

Systemic Analysis of Zoological Parks: A Comprehensive Study of Components, Functions, and Relationships

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Abstract—This paper presents a comprehensive systemic analysis of zoological parks, examining their fundamental components, functions, and the complex relationships between different elements. We explore the critical role of zoos in animal conservation, public education, and scientific research while analyzing the various sectors that contribute to their operation. The study emphasizes the importance of understanding zoos as intricate systems where multiple components interact to achieve objectives of animal welfare, conservation, and public engagement.

Index Terms—zoological parks, animal conservation, systemic analysis, wildlife management, public education

I. INTRODUCTION

Zoological parks, commonly known as zoos, are artificially created spaces designed to maintain and exhibit exotic or non-domestic animals that are uncommon in urban habitats. Beyond their role as exhibition spaces, modern zoos serve as critical centers for animal preservation and reproduction, where experts and scientists work to recreate natural environments and ensure optimal living conditions for various species. This is particularly crucial for endangered animals that require human intervention to increase their populations.

II. IMPORTANCE AND CURRENT CONTEXT

In today's world, zoological parks are more important than ever:

- Of the eight million animal and plant species globally, one million are endangered
- This represents the largest extinction event since the disappearance of dinosaurs
- Human activities are the primary cause of this crisis
- The quality and focus of zoological parks vary significantly

Each day, approximately 150 species become extinct irreversibly. Amphibians are particularly affected worldwide, with a 40% loss in species diversity. Cartilaginous fish, such as sharks and rays, face a 30% mortality rate in their species diversity, and nearly one-third of all lemur species are on the brink of extinction.

III. COMPONENTS OF A ZOOLOGICAL PARK

A. Core Components

- **Animals:** Living organisms that are the primary focus, each with specific needs for feeding, space, and care
- **Visitors:** Provide necessary revenue to maintain the system
- **Infrastructure:** Physical spaces including enclosures, exhibition areas, pathways, offices, and facilities

B. Operational Sectors

- **Administrative Sector:** Manages resources, planning, and coordination
- **Maintenance and Care Sector:** Responsible for cleanliness, facility maintenance, and animal care
- **Legal Sector:** Handles contracts, labor regulations, licenses, and environmental compliance
- **Publicity and Public Relations:** Manages the zoo's public image and communication
- **Logistics Sector:** Organizes supply distribution, inventory management, and animal transport
- **Security:** Ensures the protection of both visitors and animals

IV. SYSTEM INPUTS, PROCESSES, AND OUTPUTS

A. Inputs

1) Economic Resources:

- Ticket sales revenue
- Donations and sponsorships

2) Supplies:

- Animal food
- Veterinary medicines and supplies
- Water and cleaning materials

3) *Animal Resources:* New species brought to enrich the collection and participate in conservation programs

B. Processes

1) Animal Care and Maintenance:

- Planning and provision of specific diets
- Regular health monitoring and veterinary care
- Environmental enrichment for animal welfare

2) Financial and Logistical Management:

- Income and expense control
- Budget planning
- Coordination with suppliers

3) Animal Monitoring and Treatment:

- Health records and disease treatment
- Participation in conservation and breeding programs

C. Outputs

- **Educational Experience:** Knowledge and awareness about wildlife for visitors
- **Species Conservation:** Contribution to maintaining endangered species through breeding and rehabilitation programs

V. SYSTEM PROPERTIES

A. Entropy

Without regular maintenance and management, zoological parks naturally tend toward disorder, affecting:

- Physical infrastructure deterioration
- Decline in animal care quality
- Resource depletion

B. Homeostasis

The system maintains balance through:

- Temperature regulation in animal habitats
- Proper nutrition management
- Visitor flow control

C. Sensitivity

The system's ability to respond to changes in its environment, including:

- Adjustments to visitor volume fluctuations
- Response to health crises among animals
- Proactive problem detection and resolution

D. Resilience

The zoo's ability to recover from adverse events such as:

- Natural disasters
- Financial challenges
- Operational disruptions

VI. SYSTEM EFFECTS

A. Legal Snowball Effect

Changes in public perception can trigger a cascade of effects:

- Criticism of animal welfare leads to negative public opinion
- Media attention and animal rights organization involvement
- Political pressure resulting in stricter regulations
- Operational adjustments increasing costs
- Potential decrease in visitors and funding

B. Conservation Snowball Effect

Success in breeding endangered species can lead to:

- Increased public interest and funding
- Enhanced reputation in conservation efforts
- New partnerships and collaboration opportunities
- Expanded conservation programs

C. Environmental Impact Snowball Effect

Inadequate waste management can result in:

- Contamination affecting public health and local fauna
- Regulatory attention and community pressure
- Increased operational costs for sustainability measures
- Potential damage to reputation and support

VII. CONCLUSION

Zoological parks represent complex systems where multiple components must work in harmony to achieve conservation, education, and animal welfare goals. Understanding the relationships, properties, and potential cascade effects within these systems is crucial for their effective management and the fulfillment of their vital role in species preservation and public education.

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