive and costly, both in terms of money and in diminished operating ability of the Zoo. Damage to utility systems may cause a disruption of service to the zoo for several days or more, forcing a reduction or curtailment of essential operations until utility service are restored. Fear and reluctance on the part of citizens to enter areas perceived to be dangerous could interrupt the normal functioning of the zoo if it is located within such an area.

If the Zoo is susceptible to such disturbances, the Site Emergency Team should develop an alternate set of response procedures including provisions for maintaining essential operations or services.

During civil disturbances, it is very important that arrangements be made to send the zoo visitors and the staff safely to safer areas. As the zoo is visited largely by women and children, evacuating them quickly to safe areas is important as panic may result in further injuries if people attempt to evacuate in a disorganized manner.

The plan below mainly emphasizes evacuation of stranded people from the zoo during civil disturbances.

Plan for Evacuating Zoo visitors and Zoo personnel

Notification and Warning

As and when information about a major civil disturbance affecting the zoo is received from the Police Department, radio and television; personnel will be given instructions about the incidence of civil disturbances.

General Response

The Emergency Coordinator will fully activate the control room to monitor conditions and determine appropriate response actions.

The Emergency Coordinator will assess the situation and determine what actions are needed to protect zoo visitors and zoo personnel. The type of protective actions taken will depend upon several factors, including the size, type, and location of the disturbance, and the level of violence and property destruction involved.

Assistance from **law enforcement personnel** will be requested.

The Emergency Coordinator will brief Unit Coordinators of the situation as soon as possible and inform them of actions to be taken. Unit Coordinators will brief persons within their work areas.

Zoo personnel may be released early as deemed appropriate and the zoo guests will be asked to leave the zoo immediately.

If conditions do not warrant or allow the early release of zoo personnel and zoo guests, all points of entry into the zoo will be secured and access should be limited to those persons transacting legitimate business.

Assistance from law enforcement personnel will be requested as deemed necessary to prevent unauthorized access into the zoo.

Checklist of Different Coordinators

Activate **control room**.

Consider releasing personnel early if conditions warrant and the Zoo guests should be asked to leave the Zoo immediately.

Authorize the use of organization resources by Emergency Team and local response agencies like Police/Fire service personnel.

Emergency Coordinator Checklist

Activate the disaster management plan.

Notify Unit Coordinators of the situation.

If necessary notify Police Department.

Ensure that all points of entry into the zoo are secured.

Ensure that vital facilities, operations, equipment and records are secured.

Augment personnel and resources as necessary.

Ensure that work areas are checked for possible damage as a result of the disturbance.

Unit Coordinator Checklist

Inform zoo personnel of their early release. Check work areas to ensure that everyone has left as per instructions.

Ensure that vital records, equipment, animals etc. are secured.

Assist Police personnel.

As conditions permit, inspect work area for damage from the disturbance. Report any damage to the Emergency Coordinator in the **control room**.

Emergency Assessment Coordinator Checklist

Report to the **control room** and maintain a written record of all events that occur related to the civil disturbance, including actions taken, decisions made and by whom, personnel involved, costs incurred, etc. If possible, a photographic or video record should be arranged.

As necessary, collect and compile damage information.

Verify and report damage information to the local police and to the Information Coordinator for and to the Officer in-Charge of the zoo.

Prepare an after-action report.

Warning / Communications Coordinator Checklist

Report to the **control room** and maintain a primary and alternate communications system between the **control room**, the various work units on-site, and with agencies like Police.

Notify key officials about the crisis.

Log messages received by and despatched from the **control room**.

Information Coordinator Checklist

*Report to the **control room and** coordinate the activities listed below :*

Obtain verified information about any damage incurred as a result of the disturbance to the Zoo.

Prepare and issue news releases and submit to the officer in-charge of the zoo,
Establish a Media Center (if necessary).

If the Zoo is attacked then conduct media tours of the site (if damage was incurred).

Medical Coordinator Checklist

*Report to the **control room and** coordinate the activities listed below :*

Ensure that emergency medical care is provided to injured persons.

Coordinate medical assistance, ambulance calling and pickup etc.,
(if necessary).

Collect and compile disturbance-related health and medical information for the
Assessment Coordinator.

Maintenance Coordinator Checklist

*Report to the **control room and** coordinate the activities listed below :*

Erect barricades and other traffic and access control devices.

Assist with securing entry points as necessary.

Provide auxiliary power and lighting as necessary.

Provide emergency repair services as necessary.

Inspect the site for possible damage (if the Zoo is attacked).

Assist with debris clearance and site cleanup as necessary (if the Zoo is attacked).

Replenish, repair or replace emergency equipment.

Security Coordinator Checklist

*Report to the **control room and** coordinate the activities listed below :*

Secure entry points to the site as necessary.

Prevent unauthorized entry into the Zoo.

Control the movement of people and vehicles.

Assist with the care and handling of injured persons as necessary.

Assist with fire suppression as necessary.

Secure vital facilities, resources, equipment, and operations.

Equipment required for dealing with Civil disturbances :

Items	Essentially Needed	Needed	What the Zoo has with it ?
Rubber boots	✓		
Alarm systems	✓		
Public address system	✓		
Wireless radio communication (walkie-talkie)	✓		
Protective gloves	✓		
Helmet	✓		
Measuring tape	✓		
Shovels	✓		
Pick axe	✓		
Tranquilizing gun with drugs	✓		
Welding machine with sufficient welding rods	✓		
Ropes and nets	✓		
Cages	✓		
Construction and repair materials like Cement, iron rods, sand etc.	✓		
Gas cutters		✓	
Earth moving equipment		✓	
Fire proof dress		✓	
Goggles	✓		

and the list goes on.....



Animal disease emergencies and preparedness of the Zoo..



Proper and scientific management of zoo animals will definitely help us in conserving these beautiful animals. Being zoo administrators, we must do our best to ensure that captive wild animals are maintained in a professional, humane and healthy manner.

Chapter VI Animal disease emergencies and preparedness of the Zoo

The captive animals of the zoos are vulnerable to a number of diseases of viral, bacterial and mycoplasmic origin. Some of these diseases are dreadful and their occurrence amongst the captive populations of the zoo may have disastrous consequences, like :

- Serious losses to the zoo by the way of loss of valuable genetic materials
- Increased concerns of animal diseases transmitting to humans (i.e. zoonotic)
- Cause unnecessary pain and suffering to the captive animals

In order to save the zoo collections from the diseases every zoo should have an emergency preparedness planning.

Benefits of emergency preparedness planning

A well prepared-zoo can recognize the disease while still it is localized and can take steps to eliminate it, before the disease becomes more widespread (amongst the captive populations) and virulent.

Components of Animal disease emergency preparedness planning

The two very important components of the planning are : early warning and early reaction to the disease. (Adopted from "Manual on the preparation of national animal disease emergency preparedness plans" by William A. Geering, Peter L. Roeder & Timothy U. Obi.)

I Early warning

Advance warning becomes imperative to zoo, considering the fact that most of the zoos get their food requirements met from outside sources. These can be very important sources for transmitting diseases from outside areas into the zoo. Early warning includes all initiatives, mainly based on disease surveillance, reporting and analysis that would lead to improved awareness and knowledge of the destruction and behaviour of disease outbreaks (and of infection).

Step-I Disease surveillance

Disease surveillance should be an integral component of the zoo. This is important for early warning of diseases, planning and monitoring of disease control and provision of sound animal health. Disease surveillance can be categorized into passive surveillance and active surveillance.

Passive disease surveillance

Passive disease surveillance is the routine gathering of information on disease incidents from different sources such as reports from the personnel of the zoo (mostly related to deaths of feral animals of the zoo), reports from the press and from the laboratory reports

of the periodic targeted serological investigations and that of urine, and fecal samples of the zoo animals.

Another important element in disease surveillance in zoos is the use of molecular diagnostics to identify and characterize novel agents responsible for disease outbreak. For it the samples obtained from the dead animals must be sent to the labs for detailed investigations.

It is important that passive surveillance systems be strengthened and the disease information be captured and analyzed. However, it should be recognized that complete reliance on passive surveillance usually leads to significant under-reporting of diseases. So it is essential that passive surveillance be supplemented by a strong system of active disease surveillance, particularly for emergency animal diseases.

Periodical inspections of the food sources (slaughter houses, areas where the grasses are grown) must be given top priority .

Active disease surveillance

Active disease surveillance requires purposeful and comprehensive searching for evidence of disease in animal populations or for verification that such populations are free of specific diseases. Active disease surveillance programmes are meant to detect any significant disease occurrences, targeted against specific high-threat diseases or designed to monitor the progress of individual disease control.

The zoo vet as a part of the disease surveillance in Zoos must follow the practice of performing complete necropsies on every animal that dies within the Zoo and should maintain a record of it.

Daily observation by animal care staff of each animal for clinical signs of disease and method of reporting abnormalities helps in early veterinary investigation.

Step-II Risk Analysis

Risk analysis is a tool that can also be used to good advantage for animal disease emergency preparedness planning. Under risk analysis we mostly follow: risk assessment, risk management and risk communication.

Risk Assessment

During risk assessment likelihood of occurrence of particular disease and its potential consequences are identified and evaluated. For example, a disease like avian influenza is a high risk disease and has maximum potential consequences hence receives high score on risk assessment.

Risks can be described as "extreme", "high", "medium" or "low", or by a simple scoring system, for example, 1-4 for the level of risk and 1-4 for the level of potential consequences.

Risk management

This is the process of identifying, documenting and implementing measures to reduce risks and their consequences. Risks can never be completely eliminated. The aim is to adopt procedures to reduce the level of risk to an acceptable level.

Risk communication

This is the process of exchange of information on the potential risk of disease in the zoo animals between the zoo and stakeholders. Stakeholders in this context include all those who could be affected by the consequences of risks, that is, everyone from zoo personnel to public to wildlifers to scientists to policy makers. Exchange of information between the keepers and the veterinary staff is also very important aspect in disease surveillance.

Step-III Risk Profiling (Assessing the seriousness of the Threat)

After having identified and listed the disease threats, the next step is to assess the seriousness of the threat of each disease. For it the questions to be raised include:

Is there a past history of the disease in the zoo?

How is the disease spread? What are the relative roles of live animals, meat, dairy and other animal products, insect vectors, migratory birds and feral animals in transmitting the disease causing agent?

How secure are your quarantine procedures and quarantine areas?

Are there any epidemiological factors that will either inhibit or facilitate the spread of the disease?

Will the disease cause human illness or deaths?

How much we are prepared to handle the situation (availability of medicines, vaccinating the individuals etc).

What is the current distribution and incidence of the disease? and how close is the disease to the Zoo? (in case of exotic diseases like avian flu)

Risk profiling helps us in -

determining the life threatening diseases for which there is a greatest need and urgency.

strengthening the active and passive surveillance needs .
preparing ourselves with imparting training to the personnel &
stockpiling of medicines, disinfectants and vaccines etc.

Step-IV Laboratory Diagnostic Capabilities

Accurate diagnosis of diseases can only be assured in fully equipped laboratories that have a range of standardized diagnostic reagents, experienced staff. Some of the diseases like avian influenza can be diagnosed only in microbiologically high-security laboratories.

For sending the materials for laboratory diagnosis, the handlers at the zoo should know how to procure and preserve the specimen. They further should be trained in the method of packaging and refrigeration and the labeling of packages. The zoos must have enough specimen transport containers with them. They must have basic information on the different reference laboratories like name of the in-charge, address and phone numbers of various laboratories.

II Early reaction

The disease-causing germs enter zoological parks through infected animals (new acquisitions/ migratory birds/ feral animals etc), contaminated vehicles, visitors to the zoo with zoonotic diseases; contaminated food (meat/milk products/fodder) contaminated biological products (vaccines) and by natural factors spread by vectors or by wind currents. Sometimes diseases can spread through the hair, clothes footwear of visitors and of the staff. Another major area of concern in the infected premises may be because of improperly disposed carcasses and other zoo waste. Further the diseases can spread from one part of the zoo to the other part by the feral animals of the zoo. This condition necessitates us to have contingency plans for early reaction

Early reaction means carrying out without delay the disease control activities needed to contain the outbreak and then to eliminate the disease and infection in the shortest possible time and in the most cost-effective way.

It may be too late to plan for the disease control/eradication by the time it has already reached gigantic proportions. In such situations we tend to make many mistakes, waste or misuse resources, and finally lose the lives of animals. The early reaction contingency plans should include the following :

1. Dealing with new acquisitions

All newly acquired animals must be identified with permanent marking method at all times and detailed records kept.

Treatment records of newly acquired animals must be procured, as this will facilitate investigations into the disease and health history of the animal.

The veterinarian should analyze the cause of death of any quarantined or imported animal (after detailed post-mortem and detailed histopathological tests) as soon as possible after the postmortem examination.

During quarantine, access to animals should be limited to essential staff only (veterinary and designated animal care staff).

Waste material from animals in quarantine should be treated in a manner that limits access by all other fauna (including free-ranging animals/birds).

Biological specimens from animals in quarantine should be handled, transported, and stored under conditions that will minimize the potential transmission of pathogens while preserving the integrity of the sample for diagnostic testing.

There may be a need to consider the spatial requirements (distance) between animals in quarantine and those that have been cleared.

2. Denial of access of the disease agent to susceptible host animals

This can be achieved by

Applying good hygiene and sanitary practices

Removing potentially contaminated materials (Feces, bedding, and used hay of the ailing animals) by disinfection, destruction and/or safe disposal.

Vector numbers in the zoo be reduced by treatment and/or elimination of potential breeding sites like bushes, stagnant water etc.

Care must be routinely exercised to ensure all food (living or dead) brought into the zoo (to feed zoo animals) should originate only from the most reliable sources. It requires periodical checking of fodder cultivation areas, and being in touch with local veterinarians in the area, for ensuring that diseases should not enter the Zoo through feed. Similar care also should be taken while procuring meat and poultry from different sources.

3. Avoiding contact between infected and non-infected zoo animal collection

To reduce the risk of transmission of disease among the inmates of the Zoo.

Exotic animals (including the free ranging animals) should not have any direct contact with the animal collection.

An effective pest- management program should be implemented and maintained.

Exhibit and holding facilities should be free from the contamination of adjacent areas by waste materials and/ or drainage.

Isolation premises for small species must be indoors and bird, vermin, and insect-proof. Such premises should also have no wind currents, efficient waste collection and disposal, and dedicated utensils, instruments, and clothing. Isolation areas should meet all requirements for quarantine facilities as outlined in the CZA guidelines.

Large animal isolation premises must be in a section of the property that has as wide a buffer zone as possible from other stock or have solid walls that prevent aerosol transmission. The enclosures must also have footbaths, dedicated utensils, instruments and clothing, and be tended by staff that will not have further contact with any other zoo animals that day.

All movements of susceptible species within and into the zoo should cease.

4. Maintaining hygiene of the zoo through proper waste disposal system

Appropriate and speedy disposal of biological wastes, carcasses, animal products, materials, etc. will help in preventing the diffusion of infection within the zoo. Hence it should be given top priority by zoo managers.

Disposal of waste should be completed as soon as possible after destruction to minimize opportunities for infectious material to disperse. Some of the measures that can be adopted by the zoo managers are listed as below :

(A) Burial

Under Indian conditions, the ideal method for disposing of wastes is through burial, as burial is easier to organize, cheaper, quicker and environmentally cleaner. But, while considering burial as a disposal method, the following things are to be kept in mind, they are :

Access to the burial site should be a very important consideration, the site should be easily approachable for the materials to be buried .

nature of soil/rock formation (issues related to permeability and stability of the soil).

slope of the site.

level of water-table.

proximity to water catchment areas, bores and wells.

presence of underground services, eg water, drainage, sewerage etc.

proximity to built up areas and dwellings.

Surface runoff should be prevented from entering the pit by the construction of diversion banks, if required.

Similar banks should be constructed to prevent any liquids escaping from the burial site.

Subsequent plans for the use of the area, eg the soil from the burial pit area may be unusable in future be consistent.

Fencing the area in order to sanitize the area from the free ranging animals of the zoo consistent.

When closing the pit, care should be taken that surplus soil should be heaped over the pit as overfill. The weight of soil acts to stop carcasses rising out of the pit due to gas entrapment, prevents scavengers digging up carcasses, helps filter out odours and assists in absorbing the fluids of decomposition.

Lime may be added to pits to prevent earthworms bringing contaminated material to the surface after pit closure. Cover the carcasses with soil and add an unbroken layer of slaked lime $[Ca(OH)_2]$ before filling is completed. Lime should not be placed directly on carcasses because it slows, and may prevent, decomposition. In order to hasten the rate of decomposition salt can also be added. (Source: Manual on procedures for disease eradication by stamping out <http://www.fao.org>).

(B) Cremation

The animals that died due to highly contaminable infectious diseases and that of felid family should be cremated as per the guidelines of Central Zoo Authority. Cremation can be done through funeral pyres, and incinerators.

If the cremation is done through the funeral pyres, the following points should be kept in mind :

Consider the ill effects of heat, smoke, odor that emanate from the burnt carcass on nearby habitations, enclosures of the animals, underground utilities like water pipes, sewage lines etc.

The ashes should be buried and the site restored as well as possible.

(C) Incinerators

In the context of zoos, incinerators are a very efficient carcass disposal system. They help us in achieving safe and complete disposal, with little pollution. However, their cost (establishment and operation) and lack of portability means they are unlikely to be readily available or easily accessible in most situations and moreover incinerators are usually only suited to disposal of small amounts of materials. Incinerators are best suited for disposing surgical wastes. However the CZA prescribes incinerators in the zoos.

(D) Composting

Where there is a minor risk of fomite spread, composting of stable manure, feeds, hay, litter and bedding is the best available alternative to burial or burning. The composting is best done by following pit method. The compost that we get from the wastes can be used in the lawns etc

5. Vaccination - a vital component in emergency disease preparedness

Well-planned vaccination programmes supplemented by other disease control measures help in eliminating disease in zoological parks. The issues related to vaccines are :

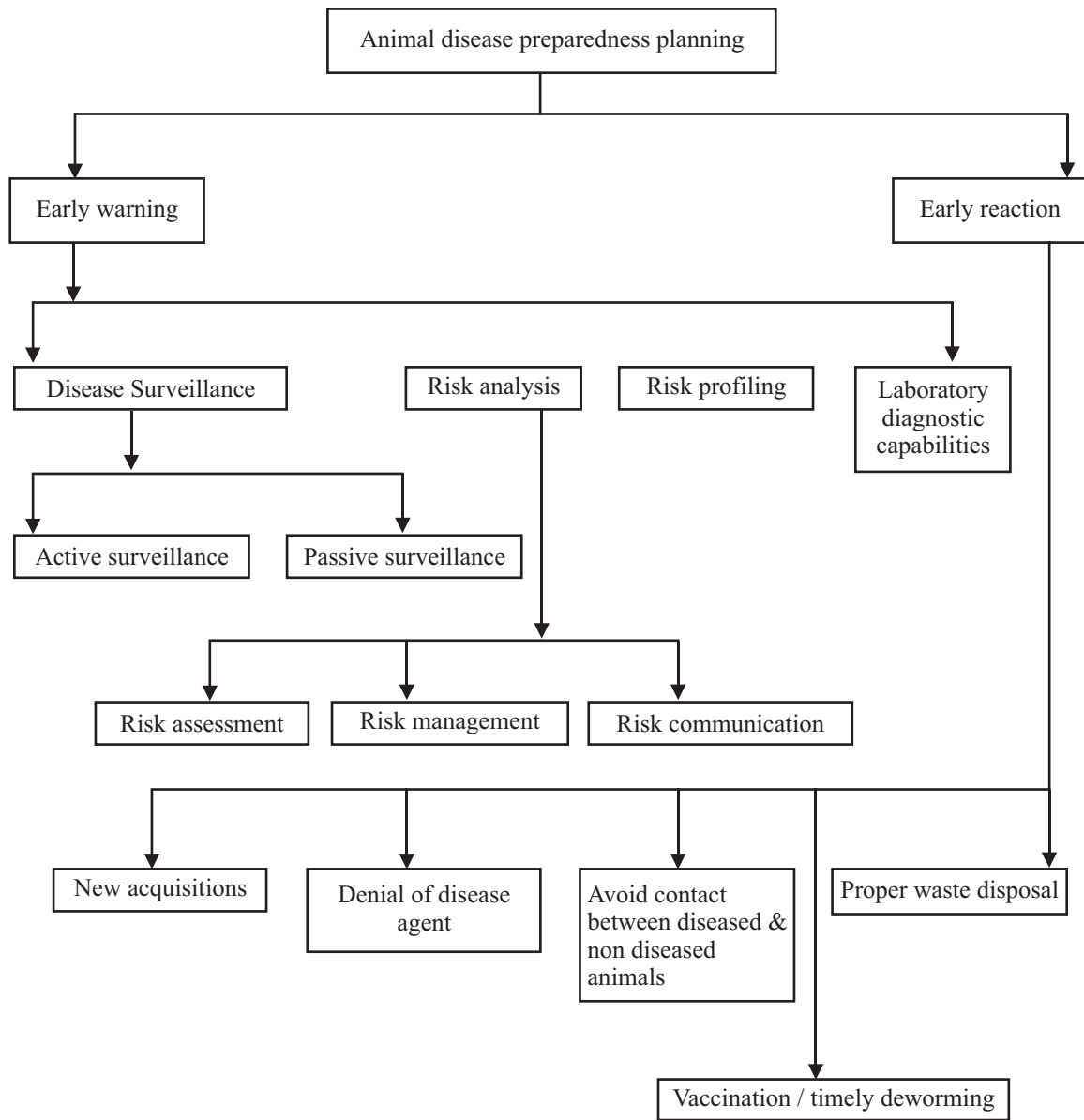
Time- tested vaccines only should be used.

It is important to select the correct antigenic type and subtype vaccine in order to achieve good levels of immunity.

It's been documented that poor quality vaccines have actually caused the diseases that they were meant to prevent. Hence, procure vaccines from reputed firms only.

Vaccines must be stored at the correct temperature by refrigeration at all times and used before expiry dates. Heat-stable, live vaccines, if available, reduce cold storage problems.

Depending upon the necessity the veterinarian can go for ring vaccination and/or blanket vaccination.



Schematic representation of Animal Disease Preparedness Planning

Contingency plans

It is very much needed by the zoos that they should have a well-documented technical contingency plans for specific and high priority animal diseases. Apart from it every zoo should prepare a resource and financial plans too for dealing with emergency situations as it is being practiced in Australia.

Contingency plan for specific diseases

AUSVETPLAN (the Australian contingency plan) provides an example of how to write these contingency plans. AUSVETPLAN can be found at <http://www.brs.gov.au./aphb/aha/ausvet.htm>. The format followed by them is as follows :

NATURE OF THE DISEASE

- 1.1 Aetiology
- 1.2 Susceptible species
- 1.3 World distribution and occurrence in Australia
- 1.4 Diagnostic criteria
 - 1.4.1 Clinical signs and lesions
 - 1.4.2 Pathology
 - Gross lesions
 - Microscopic lesions (histopathology)
 - 1.4.3 Laboratory tests
 - Specimens required
 - Transport of specimens
 - Laboratory diagnosis
 - 1.4.4 Differential diagnosis
- 1.5 Resistance and immunity
 - 1.5.1 Innate and passive immunity
 - 1.5.2 Active immunity
 - Cell-mediated immunity
 - Interferons
 - 1.5.3 Vaccination
 - Inactivated vaccines
 - Attenuated vaccines
 - Recombinant vaccines
- 1.6 Epidemiology
 - 1.6.1 Incubation period

1.6.2 Persistence of virus

- General properties/environment
- Live animals
- Animal products and by-products
- Fomites
- Vectors

1.6.3 Modes of transmission

- Live animals
- Artificial breeding
- Animal products and by-products
- Fomites
- Biological transmission by vectors
- Mechanical transmission by vectors
- Vertical transmission in vectors

1.6.4 Factors influencing transmission

- Environment/climate
- Vector activity
- Windborne spread of vectors

1.7 Manner and risk of introduction

- Introduction by vectors
- Introduction by hosts
- Introduction by vaccines
- Introduction by genetic material

2. PRINCIPLES OF CONTROL AND ERADICATION

2.1 Introduction

2.2 Methods to prevent spread and eliminate pathogens

2.2.1 Quarantine and movement controls

Zoning

2.2.2 Tracing

2.2.3 Surveillance

Livestock surveillance

Vector surveillance

2.2.4 Treatment of infected animals

2.2.5 Destruction of animals

- 2.2.6 Treatment of animal products
- 2.2.7 Disposal
- 2.2.8 Decontamination
- 2.2.9 Vaccination
 - Vaccine stocks
 - Vaccination schedules
 - Identification of vaccinates
- 2.2.10 Wild animal control
 - Tracing and surveillance of feral animals
 - Depopulation of feral animals
- 2.2.11 Vector control
 - Application of insecticide to the environment
 - Ivermectin treatment of livestock
 - Housing
- 2.2.12 Sentinel and restocking measures
- 2.2.13 Public awareness
- 2.3 Feasibility of control in Australia

3. POLICY AND RATIONALE

- 3.1 Overall policy for the disease
- 3.2 Strategy for control and eradication
 - 3.2.1 Stamping out
 - 3.2.2 Quarantine and movement controls
 - Zoning
 - 3.2.3 Treatment of infected animals
 - 3.2.4 Treatment of animal products and by-products
 - 3.2.5 Vaccination
 - 3.2.6 Tracing and surveillance
 - 3.2.7 Vector control
 - 3.2.8 Decontamination
 - 3.2.9 Wild animal control
 - 3.2.10 Media and public relations
- 3.3 Social and economic effects
- 3.4 Criteria for proof of freedom
- 3.5 Funding and compensation
- 3.6 Strategy if the disease becomes established

- APPENDIX 1 Guidelines for classifying declared areas
- APPENDIX 2 Recommended quarantine and movement controls
- APPENDIX 3 OIE International Animal Health Code
- APPENDIX 4 Procedures for surveillance and proof of freedom
- APPENDIX 5 Procedures for vector monitoring and control
- APPENDIX 6 Procedures for vaccination

GLOSSARY

Abbreviations

REFERENCES

Further reading

Training resources

OIE publications

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Providing the staff with job-description cards which describe their roles, duties and responsibilities in disease emergency situations, and training them through simulation exercises is very important part of the contingency plans.

The contingency plans are to be regularly reviewed and updated as warranted by changing circumstances.

II Resource plan

Preparing an inventory (of equipment, personnel and other physical resources) and the zoos' future requirements for dealing with animal disease emergency situations is the impending part of the resource plan. The resource plan should deal with the existing capabilities of the personnel working in the zoo, for example some may be expert in handling or restraining the animals; some may be good at making knots; some may be good at physical work; some may be good at aiming at targets, etc. Similarly, the well-documented resource plan gives zoo administrators an idea about the deficiencies in their system and thus, a chance to rectify them.

A list of some of the resources needed is listed below :

Animal disease control room at Zoo level : comprised of veterinary officers, pathologists, lab technicians, compounders and pharmacists, with communication equipments like phone, fax, and e-mail facility.

Laboratory : Trained staff who can handle laboratory equipment and specimens (serum/urine/fecal matter, etc) and also can pack the specimens for sending them to other labs.

Surveillance : Veterinarian and his support staff, communication equipment, diagnostic kits, blood -collection equipment, and animal- restraint equipment.

Vaccination : Vaccines, storage facility for storing vaccines, vaccination and animal restraint equipment.

Burial and cremation : Done under the supervision of veterinarian in designated places. Protective clothing, animal restraint equipment, disinfectants, soaps and detergents, shovels, etc.

Movement of animals within the Zoo : Done under the supervision of qualified people.

The resource plan and associated inventory lists need to be regularly updated.

III Financial plan

It's a well-known fact that delay in obtaining money is major constraint controlling animal disaster emergencies. It is essential that every zoo should have access to emergency funds. The money so sought should be over and above the normal veterinary operating costs of the zoo.

An approach to a comprehensive pest control program in Zoological Parks

Introduction -

Pests in the form of insects, birds, rodents, and certain other mammals are common in zoos due to the ready availability of shelter, food and water. Despite the prevalence of pests in a zoological Park, the ways in which a zoo chooses to confront the problems are as variable as the types of pests. Ignoring the presence of unwanted pests especially in the enclosures of birds, etc. detracts from the visitor experience, increases operating costs due to physical damage and food waste, and presents a real threat to the health and welfare of the animal (and plant) collection as well as that of the employees and visitors.

Attention to sanitation and proper storage and removal of refuse and solid waste are important first steps while tackling pest control. Using basic principles of pest control, one must appreciate the complexity of implementing these control procedures in zoological parks. A successful control program must combine a thorough knowledge of both the biology of the pests in question and the effects of any proposed control methods on the zoo's animal collection, the employees and visitors, as well as the pests.

Implementing a pest control program in a zoological park poses many unique problems. One must attempt to control pest populations in and around exhibits without harming any of the exhibit specimens. One must consider primary toxicity of the materials

used as well as the secondary effects. Not only can the exhibit specimens be poisoned directly by coming in contact with residual deposits, but they may eat insects or other animals that have ingested chemicals, or experienced external contamination. One must consider cumulative dosages arising from the ingesting of such carcasses.

Identifying the Problem

In most of the zoological parks the imminent pest problems are to some extent a consequence of their settings, such as in a park in a large urban area, and a consequence of heavy visitation and even vegetation. The lakes of many of our zoological parks within their premises create ideal environments for rodents to live and breed. Proximity of many of our zoological parks near water bodies, lakes, and rivers makes them a frequent stopover for several species of waterfowl. As in any urban area, problems from monkeys, cats and dogs abound, and the zoos are no exception. The forest setting of many zoos creates pressure from free-ranging animals like Peacocks, Pea Fowls, Mongoose, Civets and other animals.

Why to Control Pests ?

To reduce the risk of transmission of disease among the inmates of the zoo

Exotic animals (including the free-ranging animals) should not have any direct contact with the animal collection.

An effective pest management program (including rats) must be implemented and maintained.

Exhibit and holding facilities should be free - of contamination by waste materials and/or drainage from adjacent areas.

Goal of the Pest Control plan

The goal of a pest control program in zoological parks is to reduce current populations of pests to acceptable levels and then maintain those levels through a plan which incorporates a weekly, regular routine for checking enclosures, buildings and other areas of the zoo. Each enclosure will be put on a schedule to enable the keepers at each site to prepare for a regular pest control visit. In the instances in which the public might interfere with a certain pest control operation, this application can be scheduled on days when the zoo is closed to the public. Once the schedule has been devised and printed, it should be disseminated to all concerned.

The zoo veterinarian should supervise a formal vermin control programme. Vermin control should be implemented in all areas of the zoo, including storage areas for food items. The programme should control, prevent, and/or eliminate vermin. Whenever possible less toxic or non-toxic agents should be given priority so that maximum protection is provided to the animal collection, non-pest free ranging animals, staff and visitors .

How to Control Pests ?

Control measures for the commonly occurring pests of the Zoo are as follows :

Rodents

Rat control consists primarily of gassing rodent burrows with hydrogen phosphate pellets and baiting perimeters of buildings and enclosures.

Mice are a bit more difficult to control in a zoological setting. Traps can be used for mouse control in areas where baiting is unacceptable, especially in bird houses.

Watering rat holes can be another effective method for controlling Rats and Mice in the Zoo.

Free - Flying Birds

For controlling 'birds of prey' populations at a zoo very little can be done. Elimination of nesting and roosting sites and trapping may help to some extent.

Attention to sanitation and proper storage and removal of refuse and solid waste are important first steps when tackling pest control.

The visitation of birds of prey will notably decrease with proper sanitation of the zoo enclosures. To a great extent, the problem can be addressed by providing food to the zoos animals within their feeding cells.

Controlling Monkeys

Monkeys in Zoological Parks pose a great threat not only to the visitors but also to the animal collection of the zoo. These monkeys may carry life-threatening diseases such as T.B.

Availability of abundant food in the zoological park attracts monkeys. Monkeys in Zoos may get their food from fruiting trees and some times from food given to the animal collections, as well as visitors.

For controlling monkey menace the following actions can be taken :

Don't allow visitors to feed the monkeys.

Take measures for feeding the animals (esp. herbivores) strictly in the feeding cells.

Periodically drive away the monkeys from the Zoo campus by bursting fire crackers or any other tactic that works.

If their populations go beyond management catch them and reallocate them to a site where they can be contained without causing damage either to themselves, other animals or the forest areas.

Controlling Dogs

Even though a boundary wall guards most of the Zoological Parks, at times dogs can enter the Zoo where they can cause havoc and death among the free-ranging animals of the Zoo. If they happen to enter the enclosures of deer family it will result in heavy losses of Zoo animals.

Dogs can enter the Zoo from the breaches in boundary wall, some times from the main gate, if it is not guarded well even for a short time. Unscrupulous elements may release dogs into the Zoo.

For controlling the dog menace within the zoo the following measures can be undertaken

Check the boundary wall periodically (may be twice in a week).

Chowkidars should be asked to report and assist in controlling stray dogs.

Dogs that enter the Zoo should be killed at once.

The main gate should always be guarded by gate man.

Commonly occurring Diseases among Wildlife

Bacterial Diseases

- **Anthrax**- Caused by *Bacillus anthracis* causes infections in chital, gaur, hog deer, sambar, leopard, primates, elephants, rhinos, etc. The blood smear of infested animals shows short chains of rod with truncated ends.
- **Clostridial infections** - caused by
 - i. *Clostridium perfringens* type D-enterotoxaemia in deer, sloth bear
 - ii. *Clostridium chauvoei*-black quarter in black buck,
 - iii. *Clostridium tetani*-tetanus in elephants, rhinos etc.
- A. **Symptoms** : in case of enterotoxaemia infections, affected animals have ballooned up intestinal tract and congestion in other organs whereas black quarter affected animals show symptoms of gangrenous myositis.
- **Leptospirosis** : attacks animals like tigers, deer, elephants, lions, sambars, nilgai, black buck etc. The important symptoms are stillbirth and abortion in the infested animals.
- **Paratuberculosis** : is caused by *Mycobacterium paratuberculosis* in spotted deer, and in swamp deer. The disease spreads from ingestion of food and water contaminated by faeces of infected animals. The main signs of the disease are diarrhea and severe emaciation

- **Pasteurellosis** : caused by *Pasteurella multocida*, *P. haemolytica* in sambars, nilgai, spotted deer, black buck, hippo, lion, tiger, wolf, etc., causing congestion in their internal organs, haemorrhage, consolidation in lungs, etc.
- **Plague** : is caused by *Bacillus pestis* in baboons, rhesus monkeys etc. the diseased animals show symptoms such as fever, dullness, early prostration, etc.
- **Spaphylococcosis** : caused by *Staphylococcus aureus* in tigers, lions, rhinos and zebras, causing arthritis and enteritis in them.
- **Salmonellosis** : This disease occurs in zoos due to the poor management of the animals. It is frequently seen in sambar, black buck, jackal, leopard, chimp, rhino, etc. characterized by symptoms like diarrhea, dysentery, etc.
- **Tuberculosis** : This zoonotic disease is caused by *Mycobacterium tuberculosis* in Rhinos, non-human primates, giraffes, barking deer, hog, Manipur Brow-antlered deer or Sangai, spotted deer, sambar, nilgai, black buck, elephants, lions, tigers, leopards, bears, pythons, crocodiles, etc. It infests lungs, intestine, and viscera of these animals. The main route of infection is through the respiratory tract.
- **Shigellosis** : occurs in lions, tigers, primates, etc. the infected animals show symptoms like pyrexia and dysentery. The disease is characterized by severe congestion in the intestine.

Viral infections

- **Aflatoxicosis** : is caused by contaminated food in bears and deer-. The kidneys become pale in colour and grayish white nodules can be seen on the liver of infected animals
- **African horse sickness** : commonly occurs in horses, zebras, monkeys, etc. the disease spreads through culicoides bites, and from infected domestic equines.
- **Rabies** : occurs in tigers, brown bear, lions, civet cats, jackals, leopards, rhinos, etc. The disease spreads mainly among the zoo animals through stray animals like dogs, etc.
- **Foot and mouth disease** : caused by 'O' Asia-1 strain in Arictodatylns. The source of infection among the animals of zoo can be contaminated grasses brought from infested areas outside the zoo.
- **Reinderpest** : occurs among nilgai, sambar, chital, etc. The natural infection among wild ruminants is mostly air-borne and by ingesting contaminated food. The infested animals show symptoms like loose faeces containing blood. Oral and nasal mucosae-hemorrhages, abomasal mucosa-swollen and congested, caecal and colonic mucosae, mesenteric lymph nodes are some of the commnly occurring other symptoms of the disease.

- **Canine distemper:** caused by RNA paramyxovirus.
- **Infectious hepatitis:** (jaundice)
- **Infectious feline enteritis:** occurs in Felidae with symptoms like pasty to watery diarrhoea and rapid emaciation and dehydration.
- **Mycotic diseases:**
 - A. Intestinal candidiasis — in Sambar, Black Buck.
 - B. Nercotic dermatomycoses — in Gharial
 - C. Dermatomycoses — in Chital, Tiger, Lion, hyena etc.

Some of the helminthic diseases are :

- * Trematodiasis
 - * Fasciolosis
 - * Paragonimosis
 - * Schistosomiasis
 - * Paramphistomiasis
 - * Cestodiasis:
 - * Taeniasis
 - * Dipylidiosis
 - * Echinococcosis
 - * Diphyllbothriosis
 - * Nematodiasis
 - * Ascariasis
 - * Oxyuriasis
 - * Capillariasis

Some of the protozoan diseases are :

- * Trypnasomiasis
- * Plasmodiasis
 - * Toxoplasmosis
 - * Sarcocystosis
 - * Coccidiosis
 - * Babesiosis
 - * Entamoebiasis
 - * Trichomoniasis
 - * Leishmaniasis

Zoo hygiene and Zoo Rules (*Source: Recognition of Zoo Rules, 1992 amended from time to time*)

Hygiene, Feeding and Upkeep:

21. Every Zoo shall ensure timely supply of wholesome and unadulterated food in sufficient quantity to each animal according to the requirement of the individual animals, so that no animal is undernourished.
22. Every Zoo shall provide for a proper waste disposal system for treating both the solid and liquid wastes generated in Zoos.
23. All left-over food items, animal excreta and rubbish shall be removed from each enclosure regularly and disposed of in a manner that maintains the general cleanliness of the Zoo.
24. The Zoo operators shall make available a round - the -clock supply of potable water for drinking purpose in each cell/enclosure/cubicle.
25. Periodic application of disinfectants in each enclosure shall be made according to the directions of the authorized veterinary officer of the Zoo.

Animal Care, Health and Treatment:

26. The animals shall be handled only by the staff having experience and training in handling the individual animals. Every care shall be taken to avoid discomfort, behavioral stress or physical harm to any animal.
27. The condition and health of all animals in the Zoo shall be checked every day by the person in charge of their care. If any animal is found sick, injured, or unduly stressed the matter shall be reported to the veterinary officer for providing treatment expeditiously.
28. Routine examinations including parasite checks shall be carried out regularly and preventive medicines including vaccination should be administered at such intervals as decided by the authorized veterinary officers.
29. The Zoo operators shall arrange for medical check-ups of the staff responsible for upkeep of animals at least once in every six months to ensure that they do not have infections of such diseases that can infect the Zoo animals.
30. Each Zoo shall maintain animal history sheets and treatment cards in respect of each animal of endangered species, identified by the Central Zoo Authority.
35. Each Zoo shall have a graveyard where the carcasses of dead animals can be buried without affecting the hygiene and cleanliness of the Zoo. The large and medium zoos shall have an incinerator for disposal of the carcasses and other refuse material.

Preventing escape of Animals...

The never ending stories of some of the great Escapes from Zoological Parks
(Stories taken from www.care2.com)

Primate Escapes at UK Zoos

Visitors and staff at Chester Zoo on Sunday can consider themselves very lucky following the reported escape of up to 30 chimpanzees from their main enclosure

Mountain Lion Killed After Escape at Kansas Zoo

Officials at a central Kansas Zoo are trying to figure out how a 150-pound mountain lion escaped from its enclosure. The 14-year-old female was shot and killed by police.

Pregnant Cougar Escapes from Handler

A pregnant cougar being taken to a veterinarian for a cesarean section escaped Saturday and ran into a wooded area in south Osceola County, wildlife officials said.

Two Wolves Escape from Oatland Island

Two wolves escaped Thursday night from their enclosure at the Oatland Island Wildlife Center, and one wandered into a nearby residential area.

Zoo-Break for Adorable Gorilla Who Met the Queen as a Baby Nine Years Ago

Yakini the gorilla became a media darling as a baby nine years ago. But he's all grown up now - and apparently has decided it is time to leave the nest. Using a palm frond, Yakini clambered out of his pen at the Melbourne Zoo in Australia

Ore. Officials Down to 1 Monkey on the Loose

Officials say they've got all but 1 of 9 monkeys back in cages at a research facility after a keeper's mistake allowed them to make an escape.

'No Choice' but to Kill Escaped Lion

There was no time to tranquilize a lioness shot dead at Mogo Zoo because of the danger the animal posed to the public

Zoo Lockdown Over, Escaped Monkey Captured

SEATTLE - The Woodland Park Zoo was in lockdown this morning after a male monkey escaped.

Wild Dog Shooting 'Sad but Necessary'

Seven of the escaped dogs had to be shot, while another died after being hit by a train near Bekesbourne

Escaped Tiger Mauls Caretaker to Death at Mexico Zoo

MEXICO CITY -- A tiger escaped from an unlocked cage at a commercial Zoo and fatally mauled its caretaker before it was captured and killed, officials said Tuesday

Orangutans Fail in Freedom Bids From US Zoos

Two orangutans have tried to escape from Zoos in California and Florida but were both recaptured

Escaped Mother Panda Found Alive

One of a pair of red pandas which escaped from a wildlife park in south west Scotland has been found alive more than two months after it went missing.

Animal Rights Group Calls for Federal Investigation on Tiger Escape

Just months after a tiger escapes from the San Francisco Zoo and fatally mauls a teenager, a wild cat gets loose at the Honolulu Zoo

Is there any end for this type of niggling problems? Let us think about some solution.

Chapter VII Escape of Animals from enclosures and ensuring Public Safety

Introduction -

The zoological parks of India house thousands of animals in enclosures and in safaris (herbivore/lion/tiger). There is always a chance that the animals can escape from their enclosures and the safari areas. For this eventuality the Zoo must have a mechanism in place for controlling the escape of animals from the enclosures, otherwise the damage caused by the escaped animals will be immense, in terms of the injuries/fatalities done to the zoo guests/staff of the zoo by the escaped animals and in terms of possible loss of the wild animal. Escape of animals is not new to the zoo community, be it in India or in USA, the problem is imminent. At times most of our zoos experienced the problems related to intrusion of visitors into the animal enclosures also.

Considering the above situation the disaster management plan for the zoo must emphasize what to be done and by whom when an animal escapes from its enclosure and the issues related to public safety.

The DMP (disaster management plan) should include information of designing of enclosures, duties of various personnel, preventing escape of wild animals, providing escape routes for the zoo guests, first aid, managing drive-through and walk-through enclosures ...in other words, to everything in the zoo.

Designing of Enclosures

Barriers must be designed, constructed and maintained to contain animals within enclosures. Enclosures must be free from any vegetation or other items that would aid escape as in case of dangerous animals.

Gates and doors to enclosures must be at least as strong and as effective in containing the animals as the rest of the enclosure barriers. In particular, gates and doors should be designed and maintained so as to prevent animals from lifting them from their hinges or unfastening the securing device.

Gates and doors to animal enclosures where the public are admitted (as in case of Nocturnal Houses), and any enclosure or standoff barrier, must be designed, constructed and maintained so as not to trap or otherwise injure visitors, particularly children or those with disabilities.

Animals which can climb or jump should be kept in enclosures that do not permit them to use this ability to escape.

Where fences are used to enclose animals, the supporting posts must be firmly fixed into the ground. Fence material should be sufficiently secured to supporting posts in such a way that the weight of the animal enclosed could not detach it from the support nor dislodge the supporting posts.

Water-filled and dry moats used for the confinement of animals must provide a means of escape back to the enclosure for animals falling into them.

Trees within or near animal enclosures must be regularly inspected and lopped or felled as necessary to avoid animals being harmed by falling branches, toxicity or trauma.

Trees and climbing plants must be pruned to prevent their aiding animal escapes.

Distance or barriers between animals and between enclosures and visitors must be sufficient to minimize transmission of disease or potential pathogens - considering – safety of the public.

The enclosure in which a digging or burrowing animal is kept must be constructed with a subterranean floor consisting entirely of concrete covered by sufficient soil so that the animal can dig or burrow without escaping, Another method is an enclosed fence of galvanized metal mesh or concrete extending below ground level to a depth of at least one meter and then extended horizontally with the enclosure for at least one meter, so that animal can dig or burrow without escaping from the enclosure.

Tough and unbreakable glass should be used in the exhibits of snakes.

Where moats are used to contain animals whether wet or dry they must be surrounded by fences, walls, hedges or shrubs sufficient to prevent the public from approaching too close to the edge.

Barbed, or razor wire should be beyond the reach of members of the public.

Stand- off barriers must be provided and designed to ensure public safety.

Safety barriers should be designed *to prevent children either from getting through, under or over them.* They should also be designed to discourage visitors from sitting on them.

Walkways should be designed, constructed and maintained to ensure that they are safe.



Figure VI : Fallen trees - a possible escape route

Gates, Doors & Slides

Gates or doors of an enclosure must open inwards to the enclosure.

If an entrance to an enclosure is a safety entrance through successive gates or doors, they must open inwards towards the enclosure.

A gate, door or slide giving entrance to an enclosure must be so designed that an animal in the enclosure cannot lift the gate or door off its hinges or a slide off its tracks or unfasten the security device such as locks.

Duties of Keepers

The following security principles are to be followed in the Zoo :

Appropriate care of locks and keys of animal's houses.

Appropriate cleansing and oiling of animal squeeze cages.

The locks of the enclosures must be submitted to authorized persons as per prescribed practices.

Animal keepers must check the chain links of the enclosures daily and if there is any breach it should be reported immediately to higher authorities through daily report forms.

Other than when under the control of authorized staff, animals kept in the zoo must be maintained at all times in enclosures or, in the case of free-ranging animals, within the perimeter of the zoo.

All animals should be kept in enclosures so constructed as to avoid escape. Gates and doors to enclosures must be securely locked so as to prevent unauthorized opening.

Animals on display or being transported should be protected from other animals and humans, and safety measures for both humans and animals should be paramount.

Duties of the maintenance staff (carpenter/blacksmith etc.)

Squeeze cages must be maintained properly and checked periodically.

The shutters, walls and animal cages of the enclosures must be maintained in good order.

Proper cleansing and oiling of animal squeeze cages.

Double doors of the night cells be maintained in good order.

Enclosures and barriers to enclosures must be maintained in good condition which presents no likelihood of harm to animals in particular.

Any defect in an enclosure barrier or in any appliances or equipment within animal enclosures likely to cause harm must be repaired, or replaced or the animal relocated immediately and recorded on keepers' daily record sheets.

Any defect likely to cause harm to animals must be rectified at once. If this is not possible, the animals should be removed from the possibility of any contact with the source of the danger until rectified.

Any vegetation capable of harming animals or which would make it possible for animals to escape from enclosures must be kept out of reach.

Water-filled and dry moats used for the confinement of animals must provide a means of escape back to the enclosure for animals falling into them.

All plant and fixed equipment, including electrical apparatus, must be installed and maintained in such a way that they do not present a hazard to animals, and their safe operation cannot be disrupted by them.

Adequate provision must be made for servicing, maintenance and uninterrupted operation of life-support systems.

Tools and other portable equipment must not be left unattended in places where they could cause harm to animals, provide a means of escape, or serve as missiles.

Escapes



Figure VII : Fallen trees over an enclosure - a possible escape route

For preventing the escape of animals from enclosures of the zoological park and for providing emergency escape routes to the zoo visitors during emergency situations, the following points should be kept in mind.

The perimeter boundary, including access points, should be designed, constructed and maintained to discourage unauthorized entry and, so far as is reasonably practicable, as an aid to the confinement of all the animals within the zoo.

The zoological parks may consider taking the services of chowkidars for minimizing the risks of theft, malicious damage or release of animals by intruders entering the grounds out of hours; the working of these chowkidars also must be watched carefully.

Zoo must assess whether any danger may arise in the event of an animal escaping from its enclosure, and consider the possible or likely attempted escape route from the zoo if this were to happen.

Every effort must be made, so far as it is reasonably practicable, to effect the recovery, live or dead, of any escaped animals. To achieve this, the use of *traps, cages, nets by experienced zoo personnel is recommended along with that of tranquilizing guns.*

The escapes within or from the zoo (or of accidental or unauthorized releases) of any animal should be brought to the attention of the Director immediately.

An adequate number of clearly visible safety signs, providing warning by means of a symbol, words, or a combination of symbol and words, should be displayed at each enclosure containing any species of dangerous animal, which is likely to cause injury.

Procedures relating to Escapes of Animals

Every Zoo must adopt the following procedures when animals escape from their enclosures :

The reporting of every escape by the quickest possible means to the Director of the Zoo be made available;

Staff should always be in full response mode to an escape in all situations; for example, whether daytime, or whether visitors are present, and whether more than one animal has escaped;

What needs to be done in the event of an escape; *including recapturing the animal, protecting visitors, alerting the police.*

Control of visitors, including reassurance, ushering them into buildings, closing doors and windows, evacuating the Zoo is very important;

The security of the perimeter barrier, involving the closure of all points of access to, and exit from, the Zoo should be made.

The provision of nets/cages/traps etc for capturing the escaped animals and fire-arms and darting equipment to tranquillize or kill escaped animals must be made;

Fire-arms, ammunition and darting equipment, must be made available for immediate use and used by trained people only; *cleaned and maintained as recommended by the manufacturer; kept securely under lock and key when not in use or under maintenance.*

Appropriate staff must be trained in drug handling, risks, side effects, human risks (if misused), and emergency protocols.

The provision of adequate equipment for members of any recapture party, including, where necessary, vehicle protection should be made available.

Director of the Zoo should be readily available at all times to take decisions regarding euthanasia of escaped animals.

The Zoo shall establish a clear chain of responsibility

The Zoo must be responsible for the selection of the appropriate firearm or darting equipment to deal with escaped animals.

Zoo operators must ensure that all members of staff are familiar with emergency procedures when animals escape. *In particular, emergency drills must be carried out at least four times a year, recorded and regularly reviewed.*

All escapes must be recorded and detailed reports made. Risk assessments must be continually reviewed in the light of experience.

Walk - through exhibits

In walk-through exhibits with herbivores, the following points should be followed; this is basically for protecting the animals as well as the Zoo guests (for ensuring public safety):

- Animals should be regularly and thoroughly screened for any zoonotic diseases;
- Public entry should be controlled in groups;
- Number of group visits per day should be limited;
- When more than five people are admitted at one time, staff must ensure that the public are counted in and out;
- Staff to visitor ratios should be adequate;
- The public must be informed as to what is unacceptable behavior;
- Where appropriate, facilities must be provided for secure storage of possessions;
- Feeding of animals by visitors should not be permitted;
- The public should not be eating or carrying food;
- Flash photography should be controlled;
- Persons trained in first aid should be available.

Drive - through enclosures

In drive-through enclosures, entry and exit to the enclosures should be through a system of gates with a cattle grid for containing the escape of animals.

Access points between enclosures should be controlled to prevent animals entering from adjoining enclosures.

A one-way road system should be used to assist traffic flow and thus reduce risk of accidents. Stopping should be permitted only at places where the road is at two vehicles wide.

Speed of vehicles should be controlled and blowing of horns should be banned.

Continuous observation by trained staff should be maintained over the entire area. Staff working in gate control and observation towers and elsewhere within the enclosure should keep in touch by hand sets. A back-up system (like whistles, flags, etc.) should be rehearsed and readied for situations when equipment is inoperative.

First-aid

Providing first aid for the needy people is very important, for which the following points are to be kept in mind :

First-aid equipment must be readily accessible on the Zoo premises.

First aid points must be adequately indicated with a signboard.

An adequate number of staff trained in first-aid must be available during the Zoo's normal operating hours.

Written instructions should be provided for staff regarding provision of health care and procedures to be followed when any venomous animal bites a visitor or staff member.

These instructions include immediate action to be taken and required information on a pre-prepared form for forwarding to the local hospital which would include :

The nature of the bite or sting and the species inflicting it (if the species is known)

The specification, for cross-reference purposes, of the anti-venom which accompanies the patient

The telephone number of the zoo and of an appropriate senior staff member

Details of the veterinarian or any staff involved in handling venomous species.

Some other important points to be kept in mind

Areas where visitors are encouraged to go should have even, non-slip surfaces, or be planted with grass to avoid the risk of visitors falling. Since grass slopes may be slippery, steps, paths or fitting rails can be provided.

Consideration should be given to providing shallow gradients for pushchairs and disabled access.

Trees within areas where visitors are likely to be walking or sitting should be regularly inspected and lopped or felled as appropriate to prevent visitors being harmed by falling branches.

Barbed or razor wire should be beyond the reach of the Zoo guests.

Equipment needed for dealing with Animal Escapes :

Captive animals	Minimal requirement	Highly recommended but not required	What your Zoo has ?
Equipment needed for capture of Animal group			
Large carnivores	Nets, pole syringes, snare, projectile guns and darts, blow dart equipment, crates, squeeze cages etc.		
Small carnivores	Nets, gloves, pole syringes, snare, crates, blow dart equipment, crates, squeeze cage etc.		
Hoofed stock	Projectile guns and darts, blow dart equipment, crates etc.	Custom designed squeeze cages	
Elephants	Elephant hook, projectile guns and darts, chains	Elephant crush	
Small mammals (e.g. Primates).	Nets, gloves, pole syringe, snares, plastic tubs, blow dart equipment, crates, squeeze cage		
Large primates like Chimps, Orangutans etc.	Nets, gloves, pole syringe, projectile guns and darts, blow dart equipment		
Birds	Nets, safety gloves, towels, pole syringe		
Reptiles	Nets, safety gloves, snares, plastic shield, bags, plastic tubes, snake tong, snake hook etc.	Squeeze cages	
Tranquilizing equipment	CO2 pistol or rifle blowpipe, pole syringe, darts etc.		

Drugs -			
(a) Paralyzing drugs (neuromuscular blockers)	Nicotine salicylate Curariform drugs		
(b) Centrally acting compounds	Etorphine HCL (M99) Fentanyl citrate Carfentanyl citrate Ketamine Tiletamine xylazine medetomidine etc.		
(c) Antidotes			
Other Equipments	Oxy-pulsometer, thermometer etc.		
Flashlight/Torch lights and spare batteries			
Helmet			
Measuring tape			
First aid kit			
Welding machine with sufficient welding rods			
Shovels			
Pick axe			
Generator with sufficient fuel			
Cages			
Construction and repair materials like Cement, iron rods, sand etc.			
Gas cutters			
Earth moving equipment			

and the list goes on.....

Annexure

Additional information sought by the Directors of various Zoological Parks during the brainstorming exercise conducted on 27th and 28th January 2008 at Kanpur Zoological Park, Kanpur

1. Terrorist Attacks on Zoological Parks and War

The internal security and external threat (war) problems are taken up together, despite of the fact that the zoo directors put these issues separately. I feel that the procedures mentioned by me under Civil Disturbance (chapter V) and Fire or Explosion Procedures (chapter IV) holds well for the exigencies like Terrorist Attacks and in War situations. As in both these conditions the zoological parks have to face situations like - disruption of supplies to the zoo, fire on account of these exigencies can cause severe damage to the property/ animals/ visitors/ zoo personnel etc, may be that the zoo animals can escape from their enclosures, visitors/ zoo personnel are to be evacuated from the zoo premises, the impaired people are to be treated immediately etc all these situations are dealt in these two chapters.

At times just before the terrorist attack there is a possibility that the Zoo administration might receive telephonic/ written information about the bomb threat, in such case it is prudent that the zoo administration must consult the local police for professional help.

2. Cyclones

The draft plan deals with situations like floods etc in chapter III, the same procedures can be adopted while dealing with the cyclones also, as during cyclones the zoological parks will face problems related to inundation of the enclosures, quality and quantity of water supply, sanitation, waste disposal and maintaining good hygiene, vector control (it becomes more relevant when we consider the deaths of many

carnivores immediately after the Super cyclone in Nandankanan Zoological Park) etc issues, all of these issues were dealt in this chapter. The team and the coordinators will remain the same while dealing with problems related with cyclones.

The zoological park should construct cyclone proof enclosures and care be taken to avoid iron sheets as roofs for temporary/ permanent buildings of the zoo.

3. Breaching of the lake

The draft plan deals with situations like floods etc in the chapter III, the same procedures can be adopted while dealing with the breach of lakes etc.

May be that under mitigatory measures the Nehru Zoological park can undertake structural measures like strengthening of bunds of the lake after consulting experts in the field. Lake Burst can happen when there are no outlets or when the outlets of the lake are choked—as this condition thwart the safe release of excess of water that enters the lake during rainstorm. May be the zoo authorities can consult with the municipal authorities of Hyderabad in tackling this problem.

4. Controlling of rats and mice

Rats spread disease, damage structures, and contaminate food, animal feed, and the environment around them. Because a single pair of rats shed more than one million body hairs each year, and a single rat will produce 25,000 droppings per year, contamination is a serious problem. They live on the principle of commensalisms that is sharing the human life without any positive help to humans except damages they give in return.

There are 1500-2000 different documented rodent species. Out of them 3 are the main types:-

- 1) Norway Rats (*Rattus norvegicus*)
- 2) Roof Rats (*Rattus rattus*) and
- 3) House Mice (*Mus musculus*)

Identification of Rats and Mice

In order to control rats and mice, one must first be able to identify the species.

Norway rats burrow under foundations, floors, stacks of goods and rubbish. The roof rat seldom burrows. If the nest is high, it is usually that of a roof rat. If it is underground, it is almost always a Norway rat. The smaller, neater nests of mice are often found in a variety of places such as under a pile of paper sacks, in loose or baled hay, inside upholstered furniture, and even in cabinet drawers.

Some of the characters of these are as given below :

S. No.	Character	Norway Rat	Roof Rat	House Mouse
1.	Color	Gray with a white underside	Grayish-black with a pale yellow underside	Grayish-brown
2.	Body	Large, robust	Sleek and graceful	
3.	Tail	Shorter than body, dark above, pale below, furless	Longer than body, furless	Furless
4.	Gestation period	21 to 23 days	21 to 23 days	19 to 21 days
5.	Little size	Two to fourteen, average seven to eight.	Five to eight	Five to six
6.	Litter number	Four to six per year with heaviest production of young in the spring and fall	Three or more per year with heaviest production of young in the winter and spring.	Thirteen per year
7.	Weaning	3 to 4 weeks, reach reproductive maturity at 3 months	3 to 4 weeks, reach reproductive maturity at 3 months	3 weeks, reach reproductive maturity at 6 to 10 weeks
8.	Life span	1 to 2 years	1 to 2 years	1 year

The signs of a rat or mouse infestation include droppings, tracks in the moist earth or dusty places, and burrows in the ground, in haystacks and in baled hay. There will be signs of gnawing, greasy smears wherever their bodies have touched walls or rafters, and runways in the grass or through trash. One can smell the presence of rats and mice, especially in a poorly ventilated room.

The degree of infestation (heavy, moderate or low) can be determined by checking for the following signs :

Droppings : Numerous or just a few? Scattered or everywhere? Fresh or old?

Smears : Faintly seen or very heavy and greasy?

Runways : Seldom used or worn smooth by the passage of many rodents?

Feeding signs : A solitary rodent may be quite neat about his feeding. If many feed, they may fight between themselves and scatter food.

When once the behavior of these individuals is known it will be easy for controlling them. Some of the rodent control measures can be using of rodenticides, using of traps (traditional and glue traps), removal of shelter, removal of food and water supply, rat-proofing, using of ultra-sonic rat repellent devices etc. But in the bird enclosures using of rodenticides should be discouraged.

As far as rat proofing is concerned; the methodology changes from one zoo to the other, some times from one enclosure of the zoo to another. But in all cases maintaining hygiene in the enclosures is paramount, providing food to the birds in bird feeders can be a solution to a greater extent. Cleaning of roofs of the enclosures esp. bird enclosures will help in getting rid of roof rats. Repairing of cracks or small holes in the foundations, repairing of broken windows and doors and sealing of any holes will help us in the control of rodents.

5. Ring vaccination of animals around the Zoological Parks -

A good suggestion in deed, CZA should think in formulating rules in the lines of Section 33-A of Wildlife Protection Act, 1972 which makes it mandatory for the Chief Wildlife Warden for taking such measures that the live-stock in the periphery of Sanctuaries and National parks are vaccinated against various communicable diseases. Government of India in deed requested the state governments for the establishment of immunization centers for the domesticated livestock in the vicinity of Sanctuaries and National Parks. *CZA in the overall interest of the health of the zoo inmates may sponsor immunization programme for the cattle kept in or with in 5 kilometers of the zoo premises and in its fodder supply areas.*

6. Precautions to be taken while procuring meat -

This is an innate and basic precautionary measure taken up by the zoo veterinarian, hence no need to put in Disaster Management Plan. However, I strongly believe that the staff engaged in the meat procurement and processing should have a basic knowledge about various diseases and their symptoms and be trained in the issues like high level of readiness in containment, cleaning and disinfection procedures.

Poor personal hygiene and practices are likely to lead to transmission of Zoonotic diseases; hence the staff engaged in this work should be free from any Zoonotic disease for it their health should be screened periodically.

7. Precautions to be taken for controlling disease spread by the Visitors -

A note on it is mentioned in the Animal disease emergencies and preparedness of the Zoo (Chapter V).

8. Dedicated slaughter houses in the Zoos -

A good suggestion but the decision can be taken by the zoo authorities/ state government concerned and nothing to do with the disaster management plan.

9. Providing dedicated areas for the cultivation of fodder grasses -

A good suggestion but the decision can be taken by the zoo authorities / state government concerned and nothing to do with the disaster management plan.

10. Capturing of strayed dogs instead of killing them in the Zoological Parks -

Administrative decision to be taken up by the zoo authorities, nothing to do with the disaster management plan.

11. Controlling of Pigs and Jackals in Pest Control -

I sincerely doubt about the entry of pigs and jackals in to the well guarded zoological parks. If at all pigs enter the zoos they should be taken care off, as these potent transmitters of various diseases can be a serious threat to the inmates of the zoo. The entry and escape routes of the zoo are to be plugged so that Pigs and Jackals can't enter the zoo premises.

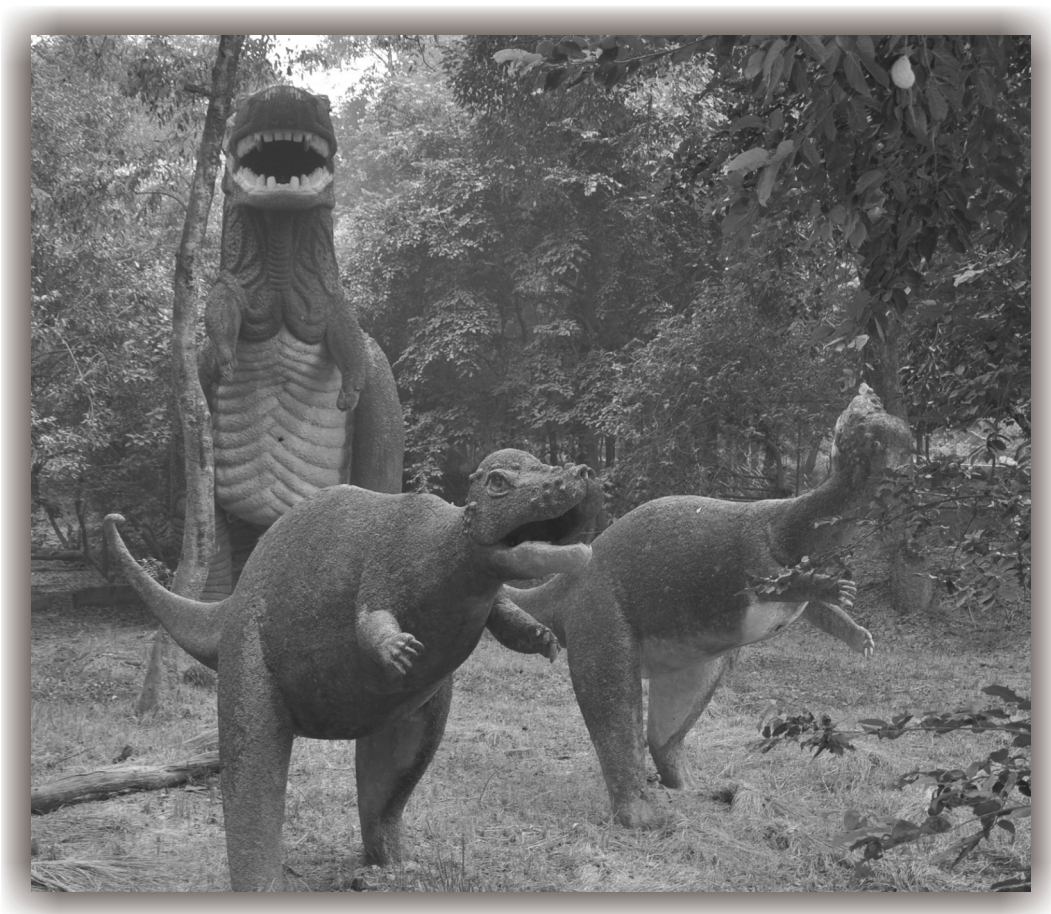
12. Case Studies -

The zoo is a dynamic and a learning organization, where day in and day out we collect lots of information about various things, which includes information about various exigencies like fire, storms, animal escapes etc. Various zoological parks faced disaster like situations in the recent past; like floods—as experienced by Mysore zoo, cyclones/ super cyclones—as experienced by Nandan Kannan zoo, outburst of deadly communicable diseases—as experienced by Trivendram Zoo in its herbivore populations and by Nandankanan zoo amongst its carnivore populations immediately after super cyclone hit it. The zoo authorities acted swiftly in tackling these situations, but unfortunately we don't have a system of sharing, retaining, archiving and transfer of this generated (acquired) knowledge.

Hence there are many known undocumented cases.

We, the zoo community never tried to convert this acquired institutional knowledge into wisdom. There is no inbuilt mechanism for knowledge management within our zoological parks. We are ignoring the fact that development, management, and transfer of knowledge are critical for organizational success.

May be because of it I couldn't find any case studies prepared by the Indian zoo manager, whose zoological park was affected by any exigency. I sincerely hope that a small endeavor from me may help in motivating the zoo managers in penning down their experiences while dealing with exigencies for future reference so that there will be **no need for reinventing the wheel.**



Dinosaurs

FURTHER READING

1. Brochures published by National Disaster Management Division, Government of India.
2. Brochures published by State Disaster Management Divisions.
3. Disaster Management - Recent Approaches by Arvind Kumar, Anmol Publications.
4. Disaster Management: Through the New Millennium by Ayaz Ahmad, Anmol Publications.
5. Disaster Management by B. Narayan, A.P.H. Publishing Corporation.
6. Modern Encyclopedia of Disaster and Hazard Management by B. C. Bose, Rajat Publications.
7. Disaster Management by Nikuj Kumar, Alfa Publications.
8. Disaster Management by G. K. Ghosh, A.P.H. Publishing Corporation.
9. Disaster Management by R. B. Singh, Rawat Publications.
10. Disaster Management : Text and Case Studies D.B.N. Murthy, Deep and Deep Publications.
11. Disaster Management Handbook Edited by Jack Pinkowski, Published by : CRC Press.
12. Encyclopedia of Disaster Management by Goel, S. L. Deep & Deep Publications Pvt. Ltd.



Grey Pelicans



Leopards



Himalayan Black Bear