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Climate change is the greatest challenge facing humanity. Its effects are already felt and are becoming more widespread. But it is closely associated with many other major environmental issues, including population growth, urbanisation, resource depletion, water shortage, pollution, and, for us conservationists, the most dramatic loss of animal and plant species and ‘wild’ landscapes ever recorded. The evidence points unequivocally at human activity as the prime cause of all these problematic issues. It is up to us as citizens, communities, organisations, and nations, to change our habits and behaviour to reduce the social, economic and environmental impacts of all these factors.

Addressing these threats to biodiversity by developing sustainably, (that is “meeting the needs of the present without compromising the ability of future generations to meet their needs”) involves organisations like ours reducing our net carbon emissions to at least zero, minimising our waste, using water wisely, procuring all our goods and services in a sustainable way. By doing this, we can help to reduce the global impacts of climate change and reduce biodiversity loss.

Under the auspices of its Conservation and Sustainability Committee, which I chair, the World Association of Zoos and Aquariums published “Building a Future for Wildlife” - the World Zoo and Aquarium Conservation Strategy (2005), which urged all members to work towards increased environmental sustainability and to reduce their ecological and carbon footprints.

The Bristol, Clifton and West of England Zoological Society has already started this, achieving ISO14001 accreditation for its environmental management system in 2008. However, the Society is committed to going further, incorporating environmental sustainability into the heart of everything we do, making sure that we use all natural resources in sustainable ways. We want, and intend to become, a visionary and inspirational environmental leader in the worldwide zoo community.

This document is a tool which we hope zoos and other visitor attractions may use to help understand the principles of sustainability, and how to measure and report it. By using these principles to reduce our overall environmental impacts, we hope we can inspire our visitors and peers to make those changes that will have maximal positive impact on the future of our planet and the animals and plants that live on it, and which we work to conserve.

Dr Jo Gipps OBE
CEO, Bristol, Clifton and West of England Zoological Society.
Director, Bristol Zoo Gardens.

Acknowledgements

I am very grateful to Craig White and his colleagues at White Design (consultant architects to Bristol Zoo Gardens) for introducing us to the concept of Ordered Retreat (explained on page 10); this idea has been central in guiding our thinking in the preparation of this Strategy.

I’d also like sincerely to thank Katie Clark, Sue Dow and Phil Jearey, all of Bristol Zoo Gardens, without whose dedication and hard work this Strategy would never have been written or finished!

Finally, I am very grateful to all those organisations mentioned in the text, whose ideas and processes we have borrowed, and which have stimulated us to produce this document.

Jo Gipps
The natural resources currently used by the human population exceed the earth’s capacity by 30%\(^1\). Combined with the threat from climate change, this consumption level is unsustainable in the long term and individuals, communities and organisations must act substantially to reduce their use of non-renewable resources and to become more environmentally sustainable. Zoos and Aquariums, as well as becoming more environmentally active and responsible, have an exceptional opportunity to encourage their visitors to make lifestyle choices and adopt more sustainable practices in their everyday lives. This is recognised by the WAZA Sustainability Resolution\(^4\), which urges member organisations to become leaders of sustainable development in their communities. Few other organisations have such prolonged personal contact with their audiences as zoos and aquariums, across socio-economic groups, meaning they are not just preaching to the converted. Reputable zoos and aquariums are also trusted far more than, for example, government departments and journalists, so are in a prime position to encourage real change.

The Bristol, Clifton and West of England Zoological Society’s (BCWEZS) charitable objects are to advance the public understanding and conservation of wildlife and the natural environment, and to advance the scientific study of animals and plants. It achieves this through its three Operating Units: Bristol Zoo Gardens (BZG), the National Wildlife Conservation Park (NWCP) and the Bristol Conservation and Science Foundation (BCSF). The conservation of wildlife and the use of natural resources are intrinsically linked, and the Society recognises that its daily activities have an environmental impact.

The Society has developed an Environmental Policy to guide its ongoing improvements in sustainability performance (Appendix 1); this formed the basis of Bristol Zoo’s Environmental Management System (EMS). Bristol Zoo received ISO 14001 accreditation in March 2008. This document provides a framework applicable to all visitor attractions, outlining how to reduce the negative environmental impact of all our activities.

How is BCWEZS achieving sustainability?

The concept of Ordered Retreat provides a logical process for organisations to reduce their ecological and carbon footprints, ultimately achieving at least zero net impact in all elements of environmental sustainability. There are four steps to the process (Fig 1):

**Ordered Retreat, Step 1: Measure, audit, analyse**

The first step is to identify the specific environmental impacts that make up an organisation’s ecological footprint. These can be assessed to create a list of Key Performance

![Ordered Retreat feedback loop](Fig1: Ordered Retreat feedback loop)
Indicators (KPIs): quantifiable metrics that can be used to define targets and benchmarks which reflect the environmental performance of an organisation. BCWEZS has chosen seven distinct areas of sustainable performance and has defined KPIs relevant to each.

1. Carbon
2. Energy (gas, electricity, and biomass)
3. Water (supply and waste management)
4. Travel (visitors and staff)
5. Waste (organic and inorganic)
6. Procurement (materials, animal and visitor food, retail, and business services and supplies)
7. Biodiversity (in breeding programmes and in the wild)

Table 1: The seven areas of environmental sustainability that the Society has chosen to measure

Once the KPIs have been established, a system must be set up to deal with the collection of the data. BCWEZS uses its Environmental Management System to collect data, set targets and monitor progress. The Society has also signed up to several external carbon reduction initiatives (see section 2B, page 19, below).

Ordered Retreat, Step 2: Stop, Avoid, Reduce

After identifying negative environmental impacts, the next stage of Ordered Retreat is to consider how to stop, avoid or reduce these impacts. This can be done in a wide range of ways, including small things, like turning down the thermostat by 1°C or replacing tungsten filament bulbs with LEDs. This must be done in a holistic fashion, considering cost and life-cycle analysis. Initially, the 'easy wins'- features that can easily be changed without incurring financial cost - can be tackled. After this, initiatives that require capital investment but will pay for themselves should be considered, including initiatives that may not offer a short enough payback on cost saving but significantly improve sustainability.

Ordered Retreat, Step 3: Renewable alternatives

There are environmental impacts that an organisation is unable to stop, avoid or reduce any further in order to continue to function effectively, in which case, renewable alternatives should be considered. These range from renewable energy sources to the procurement of food from sustainable sources, and breeding programmes for species held in captivity.
Ordered Retreat, Step 4: Offset

There is sometimes a negative environmental impact that cannot be reduced and where a renewable alternative is not available; the last resort is to offset. Although offsetting is commonly referred to within the context of carbon emissions, projects which benefit communities, such as providing access to clean water, reforestation and habitat recreation projects, may also be valid.

In this document, we have attempted to consider and to articulate how to implement all four steps of Ordered Retreat for all seven areas of environmental sustainability.

CASE STUDY:
What has Bristol Zoo Gardens achieved so far?

Bristol Zoo is committed to improving its environmental sustainability. The Zoo has achieved the following in the context of the Society’s KPIs:

**Carbon:** In 2007, Bristol Zoo developed a software tool (SALOME), to measure direct and indirect carbon emissions, and uses this annually to report them. The Zoo has committed to reduce its carbon emissions by 2.5% year on year.

**Energy:** We have increased the proportion of energy provided by renewable sources from zero to 47% between 2007 and 2009 and are working to increase this percentage further. We are addressing all our existing buildings in order to assess and implement retrofit of energy-conserving measures such as insulation and double glazing. New buildings are designed and built to the equivalent of BREEAM outstanding.

**Water:** We have decreased water consumption annually since 2006, by 10% in 2007 and 2008, and by a further 3.5% in 2009.

**Travel:** Travel plans for staff, visitors and corporate guests have been developed to reduce car use by providing incentives to use public transport, cycling or walking.

**Waste:** Bristol Zoo currently composites all animal and plant waste at its Hollywood Tower Estate, and recycles paper, cardboard, plastic bottles, cans and glass. We are working to reduce further the amount of waste we produce. Future plans include the installation of an in-vessel composter at the Hollywood Tower Estate.
Procurement: Bristol Zoo intends to source products, including building, retail, business and food items, as locally and as sustainably as possible. Currently we are reviewing the supply chain of all the items we buy. Where possible, we also purchase certified ethical produce (Fair-trade, Forest Stewardship Council (FSC) and Marine Stewardship council (MSC)-certified produce).

Biodiversity: Enhancing conservation and increasing biodiversity is at the heart of Bristol Zoo’s activities, shown by our dedicated conservation breeding programmes and projects to protect populations of threatened species in the wild, at home and abroad.

Conclusions

The Society is strongly committed to sustainable development. Through its mechanisms of environmental management in accordance with many of the schemes employed at Bristol Zoo, we will develop further our obligations to social, environmental and economic sustainability.

Along with the aim of improving our own sites, we look to this document to provide a framework for other zoos to use our experience and findings, both positive and negative, to guide their own sustainable development programmes. Zoos as organisations have a huge potential to influence the behaviour, not just of visitors and staff, but also of communities abroad. Through the development projects initiated by the Society, we have been able to change the behaviour of communities local to endangered species and ecosystems, thus ensuring that conservation can occur from the bottom up. The process is slow, but with the contributions of many zoos, it will make a real difference, not just to the biodiversity of threatened ecosystems but also to the people in contact with them. For example, in the Comoros, where the Livingstone’s fruit bat is threatened by deforestation, we employ a team of local facilitators to work with communities to help identify and develop alternatives to slash and burn agriculture. Capacity building underlines all of our work with the aim of ensuring that any changes in land use are long-lasting. Our local team helps to educate the people about the consequences of the loss of forests and in addition set up capacity-building and income-generating initiatives such as market gardening and improved farming methods, to increase crop production and tourism.
1. The Global Picture

A. Introduction

Emissions of carbon dioxide (CO₂) and other greenhouse gases over the last 200 years have instigated a rapid warming of the planet⁵. CO₂ concentrations in the atmosphere are now above 380 ppm (Fig 2). If emissions continue to rise at the present rate, CO₂ concentrations in the atmosphere will reach twice pre-industrial levels by 2050⁵, with an associated rise in temperature by up to 7°C above pre-industrial temperatures (Fig 2), resulting in a catastrophic loss of species from sensitive ecosystems.

Even if global temperatures rose by 2°C, the IPCC suggest that this rise would result in the extinction of 20-30% of the world’s species⁵. Many scientists and wildlife conservation organisations are calling for governments to commit to limiting the rise of global temperature to less than 2°C, by keeping CO₂ concentrations in the atmosphere below 350 ppm, thus reducing the threat to ecosystems and species. Conserved or restored habitats can remove carbon dioxide from the atmosphere, thus helping to address climate change.

In 2005, the natural resources used by the human population exceeded the earth’s biocapacity by 30% and this percentage continues to rise. In Britain, our use of natural resources exceeds our capacity by 300% (Fig 3). Such high usage is unsustainable in the long term and requires immediate action to minimise the negative human impact. This is a global issue, but it requires local action by individuals, communities and organisations to achieve a sustainable future.

Zoos and zoological societies across the world have a vital role in maintaining and defending biodiversity for future generations⁴. UK Zoos are visited by over 18 million people every year and all are required to work within the fundamental principles of education, conservation and science¹⁰. This is detailed in the UK Secretary of State’s Standards of Modern Zoo Practice and the EU Zoos Directive¹². These factors provide the UK zoo community with a unique opportunity to be a collective advocate for
sustainable lifestyles and to facilitate a positive change in visitor attitudes and behaviour towards environmental issues. This is recognised by the World Association of Zoos and Aquariums (WAZA) Sustainability Resolution, which urges member organisations to become leaders of sustainable development in their communities.

The Society has developed an Environmental Policy to guide on going improvements in sustainability performance (Appendix 1) - this formed the basis of Bristol Zoo’s Environmental Management System (EMS), which manages the Zoo’s environmental performance. Bristol Zoo received ISO 14001 accreditation for this in March 2008.

Conventionally, the performance of an organisation has been assessed purely on financial measures. This one-dimensional approach is not sustainable and Elkington proposed an alternative concept, the ‘Triple Bottom Line’ approach. This model promotes a more balanced approach to business reporting, proposing that the social and environmental aspects of an organisation are as important as economic factors in achieving truly sustainable performance.

The Triple Bottom Line approach has received legislative backing through the EU Accounts Modernisation Directive; this requires large and medium businesses (250+ employees) to produce a review that reports on both financial and non-financial Key Performance Indicators (KPIs), including information relating to environmental and social matters. By considering these matters as well as economic factors in business decisions, organisations can assess their performance more holistically. In addition to the potential benefits that this approach brings for the environment and the local community, there are also clear business benefits:

1. **Cost savings:** Improved energy efficiency reduces energy bills as well as reducing carbon emissions. Reducing waste sent to landfill reduces the amount of landfill tax an organisation must pay. Undertaking appropriate risk management through the EMS can help to reduce insurance premium costs.

2. **Productivity Gains:** Consideration of social factors ensures that employees are treated fairly and can increase their motivation to work hard and achieve targets. Assessing how current systems work as part of the EMS enables areas of inefficiency to be highlighted and addressed.

3. **Improved reputation:** Sustainability credentials are increasingly being considered when discussing whether to support an organisation. Promoting sustainable ideals
can increase sales (in our case, visitor numbers and membership).

4. Increased investment: Donors, customers and sponsors are increasingly demanding evidence of social and environmental investment as well as financial responsibility.

5. Service innovation: Organisations must monitor ongoing performance and highlight areas requiring improvement.

6. Employee Recruitment: Corporate Social Responsibility Policies are increasingly influencing potential members of staff in their decision to work for an organisation.

THE PURPOSE OF THIS DOCUMENT:

The Society is committed to improving its environmental sustainability and reducing its environmental footprint. This document outlines how the Society is reducing the environmental impact of its activities by:

1. Establishing a list of Key Performance Indicators that can easily be measured and reported upon in a standard way.

2. Providing a starting point in encouraging more collaboration between zoos to develop useable sector-specific Environmental Management Systems that can then be used by others wanting to improve their sustainability performance.

3. Demonstrating a common approach to calculating carbon and ecological footprints, to enable comparison of performance between zoos and other leisure attractions.
B. Bristol, Clifton and West of England Zoological Society: Structure, Governance and Strategic Plan

The Society is an education and conservation charity founded in 1835; it administers and operates three financially separate but ideologically overlapping operating units: Bristol Zoo Gardens, the National Wildlife Conservation Park and the Bristol Conservation and Science Foundation. Despite the financial independence of the three operations, all the Operating Units share knowledge, staff and other resources (Fig 4).

The Society recently published its Strategic Plan 2008 – 2018 (Fig 5). Our charitable objects are to advance:

a) The public understanding and the conservation of wildlife and the natural environment; and

b) The scientific study of plants and animals.

The overarching vision statement, common to the Society and all three of its operating units, is “Creating a sustainable future for wildlife and people”.

The Society intends to integrate conservation, sustainable activities and social and environmental awareness into all aspects of its work and to promote these values widely through partnerships, learning and commerce, in line with the requirements set out in “Building a Future for Wildlife” - the World Zoo and Aquarium Conservation Strategy (2005).

With reference to environmental sustainability, the Society’s Strategic Plan states that it “intends to use the latest technologies and successes to ensure continual improvement in our sustainable practices, and to reduce our environmental impact by implementing a clear environmental management system, and to promote the system through our business and other partners”.

Fig 6: Monkey Jungle at Bristol Zoo
BRISTOL ZOO GARDENS is located on a 5ha site in Clifton and was opened in 1836. It is a forward-looking zoo, dedicated to delivering the BCWEZS vision of creating a sustainable future for wildlife and people.

**Bristol Zoo’s mission is:** To make a significant contribution to wildlife conservation, through operating the best city zoo in the world.

The BCWEZS strategic plan requires Bristol Zoo to lead by example, assessing the environmental impact of every project and decision, and using sustainable practices in all aspects of its operations. In particular, best practice measures and activities that help sustain natural resources are being implemented in the areas of energy efficiency, water consumption, waste management, building practices and recycling. This enabled the Zoo to achieve ISO 14001 accreditation in 2008 for its environmental management systems and practices. This accreditation requires Bristol Zoo to continue to monitor and improve environmental performance year on year.

Bristol Zoo will communicate its sustainable and environmental practices to visitors and partners, requiring suppliers, franchises and other partners to develop and implement sustainable practices in their businesses, and demonstrating methods and providing opportunities through which visitors and partners can minimise their environmental impacts.

Fig 7: Map of Bristol Zoo Gardens
**THE NATIONAL WILDLIFE CONSERVATION PARK (NWCP)** is a proposed new world wildlife reserve at the hub of a global conservation network, to be located at the Society’s 55ha estate, seven miles north of the existing zoo in Clifton. Planning permission for the Park has recently been obtained and funding for the initial phase is now being sought.

**The National Wildlife Conservation Park’s mission is:**
To mobilise mass action to conserve wildlife and the natural environment, through being the world’s leading conservation-led visitor attraction.

**The BCWEZS Strategic Plan states**[17]: “The National Wildlife Conservation Park will undertake the same activities as Bristol Zoo and in addition, will ensure that all its design and building work is to exemplary and significantly higher environmental standards that those required by regulation or found in common practice. It will generate its own heating, it will compost its organic waste and recycle its inorganic waste and generally adopt best practice in all matters relating to environmental sustainability. It will act as a regional and national hub for sustainable best practice for visitor attractions and become the national centre for ‘green’ issues”.

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![National Wildlife Conservation Park masterplan](image-url)
THE BRISTOL CONSERVATION AND SCIENCE FOUNDATION was formally launched in 2008, and conducts the Society’s conservation action and conservation research activities in the field, at home and internationally. In recent years, the Society has expanded several existing projects and is constantly researching new initiatives. International projects, such as those ongoing in Cameroon, Madagascar, the Comoros and in South Africa, will continue, together with new partnerships for exhibits within the National Wildlife Conservation Park.

The Bristol Conservation and Science Foundation’s mission is: To identify and implement sustainable solutions to species and ecosystem conservation challenges, through research, action and local collaboration.

The Society’s strategic plan states: “The Bristol Conservation and Science Foundation will adopt measures and activities that help sustain natural resources in all aspects of its work, including supporting local communities in using natural resources in their sustainable development”.

All the Foundation’s current field projects are linked to major exhibits at Bristol Zoo. In future, the same one-to-one relationship between field project and exhibits will apply at NWCP.

Current Bristol Conservation and Science Foundation field projects

1. Birds of Prey, South West England
2. Water voles, South West England
3. Avon Gorge and Downs Wildlife Project, Bristol
4. White Clawed Crayfish, South West England
5. Gorillas and chimpanzees, Cameroon
6. Sustainable Community Development, Cameroon
7. African Penguins, South Africa
8. Livingstone’s fruit bats, Union of Comoros
9. Lemurs, Madagascar
10. Turtles, Vietnam
11. Silvery-brown tamarins, Colombia
12. *Partula* Snails, French Polynesia

![Fig 9: Measuring white-clawed crayfish as part of a BCSF programme in the UK](image)
Along with international projects, the Bristol Conservation and Science Foundation is committed to conservation at home; a Native Species Officer advises on the development of the National Wildlife Conservation Park, works to increase biodiversity at Bristol Zoo Gardens, and takes forward native species projects in the South West.

In addition, the proposed National Wildlife Conservation Park is to be divided into ecologically-themed zones, each explicitly linking to the areas where conservation is undertaken.

**Proposed exhibit areas for the National Wildlife Conservation Park**

1. Ancient woodland, Britain
2. Other British habitats
3. Kolkheti Ramsar site, Georgia
4. Bardia National Park, Nepal
5. Shishou State Reserve, Hubei, China
6. Qinling mountains, Sichuan, China
7. Lomako Forest, Democratic Republic of Congo
8. Gunung Leuser National Park, Sumatra
9. Moheli, Republic of Comoros
10. Tarangire National Park, Tanzania
11. Tortuguero National Park, Costa Rica

**Fig 10:** African Penguins, part of a BCSF conservation programme in South Africa
2. How is BCWEZS achieving Sustainability?

A. Ecological footprint and ‘One Planet Living’

An organisation’s ecological footprint is an estimate of the amount of biologically productive land and sea area needed to generate the resources used by, and to absorb the waste of the organisation, given prevailing technology. Ecological footprint analysis compares human demand on nature against the biosphere’s ability to meet that demand. Ecological footprinting is now widely used around the globe as an indicator of environmental sustainability, by converting the consumption of energy, biomass, building material, water and other resources into a normalised unit of land area called a Global Hectare (gHa). It can be used to measure and manage the use of resources throughout the economy, and is commonly used to explore the sustainability of individual lifestyles, goods and services, organisations, industry sectors, neighbourhoods, cities, regions and nations.

The Bioregional and WWF One Planet Living initiative highlighted that there has been a rise in the global ecological footprint by 150% in the last 40 years. This initiative aims to decrease the amount of natural resources used by the human population, by encouraging individuals and businesses to live and work within the resource limits of one planet. It outlines ten principles to follow in order to minimise the use of natural resources (Fig 11). The initiative can be used as part of an accredited Environmental Management System such as ISO 14001.

Fig 11: The ten principles of one planet living

1. Zero carbon
2. Zero waste
3. Sustainable transport
4. Sustainable materials
5. Local and sustainable food
6. Sustainable water
7. Land use and wildlife
8. Culture and heritage
9. Equity and local economy
10. Health and happiness
B. Applying Ordered Retreat

The concept of Ordered Retreat provides a hierarchy of actions for organisations to follow in order to reduce their environmental impact (Fig 12). After measuring, auditing and analysing the impact, the next step is to stop, avoid or reduce it. Where such reductions are not possible, organisations should consider renewable alternatives before undertaking offsetting options. Progress can be reviewed through the feedback loop, enabling continuing improvements.

In Table 2 we have tried to apply this four-stage feedback loop to the following elements of environmental sustainability:

1. Carbon
2. Energy
3. Water
4. Transport and Travel
5A. Waste: organic
5B. Waste: inorganic
6A. Procurement: Materials
6B. Procurement: Food (for animals and visitors)
6C. Procurement: Retail supplies
6D. Procurement: Business services and supplies
7A. Biodiversity: Breeding Programmes
7B. Biodiversity: In the wild

The method works somewhat better for some elements than for others, but we feel that the principle of attempting to apply it to all elements is a sound one.
## The Application of 'Ordered Retreat' to all the Elements of Environmental Sustainability

<table>
<thead>
<tr>
<th>Element</th>
<th>Measure, Audit, Analyse</th>
<th>Stop, Avoid, Reduce</th>
<th>Sustainable &amp; renewable alternatives</th>
<th>Offset</th>
</tr>
</thead>
</table>
| Carbon           | • Carbon calculators:  
|                  |   ○ SALOME  
|                  |   ○ Carbon Trust  
|                  |   ○ Carbon accounting software  
|                  | • Do everything in columns 2-7B                                                       | • Do everything in columns 2-7B                   | • Credible Carbon Offset scheme, e.g.:  
|                  |                                                                                       |                                                  | ○ World Land Trust  
|                  |                                                                                       |                                                  | ○ Woodland Trust  
|                  |                                                                                       |                                                  | ○ PURE Trust  
|                  |                                                                                       |                                                  | ○ The Converging World  
| Energy           | • Sub-metering  
|                  |   • Bill auditing  
|                  | • Insulate  
|                  | • Switch off  
|                  | • Natural ventilation  
|                  | • 'Green Energy'  
|                  | • Wind turbines  
|                  | • Ground/Air source heat pump  
|                  | • Solar thermal  
|                  | • Combined heat and power  
|                  | • Biofuels  
|                  | • Photovoltaics  
|                  | • Sustainable supply  
|                  | • Borehole  
|                  | • Rainwater harvesting  
|                  | • Use grey water  
|                  | • Provide clean water for communities in the developing world  
|                  | • Develop a Green Travel Plan for employees & visitors  
| Water            | • Sub-metering  
|                  |   • Bill auditing  
|                  | • Waterless urinals  
|                  | • Compost toilets  
|                  | • Spray taps  
|                  | • Water butts  
|                  | • Travel less  
|                  | • Bicycle  
|                  | • Walk  
|                  | • Public transport  
|                  | • Low emission vehicles  
|                  | • Video & web conferencing  
| Transport & Travel| • Visitor surveys  
|                  |   • Staff surveys  
|                  | • Minimise waste  
|                  | • Low-flush toilets  
|                  | • Compost toilets  
|                  | • In-vessel composting  
|                  | • Anaerobic digestion  
|                  | • Reed bed water treatment  
|                  | • Avoid landfill  
|                  | • Provide sustainable technology to developing world  
|                  | • Credible Carbon Offset scheme, e.g.:  
|                  |   ○ World Land Trust  
|                  |   ○ Woodland Trust  
|                  |   ○ PURE Trust  
|                  |   ○ The Converging World  
| Organic Waste    | • Audit all exported waste  
|                  | • Minimise waste  
|                  | • Low-flush toilets  
|                  | • Compost toilets  
|                  | • In-vessel composting  
|                  | • Anaerobic digestion  
|                  | • Reed bed water treatment  
|                  | • Avoid landfill  
|                  | • Provide sustainable technology to developing world  
|                  | • Credible Carbon Offset scheme, e.g.:  
|                  |   ○ World Land Trust  
|                  |   ○ Woodland Trust  
|                  |   ○ PURE Trust  
|                  |   ○ The Converging World  
| Inorganic Waste  | • Audit all exported waste  
|                  | • Less packaging  
|                  | • Responsible hazardous waste disposal.  
|                  | • Recycle plastic, glass, paper, cardboard.  
|                  | • Re-use containers  
|                  | • Use biodegradable alternatives  
|                  | • Avoid landfill  
|                  | • Provide sustainable water treatment in developing world  
|                  | • Credible Carbon Offset scheme, e.g.:  
|                  |   ○ World Land Trust  
|                  |   ○ Woodland Trust  
|                  |   ○ PURE Trust  
|                  |   ○ The Converging World  

Table 2: The application of Ordered Retreat to the elements of environmental sustainability. Part 1
<table>
<thead>
<tr>
<th>Element</th>
<th>Measure, Audit, Analyse</th>
<th>Stop, Avoid, Reduce</th>
<th>Sustainable &amp; renewable alternatives</th>
<th>Offset</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Procurement</strong></td>
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<td><strong>Materials</strong></td>
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<td><strong>Food</strong></td>
<td>6B</td>
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<td><strong>Retail supplies</strong></td>
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<td><strong>Biodiversity</strong></td>
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<tr>
<td><strong>Breeding programmes</strong></td>
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<tr>
<td><strong>In the wild</strong></td>
<td>7B</td>
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</table>
Ordered Retreat, Step 1: Measure, audit, analyse

(a) What is being measured?

Environmental Key Performance Indicators (KPIs)

Measuring environmental performance allows an organisation to determine what measures are working to reduce environmental impacts. The first key aspect is to establish those specific environmental impacts that make up an organisation’s ecological footprint. These elements can then each be assessed to create a list of quantifiable and measurable KPIs, which can be used to define targets and benchmarks. It is important that the chosen environmental KPIs fit within existing social and financial reporting frameworks, to enable easy assessment of current environmental performance. KPIs can also be used for external benchmarking against similar organisations or against ‘best practice’ data.

Establishing the right KPIs

The Society has chosen an elemental approach to establishing its list of KPIs, dividing them into categories: Carbon, Energy, Water, Travel, Waste, Procurement, and Biodiversity (Table 3). This approach was chosen because the categories provide a simple, straightforward framework in which to report performance.

In order to be able to compare figures year-on-year and between organisations, the boundaries of what is reported must be clearly defined. The Society reports on Bristol Zoo, the National Wildlife Conservation Park and the Bristol Conservation and Science Foundation separately wherever possible; this can then be summed up to give the Society’s total impact. In addition, boundaries upstream (suppliers) and downstream (visitors) in the supply chains must be considered. Any impacts that arise from actions of the Society are classed as direct, such as burning wood pellets in the biomass boiler or impacts associated with the amount of waste sent to landfill. Any products that the Society buys will have an associated environmental impact as a result of their production and transport, leading to an indirect impact for the Society. Visitor travel also constitutes an indirect impact for the Society, given that the zoo benefits from visitors travelling to the zoo through admission charges and other visitor spending.

Measuring KPIs

Once the KPIs to be measured and their boundaries have been established, it is important to decide what metrics to use and how to collect the data. The data collected must be useable and easy to interpret. Using universal units is also helpful to enable comparison with best practice figures and with other organisations. For each environmental element, specific measurement methods must be adopted. For example, energy or water consumption can be measured...
using meters or bills from suppliers; bespoke measurement systems may have to be devised for other elements such as assessing travel or waste impact.

**Challenges**

Comparing environmental performance year-on-year or across organisations is made complex by a number of different impacts that contribute to variability. For example, in zoos, energy is used for maintaining suitable environments for the animals, as well as associated with visitors, with the latter varying with annual visitor numbers. Weather also affects visitor numbers and energy used for heating or cooling, so can make year-on-year comparisons of performance difficult. Variation in the age and construction of buildings can also make comparative environmental performance difficult. For example, additions and changes historically to the buildings at Bristol Zoo mean that metering and apportioning environmental impacts to specific buildings or zoo areas is difficult to achieve. These challenges must be assessed on a case-by-case basis and appropriate decisions made.

**BCWEZS Key Performance Indicators List**

Table 3 shows a list of KPIs that are relevant to the sustainability performance of the Society and its operating units. The list is not exhaustive and may be amended as new information about the Society’s sustainability performance emerges. The KPIs will be reported on to the Society’s Trustees on either a quarterly or annual basis. At Bristol Zoo, the KPIs within this list fit into the EMS. This gives targets that change annually to ensure that the zoo continues to measure and improve its environmental performance.
<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>REPORT</th>
<th>BZG</th>
<th>NWCP</th>
<th>BCSF</th>
<th>10 YEAR TARGET</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Carbon</td>
<td>Carbon emissions excluding visitor travel</td>
<td>tCO₂</td>
<td>Annually</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>↓ 25%</td>
</tr>
<tr>
<td></td>
<td>Carbon emissions including visitor travel</td>
<td>tCO₂</td>
<td>Annually</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>↓ 25%</td>
</tr>
<tr>
<td>2. Energy</td>
<td>Electricity consumption</td>
<td>kWh</td>
<td>Quarterly</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>↓ 30%</td>
</tr>
<tr>
<td></td>
<td>Gas consumption</td>
<td>kWh</td>
<td>Quarterly</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>↓ 30%</td>
</tr>
<tr>
<td></td>
<td>Consumption of renewable heat sources</td>
<td>kWh</td>
<td>Quarterly</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>↑ 30%</td>
</tr>
<tr>
<td></td>
<td>Percentage of renewable energy used of total</td>
<td>%</td>
<td>Quarterly</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>50% of total</td>
</tr>
<tr>
<td></td>
<td>energy consumed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Water</td>
<td>Mains water usage</td>
<td>M³</td>
<td>Quarterly</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>↓ 30%</td>
</tr>
<tr>
<td></td>
<td>Waste water to mains sewerage</td>
<td>M³</td>
<td>Quarterly</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>↓ 10%</td>
</tr>
<tr>
<td></td>
<td>Grey water used</td>
<td>M³</td>
<td>Quarterly</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>↑ 100%</td>
</tr>
<tr>
<td>4. Travel</td>
<td>Carbon emissions from visitor travel</td>
<td>tCO₂</td>
<td>Annually</td>
<td>✓</td>
<td></td>
<td></td>
<td>↓ 20%</td>
</tr>
<tr>
<td></td>
<td>Carbon emissions from staff commuting</td>
<td>tCO₂</td>
<td>Annually</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>↓ 30%</td>
</tr>
<tr>
<td></td>
<td>Carbon emissions from business travel</td>
<td>tCO₂</td>
<td>Annually</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>↓ 50%</td>
</tr>
<tr>
<td>5. Waste</td>
<td>Waste sent to landfill</td>
<td>t</td>
<td>Quarterly</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>↓ 25%</td>
</tr>
<tr>
<td></td>
<td>Percentage of organic waste by weight</td>
<td>%</td>
<td>Quarterly</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>100% of total</td>
</tr>
<tr>
<td></td>
<td>being composted</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Percentage of inorganic waste by weight</td>
<td>%</td>
<td>Quarterly</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>25% of total</td>
</tr>
<tr>
<td></td>
<td>being recycled</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ELEMENT</td>
<td>DESCRIPTION</td>
<td>UNIT</td>
<td>REPORT</td>
<td>BZG</td>
<td>NWCP</td>
<td>BCSF</td>
<td>10 YEAR TARGET</td>
</tr>
<tr>
<td>---------</td>
<td>------------------------------------------------------------------------------</td>
<td>------------</td>
<td>----------</td>
<td>-----</td>
<td>------</td>
<td>------</td>
<td>----------------</td>
</tr>
<tr>
<td>6A. Procurement: Building Materials</td>
<td>Building materials transport impact</td>
<td>Kg.Km</td>
<td>Annually</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td>↓ 30%</td>
</tr>
<tr>
<td></td>
<td>Materials sourced within 100 Km (by weight)</td>
<td>%</td>
<td>Annually</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td>80% of total</td>
</tr>
<tr>
<td></td>
<td>Building materials disposed of during construction (by weight)</td>
<td>%</td>
<td>Annually</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td>10% of total</td>
</tr>
<tr>
<td>6B. Procurement: Food</td>
<td>Animal, visitor and hospitality food transport impact</td>
<td>Kg.Km</td>
<td>Quarterly</td>
<td>✔</td>
<td></td>
<td></td>
<td>↓ 50%</td>
</tr>
<tr>
<td></td>
<td>Visitor &amp; hospitality food sourced within 100Km (by weight)</td>
<td>%</td>
<td>Quarterly</td>
<td>✔</td>
<td></td>
<td></td>
<td>80% of total</td>
</tr>
<tr>
<td></td>
<td>Animal food sourced within 100km (by weight)</td>
<td>%</td>
<td>Quarterly</td>
<td>✔</td>
<td></td>
<td></td>
<td>80% of total</td>
</tr>
<tr>
<td></td>
<td>All food sourced with accreditation such as Fairtrade or Rainforest Alliance (by weight)</td>
<td>%</td>
<td>Quarterly</td>
<td>✔</td>
<td></td>
<td></td>
<td>25% of total</td>
</tr>
<tr>
<td>6C. Procurement: Retail</td>
<td>Retail transport impact</td>
<td>Kg.Km</td>
<td>Quarterly</td>
<td>✔</td>
<td></td>
<td></td>
<td>↓ 30%</td>
</tr>
<tr>
<td></td>
<td>Retail products sourced with accreditation such as Fairtrade or Rainforest Alliance (by weight)</td>
<td>%</td>
<td>Quarterly</td>
<td>✔</td>
<td></td>
<td></td>
<td>50% of total</td>
</tr>
<tr>
<td></td>
<td>Retail supplies sourced within 100km (by weight)</td>
<td>%</td>
<td>Quarterly</td>
<td>✔</td>
<td></td>
<td></td>
<td>50% of total</td>
</tr>
<tr>
<td></td>
<td>Paper or wood products carrying FSC certification (by weight)</td>
<td>%</td>
<td>Quarterly</td>
<td>✔</td>
<td></td>
<td></td>
<td>100% of total</td>
</tr>
<tr>
<td>6D. Procurement: Business Supplies and Services</td>
<td>Business supplies transport impact</td>
<td>Kg.Km</td>
<td>Quarterly</td>
<td>✔</td>
<td></td>
<td></td>
<td>↓ 30%</td>
</tr>
<tr>
<td></td>
<td>Business supplies sourced within 100Km (by weight)</td>
<td>%</td>
<td>Quarterly</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>75% of total</td>
</tr>
<tr>
<td></td>
<td>Paper products carrying FSC certification or are more than 75% recycled.</td>
<td>%</td>
<td>Quarterly</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>100% of total</td>
</tr>
<tr>
<td>7A. Biodiversity: Breeding Programs</td>
<td>Number of species in collections in threatened categories on IUCN Red List</td>
<td>number</td>
<td>Annually</td>
<td>✔</td>
<td></td>
<td></td>
<td>↑ 30%</td>
</tr>
<tr>
<td></td>
<td>Number of species in collections in EAZA and global managed breeding programmes</td>
<td>number</td>
<td>Annually</td>
<td>✔</td>
<td></td>
<td></td>
<td>↑ 30%</td>
</tr>
<tr>
<td>7B. Biodiversity: in the wild</td>
<td>Number of UK threatened species on BZG and NWCP sites</td>
<td>number</td>
<td>Annually</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td>↑ 10%</td>
</tr>
<tr>
<td></td>
<td>Value of BCSF projects</td>
<td>£</td>
<td>Annually</td>
<td>✔</td>
<td></td>
<td></td>
<td>↑ 200%</td>
</tr>
</tbody>
</table>
(b) Frameworks for Measuring

Once the KPIs have been established, a system for data collection must be set up. A range of pre-established standards and frameworks are available which provide an effective way of managing the data gathering process. Several of these standards have been used by the Society and are described below.

**Environmental Management System: ISO 14001**

The international standard ISO 14001 specifies a model for an Environmental Management System which can be applied to any organisation regardless of size or type. An effective EMS establishes a framework to help organisations systematically identify, evaluate, manage and decrease the environmental impacts of their activities, products and services. The system is based on four processes (PLAN – DO – CHECK – REVIEW) and can be internally audited by trained individuals as well as by obligatory external auditors. At the Zoo, members of Team Green have been trained in this auditing process. After identification of specific environmental impacts and applicable legal requirements, the significance of each area must be evaluated. It is upon the results of this evaluation process that the management system will be based and the list of the most relevant KPIs for an organisation can be established.

**Global Reporting Initiative (GRI)**

The Global Reporting Initiative was established to create a sustainability reporting framework to enable organisational performance to be compared year-on-year and between organisations. The scheme requires that each organisation publicly communicates its economic, environmental and social performance. The initiative has been used by BCWEZS to help establish the selection of bespoke KPIs tailored to the many specific needs of zoological gardens (Table 3). The intention has been to maintain the comparative nature of the GRI framework, but to reduce the number to the key aspects zoos should be reporting on.

**Carbon Trust Standard**

The Carbon Trust Standard was created in June 2008 to encourage all public and private sector organisations to reduce carbon emissions year on year. The Carbon Trust Standard is a mark of excellence is awarded to organisations that measure, manage and reduce carbon emissions. The Standard focuses on the direct action taken by organisations, and is only awarded to companies and organisations which measure their carbon emissions year-on-year and show an absolute reduction or relative reduction of >2.5%. Thus far, the Standard has been awarded to over 250 organisations with certified footprints totalling 28 mtCO₂ and certified reductions of 2 mtCO₂. The Society hopes to lead the way among zoos and other visitor attractions in the UK by achieving this standard in due course.
Measuring greenhouse gas emissions

The carbon footprint of an organisation is a measure of total greenhouse gas emissions from its activities. The six Kyoto Protocol greenhouse gases (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride) are converted to tonnes of carbon dioxide equivalent (tCO₂e).²⁰

The Greenhouse Gas Protocol standard is commonly used to categorise an organisation’s emissions into three groups or ‘scopes’:

Scope 1: Direct emissions: emissions from activities within the organisation’s control, such as on-site fuel combustion, refrigerant losses and company vehicles.

Scope 2: Indirect emissions: indirect emissions from electricity, heat or steam purchased and used by the organisation.

Scope 3: Other indirect emissions: any other indirect emissions from sources not directly controlled by the organisation. Examples include: business travel, visitor travel, staff commuting, procurement of materials, and food, waste and water.

Most organisations measure and report scope 1 and 2 emissions only, as required by the Carbon Trust, the Prince of Wales’s Mayday initiative, DEFRA, Forum for the Future’s West of England Carbon Challenge and nearly all other reporting schemes.

A tool for measuring ecological footprints: SALOME

Named after one of Bristol Zoo’s female western lowland gorillas, SALOME is a software tool created by Carbon Plan in conjunction with BCWEZS to measure, monitor and manage the organisation’s carbon and ecological footprints. Data from the nominal ledger are allocated to different categories, and conversion factors derived from comparable industry norms are applied to give carbon and ecological footprints. The conversion factors must be reviewed each year to take into account inflation and changes in global trade.

This tool also provides a means of modelling the impacts of environmental targets in terms of cost, carbon or environment, bringing together different reporting parameters. Since 2005, the SALOME process has been used at Bristol Zoo to produce a comprehensive annual report on carbon emissions, and to establish benchmarks and targets for the following years.
A tool for monitoring and analysing environmental data: environmental accounting software

The Society is currently considering the use of environmental accounting software to monitor and analyse our environmental KPIs, as well as our carbon footprint. This will allow us to enter data specific to our own KPIs, and provide regular reports to track progress.

(c) Setting Targets and Monitoring Progress

Once the initial data have been collected and the relevant KPI figures calculated, it is possible to set quantifiable targets to work towards, which can be inserted into the EMS. Initial KPI figures can also be used to compare the organisation’s performance in different elements to highlight which have the biggest impact on the overall ecological footprints, enabling strategies for improving performance to be focused. The reporting frequency, level of detail and format need to be decided, to fit in with the guidelines of all the initiatives to which the organisation has signed up. In addition to targets set internally, Bristol Zoo has also pledged to achieve targets set by a range of external initiatives:

1. ISO 14001 accreditation: Our Environmental Management Plan (EMP) will continue to be audited every six months. The EMP must set annual targets for the KPIs that must be audited to keep the ISO14001 accreditation. Bristol Zoo continues to look at other areas for improvement as well as reduction of our overall carbon footprint.

2. Forum for the Future: The West of England Carbon Challenge: This initiative was established to encourage local businesses to reduce their carbon emissions in line with the UK governments CRC energy efficiency scheme. The initiative requires that members reduce their carbon emissions by 10% within four years (by 2012 in the case of Bristol Zoo).

3. The Prince of Wales’s May Day initiative: The Society pledged in 2008 to reduce its carbon emissions by 2.5% every year for the next five years. Our carbon footprint is reported annually to the May Day Initiative and members are encouraged to work with suppliers and customers to assist in reducing their emissions.

4. The Bristol Green Capital Momentum Group Pledge aims to accelerate the pace of change in the local economy and community towards a low carbon future, by tackling both the issue of climate change and the overuse of finite natural resources. It requires members to report their climate change emissions annually.
**Ordered Retreat, Step 2: Stop, Avoid, Reduce**

Where negative environmental impacts have been identified, the next stage of Ordered Retreat is to consider ways in which those impacts can be prevented or reduced. Examples of how this can be achieved for each of the Society’s KPI elements are detailed in Table 2 (pg 11). The best place to start is to tackle the ‘easy wins’. These are the aspects of an organisation’s work that can easily be changed, often not requiring additional cost. For example, switching off equipment when it is not being used or setting the room heating thermostats at 18°C instead of 20°C are small changes, but they can have a significant impact in terms of reducing overall use of resources and money if the whole organisation buys into the sustainability culture.

Many of these easy wins involve behavioural change; organisations must consider how they will be able to promote and sustain more efficient work practices and monitor progress. The Environmental Policy (as required by ISO 14001) helps to send a positive message from the top that sustainability is high on the organisation’s agenda and requires participation from everyone. Bristol Zoo has a group of volunteers from different departments to form ‘Team Green’, who work hard to ensure the zoo is meeting its sustainability objectives.

Once ‘easy wins’ have been identified and implemented, the next stage is to consider initiatives that require capital investment, but which should pay for themselves in savings within a relatively short time (e.g. 1-2 years). E.g. changing all tungsten filament bulbs to compact fluorescent bulbs or LEDs. When considering the payback period, it is important to ensure that the life of the product will exceed the time it takes for payback to be achieved and to factor in any additional maintenance costs that may be required during this time.

Consideration should then be given to more costly options that will have a longer payback period (e.g. 5+ years); these might include installing a more energy-efficient heating system or retrofitting insulation to a building. Again, careful consideration to payback and whole life energy use are crucial. Also, it must be considered whether a scheme will cause an increase in environmental impacts elsewhere within the organisation; for example, solar shading may reduce the cooling load, but it may also increase the heating requirement in the winter, negating the initial benefit.

Finally, there are those options for reducing the ecological footprint that may be so costly that the payback period may not seem to make them a viable option. However, if the organisation, such as Bristol Zoo, is a visitor attraction, and has strong links with science and research organisations, some initiatives may be worth while based on the added visitor interest or research funding they may attract.

Overall, this stage requires a holistic approach to establish what sustainable initiatives will truly help to reduce the ecological footprint from a whole life cycle perspective and in a cost-effective manner. This approach enables key stakeholders and those in charge of apportioning budgets to make informed decisions about the schemes the Society should or should not invest in.
Ordered Retreat, Step 3: Renewable alternatives

An organisation cannot depend on non-renewable sources within the framework of sustainable development. Suggested renewable alternatives for each of the sustainability elements are provided in Table 2 (pg 11). However, there are often complex trade-offs involved in establishing whether these initiatives would be viable in the long term from all three triple bottom line (financial, social and environmental) perspectives. In the same way as when considering schemes to stop or reduce environmental impacts, the viability of renewable alternatives must be assessed using life-cycle analysis, including consideration of capital cost, maintenance cost, payback period, embodied energy and impact on disposal.

The concept of renewable alternatives is very wide ranging, and alternatives exist for all elements:

1. **Carbon**: reducing direct and indirect carbon emissions involves incorporating renewables into elements 2-7 below.

2. **Energy**: Wind turbines, ground or air-source heat pumps, solar thermal or photovoltaic panels, combined heat and power, tidal power, biofuels.

3. **Water**: Sustainable use of water, harvesting and using rainwater; we are considering a borehole.

4. **Transport and Travel**: Cycling, walking, using public transport, low emission vehicles, reducing the need for transport by using video- or web-conferencing.

5. **Waste**: composting inorganic waste, using biodegradable alternatives to inorganic waste and recycling as much as possible.

6. **Procurement**: sustainable sourcing of all materials, food and supplies.

7. **Biodiversity**: Breeding programmes for threatened species, reintroduction programmes for zoo-bred animals and sustainable sourcing of all other animals and plants.

Additional factors must be considered before the overall benefit of such schemes can be measured. For example, if wind turbines are proposed as an alternative for generating electricity, we must consider the local residents in terms of noise and visual impact. In addition, could they disturb local wildlife and have a negative impact upon biodiversity? It is important to understand clearly the dynamics of a proposed location to be able to assess the overall benefits and costs of a renewable alternative scheme.
Ordered Retreat, Step 4:
Offset

There are sometimes negative environmental impacts that are unavoidable. These must be offset, but this should only be done after working down through all the stages of Ordered Retreat.

Offsets are commonly only applied to carbon emissions, but it can be applied to any of the sustainability elements, as shown in Table 2 (pg 11). For example, schemes which involve forest regeneration in developing countries not only have a carbon offsetting value, but can provide a sustainable income for communities and also benefit biodiversity by protecting the forest.

There is a range of carbon offsetting schemes available, some of which also incorporate protecting endangered species and ecosystems. The UK government has established a quality assurance scheme for carbon offsetting, and there are several international standards, both for schemes that are purely based on renewable energy generation and those that consider reforestation and biodiversity. Some examples of carbon offset schemes that the Society is currently considering are given below.

World Land Trust

The World Land Trust (WLT) is an international conservation organisation that takes direct action to save rainforest and other wildlife habitats. They run Carbon Balanced, a carbon offsetting scheme that both offsets CO₂ emissions and conserves biodiversity. These projects combine the reduction of atmospheric carbon with addressing urgent global threats by providing secure habitats for wildlife. The schemes are accredited by the Climate, Community and Biodiversity Project Design Standards (CCB Standards), and include both reforestation of cleared land and ‘avoided deforestation’ – i.e. preventing release of emissions by cutting down standing forest. The current cost of offsetting one tonne of CO₂ is £15.

Woodland Trust

The vision of the Woodland Trust is to see a UK rich in native woods and trees enjoyed and valued by everyone. The Trust believes planting trees is a viable way to capture and store the carbon when its production cannot be avoided. The Trust estimates that one hectare of newly created woodland will sequester one tonne of CO₂, at a current cost of £25. This scheme is not currently accredited but is working with the Forest Stewardship Council (FSC) to set up a UK-based certification for forestry schemes.

The Converging World

The Converging World (TCW) is a charity that uses proven technologies to generate clean, renewable energy, and invests the profits in sustainable development overseas (primarily in Tamil Nadu, India) while working to reduce the carbon footprints of people in the

22
UK. It sees carbon reduction as the best available means to promote sustainable development globally and to address the increasingly devastating effects of climate change. TCW is going to sell and retire WWF Gold Standard carbon credits from late 2010. The Society is considering embarking on a partnership with Converging World to bring together some of their projects overseas, so as not only to advance our biodiversity pledges, but also to benefit local communities.

**PURE Trust**

PURE is a UK based carbon offset charity that supports international and UK renewable energy projects. All the schemes comply with the UK Government’s Quality Assurance Scheme. Current international projects are wind farms in Costa Rica and China, a crop waste power plant in India, hydroelectric projects in China, and sustainable forestry projects in Brazil. In the UK, PURE offers grants to UK schools and charities to install solar panels, wind turbines and other zero/low carbon energy technologies.

**C. Communicating Environmental Sustainability**

**Why Communicate?**

Demonstrating how an organisation has improved its environmental sustainability through the process of Ordered Retreat is vital to its success, but it is equally important to communicate these improvements and plans for the future. This Manifesto is one such way in which the Society is promoting our environmental commitments and sharing best practice with a wider audience.

It is only through communication that zoos and other visitor attractions can influence how their visitors think and act towards environmental issues. The large number of visitors that Bristol Zoo attracts every year means there is huge potential to communicate with them, sharing our vision of creating a sustainable future for wildlife and people. Additionally, the link between protecting endangered species and habitats with specific environmental choices can be explained to our visitors very clearly.

**Who are our audiences?**

An organisation must identify the audience to which it is communicating. Bristol Zoo has a young audience which offers a significant opportunity to change the thinking of a generation. Additionally, through the Bristol Conservation and Science Foundation, the Society has an opportunity to communicate with a scientific audience, and, through national and international organisations such as BIAZA, EAZA and WAZA, we have the opportunity to communicate and share practice within the wider zoo community. Through our outreach programmes we have the opportunity to target a wide range of audiences such as schools, care homes, festivals and shows.
How are we communicating?

Bristol Zoo communicates with its visitors in many different ways. Formally, it holds education sessions and holds presentations around the Zoo, as well as displays and animal encounters. 37,398 children and adults attended one of our education sessions in 2009, 37% of which discussed sustainability. We also highlight specific environmental issues connected with exhibits, such as the use of FSC-accredited timber to build the Monkey Jungle, containing many species which are threatened by deforestation; and the Heap of Trouble, an exhibit made from a year’s worth of waste of a typical household.

We communicate environmentally friendly actions for our visitors to do, such as buying FSC timber and paper and we encourage them to recycle. Some of the zoo’s actions are very obvious to visitors—such as turning off the Splash exhibit on quiet days to conserve water, the MSC certified fish and Palm oil free ice cream available in our restaurants. Additionally our summer campaigns (e.g. 2010 Year of Biodiversity, 2009 Year of the Gorilla) send strong messages about conservation and sustainability. We also run events throughout the year, such as plant conservation week. We promote sustainable methods of travelling to the Zoo on our website and in our leaflets.

Externally, we run outreach programmes to various groups, such as the Women’s Institute, Scouts and Guides, schools and libraries, and the Bristol Festival of Nature. In 2009 we ran 116 such programmes, taking some of our smaller animals, such as tarantula spiders and giant stick insects, into the community to communicate about species, ecosystems and conservation.
3. What has BCWEZS achieved so far?

The Key Performance Indicators (KPIs) that the Society is using to evaluate its environmental impact have been detailed in Table 3 (pg 15). Bristol Zoo, the Bristol Conservation and Science Foundation and the National Wildlife Conservation Park are at different stages of implementing sustainable practices; and the progress of the three operating units is discussed separately below.

A. Bristol Zoo Gardens

The Zoo is committed to improving environmental performance across all areas. This will now be considered in terms of the KPIs outlined in Table 3, providing data from 2006 where available and a progress report with current practices and future plans. The annual targets for each element in 2010 are set alongside the reported figures from 2009.

At present, the animal holding pens and nurseries at the Hollywood Tower Estate (HTE), on the site for the National Wildlife Conservation Park, are entirely used for the benefit of Bristol Zoo, and as such are currently reported within the Zoo's KPIs. In future, the nurseries and the animal holding areas will also be used for the National Wildlife Conservation Park and at that time the carbon footprint of this resource will be split accordingly.
1. Carbon

<table>
<thead>
<tr>
<th>Carbon</th>
<th>Measure, Audit, Analyse</th>
<th>Stop, Avoid, Reduce</th>
<th>Renewable Alternatives</th>
<th>Offset</th>
</tr>
</thead>
</table>
| 1               | • Carbon calculators e.g.:  
                  ○ SALOME  
                  ○ Carbon Trust  
                  ○ Carbon accounting software  
                  • Do everything in energy, water, travel, waste, procurement & biodiversity sections  
                  • Do everything in energy, water, travel, waste, procurement & biodiversity sections  
                  • Credible Carbon Offset scheme, e.g.:  
                    ○ World Land Trust  
                    ○ The Converging World  
                    ○ PURE Trust  
                    ○ Woodland Trust |

Table 4: The application of Ordered Retreat to Carbon.

Table 5: Carbon KPIs

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>REPORT</th>
<th>10 YEAR TARGET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon</td>
<td>Carbon emissions excluding visitor travel</td>
<td>tCO₂</td>
<td>Annually</td>
<td>↓ 25%</td>
</tr>
<tr>
<td></td>
<td>Carbon emissions including visitor travel</td>
<td>tCO₂</td>
<td>Annually</td>
<td>↓ 25%</td>
</tr>
</tbody>
</table>

Bristol Zoo is committed to decreasing its CO₂ emissions by a target annual decrease of 2.5% through the May Day Initiative and the Forum for the Future West of England Carbon Challenge. CO₂ emissions are measured in accordance with the Carbon Trust Standard and calculated using the SALOME measuring tool. The Zoo’s carbon footprint from 2006-09 is shown in Table 6, and the top nine contributors in Fig 19.

Table 6: Bristol Zoo Garden’s Carbon KPIs, and percentage change from 2006-2009

<table>
<thead>
<tr>
<th>Carbon</th>
<th>Unit</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Carbon emissions including visitor travel</td>
<td>tCO₂</td>
<td>-</td>
<td>3602</td>
<td>3707</td>
<td>3710</td>
</tr>
<tr>
<td>Percentage change in CO₂ emissions from previous year</td>
<td>%</td>
<td>-</td>
<td>-</td>
<td>+ 2.9</td>
<td>0</td>
</tr>
<tr>
<td>Total Carbon emissions excluding visitor travel</td>
<td>tCO₂</td>
<td>1300</td>
<td>1339</td>
<td>1400</td>
<td>1333</td>
</tr>
<tr>
<td>Percentage change in CO₂ emissions from previous year</td>
<td>%</td>
<td>-</td>
<td>+ 2.9</td>
<td>+ 4.6</td>
<td>- 4.8</td>
</tr>
<tr>
<td>Total tCO₂ offset</td>
<td>tCO₂</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Net tCO₂ emitted (without visitor travel)</td>
<td>tCO₂</td>
<td>1300</td>
<td>1339</td>
<td>1400</td>
<td>1333</td>
</tr>
</tbody>
</table>
All the elemental components covered by the Society’s KPIs impact on the carbon footprint. The top nine contributors to the Zoo’s total carbon emissions from 2006-2009 (after visitor travel, which makes up about 60% each year) are shown in Fig 19. Between 2006 and 2008 we did not reduce our CO₂ emissions, largely because of development in the Zoo. In 2009 we reduced our carbon emissions (excluding visitor travel) by 4.8% against 2008. This was largely by reducing our gas consumption by increasing energy-saving measures and staff training since 2008.

Fig 19: Top nine contributors (after visitor travel) to Bristol Zoo Garden’s carbon footprint from 2006-09 in tCO₂

What changes have been made?

Many changes affecting the different elemental components of the KPIs have been put in place in 2008 and 2009 to improve the sustainability of all areas, which should be reflected in the carbon footprint. Additionally, the continued development of the Zoo will mean a rise in CO₂ emissions with specific developments. This additional CO₂ will have to be offset in order for the Zoo to meet its target of a 2.5% year on year decrease in CO₂ emissions.

Carbon Offset

In 2009, Bristol Zoo emitted a total of 1333 tCO₂ from its activities, which, at a notional £15 a tonne, equals £19,995. Therefore, in 2010, £20,000 has been set aside from the budget to offset these carbon emissions. We will do this through The Converging World, and the World Land Trust schemes (pg 24), and will also make a contribution to reforestation projects that are part of the Bristol Conservation and Science Foundation project in the Comoros Islands.
2. Energy

Table 7: The application of Ordered Retreat to Energy

<table>
<thead>
<tr>
<th>Energy</th>
<th>Measure, Audit, Analyse</th>
<th>Stop, Avoid, Reduce</th>
<th>Renewable alternatives</th>
<th>Offset</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>• Sub-metering • Bill auditing</td>
<td>• Insulate • Switch off • Natural ventilation • ‘Green Energy’</td>
<td>• Wind turbines • Ground/Air source heat pump • Solar thermal • Combined heat and power • Bio fuels • Photovoltaic panels</td>
<td>• Credible Carbon Offset scheme, e.g.: ○ World Land Trust ○ The Converging World ○ PURE Trust ○ Woodland Trust</td>
</tr>
</tbody>
</table>

Table 8: The Society’s Energy KPI targets

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>REPORT</th>
<th>10 YEAR TARGET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>Electricity consumption</td>
<td>KWh</td>
<td>Quarterly</td>
<td>↓ 30%</td>
</tr>
<tr>
<td></td>
<td>Gas consumption</td>
<td>KWh</td>
<td>Quarterly</td>
<td>↓ 30%</td>
</tr>
<tr>
<td></td>
<td>Consumption of renewable heat sources</td>
<td>KWh</td>
<td>Quarterly</td>
<td>↑ 30%</td>
</tr>
<tr>
<td></td>
<td>Percentage of renewable energy used of total energy consumed</td>
<td>%</td>
<td>Quarterly</td>
<td>50% of total</td>
</tr>
</tbody>
</table>

Second only to visitor travel, energy use contributes the largest source of carbon emissions for the Zoo (Fig 19). Energy use on site is always likely to be high due to the complex nature of maintaining a range of environmental conditions for the varied animal collection. Bristol Zoo is targeting to reduce the consumption of non-renewables (e.g. gas) annually by 3%. Overall, we are aiming to increase the proportion of renewable energy used at Bristol Zoo year on year, to 50% of total energy in ten years (Table 8).
2A. Electricity

Between 2005 and 2008 Bristol Zoo was on a ‘green tariff’ which at the time allowed the CO₂ emissions associated with electricity consumption to be set to zero. However, due to some energy companies ‘double counting’ green energy, Defra now requires that CO₂ emissions are reported based on the grid average unless the supplier has the REGO (Renewable Energy Guarantee of Origin) certificates. In 2008, Bristol Zoo moved to GQCHP (good quality combined heat and power), which had reduced CO₂ emissions associated with it, and in 2009 to green electric with the required REGO certificates.

Half-hourly meter readings are reviewed regularly to monitor electricity consumption. The annual electricity consumption from 2006-2009 is reported in Table 9 with the resultant tCO₂ emitted, calculated using reported conversion factors\(^27\) of 0.53655 in 2006, 0.54055 in 2007 and 0.298 for the CHP-backed tariff in 2008. Electricity used at the Hollywood Tower Estate (HTE) nurseries is still on a green tariff and so must be reported as grid average in 2009. This will be upgraded to green electricity, with the required REGO certificates when the contract comes up for renewal.

Electricity consumption on the Clifton site has decreased since energy saving measures were implemented in 2007 (Fig 20). We did not meet our targets however, mainly due to development. At HTE there was a 100% increase in 2009 against 2008. This was due to the overwintering of a large number of exotic birds for a new exhibit at Bristol Zoo, the Forest of Birds.

<table>
<thead>
<tr>
<th>Electricity</th>
<th>Unit</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tariff</td>
<td></td>
<td>Green Tariff</td>
<td>Green Tariff</td>
<td>GQCHP (BZG)</td>
<td>Green Electric (BZG)</td>
</tr>
<tr>
<td>Consumption</td>
<td>KWh</td>
<td>2487130</td>
<td>2526437</td>
<td>2448135 (BZG)</td>
<td>2430128 (BZG)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>66379 (HTE)</td>
<td>138016 (HTE)</td>
</tr>
<tr>
<td>Percentage change in consumption from previous year</td>
<td>%</td>
<td>-</td>
<td>+1.6</td>
<td>-3.1 (BZG)</td>
<td>-0.7 (BZG)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+108 (HTE)</td>
</tr>
<tr>
<td>Gross tCO₂ emitted</td>
<td>tCO₂</td>
<td>1334.5</td>
<td>1365.7</td>
<td>729.6</td>
<td>54.8 (HTE)</td>
</tr>
<tr>
<td>Total tCO₂ reported</td>
<td>tCO₂</td>
<td>0(^1)</td>
<td>0(^0)</td>
<td>0(^0)</td>
<td>54.8</td>
</tr>
</tbody>
</table>

\(^1\)Green Tariff rates from 2006-2008 have been zero-emission rated as they were Climate Change Levy exempt when they were supplied to us, allowed to be zero rated when reporting on those timescales.

Table 9: Electricity consumption within Bristol Zoo and associated CO₂ emissions from 2006-09
Recent measures taken to reduce electricity consumption are:

- Increased staff training, highlighting environmental awareness and best practice.
- Monitoring of energy use in specific areas. The recent purchase of an electrical removable supply meter allows the electricity use of specific areas to be more directly measured and acted on.
- Assessing the efficiency of high energy use equipment and systems. Currently, for example, low wattage LED light bulbs are being fitted in areas where their payback period is less than 2 years. All the Christmas lights displayed in 2009 also contained LEDs.
- Examination of power use during the design of every new development or refurbishment, incorporating low-energy solutions.

**Fig 20:** Monthly electricity consumption from 2007-2009
2B. Gas

Gas is used to heat most of the buildings at Bristol Zoo, and to heat water where required. Table 10 shows the annual gas consumption between 2007 and 2009 at the Zoo, and the resultant gross tCO₂ emitted, calculated using the reported conversion factor of 0.18527. The gas consumption data from 2006 was not included as much of the data is from estimated values rather than meter readings.

The rise in gas consumption between 2007 and 2008 can mainly be attributed to development within the Zoo, when the Twilight World boilers were upgraded, an additional gibbon enclosure added, and the Pavilion building was used more frequently. In 2009, after some ‘easy win’ management measures had been put in place, gas consumption dropped by 11%, with less gas being used nearly every month (Fig 21) compared with 2008.

Measures being used to reduce gas consumption are:

- Increased staff training, highlighting environmental awareness and best practice.
- Monitoring of energy use in specific areas by taking more regular (monthly) gas meter readings and analysing these for unusual increases.
- Examination of insulation and thermal efficiency of buildings during the design of every new development or refurbishment, to reduce heat loss.
- Efficiency assessment of equipment

<table>
<thead>
<tr>
<th></th>
<th>Unit</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumption</td>
<td>kWh</td>
<td>3609126</td>
<td>3707666</td>
<td>3299280</td>
</tr>
<tr>
<td>Gross tCO₂ emitted</td>
<td>tCO₂</td>
<td>667.7</td>
<td>685.9</td>
<td>610.4</td>
</tr>
<tr>
<td>Percentage change in CO₂ emissions from previous year</td>
<td>%</td>
<td>-</td>
<td>+2.7</td>
<td>-11.0</td>
</tr>
</tbody>
</table>

Table 10: Gas consumption within Bristol Zoo Gardens and associated CO₂ emissions from 2007-09

![Fig 21: Monthly gas consumption in 2008 and 2009.](image-url)
2C. Biomass

Two biomass boilers, fuelled by FSC-certified wood pellets, were installed in the new Butterfly Forest exhibit in 2008 as an alternative to gas boilers. These keep this exhibit at a constant temperature, around 20.5°C. The decision to use this alternative was based on the lower carbon emissions from the biomass boiler when compared with a conventional gas boiler of same size. Table 11 shows the consumption of wood pellets, measured by the weight burnt, in KWh, with the associated tCO₂ emitted calculated using a conversion factor of 0.13227.

From April-December 2008, a total of 17.82 tonnes of wood pellets were used to produce a total of 83754 KW power. The gross CO₂ emissions resulting from this were 2.35 tCO₂, which results in a saving of 14.9 tCO₂ when compared with gas emissions to produce the same amount of energy.

<table>
<thead>
<tr>
<th>Biomass</th>
<th>Unit</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumption of wood pellets</td>
<td>KWh</td>
<td>83754</td>
<td>225318</td>
</tr>
<tr>
<td>Gross tCO₂ emitted</td>
<td>tCO₂</td>
<td>2.35</td>
<td>6.33</td>
</tr>
</tbody>
</table>

Table 11: Wood pellet consumption within the Zoo and associated CO₂ emissions in from April 2008 (on the opening of the exhibit) and in 2009

2D. Percentage of renewable energy supply

The proportion of renewables used has increased from 2007-09 by the use of green electricity and the introduction of a biomass boiler in the Butterfly Forest exhibit in 2008 (Table 12). This percentage can be increased in the future by making sure the HTE nurseries are on green electric and by reducing gas consumption.
Energy: Future plans

Having reduced energy consumption in 2008 and 2009 with ‘easy win’ measures, the Zoo is now considering more costly options with longer payback periods. These include:

- Modelling individual building performance: All the existing buildings at the Zoo will be assessed for thermal and electrical efficiency, accounting for heat loss and gain, natural ventilation and natural light within the building and recommendations will be made to improve the thermal efficiency and reduce energy consumption.

- Improved sub-metering: Gas and electricity sub-meters will be installed around the Zoo to improve energy monitoring.

- Renewable energy generation: The Society will install solar thermal panels, air-/ground-source heat pumps, and replace inefficient gas boilers with biomass boilers where appropriate (Fig 22). Many factors need to be considered: initially if the Society has a suitable site; energy generated verses the cost, maintenance and payback period, with consideration of the embodied energy used in manufacture.

A small scale renewable energy generation project, as a demonstration of what visitors could achieve with their own home, is also being considered.

<table>
<thead>
<tr>
<th>Summary</th>
<th>Unit</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity consumption (renewable sources)</td>
<td>KWh</td>
<td>0</td>
<td>2448135</td>
<td>2430128</td>
</tr>
<tr>
<td>Electricity consumption (non-renewable sources)</td>
<td>KWh</td>
<td>2328448</td>
<td>66379</td>
<td>138016</td>
</tr>
<tr>
<td>Gas consumption (non-renewable)</td>
<td>KWh</td>
<td>3609126</td>
<td>3707666</td>
<td>3299280</td>
</tr>
<tr>
<td>Other consumption (renewable)</td>
<td>KWh</td>
<td>0</td>
<td>83754</td>
<td>225318</td>
</tr>
<tr>
<td>Percentage of supply from renewable sources</td>
<td>%</td>
<td>0</td>
<td>40.2</td>
<td>43.6</td>
</tr>
</tbody>
</table>

Table 12: Summary of energy consumption showing the percentage of renewable energy used. Green tariff electricity from 2007 is counted as non-renewable\(^2\) and the GCHP electricity in 2008, and green electric in 2009 as renewable.
3. Water

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>REPORT</th>
<th>10 YEAR TARGET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>Mains water usage</td>
<td>m³</td>
<td>Quarterly</td>
<td>↓ 30%</td>
</tr>
<tr>
<td></td>
<td>Waste water to mains sewerage</td>
<td>m³</td>
<td>Quarterly</td>
<td>↓ 10%</td>
</tr>
<tr>
<td></td>
<td>Grey water used</td>
<td>m³</td>
<td>Quarterly</td>
<td>↑ 100%</td>
</tr>
</tbody>
</table>

Like other utilities at Bristol Zoo, water consumption is measured using the supplier billing as well as self-metering at more regular intervals. The amount of waste water to annual sewerage is estimated by the supplier, Bristol Water, based on the water consumption. The Zoo has set an annual target to reduce water consumption by 5% year on year. Table 15 shows the annual mains water use and waste water to sewerage for the last three years.

<table>
<thead>
<tr>
<th>Water</th>
<th>Unit</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total mains water used</td>
<td>m³</td>
<td>56192</td>
<td>49681</td>
<td>44422</td>
<td>42847</td>
</tr>
<tr>
<td>Total waste water to mains sewerage</td>
<td>m³</td>
<td>40092</td>
<td>35368</td>
<td>30704</td>
<td>29624</td>
</tr>
<tr>
<td>Percentage change in mains water use</td>
<td>%</td>
<td>-</td>
<td>-11.6</td>
<td>-10.6</td>
<td>-3.5</td>
</tr>
<tr>
<td>Percentage change in waste water</td>
<td>%</td>
<td>-</td>
<td>-11.6</td>
<td>-10.6</td>
<td>-3.5</td>
</tr>
<tr>
<td>Grey water used</td>
<td>m³</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Bristol Zoo is currently meeting its water consumption targets on the Clifton site, with a year-on-year reduction since 2007 (Table 15). This has been achieved by training staff in more efficient practices, and monitoring of monthly water consumption to identify leaks and malfunctioning equipment. Fig 23 illustrates the monthly water consumption at the Zoo from 2006-09.

Currently, there is no water consumption data available from the HTE as the meter readings have been infrequent, but consumption has been estimated at around 100 m³ a year. Some measures for reduced water consumption already exist, for example the run-off from the roofs at the HTE goes into temporary storage and is then used for irrigation when required. Meter readings are now being taken frequently so water consumption can be reported accurately in the future.

**Water: recent improvements and future plans**

- Water consumption is now considered when all new exhibits or buildings are designed or component parts replaced. For example, when the Monkey Jungle exhibit was built in 2007 it was designed so that the rainfall run-off from the roof is fed into the Gorilla Island moat, which consequently requires less topping up. Similarly, the water in the Seal and Penguin Coasts exhibit is re-circulating to reduce consumption.

- The efficiency of equipment and systems will be reviewed, and some may be replaced if a reasonable payback period is offered. For example, spray taps and low-flush toilets are being installed in new buildings or when existing taps and toilets are replaced.

- Rainwater harvesting will be installed in all suitable locations for use in the gardens or to flush toilets.

- Water sub-meters will be installed at all major water access points to provide detailed auditing of consumption rates in different areas of the Zoo. Such improved sub-metering will assist in detecting any malfunctioning equipment or leaks which could lead to increased water consumption. Currently, for example, the efficiency of the reverse osmotic system in the saltwater aquarium is currently being reviewed as it has a higher than expected consumption rate.
4. Transport and Travel

<table>
<thead>
<tr>
<th>Table 16: The application of Ordered Retreat to Travel</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transport &amp; Travel</strong></td>
</tr>
</tbody>
</table>
| 4 | • Visitor surveys  
   • Staff surveys | • Travel less | • Bicycle  
   • Walk  
   • Public transport  
   • Low emission vehicles  
   • Video & web conferencing | • Develop a Green Travel Plan for employees & visitors |

Table 17: The Society’s Travel KPIs

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>REPORT</th>
<th>10 YEAR TARGET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel</td>
<td>Carbon emissions from visitor travel</td>
<td>tCO₂</td>
<td>Annually</td>
<td>↓ 20%</td>
</tr>
<tr>
<td>Travel</td>
<td>Carbon emissions from staff commuting</td>
<td>tCO₂</td>
<td>Annually</td>
<td>↓ 30%</td>
</tr>
<tr>
<td>Travel</td>
<td>Carbon emissions from business travel</td>
<td>tCO₂</td>
<td>Annually</td>
<td>↓ 50%</td>
</tr>
</tbody>
</table>

Travel by visitors and staff accounts for most of the Zoo’s carbon footprint and is therefore a key area to address. The largest proportion of this impact is from visitor travel, and although the Zoo is not directly responsible for the CO₂ emissions produced, it must consider how to influence both visitors and staff to use more sustainable methods of transport. Visitor and staff CO₂ emissions are estimated from travel surveys conducted during the year, and the business travel is estimated from available data of train, bus and car mileage as well as flights. CO₂ emissions are then calculated from mileage and converted using the reported DEFRA conversion factor for that year. Flight CO₂ emissions are calculated by using a mileage calculator to determine flight distance, then an emissions calculator.

The decrease in CO₂ emissions by 17 tCO₂ in 2008 was because fewer flights were taken than in 2007; part of a staff initiative to reduce the large proportion of CO₂ emissions from flying. The slight rise in tCO₂ from staff commuting from 2007 to 2008 (Table 18), despite there being an overall reduction in car use by 7% from 2007-09 (Fig 24) is due to an increase in the average commuting distance. Car travel is the most common mode of transport for both staff and visitors (Fig 24), accounting for more than 90% of visitor travel in 2008 and 2009, but the average visitor car occupancy is high, at 3.32 in 2008, and 3.75 in 2009. Whilst promoting more sustainable travel options, it is important that this high rate of car occupancy is maintained.
Table 18: The Society’s Travel KPIs with data from Bristol Zoo from 2007 -2009

<table>
<thead>
<tr>
<th>Travel</th>
<th>Unit</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon emissions per visitor travel</td>
<td>Kg CO₂</td>
<td>(2008 data used)</td>
<td>3.99</td>
<td>3.82</td>
</tr>
<tr>
<td>Total Carbon emissions for visitor travel</td>
<td>tCO₂</td>
<td>2263.14</td>
<td>2306.75</td>
<td>2377.0</td>
</tr>
<tr>
<td>Total Carbon emissions for staff commuting</td>
<td>tCO₂</td>
<td>119.29</td>
<td>123.89</td>
<td>114.35</td>
</tr>
<tr>
<td>Total Carbon emissions for business travel</td>
<td>tCO₂</td>
<td>50.67</td>
<td>32.92</td>
<td>49.78</td>
</tr>
</tbody>
</table>

**Travel: recent improvements and future plans**

Currently, an integrated travel plan is being developed with the aim of reducing overall carbon emissions associated with all staff and visitor travel by 10% in 2015 compared with 2010.

Measures to help achieve this include:

- Detailed travel surveys carried out annually for both staff and visitors.
- Staff will be encouraged to walk, cycle, use public transport and car share by various incentives, such as promoting car share schemes, 10% off bus passes and interest-free loans to buy bicycles. Building a sheltered, secure cycle store is also being considered. The use of video- and tele-conferencing by staff will be further encouraged.
- Sustainable travel choices will be promoted to visitors, encouraging them to walk or use public transport and bicycles. To relieve car parking problems on peak days, a park and ride service will be offered on nine days during 2010. Reduced entry tickets for visitors who walk or cycle are being discussed.
- Staff are encouraged to minimise business travel whenever possible.
- Currently, the use of the Zoo’s cars is being analysed, and the fleet may be reduced, possibly to be replaced with a club car scheme, where cars may be booked when required.
5. Waste

An organisation such as a zoo produces a large amount of waste, ranging from clinical waste to animal bedding and plastic bottles (Table 21). With each waste stream comes the challenge of responsible and sustainable disposal. Until recently, the auditing of waste collection has been patchy. However, waste streams are now being measured more accurately and reported as part of the Zoo’s Environmental Management System, which has formed the basis of the waste KPIs (Table 20).

<table>
<thead>
<tr>
<th>Waste</th>
<th>Measure, Audit, Analyse</th>
<th>Stop, Avoid, Reduce</th>
<th>Renewable alternatives</th>
<th>Offset</th>
</tr>
</thead>
</table>
| 5A Organic| • Audit all exported waste | • Minimise waste  
• Low-flush toilets  
• Compost toilets | • In-vessel composting  
• Anaerobic digestion  
• Reed bed water treatment | • Avoid landfill  
• Provide sustainable water treatment in the developing world  
• Credible Carbon Offset scheme, e.g.:  
  o World Land Trust  
  o The Converging World  
  o PURE Trust  
  o Woodland Trust |
| 5B Inorganic | • Audit all exported waste | • Less packaging  
• Responsible hazardous waste disposal | • Recycle plastic, glass, paper, cardboard  
• Re-use containers  
• Use biodegradable alternatives | • Avoid landfill  
• Help others to source food sustainably & locally  
• Credible Carbon Offset scheme, e.g.:  
  o World Land Trust  
  o The Converging World  
  o PURE Trust  
  o Woodland Trust |

Table 19: The application of Ordered Retreat to Waste

Table 20: The application of Ordered Retreat to Waste
### Table 21: The different waste streams and their disposal at Bristol Zoo

<table>
<thead>
<tr>
<th>Organic Waste</th>
<th>Disposal</th>
<th>Inorganic Waste</th>
<th>Disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal waste</td>
<td>Composted</td>
<td>Plastic Bottles</td>
<td>Recycled</td>
</tr>
<tr>
<td>Garden waste</td>
<td>Composted</td>
<td>Paper</td>
<td>Recycled</td>
</tr>
<tr>
<td>Food Waste</td>
<td>Landfill</td>
<td>Glass</td>
<td>Recycled</td>
</tr>
<tr>
<td>Cooking Oil</td>
<td>Specialist disposal</td>
<td>Tins</td>
<td>Recycled</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hazardous, chemical and electronic waste</td>
<td>Specialist disposal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>General Waste</td>
<td>Landfill</td>
</tr>
</tbody>
</table>

**Inorganic waste**

Inorganic waste (such as plastic, glass and paper) has caused serious problems for wildlife around the world, and as a champion of biodiversity and conservation, this is a vital area of management for the Zoo. In the last 18 months, a complete series of 23 recycling bin stations has been installed throughout the Zoo site, to separate various waste streams (Fig 26), enabling easy recycling of materials, and this has formed the basis of the waste KPIs (Table 20).

**Organic waste**

The production of organic waste by a zoo is also an inherent and unavoidable problem. Organic waste is produced from three main sources: the by-products of animal husbandry, visitor food waste and toilet facilities. Currently, organic waste from animal husbandry is composted at HTE, along with any organic waste from garden maintenance. Table 22 reports that the number of skips taken to Hollywood for composting reduced by 17 in 2009. This was not due to less waste being composted but by reducing the number of deliveries when the skip was not full. Food waste currently goes to landfill, but this will go into the in-vessel composter, along with cardboard and animal waste, which has been planned as part of the development of NWCP.

Available historical data is reported in Table 22. Ongoing staff training has encouraged staff to minimise waste to landfill by simple measures, such as double-sided printing, recycling and reusing as much as possible. Waste that is produced by building and refurbishment projects is kept to a minimum, and wherever possible is reused.
Table 22: Waste data available from 2008-2009

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total waste to landfill</td>
<td>Number of Eurobins</td>
<td>1204</td>
<td>978</td>
</tr>
<tr>
<td>Inorganic waste composted</td>
<td>Number of skips</td>
<td>61</td>
<td>44</td>
</tr>
<tr>
<td>Plastic bottles recycled</td>
<td>kg</td>
<td>135</td>
<td>137</td>
</tr>
<tr>
<td>Clinical waste and animal by-products</td>
<td>Number of bins</td>
<td>1122</td>
<td>1364</td>
</tr>
</tbody>
</table>

However good Bristol Zoo’s initiatives to reduce, recycle or reuse its waste products, there will remain a residue of waste that cannot be treated in this way. However, the waste management policies at the Zoo will ensure that this is minimised.

Waste: recent improvements and future plans

- **Auditing:** waste is now being audited more accurately and frequently to ensure that waste reduction targets are met.

- **Take back schemes:** where possible we return used items to suppliers to reuse or recycle parts. Recently we have returned fluorescent lights, paint tins and computers to suppliers. We also have a collection point for batteries, in line with the batteries directive to take back the batteries sold in the shop. We are collecting mobile phones for recycling as part of our Gorilla fundraising campaign.

- **Hazardous waste management:** recently the hazardous waste has been reduced by eliminating the x-ray chemicals. X-rays are now done digitally.

- **Further waste segregation:** we are re-evaluating our segregation of waste in order to maximise what can be recycled. For example, we are considering adding a food recycling bin.

- **Anaerobic digestion or in-vessel composting:** we are considering the use of an anaerobic digestion facility which processes organic waste into heat and power, or purchasing an in-vessel composter, possibly in collaboration with other organisations.

- We are considering joining a **NISP (National Industrial Symbiosis Programme)** scheme to match waste between companies and trade resource materials.

- **Minimising construction waste** by reusing materials where possible and making sure that the design of a building reduces waste. For example, a building could be designed to use whole lengths of timber instead of three-quarter lengths.

---

Fig 26: Organic waste collection
6. Procurement

The procurement of products is an essential component to the effective functioning of any organisation, and responsible supply chain management is key to achieving a sustainable procurement strategy. By managing the economic, environmental and social issues throughout the supply chain, purchasing power can effect positive change. Bristol Zoo is developing a sustainable procurement strategy which reflects the commitment of the Society to reducing its ecological footprint. The key focus of the current procurement strategy is to increase the number of products sourced locally and from sustainable sources. These two factors can sometimes be in conflict as the most sustainable source may be located further away, but a sensible and consistent approach will be applied to resolve these issues on a case by case basis.

As the move to sustainable procurement practices is relatively recent within the Zoo, no data are reported here, but the methods and practices used in sustainable procurement are discussed, and plans for the future outlined. The Society is developing a general procurement checklist for employees to run through before an item is purchased, adapted from the Forum for the Future sustainable procurement toolkits and BIAZA guidelines. These will cover other procurement options, such as hiring/sharing a purchase instead of buying it outright, consideration of the social impacts of buying a particular product and the balancing of negative impacts of the manufacture and disposal of the product with reference to its product life.

We have used the Kg.Km unit to measure the transport impact by weight of an item, but as yet have not applied the relevant mode of transport. DEFRA conversion factors for freight transport per tonne km travelled to tCO₂ are available on the DEFRA website, and are updated regularly, to allow for conversion to tCO₂.

<table>
<thead>
<tr>
<th>Process</th>
<th>Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food</td>
<td>Goods</td>
</tr>
<tr>
<td>Seed, seedlings</td>
<td>Raw materials - growth and extraction</td>
</tr>
<tr>
<td>Grow, harvest</td>
<td>Manufacture</td>
</tr>
<tr>
<td>Pack</td>
<td>Pack</td>
</tr>
<tr>
<td>Transport</td>
<td>Transport</td>
</tr>
<tr>
<td>Cook</td>
<td>Handling</td>
</tr>
<tr>
<td>Waste</td>
<td>Waste</td>
</tr>
<tr>
<td>End of life disposal</td>
<td>End of life disposal</td>
</tr>
</tbody>
</table>
### 6A. Procurement: Materials

<table>
<thead>
<tr>
<th>Procurement</th>
<th>Measure, Audit, Analyse</th>
<th>Stop, Avoid, Reduce</th>
<th>Renewable alternatives</th>
<th>Offset</th>
</tr>
</thead>
<tbody>
<tr>
<td>6A Materials</td>
<td>• Calculate carbon emissions of:</td>
<td>• Local procurement (80% within 100 km)</td>
<td>• Use recycled materials.</td>
<td>• Avoid landfill</td>
</tr>
<tr>
<td></td>
<td>o Embodied energy</td>
<td>• Minimise waste</td>
<td>o Recycle waste</td>
<td>• Help others to source materials sustainably &amp; locally</td>
</tr>
<tr>
<td></td>
<td>o Transport</td>
<td></td>
<td>o Sustainable sourcing of materials e.g.</td>
<td>• Credible Carbon Offset scheme, e.g.:</td>
</tr>
<tr>
<td></td>
<td>o Packaging</td>
<td></td>
<td>o FSC timber</td>
<td>o World Land Trust</td>
</tr>
</tbody>
</table>

**Table 24:** The application of Ordered Retreat to procurement of materials

**Table 25:** BCWEZS materials procurement KPIs

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>REPORT</th>
<th>10 YEAR TARGET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procurement: Building Materials</td>
<td>Building materials transport impact</td>
<td>Kg, Km</td>
<td>Annually</td>
<td>↓ 30%</td>
</tr>
<tr>
<td></td>
<td>Materials sourced within 100Km (by weight)</td>
<td>%</td>
<td>Annually</td>
<td>80% of total</td>
</tr>
<tr>
<td></td>
<td>Building materials disposed of during construction (by weight)</td>
<td>%</td>
<td>Annually</td>
<td>10% of total</td>
</tr>
</tbody>
</table>

Bristol Zoo is committed to optimising the design of new buildings to make them as environmentally sustainable as possible, including buildings that are as near to zero carbon as practical. The sustainability performance of all new buildings will be assessed at design and planning stage, on completion and post-occupancy. Sustainable procurement is involved with all aspects of the process and can be assessed using Life Cycle Analysis (LCA) during the design phase. This analysis assesses the overall environmental impact from extraction of raw materials, production, transportation, construction, operation, maintenance and disposal. The carbon emissions and environmental impacts of production and disposal need to be weighed against the reduction of carbon emissions and increased thermal comfort during use. The use of recycled materials is becoming more popular along with other naturally sustainably sourced materials such as straw bale walls, green roofs and rammed earth walls. Once the correct materials have been identified using LCA, the supply chain of each must be assessed, and local or sustainably-sourced materials should be used whenever possible. Any future projects by the Zoo will look to use these principles when designing buildings and exhibits.
Timber, a renewable and recyclable resource, is an essential component of a sustainable building. Timber harvesting, however, is also a major conservation issue around the world. Deforestation rates still far outstrip natural and human re-afforestation, and biodiversity is far lower in re-afforested sites than in old growth forest.

The Forest Stewardship Council (FSC) standard is widely regarded as the benchmark certification scheme for well-managed forestry. The FSC regulates the production and movement of timber by ensuring that it is being harvested legally and with sympathy to the flora and fauna of the forest, and by tracking a ‘chain of custody’ to ensure that non-FSC wood does not enter FSC certified products.

By sourcing FSC-approved timber and timber products wherever possible, the Zoo is helping to conserve wildlife throughout the world. However, a balance must be struck between the use of FSC wood and sustainable timber sourced more locally (with therefore lower embedded energy) which, although lacking certification, has a demonstrable chain linking the supplier with the forest from which the wood was obtained (Fig 27).
6B. Procurement: Food for animals and visitors

Table 26: The application of Ordered Retreat to procurement of food for animals and visitors

<table>
<thead>
<tr>
<th>Procurement</th>
<th>Measure, Audit, Analyse</th>
<th>Stop, Avoid, Reduce</th>
<th>Renewable alternatives</th>
<th>Offset</th>
</tr>
</thead>
<tbody>
<tr>
<td>6B Food</td>
<td>• Calculate carbon emissions of:</td>
<td>• Local procurement (60% within 100 km)</td>
<td>• Grow our own fruit, vegetables, meat</td>
<td>• Avoid landfill</td>
</tr>
<tr>
<td></td>
<td>○ Embodied energy</td>
<td>• Minimise waste</td>
<td>• Sustainable sourcing of all food e.g.</td>
<td>• Help others to source food sustainably &amp; locally</td>
</tr>
<tr>
<td></td>
<td>○ Transport</td>
<td>• Use all the edible parts</td>
<td>○ MSC fish</td>
<td>• Credible Carbon Offset scheme, e.g.:</td>
</tr>
<tr>
<td></td>
<td>○ Packaging</td>
<td></td>
<td>○ Fairtrade produce</td>
<td>○ World Land Trust</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>○ The Converging World</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>○ PURE Trust</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>○ Woodland Trust</td>
</tr>
</tbody>
</table>

Table 27: BCWEZS Food Procurement KPIs

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>REPORT</th>
<th>10 YEAR TARGET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procurement: Food</td>
<td>Animal, visitor and hospitality food transport impact</td>
<td>Kg.Km</td>
<td>Quarterly</td>
<td>↓ 50%</td>
</tr>
<tr>
<td>Visitor &amp; hospitality food sourced within 100Km (by weight)</td>
<td>%</td>
<td>Quarterly</td>
<td>80% of total</td>
<td></td>
</tr>
<tr>
<td>Percentage animal food sourced within 100km (by weight)</td>
<td>%</td>
<td>Quarterly</td>
<td>80% of total</td>
<td></td>
</tr>
<tr>
<td>All food sourced with accreditation such as Fairtrade or Rainforest Alliance (by weight)</td>
<td>%</td>
<td>Quarterly</td>
<td>25% of total</td>
<td></td>
</tr>
</tbody>
</table>

Food for visitors and hospitality

At Bristol Zoo, visitor and hospitality catering is contracted to an external operator, Milburns. Milburns is part of the Compass Group which sets its own sustainability KPIs for its catering contracts. In collaboration with the Zoo, Milburns has agreed to rigorous procurement and waste disposal controls. This includes providing a chain of custody for the food, be it from organic, fair-trade or free-range sources. The UK has not been self-sustainable in terms of food production for the last two decades and so importing some of the produce is unavoidable. However by using Fairtrade produce or by linking food production to ethical practices and biodiversity conservation (e.g. the Slow Food Movement) we can balance the unavoidable carbon cost of importing food with development and sustainable offset schemes.

Consequently, careful consideration must be given to ensure the most sustainable and cost effective option (from the triple bottom line perspective) for the Zoo is chosen. As a result, Bristol Zoo has asked Milburns to increase the
82% of bakery products are sourced from less than 22 km away. 89% of cakes are baked by the pastry chef at the Zoo using 100% British flour.

- All wild-caught fish are Marine Stewardship Council (MSC) certified, and farmed fish are also from sustainable sources.

- 100% of coffee is Fairtrade, Organic and Rainforest Alliance certified. 100% of tea and hot chocolate is Fairtrade.

- 63% of pork, lamb and beef is sourced from less than 55 km away.

- All fresh poultry is British Farm assured, Red Tractor marked. All eggs are free range.

- 72% of beer and cider is provided from Bath Ales, brewed 12 km away from the Zoo.

- Fruit and vegetables are locally sourced as far as possible.

- The proportion of Fairtrade products that has to be bought from developing countries is increasing.

- Packaging has been minimised as far as possible, using biodegradable or easily recyclable packaging.

Table 28: Milburns Food Procurement data from October and May 2010

<table>
<thead>
<tr>
<th>Procurement: Food</th>
<th>Unit</th>
<th>Five week period over October 2009</th>
<th>Five week period over May 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visitor &amp; hospitality food sourced within 100Km (by weight)</td>
<td>%</td>
<td>10</td>
<td>24</td>
</tr>
<tr>
<td>Total visitor and hospitality food impact</td>
<td>Kg.Km</td>
<td>12,516,476</td>
<td>10,105,025</td>
</tr>
<tr>
<td>Visitor and hospitality food from sustainable/ Fairtrade sources (by weight)</td>
<td>%</td>
<td>7</td>
<td>4</td>
</tr>
</tbody>
</table>

Procurement:

Currently, Milburns are sourcing 325 products of which 215 are from the UK of which 78 are local, 24% from within 100km (Fig 28). The product supply chain is continually being reviewed with the aim of ultimately sourcing 80% of produce within 100km of the Zoo. Each product is being categorised by weight, so that the percentage of visitor food sourced locally by weight can be reported on quarterly, as shown in Table 28. Data collection started in October 2009.
Animal Feed

The wide range of animals within the Zoo’s collection means that the food required to sustain them is highly varied and is often required in large quantities. Many of the animals have highly specific dietary requirements, which can raise difficulties in achieving procurement targets of local and sustainable sourcing. For example, the penguins and seals found at the Zoo are dependant on fish. Although every attempt is made to procure fish from MSC certified fisheries, market fluctuations and availability can result in the procurement of non-sustainably sourced fish. Likewise some specialist food items are only available from imports. Ensuring animal welfare is the Zoo’s highest priority and ongoing monitoring of food procurement is being carried out to seek to improve sustainable sourcing wherever possible.

Some current measures that have been introduced to improve sustainability are:

- Linking up with our hospitality contractors, Milburns, to limit the number of food deliveries to the Zoo by using as many of the same suppliers as possible, as well as bulk buying non-perishables to limit deliveries.
- The supply chain is currently being investigated by tracking the origin and transportation method of each item and its associated carbon footprint. Once we know the chain of supply of each item, we can then try to order from more sustainable sources, maximising the produce we can obtain within 100km and from fair-trade sources.
- Utilising unsold food from local supermarkets.
- Growing our vegetables and fruit at the Hollywood Tower Estate.

*Fig 29: Baby meerkat with an egg at the Zoo*
### 6C. Procurement: Retail Supplies

<table>
<thead>
<tr>
<th>Procurement</th>
<th>Measure, Audit, Analyse</th>
<th>Stop, Avoid, Reduce</th>
<th>Renewable alternatives</th>
<th>Offset</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retail supplies</td>
<td>• Calculate carbon emissions of:</td>
<td>• Local procurement (80% within 100 km)</td>
<td>• Use biodegradable packaging</td>
<td>• Avoid landfill</td>
</tr>
<tr>
<td></td>
<td>o Embodied energy</td>
<td>o Minimise waste</td>
<td>o Sustainable sourcing of all supplies e.g.</td>
<td>• Help others to source stock sustainably</td>
</tr>
<tr>
<td></td>
<td>o Transport</td>
<td></td>
<td>o FSC wood &amp; paper</td>
<td>• Credible Carbon Offset scheme, e.g.:</td>
</tr>
<tr>
<td></td>
<td>o Packaging</td>
<td></td>
<td>o Fairtrade</td>
<td>o World Land Trust</td>
</tr>
</tbody>
</table>

Table 29: The application of Ordered Retreat to procurement of retail supplies

Table 30: BCWEZS Retail Procurement KPIs

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>REPORT</th>
<th>10 YEAR TARGET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procurement: Retail</td>
<td>Retail transport impact</td>
<td>Kg.Km</td>
<td>Quarterly</td>
<td>↓ 30%</td>
</tr>
<tr>
<td></td>
<td>Retail products sourced with accreditation such as Fairtrade or Rainforest Alliance (by weight)</td>
<td>%</td>
<td>Quarterly</td>
<td>50% of total</td>
</tr>
<tr>
<td></td>
<td>Retail supplies sourced within 100km (by weight)</td>
<td>%</td>
<td>Quarterly</td>
<td>50% of total</td>
</tr>
<tr>
<td></td>
<td>Paper or wood products carrying FSC certification (by weight)</td>
<td>%</td>
<td>Quarterly</td>
<td>100% of total</td>
</tr>
</tbody>
</table>

Stocking the shop is an important component of the Zoo’s procurement strategy and can cover a number of sustainability issues from biodegradable packaging to Fairtrade toys. The complete sustainable procurement policy of the shop is still being developed as some compromise must be made over inexpensive lines that are known bestsellers versus more expensive, more sustainably sourced lines. However some policies have already been initiated in 2008 such as removing plastic bags, reducing the number of deliveries to the shop and introducing a range of locally manufactured recycled goods. Currently, the source and manufacture of every item in the shop is being investigated. Once this information has been collated, we can identify the items with the largest environmental impact and try to find more sustainable alternatives. Some wooden products already carry FSC certification, and some are locally produced but we currently have no data on the proportion of each. Other products, such as our experience days and adoption gifts are also very popular and provide funds to support our breeding programmes and conservation projects in the wild.

**Current measures being taken:**

- Chain of supply analysis to allow us to increase the proportion of sustainable products purchased.
- Bulk-buying of products and reducing the number of suppliers as far as possible has already reduced the number of deliveries.
6D. Procurement: Business services and supplies

<table>
<thead>
<tr>
<th>Procurement</th>
<th>Measure, Audit, Analyse</th>
<th>Stop, Avoid, Reduce</th>
<th>Renewable alternatives</th>
<th>Offset</th>
</tr>
</thead>
</table>
| 6D Business services and supplies | • Calculate carbon emissions of:  
  ○ Embodied energy  
  ○ Transport  
  ○ Packaging | • Local procurement (80% within 100 km)  
  • Minimise waste | • Use biodegradable packaging  
  • Sustainable sourcing of all supplies e.g.  
  ○ FSC paper products  
  ○ Fairtrade | • Avoid landfill  
  • Help others to source sustainably  
  • Credible Carbon Offset scheme, e.g.:  
  ○ World Land Trust  
  ○ The Converging World  
  ○ PURE Trust  
  ○ Woodland Trust |

Table 31: The application of Ordered Retreat to procurement of materials

Table 32: BCWEZS Business procurement KPIs

### Business materials

Business supplies can cover stationery, cleaning products and equipment, electrical products, office furniture and animal husbandry supplies such as bedding and medical equipment. For each item the chain of supply must be analysed and as many practical cost-effective, sustainable alternatives found as possible. This is currently being done at the Zoo. Some of these items, such as medical supplies, cannot be sustainably sourced but deliveries can be reduced by using the same supplier for different lines and buying in bulk where practical. This has recently been done with cleaning supplies. When buying electrical equipment, the whole life carbon costs must be considered and equipment returned to suppliers for recycling under the WEEE directive at the end of its life. Every effort will be made in 2010 to reduce the number of deliveries of business supplies, and to increase the proportion of local and sustainable products used.
Current measures being taken:

- Analysing the chain of supply of each item procured by the Zoo will allow us to increase the proportion of sustainable and local products purchased.

- Bulk-buying of products and reducing the number of suppliers as far as possible has reduced the number of deliveries.

- The printers that we use have an ISO14001 accredited environmental management system. Additionally they print with vegetable-oil based inks on recycled paper which also contains fibre from forests meeting the FSC principles and criteria, for which they are FSC certified.

Business Services

When we require business services such as architects, lawyers, or builders, we employ companies who understand best the principles on which we operate. These are normally local companies, so that we can minimise the environmental impact of their activities.
7. Biodiversity

The Society is a leader in the global zoo community in both conservation breeding programmes (at the Zoo) and conservation in the wild (through the Bristol Conservation and Science Foundation). Our Biodiversity KPIs, outlined in Tables 34 and 36, address the need to increase native biodiversity onsite, and to continue to increase the number of endangered species included in breeding programmes. Additionally, the level of funding for conservation projects is used as an indicator of the Society’s contribution to national and international conservation projects. Our achievements and objectives for both breeding programmes and conservation in the wild are discussed in more depth below.

7A: Breeding programmes

Bristol Zoo participates in over 100 co-operatively managed breeding programmes. Most of these are for endangered and critically endangered species, and a small number are for animals that are extinct in the wild. These captive populations serve two major functions. First, they are an important safeguard against complete extinction of the species and offer a resource for reintroduction to the wild should that be necessary. We have successfully reintroduced water voles and barberry carpet moths into the UK and have participated in breeding programmes that have resulted in reintroduction overseas, such as the golden lion tamarin. Second, they allow us to raise awareness of the plight of these and other species in the wild, thus

<table>
<thead>
<tr>
<th>Biodiversity</th>
<th>Measure, Audit, Analyse</th>
<th>Stop, Avoid, Reduce</th>
<th>Renewable alternatives</th>
<th>Offset</th>
</tr>
</thead>
<tbody>
<tr>
<td>7A Breeding programmes</td>
<td>• IUCN Red List</td>
<td>• Removal of animals from the wild only for species rescue</td>
<td>• Breeding programmes for threatened species</td>
<td>• Reforestation</td>
</tr>
<tr>
<td></td>
<td>• Survey</td>
<td></td>
<td>• Assurance populations in human care</td>
<td>• Avoid deforestation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Habitat recreation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Field conservation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Research Projects</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Biodiversity Action Plans</td>
</tr>
</tbody>
</table>

Table 33: The application of Ordered Retreat to Biodiversity: Breeding Programmes

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>REPORT</th>
<th>10 YEAR TARGET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biodiversity: Breeding Programmes</td>
<td>Number of species in collections in threatened categories on IUCN Red List</td>
<td>number</td>
<td>Annually</td>
<td>↑ 30%</td>
</tr>
<tr>
<td>Biodiversity: Breeding Programmes</td>
<td>Number of species in collections in EAZA and global managed breeding programmes</td>
<td>number</td>
<td>Annually</td>
<td>↑ 30%</td>
</tr>
</tbody>
</table>

Table 34: The Society’s Biodiversity: Breeding Programmes KPIs
helping to raise funds for conservation. Our gorillas, for instance, are ambassadors for their critically-endangered wild counterparts, enabling us to raise funds to support our efforts in Cameroon to safeguard them. A primary aim of our biodiversity strategy is to increase further the number of conservation breeding programmes in which we participate. A recent example has been the addition of the white-clawed crayfish, a threatened native species, as part of a programme of measures to halt the decline of the species in the wild; the crayfish that are bred all the year are destined for almost immediate reintroduction to the wild.

The number of threatened or endangered species within the collection found on the IUCN Red List provides an indicator for the contribution to wildlife conservation by the Zoo (Fig 31). Further to this, the collection can be related to international studbooks and breeding programmes. Increasing the number of species within the programmes will benefit the Zoo’s conservation profile and will contribute more to worldwide biodiversity.

Fig 31: Percentage of species in Bristol Zoo Gardens on 1st Jan 2008 within each category on the IUCN Red List
**7B. In the wild**

<table>
<thead>
<tr>
<th>Biodiversity</th>
<th>Measure, Audit, Analyse</th>
<th>Stop, Avoid, Reduce</th>
<th>Renewable alternatives</th>
<th>Offset</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>7B In the wild</strong></td>
<td>• IUCN Red List Survey</td>
<td>• Stop business practices which result in destruction of the natural environment</td>
<td>• Reintroduction programmes for zoo-bred animals</td>
<td>• Reforestation • Avoid deforestation • Habitat recreation • Field conservation • Research Projects • Biodiversity Action Plans</td>
</tr>
</tbody>
</table>

**Table 35:** The application of Ordered Retreat to Biodiversity: In the wild

**Table 36:** The Society’s biodiversity: In the wild KPIs

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>REPORT</th>
<th>10 YEAR TARGET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biodiversity: in the wild</td>
<td>Number of UK threatened species on BZG and NWCP sites</td>
<td>number</td>
<td>Annually</td>
<td>10% of total</td>
</tr>
<tr>
<td></td>
<td>Value of BCSF projects</td>
<td>£</td>
<td>Annually</td>
<td>↑ 200%</td>
</tr>
</tbody>
</table>

**Native Species**

**Animals:** Bristol Zoo has been working to increase the biodiversity of native species within the Zoo since 2004 with the setup of a working group. Additionally, a biodiversity strategy is currently being written, which aims to support local Biodiversity Action Plan (BAP) targets for specific native species and habitats. The strategy is to enhance the Zoo’s attractiveness to native wildlife, increase the number of native species, and inspire visitors to take similar action, while maintaining the high quality amenity value of the Zoo for our visitors.

Surveys of native species at Bristol Zoo are still ongoing, but in 2009 an amphibian survey recorded the presence of 19 adult individuals of the toad *Bufo bufo*, a UK BAP species. Healthy populations of smooth newts and common frogs were also reported. Another UK BAP species, the house sparrow *Passer domesticus*, is also present at the Zoo. The tadpole shrimp *Triops cancriformis* and the European turtle dove *Streptopelia turtur*, both UK BAP species, are also present within the collection at the Zoo.
Plants:

Our approach is to assess our landscape management practices and to use them to create an environment where our native wildlife can flourish. Through careful plant choice we are able to increase the sustainability and biodiversity of the site, while maintaining its appeal as a zoo garden. For example, we replaced an area of hybrid tea roses that required pest and disease control sprays twice a week with nectar producing plants, we encourage insects, and rather than grassing enclosures we use more diverse native plants or seed mixes. We also encourage biodiversity through our horticultural practices, such as leaving the seed heads on the herbaceous border until the spring, and leaving autumn leaves and other debris over winter in the more informal areas of the site. With the addition of branch piles, bird feeding stations and bird and insect homes, this creates both refuges and food sources for our wildlife. The result is that despite the intensive use of the site we maintain a surprisingly diverse plant and animal population. This can be demonstrated by the diverse flora on Gorilla Island, with over 60 different native plants at the last count, or the numerous bee species that can be seen on the herbaceous border. These areas then give us the opportunity to tell people about our actions and encourage similar behaviour from our visitors and other similar organisations.

Biodiversity: Where we are now and future improvements

We have a biodiversity strategy which we review regularly. We are developing a specific strategy for native species and have started to survey the site more regularly for UK threatened species, and to improve the habitat to allow more of these threatened species to live and breed successfully. Our biodiversity data from 2007-2009 is shown in table 37.

We are aiming to:

- Increase the number of conservation breeding programmes in which we participate
- Increase the number of species which we hold that are included on the IUCN Red List
- Increase the number of native plant and animals species on-site, supporting local Biodiversity Action Plans
- Improve the monitoring of native species on-site
Table 37: The Society’s Biodiversity KPIs with data from 2007-2009

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biodiversity: Breeding Programmes</td>
<td>Number of species in collections in threatened categories on IUCN Red List</td>
<td>number</td>
<td>111</td>
<td>110</td>
<td>112</td>
</tr>
<tr>
<td></td>
<td>Number of species in collections in EAZA and global managed breeding programmes</td>
<td>number</td>
<td>77</td>
<td>81</td>
<td>84</td>
</tr>
<tr>
<td>Biodiversity: in the wild</td>
<td>Number of UK threatened species on BZG and NWCP sites</td>
<td>number</td>
<td>No annual data</td>
<td>No annual data</td>
<td>No annual data</td>
</tr>
<tr>
<td></td>
<td>Value of BCSF projects</td>
<td>£</td>
<td>BCSF set up in 2008</td>
<td>414,000</td>
<td>433,000</td>
</tr>
</tbody>
</table>

Fig 35: Flamingo chicks at Bristol Zoo
Environmental sustainability is at the core of the development, construction and operation of the National Wildlife Conservation Park. The commitment to conservation and biodiversity runs through its heart, as it aims to redefine the role of the modern zoo by inspiring people to contribute to global wildlife conservation affairs. The exhibits which have been selected are all linked to conservation projects from some of the most endangered ecosystems in the world. Habitats for native species will also be protected, including those of five BAP species that have been identified on site: three bat species (the soprano pipistrelle, brown long-eared and noctule bats) and two moth species (the latticed heath moth and cinnabar moth).

Environmental sustainability is also an essential element in the structural design of the NWCP. The sustainability strategies for different elements of the build are listed in Table 38. These will include buildings with green roofs, district heating systems, rainwater harvesting, installing compost toilets and waterless urinals, a ground source heat pump to heat a glass atrium, and the use of an in-vessel composter among many other measures.

Environmental Management System (EMS)

An EMS, incorporating the BCWEZS KPIs outlined in Table 3 (pg 15) will be drawn up for the National Wildlife Conservation Park prior to the start of the build, and sustainability will be considered throughout. The KPIs will be reported annually to ensure the carbon footprint of National Wildlife Conservation Park is kept to a minimum. This will enable the centre to act as the national hub for sustainable best practice for visitor attractions, becoming a beacon that will promote the principles of BCWEZS, and a flagship example of the sustainable credentials of the Greater Bristol City region.
Table 38: The sustainable elements built into the design of NWCP

| Heating supply                                      | District heating systems to enable more economic management of demand and minimise installation of pipe-work. |
|                                                    | Biomass-fuelled energy cabins (wood chip/pellets)                                                       |
| Cooling                                            | Passive cooling by orientation, insulation and glazing. When absolutely necessary, absorption chillers and refrigerator-based cooling will be used. Phase change materials and floor slabs will be used for low energy cooling. |
| Ventilation                                        | The primary choice is for passive and natural ventilation. Fan assisted ventilation will be considered only as supplement to passive systems. When necessary, we will consider mechanical ventilation with heat recovery systems. |
|                                                    | Conduct further research into dynamic insulation for high humidity buildings and prepare well-defined building control strategies, based on best practice. |
| Light                                              | Use of natural daylight when possible, avoiding external obstructions to windows.                        |
| Power supply                                       | Minimise power demand by design and operational strategies.                                             |
|                                                    | Discuss with energy companies re on- and off-site wind turbines.                                        |
| Water supply                                       | Water will be supplied from on-site boreholes.                                                          |
|                                                    | Minimise water consumption through design and operational strategies.                                    |
|                                                    | Install rain water harvesting systems.                                                                  |
|                                                    | The majority of buildings to have green roofs.                                                          |
| Waste water                                        | Install composting WC facilities wherever possible, and harvest urine in-vessel composting and injection into soil. |
|                                                    | Gravity drainage systems will be used in place of pumps.                                               |
|                                                    | Biodegradable cleaning products will be used throughout.                                               |
|                                                    | Sustainable drainage systems will be adopted for managing rain water, including green roofs etc.         |
| Waste management                                   | Minimise waste products by efficient management and operational systems.                                |
|                                                    | Run an in-vessel composter to treat a wide variety of waste products including animal by-products, card/paper etc from offices, takeaway foodstuffs, catering waste and garden waste. |
| Construction materials                             | Adopt a local sourcing policy.                                                                          |
|                                                    | Maximise the use of natural renewables and recycled materials. When new materials are unavoidable, they will be recyclable or biodegradable where possible. Minimise use of metals by investigating more sustainable options first. |
|                                                    | Consider the embodied energy of all materials and keep this to a minimum. All NWCP components will be designed for re-use following deconstruction, where possible. |
| Transportation                                     | Three separate Green Travel Plans have been prepared, for visitors, staff and corporate events in order to identify ways of reducing the reliance of individuals on independent car borne traffic. |
| Carbon offset                                      | Measure our carbon footprint, and, using the principle of Ordered Retreat, shall do all we can to minimise it and use renewable alternatives. As a last resort, we shall employ offset schemes; we are in the process of developing collaborative schemes with partners that deliver genuine carbon offset linked to biodiversity conservation projects. |
C. Bristol Conservation and Science Foundation

The aim of the Bristol Conservation and Science Foundation is to be an internationally recognised authority on wildlife and conservation in the context of sustainable development. The field programmes run by the Foundation all link back to activities, exhibit areas and species that are held in Bristol Zoo. Currently the Foundation supports, participates in, or actively manages fourteen projects around the world. These include:

- funding okapi conservation in the Democratic Republic of Congo
- leading a consortium of zoos working with colleagues in South Africa to try to halt the rapid decline in African penguin populations
- managing a research project in Madagascar that has resulted in the establishment of a National Park protecting several species of endangered lemur
- working with communities and the Government of Cameroon to support efforts to control the hunting and trade in wild apes
- working with communities in the Republic of the Comores to safeguard forests holding one of the world’s most endangered fruit bats.

These efforts result in funding and support for field conservation programmes that otherwise would struggle for attention or funding. It is our aim to find local solutions to conservation problems, and a major pillar of our strategy is to work with local communities to find those solutions. The Foundation believes that conservation should be a winner both for wildlife and for people.

Since the Foundation was set up in October 2008, its carbon footprint has been included in the Bristol Zoo footprint as most of the staff are based at the Clifton site. Starting in 2010, a separate carbon footprint is being calculated for the Foundation. Some of these KPIs such as energy consumption and waste, will not apply as the energy used by the Foundation on the Zoo’s site is minimal. However some activities such as travel, will heavily contribute to the Foundation’s carbon footprint. The Foundation can use the KPIs and the best practice methods outlined in this document as a guideline to supplement its sustainable practice both in the UK and at its project sites abroad. This applies particularly in developing countries where there is an opportunity to lead by example, educating locally-employed staff and volunteers about the Society’s sustainable principles, and why they are important.

*Fig 37: Left to right: The greater water parsnip, propagated for reintroduction to the Somerset Levels; a black blue-eyed lemur, subject of a Foundation conservation programme in Madagascar; and a Livingstone’s fruit bat, exhibited at the Zoo to highlight the conservation project the Foundation is managing in their native Comoro Islands*
4. The Collective Approach

As an education and conservation charity, BCWEZS has a responsibility to promote and encourage sustainable best practice, not only to staff and visitors but within the local community and the zoo community.

**In the local community**

In recent years, the South West has become a ‘green hotspot’. There is a clear cluster of environmental technology companies, government agencies and environmental NGOs working together to try to improve and promote the green credentials of the South West. Bristol, in particular, has a vibrant green community, harnessed by the Bristol Green Capital Momentum Group to enthuse individuals and businesses to become more sustainable. The Society is actively involved in promoting its conservation and sustainability values within the local community, through community initiatives such as the West of England Carbon Challenge, the Bristol Green Capital Momentum Group and the Bristol Natural History Consortium, which aims to deliver entertaining and informative events and activities that inspire greater public interest and participation in nature conservation.

**In the international zoo community**

BCWEZS is at the forefront of decision making that influences the zoo community. The Society is an active member of the British and Irish Association of Zoos and Aquariums (BIAZA), the European Association of Zoos and Aquaria (EAZA) and the World Association of Zoos and Aquariums (WAZA), with many staff members sitting on and chairing various committees. The Society wants to help improve the sustainability of all zoos and other visitor attractions by building on collaboration between zoos. This document is intended to be a tool that other organisations can use to improve their own sustainability. We hope that all zoos will publish their own methods and results, so that new ideas and best practice methods can be established. There may be scope for annual sustainability meetings to share knowledge, experience and ideas, or for collaborating with other nearby attractions to buy specialist items in bulk together to reduce costs and transportation.

The Society is committed to incorporating sustainability throughout every aspect of its activities, and helping other organisations to do the same. WAZA members have 600 million visitors a year through their collective doors, which gives the organisation some influence. As a community, zoos and aquariums can collaborate to encourage individuals and businesses to improve their sustainability and reduce their ecological footprint, consequently helping to conserve species and increase biodiversity worldwide. The Society hopes to lead the way by meeting our own targets for reducing carbon emissions and reducing our other negative environmental impacts.
The Bristol, Clifton and West of England Society continues to show a strong commitment towards sustainable development. Through its mechanisms of environmental management in accordance with many of the schemes employed at Bristol Zoo Gardens, it aims to further its obligations to social, environmental and economic sustainability issues. By developing innovative projects (such as the SALOME strategy tool for carbon measurement), installing low-cost energy-saving equipment, and employing a new, more ambitious travel plan, the Society can remain in line with its future targets. The Society will practise environmental sustainability through everything that it does, and encourage partners and suppliers to reduce their ecological footprint.

Along with this aim of improving our own sites, we look to this document to provide a framework for other zoos to use our findings, both positive and negative, to guide their own sustainable development programmes. Through the development projects initiated by the Society, we are trying to change the views of communities local to the endangered environments, thus ensuring that conservation can occur from the bottom up. The process is slow, but with the contributions of many zoos, it can and will make a real difference not just to the biodiversity of endangered ecosystems but also to the people in contact with them.

However, to continue with these projects and continue development, there must be resources to facilitate them. Under the indubitable strain of the financial climate in the coming years, it will be a challenge for all organisations, including the Society, to maintain the high environmental standards and principles to which it aspires. The Society is rising to this challenge, and intends to become a flagship organisation that is used as a benchmark for other visitor attractions, helping to change social attitudes and behaviour and contributing to Bristol as a Green Capital.
Carbon Footprint

A carbon footprint is a measure of total greenhouse gas emissions, often quantified as tonnes of carbon dioxide equivalent (tCO₂e), from activities of a person, organisation or product. These are classed in three categories:

Scope 1: Direct emissions resulting from activities within the organisation's control. Includes on-site fuel combustion, manufacturing and process emissions, refrigerant losses and company vehicles.

Scope 2: Indirect emissions from electricity, heat or steam purchased and used by the organisation.

Scope 3: Indirect emissions: Any other emissions from sources not directly controlled by the organisation. Examples include: employee business travel, outsourced transportation, waste disposal, water usage and employee commuting.

Corporate Social Responsibility

Corporate social responsibility (CSR) is the business approach towards addressing societal concerns and making a positive contribution to the community. It does, however, sometimes get used as an umbrella phrase that also encompasses a business's environmental activities. CSR is an ongoing commitment of an organisation towards improving working conditions, equal opportunities and general wellbeing of employees alongside being a positive influence to society as a whole.

Ecological Footprint

An environmental footprint is a measure used to estimate the proportion of the Earth's natural resources that are required to carry out a particular activity. This could be measured at any scale, such as one person's lifestyle choices over a year or the resources consumed by a city over a decade. The footprint can be used to highlight the level of unsustainable resource use by an organisation to highlight areas where reductions in consumption can be made.

Environmental Management Systems

An Environmental Management System (EMS) is a systematic and coordinated framework used by an organisation to deliver integrated environmental activities, as set out in its environmental policy. An EMS is used to identify and solve environmental problems, to manage environmental activities, products and services and to achieve obligations and performance targets. An EMS can be implemented in different ways depending on the sector or needs of management, but core elements include an environmental policy; environmental action plan; organisational structure; integration into operations; documentation system to collect, analyse, monitor and retrieve information; corrective and preventive action; EMS audits; management review; training and external communications.

ISO14001

There are a number of verification systems in place to formalise an organisation's EMS. ISO14001 has become the most popular internationally-recognised voluntary scheme as it is applicable to all sectors and is relatively...
straightforward to implement. ISO14001 does not specify a level of environmental performance to be achieved, as this would be highly dependent on the individual sector involved, or the starting level of an organisation. ISO14001 rather provides a framework to help organisations deliver the commitments set out in their environmental policies, and to provide a holistic, strategic approach for organisations to achieve ongoing environmental improvements.

**SALOME**

Named after one of Bristol Zoo’s female western lowland gorillas, SALOME is a software tool created by Carbon Plan in conjunction with the Society to measure, monitor and manage the organisation’s carbon and ecological footprints. Data from the nominal ledger are allocated to different categories, and conversion factors derived from comparable industry norms are applied to give carbon and ecological footprints. The conversion factors must be reviewed each year to take into account inflation and changes in global trade.

**Scope 1, 2 and 3 emissions**

See Carbon Footprint.

**Sustainable Development**

Sustainable development is meeting the needs of the present without compromising the needs of future generations. It refers to economic development that maintains or enhances quality of life and the integrity of the environment indefinitely, with minimum depletion of non-renewable resources.

**Sustainable Procurement**

Sustainable procurement is procurement of goods, services, utilities and works that takes into consideration wider environmental, economic and social costs and benefits, over and above private cost-benefit analysis. The process is cyclical because it follows the life cycle of these goods, works and services – from the initial identification of a business need, maintenance throughout their serviceable life, to how goods are reused, recycled, or disposed of, or once a service contract comes to an end. The aim of sustainable procurement is to move away from a linear system of purchase, use and disposal, towards a closed loop system whereby resources are re-circulated and waste is eliminated or minimised.

**Triple Bottom Line**

The ‘triple bottom line’ approach was a term first coined by John Elkington that has become the new paradigm to the traditional ‘financial bottom line’. The triple bottom line approach promotes the balance of social and ecological factors alongside economic ones within an organisation’s decision making process. Triple bottom line reporting is reporting which brings together the financial, environmental and social reporting needs of an organisation into an easily understood whole. To report on social and environmental impacts, a zoo will need to decide what to measure, how to verify performance and how to communicate impacts and achievements to stakeholders. The Global Reporting Initiative sets out a possible framework for this that could be adopted by zoos to adapt their annual reporting mechanisms.


4 WAZA (2009) WAZA Sustainability Resolution (RES.64.1) from the 64th WAZA Annual Conference.


Appendix 1:  
BCWEZS Environmental Policy

Bristol, Clifton and West of England Zoological Society is a registered educational and scientific charity dedicated to the conservation of wildlife and the natural environment. The Society recognises that the conservation of wildlife and that of materials and resources are intrinsically linked and that the daily activities of the organisation create significant environmental impacts, especially in the areas of waste production, water and energy use.

The Society is committed to managing existing and new practices at each of its sites in order to minimise the environmental impact of these activities and to support the principles of sustainable development. This will be achieved by investigating and using the best available and most cost-effective techniques and by allocating sufficient resources of time and money to achieve these goals.

Environmental Commitments

The Society is committed to the continuous improvement of its environmental performance in relation to its activities, products and services.

In the course of our operations and within resource constraints, we will improve our environmental performance by:

- **Resources**
  
  Preventing pollution and monitoring and reducing any adverse impact of our operations on the environment and local community;

  Demonstrating efficiency in the use of energy, water and natural resources, thereby assisting in the conservation of these resources;

  Minimising waste by re-using and recycling where practicable;

  Ensuring that any products used or derived from natural resources, such as timber and plants, are from sustainable sources, and comply with EU and international trading rules such as CBD and CITES;

- **Pollution**

  Developing appropriate emergency response plans for potential incidents on our land to minimise their environmental impact;

  Monitoring discharges of substances that affect air quality;

  Monitoring the use of substances damaging to health and the environment;

- **Management – Regulations**

  Meeting and complying with all relevant, current and foreseen legislation, regulations, official codes of practice and other requirements related to the environment and its protection and other standards of relevance to the zoo industry;

  Specifying contractors do the same when working on our premises;

  Developing and maintaining emergency procedures for effectively dealing with significant hazards where they exist;

  Limiting the risk to health and the environment;

  Maintaining an Environmental Management System in line with the requirements of ISO14001:2004
Training and Communication

Training staff in order to enhance awareness of relevant environmental issues and ensuring effective management of the Society’s environmental impacts;

Developing educational programmes to provide opportunities for visitors to further their understanding of environmental issues and sustainable development;

Communicating this Environmental Policy to all those who have an interest in the Society, including Trustees, staff, volunteers, visitors, suppliers, contractors, investors, appropriate authorities, local communities and other organisations;

Purchasing

Encouraging manufacturers, suppliers and contractors, through contracts and other means, to improve or develop environmentally preferable goods and services at competitive prices;

Purchasing environmentally preferable goods and services where appropriate and ensuring the Society’s suppliers and contractors demonstrate a responsible attitude towards the environment when on site;

Estates Management

Ensuring that buildings occupied by us are operated, and, in the case of new buildings, designed and constructed, to optimise their environmental performance;

Management – Environment

Ensuring that environmental issues are always considered when making decisions and policy, and planning projects;

Reviewing all our activities, products and services to identify, quantify and evaluate their environmental impact;

Improving the sites’ habitats for the benefit of native species of fauna and flora.

In order to meet these commitments, the Bristol, Clifton and West of England Zoological Society Ltd has implemented and will maintain an Environmental Management System and will develop objectives and targets each year in order to achieve continuous environmental improvement.

The Environmental Policy has been communicated to all members of staff and copies are available from Bristol Zoo Gardens. This policy will be reviewed at least every two years.

Dr Jo Gipps OBE
Director
CEO, Bristol, Clifton and West of England Zoological Society
Creating a sustainable future for wildlife and people

Bristol, Clifton and West of England Zoological Society Ltd.

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