



South Asian Zoo Association for Regional Cooperation Newsletter, Vol III, Number 1 February 2009

To: All SAZARC participants, 9th SAZARC Conference
From: SAZARC Secretariat. Sally, Sanjay and the ZOO Crew

Dear Participants:

Welcome to the Ninth Annual Conference of the South Asian Zoo Association for Regional Cooperation, SAZARC. Thanks to all of you for taking time from your busy life and work to attend and contribute to our meeting.

Our first pleasant duty is to thank our SAZARC President, H.M.B.C. Herath, our kind hosts the The Director of the National Zoological Gardens, Mr. Duminda Jayarathne and his gracious staff persons for all their hard work in arranging this conference. We are most grateful for the interest of Hon. Hon. Gamini Lokuge, Minister for Sports and Recreation, who has insisted on an marvellous array of gala evenings and outings for us.

We have, for our training this year, resource persons from USA and UK. Dr. Kris Vehrs, Executive Director of the American Zoo Association, has been especially chosen for her expertise both as a lawyer and as a zoo association lobbyist. She will teach us some of the fine points of legal language among other subtle aspects of zoo regulation. Dr. Miranda Stevenson, Director, British and Irish Association of Zoos and Aquaria will be sharing her experience on various legislative and welfare committees as well as a Curator and Director of Zoo. Mike Jordan, who is a familiar face in CBSG/RSG as well as SAZARC, will assist with inspection training and enlighten us about various global and regional conservation issues. We have resource persons from the SAZARC office also, Sanjay Molure, B.A. Daniel and R. Marimuthu.

We do not have a stonecast Agenda but we do have very specific objectives, and will run the meeting so that we have time to learn and share as much as possible to improve our zoos and their activities. Every morning we will announce our plans for the day.

Some of our countries have made some remarkable progress on generating zoo legislation or similar regulation. This is now the most important task of SAZARC and will prove to be a boon for your country in future and for the animals in your care.

Generally, our schedule will be in the mornings we have training in zoo legislation and working groups here at the hotel. We will go to the zoo for lunch and practicals of zoo inspection. In the zoo inspection sessions our intent was not to make you inspectors only of other zoos but to fine tune your skills in seeing the dust under your own desk and dangers in your own zoo enclosures. After this we will have a variety of presentations and discussions in the zoo auditorium, followed by an outing and dinner.

We will not have time for individual presentations from participants. We would like each country to make a short presentation about your progress and problems with zoo legislation. We want only one per country so select some one person for this contribution.

Our hosts have a wonderful serious of outings and dinners for us and a lovely tour after our conference. I hope each of you enjoy yourselves and get to know each and every person here.

Next year is our 10th year of SAZARC and as our first meeting was in Nepal at Central Zoo, I have accepted on your behalf the invitation of the National Trust for Nature Conservation, Nepal, administrators of Central Zoo where SAZARC began to host the 10th anniversary meeting next year. You may want to say "thank you" to Ms. Sarita Jnawali, Director of Central Zoo for her help in this happy news.

Have a wonderful time.

Sally R. Walker

2009 SAZARC Invitees

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Ms.Chamila Dhanawardane, Assistant Director
Ms.Ramani Jayalath, Senior Veterinary Surgeon
Ms.A.S.Ponnusami, Veterinary Surgeon
Ms.Ganga Wijesinghe, Veterinary Surgeon
Ms. Samantha Mendis, Veterinary Surgeon
Mr.Jagath Jayasekare, Veterinary Surgeon
Mr.Rajapaksha, Senior Veterinary Surgeon
Mr.Chaminda Dissanayake, Veterinary Surgeon

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Mr.Nihal Senerath, Education Officer
Ms. M.M.U.P.Herath, Education & Research Assistant
Ms.K.K.S.K.Kodithuwakku, Education & Research Assistant
Ms.R.D.J.Priyangani, Education & Research Assistant
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Ms.D.P.M.Devapura, Education & Research Assistant
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Mr.Nadun Kushan, Assistant Curator
Mr.Ashoka, Kumara, Assistant Curator
Mr. R.A.U.Padmalal, Assistant Curator
Mr.K.C.Kithsiri, Curator
Mr.S.S.M.S.Seelarathne, Curator
Mr.R.M.S.Rathnayake, Assistant Curator
Mr.S.A.Lasantha Dileep Kumara, Assistant Curator

Other Participants

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Ms.Shashe Prabha Pathirag, Asst Secretary -Ministry of Sports & Public Recreation
Mr.Jagath Gunawardena, Advisor- Ministry of Environment & Natural Res.
Mr.Sanath Gunasekara, Chief Preventive Officer- Sri Lankan Customs
Mr. Semasinghe, Deputy Director- Dept. of Wildlife Conservation
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One person from environmental Authority
3 personnel from young Zoologist Association

Resource persons

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About Resource persons and their Institutions

Dr. Kris Vehrs

Introducing Kris Vehrs, Executive Director of the Association of Zoos and Aquariums

We introduce Dr. Kris Vehrs first because it is the first time we have had the honor of having her as a visitor or a Resource Person. In fact, although Kris has been all over the world attending zoo and other conservation meetings, it is her first visit to South Asia.

Kris Vehrs is a lawyer by profession but she has not practised as the kind you see on T.V. Kris first got involved with zoos as a lobbyist with (then called) the AAZPA, the American Association of Zoological Parks and Aquaria, where she served the association and wildlife by her excellent arm-twisting capability in getting legal and policy matters taken care of for conservation.

I first knew of her through her excellent column in the monthly magazine of AAZK, the Animal Keeper's Forum. Kris has held a number of positions in her swift climb up the professional ladder of the (now called) The Association of Zoos. In between AAZPA and The Association of Zoo I think the American national association was called American Association of Zoos.

Kris, in her current position in AZA, attends many of the international meetings including CBSG and WAZA. I first met her on the WAZA Drafting Committee which used to meet every year and draft policy documents for WAZA from 9-6 pm.

She is a very busy woman and we appreciate taking a week out of her life, very much. Her task here is to share what AZA does in the areas of ethics, accreditation and legal matters. She will give us pointers on how to fine tune zoo legislation and where the legal potholes might be. You should know also about her Association, hence this profile taken straight from their website.

AZA, The Association of Zoos and Aquariums

Founded in 1924, the Association of Zoos and Aquariums (AZA) is a nonprofit organization dedicated to the advancement of accredited zoos and aquariums in the areas of animal care, wildlife conservation, education and science. AZA is America's leading accrediting organization for zoos and aquariums and accredits only those institutions that have achieved rigorous standards for animal care, education, wildlife conservation and science. With its more than 200 accredited members, AZA is building America's largest wildlife conservation movement.

AZA Mission Statement

AZA zoos and aquariums are places where people connect with animals. We are therefore dedicated to excellence in animal care and welfare, conservation, education, and research that collectively inspire

respect for animals and nature. Our professional association's mission is to:

- Provide its members the best possible services.
- Establish and maintain excellent professional standards in all AZA institutions through the accreditation program.
- Establish and promote high standards of animal care and welfare.
- Promote and facilitate collaborative conservation programs.
- Advocate effective governmental policies for our members.
- Strengthen and promoting conservation education programs for our public and professional development for our members.
- Raising awareness of the collective impact of our members and their programs.

Global Conservation Leadership

Over the last five years, AZA-accredited institutions supported 3,693 conservation projects with \$89,000,000 in more than 100 countries. In addition, zoo and aquarium scientists contribute to hundreds of conservation, biology and veterinary science publications.

Saving Endangered Species

AZA-accredited zoos and aquariums are leaders in the protection of endangered species. Twenty years ago, AZA established the Species Survival Plan (SSP) program, a long-term plan involving genetically diverse breeding, habitat preservation, public education, field conservation and supportive research to ensure survival for many threatened and endangered species. Currently, AZA members are involved in 110 SSP programs that include more than 160 species.

Experts In Animal Care

Accredited zoos and aquariums are providing excellent care for more than 700,000 animals. As part of AZA's mandatory accreditation process, AZA members have met rigorous, professional standards for animal care, welfare and management, veterinary care, wildlife conservation, research, education, safety, staffing, etc.

More Visitors Than Professional Sports

With 216 accredited members, AZA is building North America's largest wildlife conservation movement by engaging more than 175 million visitors every year, reaching more people than the annual attendance of all NFL, NHL, MLB and NBA games combined.

Conservation Volunteerism

Annually, more than 58,000 volunteers invest over 3,000,000 hours of their time supporting virtually every aspect of zoo and aquarium operations. As centers for conservation volunteerism, AZA-accredited zoos and aquariums offer the public a great way to discover connections to their environment and to learn how they can make a difference in conservation.

Science Education

In the last 10 years, AZA-accredited zoos and aquariums formally trained more than 400,000 teachers, supporting science curricula with effective

Dr. Miranda Stevenson

Miranda Stevenson, BA, MBA, PhD, is familiar to nearly all of us in SAZARC as this is her third visit as a Resource Person to South Asia and SAZARC. She first came as our trainer in 2002 to the conference in Bangladesh and then in 2004 to Pakistan. Miranda has been a zoo professional for her whole career. She earned her Ph.D. in primate studies and also got an advanced degree in Business Management. She is from Scotland but has lived a number of years in England.

Miranda currently is Director of BIAZA, the British and Irish Association of Zoos and Aquariums, the professional body representing zoos in Great Britain and Ireland. Previously she has worked as a self-employed consultant in issues relating to zoos, conservation and animal welfare. Posts include: Manager of Conservation Programmes in the Zoological Society of London which involved managing the Field Programmes of ZSL; Director of Marwell Zoological Park, Curator of Animals and latterly also Deputy Director of Edinburgh Zoo, Royal Zoological Society of Scotland.

She was a member of the Zoos Forum, the body that advises government on zoos for 10 years is active in both the European and Global zoo community. Has been connected with the zoo world for some thirty years in various capacities, and is currently involved in raising the profile of zoos and aquariums and actively promoting their education and conservation work to decision makers.

Dr. Stevenson is an excellent trainer and her task here is to provide training in a variety of topics including

For SAZARC and CBSG

- o CBSG work on welfare audits in zoos
- o BIAZA elephant audit and guidelines
- o Zoo legislation : how to ensure that it is effective
- o Zoo standards [this could be two talks welfare in one and conservation education etc in a second]
- o Inspection process: going through an inspection
- o WAZA tool and inspector training
- Mentoring i.e. one zoo helping another
- o Conservation – what is it and measuring input, Including conservation education

A bit about the British and Irish Association of Zoos and Aquariums follows.

BIAZA is the British and Irish Association of Zoos and Aquariums. We are the professional body representing the best zoos and aquariums in Britain and Ireland. Our Member Collections pride themselves on their excellent animal welfare, education and conservation work. BIAZA supports them in their work and helps promote the work of good zoos and aquariums.

The British and Irish Association of Zoos and Aquariums (BIAZA) (formerly the Federation of Zoological Gardens of Great Britain and Ireland) is a conservation, education and scientific wildlife charity (Registered Charity Number: 248553) founded in 1966

out of a mutual desire within the zoo and aquarium community to see sound principles and practices of animal management widely adopted in the British Isles and Ireland. Today BIAZA is the professional organisation representing the zoo and aquarium community.

The Vision of the organisation:

To be a powerful force in the care and conservation of the natural world

Is reflected in its Mission:

BIAZA is a professional organisation which represents its members and promotes the values of good zoos and aquariums. It leads and supports its members:

To inspire people to help conserve the natural world.
To participate in effective co-operative conservation programmes.

To deliver the highest quality environmental education, training and research.

To achieve the highest standards of animal care and welfare in zoos, aquariums and in the wild.

BIAZA believes that:

The natural world is intrinsically precious and the biodiversity of animals, plants, habitats and people must be sustained and protected.

Zoos and aquariums are uniquely placed to inspire and educate people to understand the interdependence of all living things, and to make changes in people's behaviour which will have a positive impact on wildlife.

Through integrated science, education and conservation programmes, zoos and aquariums can be a powerful force for wildlife conservation.

The global network of zoos and aquariums enables effective partnerships with each other, as well as with governments, other conservation agencies and local communities at home and overseas.

We can ensure that our members deliver the highest standards of animal welfare, as well as excellence in environmental education, scientific research and visitor experience.

BIAZA members have to do more than follow legislation as laid down in the Zoo Licensing Act (Amendment, England and Wales) Regulations 2002. In addition to following the Secretary of States Standards of Modern Zoo Practice (which are amongst the highest in the world) Member collections must undertake work in the field of animal welfare, conservation, education and research under the terms of the Constitution and Codes of Practice of the organisation.

BIAZA are members of WAZA. World Association of Zoos and Aquariums and EAZA, European Association of Zoos and Aquaria.

Saving trees with CD's

Contents of SAZARC Briefing and Souvenir CD

A couple of years ago, Miranda Stevenson and I approached the Director of WAZA and the Chair of CBSG and suggested that the heavy briefing books and massive paper we got at meetings was against the principles of green living that we wanted to espouse. We didn't get a great reception for this idea but, by God, the next meetings, there was no paper. The briefing material was on the websites and had also been sent to us by email. Good start! Just so you have something in hand, we have created the SAZARC Meeting Newsletter.

In our SAZARC meetings we also used to give out big, heavy briefing books which we sometimes saw in airport trash bins as the choice between a briefing book and purchased souvenirs was a "no brainer." Now we are providing CD's with the information we want you to carry home. We have deliberately not used only the website or email because we know that many of you do not have easy access.

We will be giving the CDs on the last day after recording presentation and photos from CBSG /RSG and SAZARC on them. Also on the CD are other materials of interest to you in running your zoo. Enjoy !

Zoo Legislation Briefing materials from Miranda

Introduction

1. The ethical review process

Appendix 1 : Ethics, species conservation and animal welfare

Appendix 2 : Examples from the population management policy of the animal department at Edinburgh zoo

Appendix 3 : Organizations/sources that may be able to provide further information

2. Conservation, education and research

Appendix 1: Convention on Biodiversity

Appendix 2: Managed breeding programmes

Appendix 3: The World Zoo Conservation Strategy

Appendix 4: Zoos and Conservation Projects

Appendix 5: Education Theory

3. Sustainability initiatives in UK Zoos

Appendix 1: Principles of sustainable development

4. Animal welfare and its assessment in zoos

Appendix 1 Zoos Forum Working Group on Animal Welfare and its Assessment in Zoos

5. Diving in Zoos and Aquariums

6. Veterinary Services

Zoos Forum checklist guidance on the Zoo Licensing Act's requirement for zoos to promote public awareness and education in relation to conservation of biodiversity.

Secretary of State's Standards of Modern Zoo Practice Introduction Last updated: September 2004 1 Section 1 - Introduction

Building a Future for Wildlife: The World Zoo and Aquarium Conservation Strategy Executive Summary
Annex to Zoos Forum Handbook Chapter 2 (Conservation, Education and Research).



IUCN Guidelines for Reintroduction

IUCN position Statement

Highlights of last meeting

Making a difference for Animals and People – New York State Bar Association Committee on Animals and the law

Zoo and Related Legislation – South Asia Presentation on Working Group Roles

Animal Stock list received till now

Zoos Print Magazine 2008 to till now

CBSG RSG Newsletter 2009

Zoo Education Manuals

Elephant

Bear

Tiger

Hoolock

Zoo Ed Book

Master planning zoo education Nepal

Zoo education master plan for SEAzoos

Bear Signage Project

SA Primate Graphics

Zoo Educational Packet Guidelines

Zoo Network forms

Selected articles from Journal of Landscape architecture, Summer 2008 -- Zoological Parks

Photos and Presentations

ZOO SAZARC news

SAZARC 2009. SAZARC's 9th Annual SAZARC Conference happens mid-February at a Sri Lankan beach-front hotel, near our host, National Zoological Gardens of Sri Lanka. Traditionally, CBSG, South Asia and RSG, South Asia meet beforehand, providing means for zoo and wildlife personnel to get a taste of these thematic specialist groups while discussing local and regional conservation issues. It makes a stimulating prelude to SAZARC.

The conference theme is Zoo Legislation II: fine tuning language of zoo legislation and zoo inspection techniques. Three countries are poised to enact or improve their zoo legislation shortly, inspiring this timely programme. Training takes 60% of conference time, and presentations, discussions of local, regional and global interest, including those brought up in CBSG WAZA recently. Afterwards a two days tour of Southern Sri Lankan Coast will cement regional relationships.

AArk-Countdown 2010: At the Conference SAZARC will introduce a programme to succeed YOTF with educational materials to complement it. SAZARC will board the Amphibian Ark again this year with activities themed around the Countdown 2010 programme (CBD) with a goal of reducing some measure amphibian biodiversity loss, and enhancement of amphibian crisis awareness end 2010. New educational materials will be provided to each country, thanks to a generous grant from Sea World/Busch Gardens.

Request from Central Zoo Authority, INDIA: Central Zoo Authority has requested SAZARC to provide membership for the 63 Large, Medium and Small zoos in India. SAZARC membership is quite different from any other association in that we do not have a membership fee or membership qualifications; we consider all zoos in the region to be members, whether they want to be or not! Our priority is to get a few individuals representing major zoos in South Asia to our conferences, where training in some very important aspect of zoo management is the highlight. We hope by hosting and training their managers in such topics, governments will respect the global zoo community and the seriousness of the zoo profession. As India was first in South Asia to pass and implement zoo legislation, they are an excellent model.

Nonetheless we have invited all the 63 zoos who wish membership in both SAZARC and in CBSG, South Asia to write to us for a formal. CZA also wants Indian zoos to become members of WAZA and we have provided information from WAZA website by post and also included WAZA membership procedure in January issue of ZOOS' PRINT.

Partner projects: ZOO partners and hosts other wildlife and organizations and networks with which we try and associate the zoos of South Asian

countries when possible. This coming year is full of exciting prospects with ZOO organising: IUCN SSC Fresh Water Biodiversity Assessment workshops for Western Ghats and the Himalaya; Twelve Human Elephant Coexistence Educator training in four countries; two Chiroptera field techniques training and ecolocation and taxonomic identification workshops (Bhutan and India); a new Hoolock Gibbon initiative (N.E. India); a Sloth Bear Educator Training Manual to end dancing bear torment. These education manuals and other items will be included on a DVD that contains much information which will be useful to the zoos of SAZARC.



The post conference tour -- tentative tidbits

The post conference tour spend one night away from Colombo and go to Hambanthota, the Southern town in Sri Lanka travelling along the Coast. We will leave your hotel in the morning after breakfast or with pack breakfast and continue on the Gall Road (along the coast) to Hikkaduwa Marine Sanctuary (about 3 hours drive) & see the corals from a Glass bottom boat which takes about 1 hour. We will stop on the way for lunch & proceed to Hambanthota where you are expected to stay overnight in a hotel called Peacock Beach Hotel. In the night it has been organised to take you all to watch turtle landing and turtle egg laying in the Bundala National Park. If you are lucky the turtles will come to lay eggs on that day.

Next morning we will go to the same National Park which is the first RAMSAR site in Sri Lanka and observe migratory birds in wilderness. After an early lunch or to have lunch on the way we will proceed to Ratnapura. It is possible that a visit to a gem mine at Ratnapura will be made on the way back to Colombo.

For dinner and very late or very early morning flights or spending the night we will be back in Colombo.

NEW : Journal of Threatened Taxa

Sanjay Molur*

Zoos' Print Journal was started in April 1999 and had been covering several wildlife topics with a focus on South Asia. We have had a good response from academics, researchers, scientists and conservationists from the South Asian region, and because of the speed of publication, quality and accessibility, some conservationists have been able to use this publication in developing conservation action plans for areas under threat and also make their work known to the government. Since early 2006 we have considered making this journal more widely available and with a wider coverage to include all of the species-rich countries of the world and to provide an opportunity for local scientists to publish in a truly international journal, who, due to certain reasons, are not able to do so. So, with experience in hand and the need, we are now starting a new journal called **Journal of Threatened Taxa**, which will be hosted online as a totally open access journal from January 2009 at www.threatenedtaxa.org. With this we intend to reach out as widely as possible and publish as quickly as possible.

Journal of Threatened Taxa (JoTT) is to be a monthly web publication, and will aim even for more frequency. It is an on-line, open and free-access, peer-reviewed journal on wildlife, conservation, taxonomy/systematics, ecology, new descriptions, veterinary and disease issues, conservation efforts such as *ex situ*, reintroduction, species status (global, regional or national) levels, reviews, checklists, new records, audio and video records (snippets) of new information to science forwarding conservation/natural history, illustrations to promote the same, natural history of flora, fauna and fungi and other topics contributing to conservation science and action.

The target audience is primarily the conservation, research, academic and actioner communities who have a stake in promoting conservation, research, policy making, and taxonomy all around the world.

Our vision is to provide tools such as audio-visual clips and illustrations to complement scientific publications and also provide an authenticity and permanence to these tools. With this, our intention for the journal is to reach out to educators, forest departments, community workers, lobbyists, para taxonomists, amateur, students and others interested in these subjects and are stakeholders in conservation work. There is no page limit to contributions and colour photographs, audios and videos are encouraged.

Journal of Threatened Taxa is to be global in its coverage. The objectives of JoTT are similar to that of ZPJ with respect to the subject areas covered.

What do we mean by "threatened taxa" & why
JoTT is not restricted to taxa (species, subspecies, varieties, forms or populations) that are threatened



with extinction as defined by the IUCN Red List. The term "threatened" is used broadly to include all forms of taxa and their ecosystems, with the premise that the natural world today is threatened and therefore all its taxa. Taxa may be threatened in several different ways, not only in their status in the wild. Lack of knowledge about a species or subspecies or a population is a threat as priorities can be compromised due to data deficiency. Taxa scientifically described for the first time are under threat from data deficiency in distribution, status, ecological needs, etc. Any taxon could be under threat in a location due to changes in habitat or quality. Ecological changes, changes in land use, socio-economic changes, human influenced changes, alien introduced species, wrong reintroduction practices, new emerging diseases, social and political unrest, improperly planned national and international wildlife and conservation legislations, constant changes in taxonomy, global climate change, and other factors that keep our environment and ecosystems in a constant flux can have widespread or localized impacts on taxa. In some instances even the so-called Least Concern species could be impacted locally or widely due to above factors.

We invite you to contribute your articles to JoTT. Send electronically to ravi@zooreach.org, zooreach@zooreach.org or herpinvert@gmail.com. Send hard copy publications to JoTT, c/o WILD, 9A, Lal Bahadur Colony, Peelamedu, Coimbatore 641 004, Tamil Nadu, India.

JoTT is a publication of Wildlife Information Liaison Development WILD.

From the U.K. Zoos Forum Appendices

ETHICS, SPECIES CONSERVATION & ANIMAL WELFARE

The human population reached the 6 billion mark in the last months of the twentieth century and continues to grow rapidly. Anthropogenic pressures on the environment threaten the viability of large numbers of species through loss of habitat, direct or indirect killing, pollution and introductions of nonindigenous species. The rate of loss of species at the end of the twentieth century is thought to be unprecedented and, in response, many programmes have been initiated for the protection and preservation of biological diversity. The conservation of animal species has been taken up by the world zoo community as a key goal and under the 1999 European Zoo Directive zoos are required to contribute to species conservation. Zoos carry out this work through education, captive-breeding programmes, research and support of *in situ* programmes. It is important that zoos pursue these endeavours with full and careful regard to the welfare of individuals.

Attitudes to animal welfare have varied over time and between cultures but in recent decades there has been a growing worldwide consensus about the importance of animal welfare. Among the many contributory factors has been the growing certainty, arising through a variety of fields of science, that consciousness (the capacity for awareness of pleasant and/or unpleasant feelings) is likely to be present in a wide range of species. It follows that we have a strong moral obligation to take animals' feelings into account in our dealings with them. This position was reflected, for example, by the agreement of the European Heads of State at the Amsterdam Summit meeting in 1997 to make provision in the Treaty of Rome (which established the European Community in 1957) 'to ensure improved protection and respect for the welfare of animals as sentient beings'.

Ethics is about what ought to be done: about what is the morally right and wrong course of action, and why. Some believe that the correctness of actions should be judged on their consequences; that is, that it can be justifiable to cause a minor harm in pursuit of a greater good. Persons who hold this 'consequentialist' view might consider, for example, that pursuit of important species-conservation objectives should not be blocked on the grounds that the procedures may have a minor adverse effect on the welfare of the animals involved. Thus, they may allow that a vaccine or a capture drug be tested on, say, domestic cats before it is used in a tiger conservation programme. Others believe that actions can be right or wrong regardless of their consequences and that it is an absolute wrong to harm an individual because causing harm cannot be justified under any circumstances. Persons who espouse this 'deontological' (rights) view may agree with Regan (1992) that 'The rights of the

individual are not to be violated in the name of some collective good, whether that good be the good of the ecosystem or the good of sentient life (both human and non-human), and independently of whether these rights are violated "humanely" or otherwise'.

In practice, most zoos are likely to take an ethical stance based on a combination of these positions. They may decide, for example, that (i) it would be absolutely wrong under any circumstances to undertake any actions that caused intense or prolonged harm to animals, no matter how great the potential benefits might be for species conservation (or some other good cause), but that (ii) they may permit certain procedures which caused only minor welfare infringements if these were highly likely to lead to significant conservation (or other) benefits. Such combinations of rights and consequentialist frameworks have been adopted by both the Banner Committee, which considered the ethics of the use of animals in science, and the Farm Animal Welfare Council (FAWC) (e.g. FAWC, 1998) which advises the government on the ethics of the use of animals in livestock production.

The latter half of the twentieth century saw the development of two sets of principles or codes, the 'Five Freedoms' and the '3Rs', which have become widely accepted tools in the welfare of farmed livestock and in the humane use of animals in research. The Five Freedoms and the 3Rs are also of relevance in zoos and are described below.

The Five Freedoms

In the SSSMZP (2000), the first five sections are organized under headings that are adapted from the Five Freedoms: these are the five guiding principles of animal welfare which were developed by the FAWC (see below) and have been taken up widely around the world. For example, they were used as key principles in New Zealand's Animal Welfare Act 1999, one of the newest pieces of legislation concerning animal welfare. Following publication of the late Ruth Harrison's book *Animal Machines* in 1964, which drew attention to the mismatch between society's responsibilities to animals as conscious beings and the use of them in intensive farming as if they were machines, the Brambell Committee was set up to look into the animal welfare aspects of factory farming. The Committee recommended the establishment of an independent Farm Animal Welfare Advisory Committee to advise the government, and this evolved into the FAWC. In attempting to summarize the key principles of animal welfare, FAWC developed precursors to the Five Freedoms and, while a FAWC member, John Webster (Professor of Animal Husbandry at Bristol University) drafted the Five Freedoms in their current form (Webster, 1995):

Freedom from thirst, hunger and malnutrition - by ready access to fresh water and a diet to maintain full health and vigour.

Freedom from discomfort - by providing a suitable environment including shelter and a comfortable resting area.

Freedom from pain, injury and disease - by prevention or rapid diagnosis and treatment.

Freedom to express most normal behaviour - by providing sufficient space, proper facilities and company of the animal's own kind.

Freedom from fear and distress - by ensuring conditions which avoid mental suffering.

These 'freedoms', which recognize both physical and behavioural needs, succinctly encapsulate the welfare requirements of animals and also form a framework that can be used in the assessment of animal welfare. They are ideals and it is important that there is some flexibility in their application because they can, at times, be contradictory. It may be impossible in practice to avoid any fear or pain because, for example, diagnosis of disease in captive wild animals (involving blood sampling etc.) may induce both. Likewise, in social animals, freedom to express normal behaviour may result in fight injuries to cage mates at times. Therefore, judgement has to be exercised in balancing the freedoms.

In the SSSMZP (2000) these freedoms have been adopted, in slightly modified form, as the principles under which the Standards in the first five sections are grouped:

* Provision of food and water

- * Provision of a suitable environment
- * Provision of animal health care
- * Provision of opportunity to express most normal behaviour
- * Provision of protection from fear and distress

It would be quite wrong to interpret the use of FAWC's Five Freedoms in the SSSMZP as zoo standards catching up with standards for farm animals. The two have evolved in different ways and zoo standards, at least in the UK, have tended to be higher, in terms of space allowances, environmental enrichment and attention to individual animal care, than those for farm animals. In adopting the Five Freedoms, the SSSMZP has built on the framework developed by FAWC.

The 3Rs

The '3Rs' principles of Russell & Burch (1959) advocate: (i) the **R**eplacement of the use of animals in biomedical research wherever possible, (ii) where no alternatives are available, **R**eduction of the numbers of animals used to the minimum required to meet the objectives and (iii) **R**efinement of experimental and husbandry techniques to minimise any risks or harm to welfare.

All three 'Rs' are directly relevant to the use of animals in conservation research. They can also have some relevance to the use of animals in zoos for other purposes, such as in conservation or education programmes, or any other circumstances in which, while the purpose for which the animals are 'used' may be worthy and justifiable, the procedures may not be necessarily in the best interests of the individuals involved. While replacement may rarely be applicable, there are often possibilities for refinement and there may also be possibilities for reduction.

EDUCATION THEORY

This appendix provides background information and some of the theoretical and philosophical considerations associated with the development and application of 'zoo education'. While each animal collection has its own opportunities and limitations, zoo education should aim not only to be about the animals on display but also to provide a broader message, link to relevant curricula and facilitate development of environmental awareness and action.

What is zoo education?

Zoo education is a holistic discipline targeted at zoo visitors, staff and the wider community, aiming to:

- promote an understanding of, and concern and respect for, biodiversity, animals and the natural world
- encourage action for a sustainable future

Zoo education incorporates the principles of environmental education and the evolving field of education for sustainability. It goes beyond provision of information via graphical interpretation and direct personal contact, and the education experience is influenced by, for example, the species exhibited and

zoo layout, exhibit design, gardens, animal behaviour, retail and catering environments and transport/parking issues.

Education programmes should acknowledge that the captive environment is unnatural. Enclosure design can simulate a 'natural' setting but there are limitations: zoos should acknowledge this and use it as a building block to illustrate ecological principles. There is a growing realisation that we cannot divorce the problems of the environment from those of development and economics...our form of education is directed towards a social end - we want to bring about change in human behaviour resulting in sustainable use of Earth's resources. ...learning should be fun... but... also be very seriously based upon clearly defined education principles and concepts. Doug Hulyer, WWT, 1990

Zoos have the potential to instigate environmental education programmes that motivate people to action.

...Zoo educators are faced with numerous target audiences with whom to develop concepts, refine skills and nurture attitudes... Malcolm Whitehead, WWT, 1995

Environmental education

The classic definition of environmental education from IUCN in 1970 is: *Environmental education is the process of recognising values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the inter-relatedness among man, his culture and his biophysical surroundings.*

Good zoo education is a specialized form of environmental education. Environmental education should provide experiences of problem solving, decision making and participation, with consideration of ecological, political, economic, social, aesthetic and ethical issues. It is also about promoting changes of attitude and behaviour.

Environmental education is not simply about 'saving the whale' but about developing an appreciation of the wonders of nature and a sense of wanting to save them. It is about touching people's belief and attitudes so that they want to live sustainably. A zoo is an appropriate environment to facilitate and promote this. Real things engage all the senses not just the intellect Professor David Orr, 1993

International co-operation for conservation and education

World Conservation Strategy

The need to conserve natural resources and biodiversity has been increasingly recognized by the international community and through the work of non-governmental organizations (NGOs). In 1977 a UNESCO-UNEP meeting at Tbilisi produced a declaration upon the provision of environmental education. As a result of intergovernmental meetings in 1980, a *World Conservation Strategy* (WCS) was drawn up to provide a framework for individual countries to develop national conservation strategies and policies.

The WCS stated: Environmental education has the task of transforming the attitudes and behaviour of entire societies if a new conservation ethic embracing plants and animals as well as people is to become a reality. The WCS was revised in 1990 with the World Commission on Environment and Development conference, resulting in the Brundtland Report *Our Common Future*.

World Zoo Conservation Strategy

The zoo community responded to this increased awareness and action with the World Zoo Conservation Strategy in 1993 (see Appendix 3). The World Zoo Conservation Strategy emphasises that the use of a wide variety of educational techniques, facilities, and considerations, together with knowledge, creativity, and inventiveness can make zoos highly interesting, attractive and effective places for environmental, conservation, and holistic life system education.

United Nations Conference on Environment and Development – Rio Summit

The 1992 UNCED *Earth Summit* in Rio de Janeiro produced a range of declarations and reports, including the CBD (see Appendix 1) and Local Agenda 21. The Agenda was designed to provide a framework for the twentyfirst century for local communities to contribute to national strategies and achievements, and subsequently to global action.

Agenda 21 1992 states:

To improve sustainable development education, nations should seek to: make environment and development education available to people of all ages; work environment and development concepts including those of population, into all educational programmes, with analyses of the causes of the major issues. There should be a special emphasis on training decision makers; involve school children in local and regional studies on environmental health, including safe drinking water, sanitation, food, and the environmental and economic impacts of resource use.

Tackling the issues internationally: globalisation and rich versus poor

Quality of life for the majority of people differs significantly between the developing and the developed nations, and this has an impact upon educational needs. Zoo environmental education should consider the issues of inequality around the world and within different environments. For example, tackling the illegal trade in wildlife is as much about social issues as conserving wildlife. The dominance of large multinational or transnational companies (and some governments) in world trade also influences the environment. The issues of: • globalisation • genetic engineering • conservation of natural resources • sustainable development are all relevant to, and can be incorporated into, the educational work of zoos.

Challenges for educators

The greatest challenge of both our time and the next century is to save the planet from destruction. It will require changing the very foundations of modern civilisation and relationship of humans to nature. Mikhail Gorbachev, 1994.

Paradoxically, the developed nations are viewed as more conscious and respectful of environmental limits than the developing nations, when all the evidence shows the environmental crisis has been precipitated almost exclusively by the wasteful and excessive consumption of the developed nations. All conservation-education programmes should address this issue.

Much of what has been labelled environmental education in developed nations has actually reinforced some of the problems by not revealing their true causes, or complexity. For example, simplistic conservation messages take no account of the local situation and the underlying reasons for endangerment (e.g poor wages for the available

work, often supplying the multinationals that sell the goods to developed countries).

...it is my firm belief that most members of environmental organisations do not yet understand that radical social change is needed ... we need to rethink our priorities. T. Trainer (Wall, 1990) Analyses of global issues, their impact and their origins suggest that unsustainable population growth is the single most important cause of environmental damage. While this is true in simplistic terms, the imbalance between developed and developing nations in terms of resource use clearly shows that a stable 'consumer' population in the developed world causes significant environmental damage. Increased longevity in developed nations also means a larger population and a significant increase in demand for consumer goods: more than that resulting from higher population growth in developing nations.

In situ conservation and education

In situ projects to save and rehabilitate natural resources will not succeed unless local people are included in land ownership and rights to water, timber, fuel, etc. Education is a critical part of building community support for the conservation work.

Field projects provide opportunities for education programmes at home and abroad e.g. working with the local community on causes of habitat loss and species endangerment, and with zoo visitors on how their lives may be impacting upon the region (e.g. through trade or consumerism) and what they can do to counteract this.

Education for sustainability Sustainability is now a feature of school curricula. Educators should be aware that the understanding, ideas and attitudes concerning sustainability differ between nations: in particular, its use by developed nations and multinationals may not concur with that of developing nations.

Sustainability can be defined as: the ability of human society to coexist in balance with the environment such that there is a reliance upon renewable resources, utilization of waste and emphasis placed upon meeting local community needs which are not to the detriment of other communities and the environment (Stephen Woollard, Bristol Zoo Gardens, 1998).

Education for sustainability draws upon the strengths of environmental and development education and is much more than the sum of the two. It is ideally suited to 'in the environment' and informal approaches, and exploring links between the environment/wildlife, trade and people. Zoo education can play a central role in the 'delivery' of some aspects of education for sustainability.

Back to basics: teaching and learning

Environmental education aims to encourage pupils to express their own views, listen to those of others, form reasoned opinions, work co-operatively, make decisions and take action for the environment. These

outcomes can be encouraged in many ways and the zoo environment provides an extra stimulus.

Education can be: · participatory · co-operative · enquiry based

It can include:

- **Action and problem solving:** practical activities involving care and action for the environment; setting a problem and providing a solution based upon experience and ideas e.g. how to stop poaching?
- **Discussion of views and beliefs:** encourage pupils to say what they think in a non-threatening way, raise controversial issues and get pupils to think through their feelings (e.g. animals in captivity, the hunting debate, Fair Trade, globalisation or local issues, such as a village pond, housing estate, motorway)
- **A positive approach:** to enjoy and appreciate the environment and wildlife, highlighting the wonder of the natural world rather than taking the 'doom and gloom' approach
- **First-hand experience:** enquiry and investigation are key skills that can be developed in the zoo visit. Direct contact provides opportunities to develop various areas of learning and action (note animal welfare/health issues).
- **The local community:** the zoo is part of the community and can demonstrate how the local environment is important, and how the local fits into the national and international. Meeting a keeper, gardener or education officer in the zoo is, in itself, a valuable experience for all visitors.
- **Real issues:** use what is really happening and relevant, keep up to date with environmental news and use it as well as examples from the pupils/visitors own experience e.g. the impact of foot and mouth disease on farmers versus zoos/tourism. Do not shy away from controversial issues.
- **Sources of information:** provide visitors with information or direct them to where they can get it, to aid informed choices and decisions. Written requests for information may be time-consuming/expensive but they provide another opportunity to promote conservation and 'market' the collection and work of the zoo.
- **Equality:** discrimination (e.g. by race, sex) is to be avoided. Worldwide interrelationships, (e.g. through economic dependence and consumerism) and the support of international treaties/laws by developed nations because of vested interests can all impact on the environment. These factors may be kept in mind when developing new graphics, talks or education programmes.

Further information

For specific questions or more information on the development of zoo education, education programmes, etc. contact swoollard@bristolzoo.org.uk

Reference

Trainer, T. (1990) The task of education. In *Getting There: Steps to a Green Society*, ed. D. Wall, pp. 120-128. London: Greenprint.

Sustainability initiatives in UK Zoos for consideration by South Asian Zoos

3.1 Introduction

This chapter attempts to define and illustrate the role of sustainable development as relevant to zoos in the United Kingdom. It explains the concept of sustainable development and its applicability to zoos. It also summarises structures and procedures that can encourage sustainable development, including examples of specific positive measures and good practice from UK zoos.

3.2 Sustainable Development

What is sustainable development? The government's definition is "ensuring a better quality of life for everyone, now and for generations to come". It is meant to be an international ideal that maintains satisfactory living conditions (environmentally, socially and economically) at present, while not compromising the same opportunities for future generations. Although the idea is simple, the task is substantial. It means meeting four objectives at the same time, in the UK and the world as a whole:

- social progress which recognises the needs of everyone;
- effective protection of the environment;
- prudent use of natural resources; and
- maintenance of high and stable levels of economic growth and employment.

Important initiatives have grown out of the idea of sustainable development, including the Earth Summit in Rio de Janeiro in 1992 which involved nearly 180 countries. This has led to initiatives such as the UK's Local Agenda 21, which can set sustainable development goals at a local level, and also to accreditation schemes, such as ISO14001 which addresses pollution prevention and environmental management to encourage sustainable development. Sustainable development should be considered in all types of organisation: government, community and business. The underlying principles of zoos in the UK - education, conservation and research (see Zoos Forum Handbook Chapter 2) - provide incentives and opportunities for zoos to act in accordance with sustainable development. Zoos vary greatly in size, the range of species maintained, the focus of their work and in other ways, so it is not appropriate to define one sustainable development model that should be adopted by all. Instead, the types of measures taken should be appropriate to the activities, scale and nature of the zoo.

Zoos should source their stock sustainably. As set out in the Conservation, Education and Research chapter, stock should only be taken from the wild, regardless of whether it is to be part of a managed programme, if there is evidence to show that collection will not have a detrimental effect on the population, species as a whole or its habitat. This is also set out in the Federation of Zoos animal transaction policy. Similarly,

the Ethical Review chapter sets out that the costs and benefits relating to obtaining stock should be weighed up. Obviously, sourcing of stock must always be in full compliance with national and international law.

3.3 Key issues to consider

This section sets out some key environmental issues which it may be useful for zoos to consider, specifically the following topics:

- Energy & Building Design
- Water
- Waste
- Purchasing, Sponsorship & Investment
- Transport
- Wildlife Habitat
- Training & Awareness
- Partnership & Participation

These headings are considered in more detail below. Sustainable development also involves economic and social aspects, as well as environmental issues, so these should be appropriately addressed, especially health and safety. Substantial sustainability initiatives have already been achieved in some UK Zoos. For example those highlighted in at a 'Sustainability in Zoos' seminar/workshop held at Blackpool Zoo on 12 October 1999. Many of these initiatives are referred to in Appendix 4, together with other examples.

Energy & building design

Energy is one of the most important sustainability issues because of its contribution to climate change and pollution. The strategy for sustainable energy use and building design is generally to first **reduce** the amount used, either through simple actions (i.e. turning off lights, computers; using only the amount of energy needed) and to introduce **efficiency** measures (i.e. energy efficient appliances / heat fixtures). In addition, energy can be purchased from **renewable sources** and new buildings should be built with energy saving techniques and fixtures, using materials such as wood from sustainable sources rather than PVC. For example, timber products carrying the Forest Stewardship Council (FSC) logo are guaranteed to come from sustainable sources.

Building design should avoid tropical hardwoods, and where this is unavoidable they should only be sourced from FSC-certified suppliers. "Green electricity" – power produced from renewable energy sources – is now available through most electricity suppliers. As well as green tariffs, a number of less formal arrangements exist around the country, through which electricity customers are tapping into renewable energy.

Water

Many zoo animals spend extensive periods in water, and all are dependent upon supplies of good quality water. Water costs to zoos have, and will continue to increase. Many measures to reduce, reuse and recycle water (the Reduction Principle of sustainability – see Appendix 1) have been implemented. Reedbeds can be constructed to treat waste water and new technological advances can reduce wastewater.

Waste

Waste management is a highly important sustainability issue for zoos to address. Waste should be approached using the 3'R's (reduce, re-use, recycle of the reduction principle of sustainability, see Appendix 1). All waste should be reduced where possible, especially in packaging. Any unavoidable waste should be re-used by, for example, re-using paper (possibly shredding for animal bedding or composting) and boxes. Recycling and composting measures should then be considered and implemented. Paper, aluminium cans, bottles and corrugated cardboard can be recycled almost everywhere, and green waste (branches, leaves, etc.) can usually be composted, as can animal dung. Although EU Regulations will require all councils to provide recycling facilities for batteries, a better policy is to only use rechargeable batteries. Administration and record keeping also contribute significantly to the waste production cycle.

Animal husbandry generates a large amount of waste on a daily basis. Animal waste represents a potential health hazard and is therefore best disposed of on the premises, though opportunities exist to generate income from "zoo poo", and much animal waste may be composted. Examples of specific measures taken in UK zoos are in Appendix 4.3.

Purchasing, sponsorship & investment

Zoos can improve their purchasing practices by ensuring that environmental and ethical standards are applied. For example, zoos can specify low-packaging items and goods from "fair trade" sources. Zoos can also encourage suppliers and sub-contractors to demonstrate responsible attitudes, require them to supply copies of Environmental Policy/statements, and only invest in environmentally and ethically sound organisations. Zoos should also try to encourage environmentally and ethically conscious behaviour from their sponsors, and specifically choose such sponsors. Zoos can therefore make a substantial contribution to local and global sustainability. The proximity and equity principles of sustainability (see Appendix 1) should impel all zoos to apply environmentally and ethically standards in their purchasing choices.

As set out in the Conservation, Education and Research chapter, stock should only be taken from the wild ONLY if there is evidence to show that collection will not have a detrimental effect on the population, species as a whole or its habitat, regardless of whether it is to be part of a managed programme.

Examples of specific measures taken in UK zoos are in Appendix 4.4.

Transport

Transport, together with energy is the main source of increasing carbon dioxide emissions to the atmosphere, which are severely impacting the climate and biodiversity directly. Reducing carbon dioxide emissions is a major contribution that zoos can make towards helping conserve biodiversity. Zoos can encourage staff and volunteers to car share or use public transportation. Visitors should be encouraged to use public transport, for example, by providing incentives (entry discounts) with evidence of public transport use (bus tickets). Another measure, which reduces carbon dioxide and other pollution, is to obtain materials for zoos from local suppliers. Examples of specific measures taken in UK zoos are in Appendix 4.5.

Wildlife Habitat

Wildlife conservation is a fundamental priority for all zoos. This is also addressed in the CER chapter of the handbook. Funding may be available to assist with the costs of creating wildlife habitat (see Appendix 5). By planting trees zoos can offset their carbon dioxide emissions and become "Carbon Neutral", thus combating climate change. Examples of specific measures taken in UK zoos are in Appendix 4.6.

Training and awareness

Training of staff is essential to ensure that environmentally friendly practices are being followed. It is also important to gain staff input, as crucial contributions and innovative ideas are always available, inside the organisation, but often remain untapped. Similarly, the public should be made aware of zoos initiatives and ought to be encouraged to adhere to environmental principles while on the zoo property. An effective way to do this is to provide information on sustainable behaviour and facilitate this by, for example, strategically placing recycling bins throughout a park and encouraging purchase of low waste materials (e.g. packaging and cups) in zoo shops and canteens. This will only be effective where all zoo staff are seen to apply environmental principles themselves. Many options for creating and protecting wildlife habitats and reducing waste and resource use can be promoted through a reed bed, or a sustainable garden exhibit. Examples of specific measures taken in UK zoos in Appx 4.7.

Partnership and participation

Zoos, aquaria, and farm park attractions are very well placed to provide both partnership, and with some opportunities, leadership. Participation is one of the most important principles of sustainable development (see Appendix 1).

Local Agenda 21 has now been added to by the duty (and powers) placed upon a local authority to prepare a Community Strategy or Plan which improves quality of life and assists moves towards sustainability. This process should provide fresh impetus to sustainable

development partnership projects. Examples of specific measures taken in UK zoos in Appx 4.8.

3.4 Ways to Implement Sustainable Initiatives

This section sets out some mechanisms to establish and implement sustainability initiatives in zoos.

"Green" Working Groups

An easy first step in giving attention to environmental issues is to form a group within a zoo, consisting of staff that volunteer because they are concerned about implementing environmental measures. It may be a good idea to first form an informal group to bring out issues and encourage staff involvement and suggestions. Green groups can carry out assessments to help senior management create environmental policies. Alternatively, if senior management has already formulated an environmental policy, green groups can be a great support to implementing the objectives and disseminating information throughout the rest of the staff and the public.

Environmental Policies

To help organisations become aware of, and take action to act responsibly towards their natural environment, a widely recognised and recommended procedure is to create and adopt an environmental policy. An environmental policy states the goals / objectives an organisation intends to undertake to create an atmosphere of awareness and action toward improving environmental impacts. Environmental policies can also greatly assist applications for funding.

Creation of environmental policies is the responsibility of senior management, who should first carry out or arrange a general review of environmental aspects upon which to base the policy. Assessment and policy formation should be combined with training and input from all staff and volunteers, as well as education of the public and shareholders of the environmental initiatives. It may also be useful both to explain the goals and to detail the exact efforts that will be used to undertake the objectives. The intention is that the stated objectives should be reviewed over time to assess performance and re-assess the goals. It is important to have boundaries and definitions or it may be difficult to achieve cohesiveness and meet goals.

Health and safety requirements should already be in place, and should not be ignored when forming the environmental policy. Case studies of environmental policies from Marwell Zoological Park, Paignton Zoo Environmental Park, Bristol Zoo Gardens and Chester Zoo are in Appendix 2 for reference. The formation of an Environmental Policy is a good foundation for any organisation to create environmental awareness and move towards environmentally sustainable practices, which often begin with an environmental audit.

Environmental Audits

Environmental audits are integral, practical measures in implementing environmentally sustainable practices, the first step in a successful Environmental Management System (EMS). The main objective is to comprehensively consider environmental issues that affect zoos, such as energy, water, waste, purchasing, transport, etc. An environmental audit measures and evaluates the environmental impacts that a zoo has on its surroundings. One example of a type of audit is the Total Assessment Audit (TAA), which attempts to account for all aspects of environment impact, with three primary objectives: improvement in productivity, reduction of waste and increase in energy efficiency (Haman, 2000).

Assessing several environmental areas together allows for examination of overlaps and innovative solutions. Individual audits—such as isolated waste audits or energy audits—are useful, though opportunities may be missed since the focus is only on a single objective.

Structures that Encourage Sustainable Initiatives

Environmental Management Systems

Environmental Management Systems (EMSs) are tools for improving environmental performance and reducing impacts upon the environment. They can provide order and consistency to address environmental concerns in a systematic manner through the allocation of resources, assignment of responsibility and ongoing evaluation of practices, procedures and processes. EMSs are routes of managing human activities that impact the environment—rather than actually attempting to manage the environment. An EMS should focus effort on the interactions that an organisation has with its environment. A case study giving an example of an EMS for a zoo is at Appx 3.

EMSs can assist businesses, including zoos, not only in recognising environmental impact but in managing themselves effectively, e.g. assisting in reacting to new circumstances (e.g. new legislation, attitudinal shifts, market forces), improving company image, exploiting market opportunities, reducing risks, and be ahead of their competitors (Alberti et al, 2000). It is possible to obtain accreditation for EMS, such as ISO 14001, denoting that an organisation has been successful in reducing its environmental impacts in a systematic manner.

(Refer SAZARC 2009 DVD for full article)

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