FIFA
WORLD CUP

SOUTH AFRICA 2010 REPORT

UNEP

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Football has an incredible power, which can be used to make this world a better place, in which everyone can live. Use this powerful platform to promote peace, equality, health and education for everyone. Make the game better, take it to the world, and you will be fostering a better world.

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FOREWORD

The FIFA 2010 World Cup™ was unique in many ways: the event was the first time the tournament had been held on the African Continent and South Africa hosted the first World Cup after FIFA announced a commitment to environmental issues in the wake of the Green Goal initiative of the 2006 FIFA WORLD held in Germany.

This report highlights the achievements of South Africa and its host cities—from Durban to Nelspruit — in respect to environmental measures planned and implemented during the matches. It also looks at the legacy of the tournament in respect to potentially lasting improvements for the country and the communities concerned.

As with the various assessments carried out by UNEP in respect to mass spectator events its main value is for those planning to host similar competitions and events the next being the 2014 winter Olympics in Sochi, Russian Federation and the FIFA World Cup and summer Olympics and in Brazil.

Among the many successes was the recycling of demolition wastes used in the construction of new stadia. Others included the introduction of energy-efficient lighting and fittings in new and existing stadia; the introduction of low flow water fixtures and the planting of 350,000 trees across the country.

Meanwhile there were investments in public transportation infrastructure including the installation of dedicated cycle lanes and walking networks which in turn hold the potential for a positive legacy in respect to lower air pollution and greenhouse gas emissions and improved urban mobility.

Improvements could have been made in respect to maximizing the benefits of introducing a two-bin segregation system for increasing levels of waste recycling—the lack of recycling facilities at municipalities meant that too much of the segregated waste ended up in landfills.

Efforts to engage and educate the South African youth and spectators on environmental issues through various awareness measures including via the media also proved successful.

The report however points to the need for more comprehensive monitoring and data being collected by host cities in order to provide the best possible assessment of environmental outcomes.

Perhaps the most important finding of the assessment is that South Africa could have achieved more if sustainability measures had been brought in sooner rather than later—indeed it underlines that the full potential of the greening of such tournaments is likely if sustainability is factored into the planning, design and construction from the word go.

Achim Steiner,

UN Under-Secretary General and Executive Director,
UN Environment Programme (UNEP)

> "Such events offer an opportunity for creativity, vision and the demonstration **of forward-looking** environmentally-friendly technologies, policies and public participation

EXECUTIVE SUMMARY

The FIFA 2010 World Cup™ was the first to be held in Africa and was expected to attract over 400,000 visitors, thereby exerting an enormous pressure on the environment. The United Nations Environmental Programme (UNEP) is therefore pleased to present this report of an Independent Environmental Assessment of the FIFA 2010 World Cup™.

The purpose of the assessment is to provide an independent review of the environmental performance of the FIFA 2010 World Cup™. The assessment reviewed the plans and strategies set out by the national Department for Environmental Affairs and the Local Organising Committee for the FIFA 2010 World Cup™ with a view to highlighting achievements and identifying lessons to improve the environmental performance of large sporting events in the future.

As the previous FIFA World Cup Organizers in Germany had implemented an extensive greening programme, the South African Government voluntarily made plans to follow their example. The aim of the greening programmes was to protect and enhance South Africa's environmental assets and natural resources and leave a positive legacy after the World Cup.

The Green Goal 2010 Programme initially focused on waste management, with each host city being directed by the Local Organizing Committee to develop a business plan for its implementation. Later on, all host cities were required to develop business plans on: the use of public transport and non-motorized transport; energy efficiency; waste reduction and recycling; efficient water use; biodiversity conservation and; enhancement and promotion of responsible tourism.

The main stakeholders in the greening of the 2010 FIFA World Cup were the Local Organizing Committee of the FIFA 2010 World Cup™, South Africa's Department of Environmental Affairs, the nine host cities - Johannesburg, Cape Town, Durban, Bloemfontein, Nelspruit, Tshwane, Rustenburg, Port Elizabeth, and Polokwane - and the management teams of the 10 stadiums that hosted the football matches. Other stakeholders included the provincial governments, transport operators and the hospitality industry.

"The purpose of the assessment is to provide an **independent review** of the environmental performance of the FIFA 2010 World Cup™.

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> "Greening of sports events is therefore vital for achieving not only **environmental sustainability** but also the sustainability of sports itself

ONE

INTRODUCTION

Sport makes up a significant part of today's lifestyles. The prominence and appeal associated with various sports activities are opportunities for promoting environmental conservation directly and indirectly.

The hosting of sport events, especially large ones, is a resource intensive exercise that often places significant pressure on natural resources and damage to the environment. Greening of sports events is therefore vital for achieving not only environmental sustainability but also the sustainability of sports itself. According to Roper (2006), "greening" of major sports events should include the following tenets:

- **Environmental best practices** – reducing negative environmental impacts by minimizing waste, energy usage and air and water pollution through sustainable resource use;
- **Socio-economic development** – selecting options that create awareness on environmental issues while creating local jobs and stimulating urban economies;
- **Education and awareness** – communicating and explaining greening plans and their benefits with the aim of changing public attitude and future actions;
- **Monitoring, evaluation and reporting** – assessing the effectiveness of greening activities before, during, and after the major event;
- **Leaving a positive legacy** – ensuring that decisions made during the event lead to considerable improvement of environmental sustainability.

Greening of events can be easily achieved through simple practical options at the local level. Creating awareness and influencing event participants to adopt better environmental practices is an implementable initiative which can result in a long-term, reduced resource consumption with a positive impact on the environment.

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1.1 Greening of FIFA World Cup™

The FIFA World Cup™ is one of the largest sporting events in the World. A greening programme for the FIFA World Cup™ was launched at the FIFA 2006 World Cup™ in Germany. Known as the 'Green Goal' programme and initiated by the German Organising Committee, FIFA subsequently added a 'Green Goal' requirement in its Football Stadiums: Technical Recommendations and Requirements.

Through the 'Green Goal' programme FIFA states that it encourages and engages with Local Organising Committees (LOC) with regard to protecting the environment. The principal goals of the programme are: the reduction in the consumption of potable water; the avoidance and/or reduction of waste; the creation of more energy efficient systems and an increase in public transport to FIFA events.

The 'Green Goal' requirements were published after the award of the World Cup™ to South Africa. However, the Host City Agreement signed by FIFA and the South African Host Cities committed South Africa to adherence to sustainability principles and promotion of environmental responsibility.

TWO

SOUTH AFRICA'S GREEN GOAL 2010'

The FIFA 2010 World Cup™ offered South Africa an opportunity to demonstrate to the world its commitment for responsible environmental management, whilst improving the living environment and livelihoods of South Africa's people.

The South African Government set out a broad National Greening 2010 Framework in order to support the delivery of the FIFA 2010 World Cup Green Goal initiative, which was developed by the national Department of Environmental Affairs (DEA). The primary objective of the DEA in developing a Greening Framework was to minimize negative environmental impacts while using resources in a judicious manner. Through this event, the DEA's National Greening 2010 Framework was anticipated to spur national capacity to host green events in the future, and disseminate environmental best practices to South African institutions and the public.

Furthermore, the Framework mandated the South African Local Organising Committee for the FIFA 2010 World Cup™ to respond to the National Greening 2010 Framework by developing Minimum Environmental Standards under each of its themes, and to implement the FIFA Green Goal 2010 programme. In addition, it mandated the host cities to manage the process and prioritize greening projects based on their capacity to implement.

The Framework focused on the following six key areas and Minimum Environmental Standards were developed for each:

- **Transport:** Maximise use of efficient public and non-motorized transport, with the emphasis on reducing carbon emissions:
- **Energy:** Initiate energy efficiency and saving programmes;
- **Waste:** Initiate waste reduction and processing programmes;

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- **Water:** Introduce efficient water use practices, savings and minimize water contamination;
- **Biodiversity:** Conserve and enhance biodiversity, in line with the 2010 International Year of Biodiversity;
- **Tourism:** Promote responsible tourism.

In addition, the following cross cutting themes were also included in the framework:

- Climate change;
- Sustainable procurement;
- Job creation; and
- Communication and outreach.

2.1 'Green Goal 2010' Minimum Environmental Standards

Using the six key environmental areas outlined in the National Greening 2010 Framework, the Environmental Forum of the Local Organising Committee developed Minimum Environmental Standards[1] to be met by the host cities in their training and event venues. Each host city was required to develop its own Greening Business Plan in accordance with the Minimum Environmental Standards for the categories above, and was encouraged to surpass the plan where possible.

The Minimum Environmental Standards were clustered into the following subjects:

- Climate Change;
- Energy Efficiency and Renewable Energy;
- Integrated Waste Management;
- Water Conservation and Management;
- Sustainable Procurement;
- Sustainable Transport;
- Accommodation.

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1 *The Minimum Environmental Standards are provided in Appendix 1*

THREE

ROLES AND RESPONSIBILITIES IN THE DELIVERY OF GREEN GOAL 2010

The following agencies participated in the greening of the FIFA 2010 World Cup™:

- The Local Organizing Committee
- The Department of Environmental Affairs
- The nine Host Cities (*Johannesburg, Cape Town, Durban, Bloemfontein, Nelspruit, Tshwane, Rustenburg, Port Elizabeth, and Polokwane*)
- Stadiums Management
- Provincial Governments
- South African National Biodiversity Institute
- South African National Parks
- Hospitality Industry
- NGOs
- FIFA

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3.1 The Local Organising Committee (LOC)

The Local Organizing Committee was responsible for setting the objectives and overseeing the performance of all sub-structures in preparing for and implementing the FIFA 2010 World Cup™ in South Africa, in alignment with its Memorandum of Understanding with FIFA.

Organizational Structure of the Organizing Committee

*Exco – Executive Committee, Finco – Financial Committee, Remco – Remuneration Committee

The Environmental Forum, a sub-structure of the Local Organizing Committee's Legacy Committee, functioned as a steering committee where all national greening activities were planned, coordinated and monitored. The Forum was chaired by the Environmental Coordinator of the Local Organizing Committee and was supported by the director of the National Greening 2010 Framework from the Department of Environmental Affairs.

Members of the environmental forum were pooled from the following institutions:

- The Local Organizing Committee;
- The Department of Environmental Affairs (DEA);
- The Department of Water and Forestry;
- Provincial governments;

- The nine host cities;
- International agencies such as the IUCN, UNEP and UNDP;
- IndaloYethu (a joint initiative of DEA and the Wildlife and Environment Society of South Africa, or WESSA, to promote environmental awareness and activism amongst South African communities, the business sector and government).

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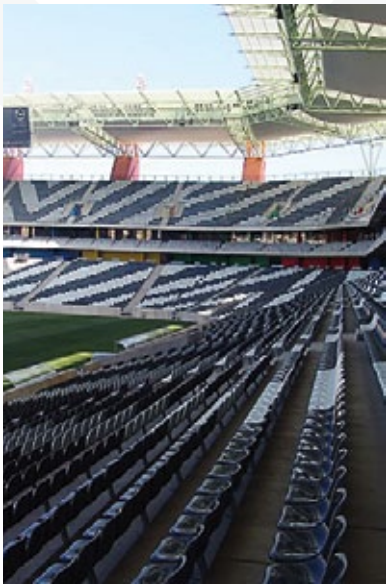

3.2 The Department of Environmental Affairs

The Department of Environmental Affairs is the national ministry with overall responsibility of protecting, conserving and enhancing the environment and natural heritage of South Africa. The Ministry was tasked with the responsibility of developing national level strategies for greening the FIFA 2010 World Cup™. It was also responsible for sourcing funds for implementing the national level greening strategy.

According to the National Greening 2010 Framework, the Department of Environmental Affairs was to provide leadership, guidance, technical and financial support to the host cities to meet the stipulated objectives.

3.3 Host Cities

The greening of the 2010 event was to be implemented by the nine host cities of the South African World Cup™. According to the National Greening 2010 Framework, each of the cities and towns was responsible for designing and implementing initiatives related to the core focus areas and underlying themes. The host cities signed an agreement with the LOC and FIFA which committed them to ensuring that environmental sustainability issues were addressed.

3.4 Other role-players

Provincial governments supported municipalities in their preparations for the FIFA 2010 World Cup™ by participating in beautification /greening of major roads linking host cities; and in promoting regional biodiversity and greening initiatives, and guiding initiatives to strengthen waste processing and recycling.

The **South African National Biodiversity Institute (SANBI)** was appointed by the Department of Environmental Affairs to coordinate the implementation of an Expanded Public Works Programme related to National Greening 2010 projects. SANBI was also required to provide advice to municipalities regarding public awareness initiatives related to water utilization and biodiversity.

South Africa National Parks (SANPARKS), in conjunction with the National Energy Efficiency Agency and the Central Energy Fund, was to implement a R575-million infrastructure upgrade of its 23 national parks, to showcase energy efficient installations to local and international visitors during the World Cup™ and beyond.

The initiative was to provide both energy efficiency and carbon offset benefits. The Energy Efficiency Financial Support Project allocated 'top-up' funding for each upgrade to buildings and other facilities within SANPARKS, to finance the specific technology improvements, ensure sustainable energy-efficient installations and substitute conventional fittings with more efficient ones such as solar geysers and compact fluorescent lamps (CFLs).

To improve energy efficiency, energy audits and retrofitting of energy efficient fittings were to be done by emerging Black Economic Empowerment (BEES) Energy Service Companies.

Through the Greening 2010 programme, the hospitality industry was expected to promote and facilitate responsible tourism. The **hospitality industry** was to showcase environmental operating practices in hospitality management. This industry therefore had a critical role to play in mitigating the adverse environmental impacts expected from the 2010 World Cup™.

A new environmental rating system for the hospitality sector in South Africa was proposed. This system was aimed at assisting environmentally discerning visitors to find accommodation in establishments whose values and environmental practices they found acceptable. The project was to be implemented on a pilot basis in the Western Cape and KwaZulu Natal, and later on to be scaled up nationally.

Non-governmental organizations had also shown interest in participating in the Environmental Forum in the initial stages of the Green Goal 2010 programme. However, most of these organizations decided to withdraw due to lack of funds and the slow pace at which the greening process was moving.

FIFA ensured that *'Green Goal 2010'* was copyrighted under FIFA and therefore in all greening activities collaboration were sought only from FIFA affiliated partners.

FOUR

CLIMATE CHANGE

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The initial aim of Green Goal 2010 was to host a carbon-neutral event, that is, to avoid and reduce greenhouse gas emissions of the event. Where greenhouse gas emissions could not be avoided, the emissions were to be compensated through viable capital investments in climate adaptation projects with social benefits for South Africa. However, due to limited resources the focus became the delivery of a low carbon event, targeting energy efficiency and use of renewable energy.

4.1 Environmental Objectives for Climate Change Mitigation

The expected emissions from the FIFA 2010 World Cup™ were associated with energy consumption, waste generation, transportation (ground and air travel) and accommodation. According to the feasibility study report for a carbon neutral FIFA 2010 World Cup™ in South Africa (DEA 2009), the projected total carbon footprint for the event was estimated at 2,753,250 tCO_2e (tonnes of carbon emissions equivalent).

Summary of the projected carbon footprint for FIFA 2010 World Cup

Component	Emissions (tCO_2e)	Share (%)
International transport	1,856,589	67.4
Intercity transport	484,961	17.6
Intra-city transport	39,577	1.4
Stadia constructions and materials	15,359	0.6
Stadia and precinct energy use	16,637	0.5
Energy use in accommodation	340,128	12.4
Total excluding international transport	896,661	
Total including international transport	**2,753,250**	**100**

Source: *Department of Environment, Feasibility study for a carbon neutral 2010 FIFA World Cup in South Africa*

To mitigate these carbon emissions, the Green Goal 2010 programme aimed to reduce greenhouse gas emission through:

- Implementation of energy efficiency standards and purchasing of green energy;
- Increased public transport use;
- Reducing waste generation at source and minimising waste to landfill;
- Raising funds through a carbon levy on all international flights and a mandatory offset of 1,000 tonnes of carbon by all host cities;
- Offsetting the carbon emissions by capital investment in climate protection projects.

4.2 Projected and Actual Carbon emissions[2]

The actual emissions produced by the event were less by an estimated 991,000 tCO_2e. This reduction is mainly due to reduced number of World Cup™ visitors and high vehicle occupancy by motorists during the World Cup™.

Projected and Actual Emissions for the 2010 FIFA World Cup TM

	Projected Carbon Footprint (tCO_2e)	Actual Carbon Footprint (tCO_2e)	Emission reductions (tCO_2e)	Factors contributing to reductions
International Travel	1,741,728	1,164,647	577,081	Reduction attributed to reduced number of international travellers for the FIFA 2010 World Cup™
Intercity transport	484,961	358,872	126,089	Based on reduced number of visitors. 76% of projected visitors attended. Therefore, 26 % reduced emissions due to reduced number of intercity travellers. This is also influenced by high car occupancy for intercity trips as indicated by transport analysis for the City of Tshwane.
Stadium construction and precincts	16,309	13,217	3,092	Based on estimated 30% reduction on operational energy requirement for Moses Mabhida, which was one of the newly constructed stadiums. This would also apply to the other 6 newly constructed stadiums

2 *Comprehensive emission calculations are provided in Appendix 2*

Intra City Transport	39,577	22,646[3]	19,789	Most stadium spectators used cars to reach the Park and Ride stations and since the actual car occupancy was more than 3.2 persons, actual emissions were reduced by up to 48%. Therefore a combination of high car occupancy and walking to the stadiums reduced emissions by approximately 50%
Stadium energy use	16,637	8,444	8,193	Projected emissions were calculated based on the use of national grid which has a conversion factor of 0.911 metric tons carbon dioxide emissions per megawatt hour[4] for South Africa. Actual emissions are calculated from use of diesel generators for electricity generation in the stadiums. This implies that use of generators lowered stadiums emissions during the event. This can be attributed to high emission factors for the South Africa power grid due to use of coal for electricity generation and power transmission losses.
Accommodation	340,128	84,234	255,894	The projected total guest nights far exceeded the actual guest nights. This translated into a huge variance from the actual emissions.
Emissions through landfilling	-	96		The emissions could exceed the calculated actual emissions due to the fact that most of the waste including the dry waste from the stadiums was landfilled. Contaminated waste could not be recovered by the informal recyclers.
Total	**2,639,341**	**1,652,156**	**990,138**	**The projected emissions do not include landfill emissions and Park and Ride emissions**

3 *Includes 2,857 tCO_2e emissions contributed by Park-and-Ride*

4 *US Department of Energy, Energy Information, Voluntary Reporting of Greenhouse Gases, Foreign Electricity Emission Factor*

4.3 Emission Mitigation Measures

Transport emissions from the event were reduced by:

- Limiting access of buses and cars to the stadium precincts, eliminating motorized transport and compelling spectators walk to the stadiums;
- Creation of exclusive lanes for non-motorized form of transport; cycle lanes and walkways in most of the cities. This encouraged the use of non-motorized forms of transport;
- Upgrades of highway infrastructure so as to include a Bus Rapid Transit system;
- All FIFA Family fleet vehicles to meet EURO II standards.

In addition, a 'Park-and-Ride' system was used to decongest the stadium precincts, and reduce emissions. Many stadiums are located far from public transport access, and as there is a widespread culture of private car use, most spectators arrived at the Park and Ride stations using cars. As per the Department of Transport statistics 54 per cent of spectators used private cars to reach Park and Ride centres and were moved to the stadiums using buses. However, instead of reducing emissions this system produced an extra 1,428 tCO_2e compared to the use of cars for travelling to walking distances to the stadiums. This was because there was high occupancy rate of at least 3.2 people per vehicle, resulting in a high number of bus passengers.

Energy emissions from the event were mainly reduced through energy efficiency measures in the venues. Based on an energy audit of Moses Mabhida stadium – one of five newly built stadiums – its Building Management System and energy efficiency fixtures resulted in a 30% reduction of energy use. From this we can estimate that the other newly built stadiums also may have achieved a 30% reduction.

4.4 Emissions Offsetting

Although most of the planned projects for offsetting carbon emissions were not implemented due to lack of funds, some emissions offsetting initiatives were undertaken, including:

- Solar-powered street lighting;
- Retrofitting of traffic lighting;
- Solar powered billboards;
- Solar water heaters in the City of Durban;
- Tree planting for carbon sequestration;

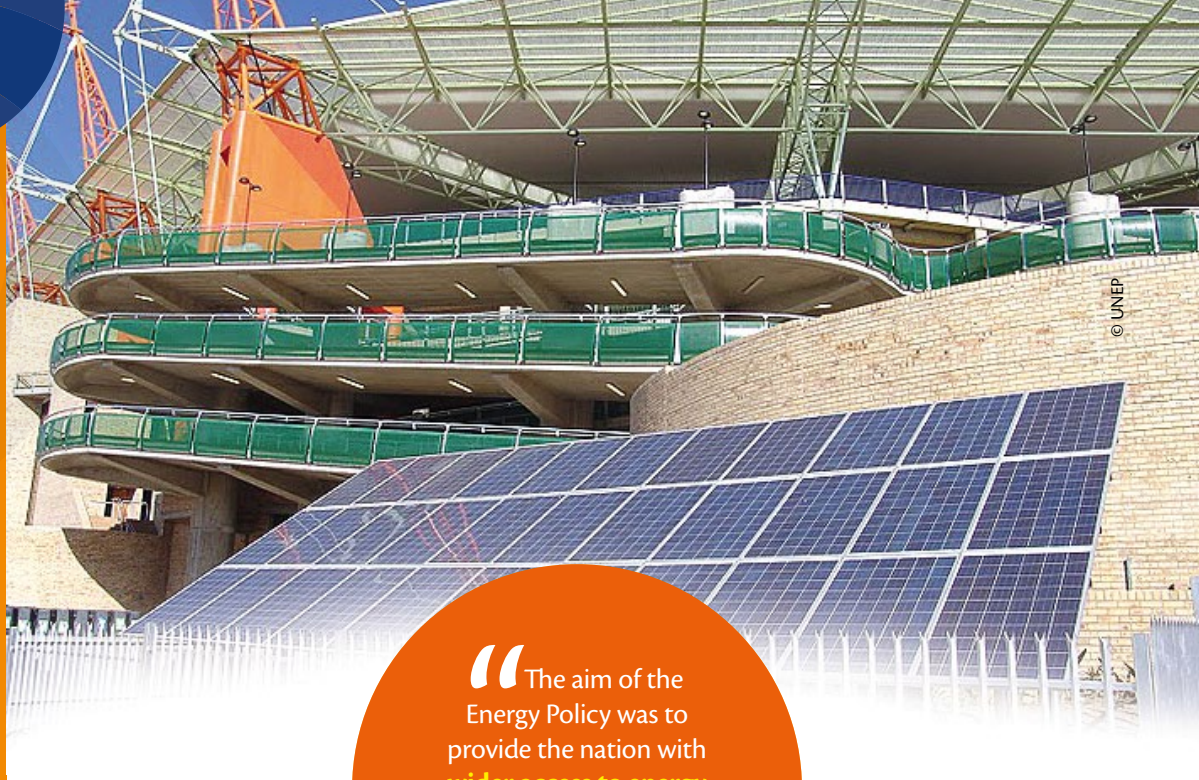
- Renewable energy use, through the energy provider, Eskom. Electrawinds donated 1.8 mw electricity to the Nelson Mandela Municipality from its wind turbine located at the Industrial Development Zone (IDZ) in Coega, Port Elizabeth. For a period of 1 month this was able to offset **1,180 tonnes** of carbon emissions equivalent.

4.5 Comments and Recommendations

Carbon emissions reduction was achieved through the implementation of the measures mentioned above, in addition to the reduced energy use as a result of reduced visitor numbers to the FIFA 2010 World Cup™. The main areas in which successful initiatives were implemented were in energy efficiency, renewable energy and public transport provision.

Although, the Park-and-Ride system to encourage public transport use conversely resulted in higher emissions from buses due to high numbers of people using the buses, it is an initiative that should be encouraged with the right approach.

In addition, other emission reduction initiatives were planned but were not implemented in time for the FIFA 2010 World Cup™ events, including fitting of energy efficient fixtures for the hospitality sector and introduction of energy efficient technologies in the mining industry.



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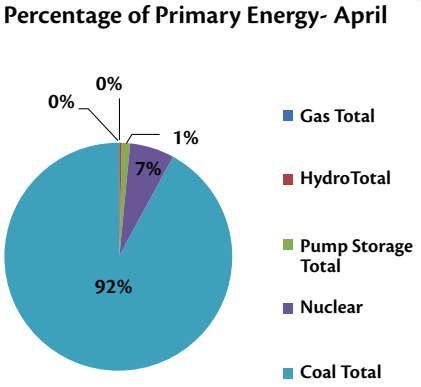
"The aim of the Energy Policy was to provide the nation with **wider access to energy** while ensuring that environmental impacts of energy conversion and use are minimized

FIVE

ENERGY EFFCIENCY AND RENEWABLE ENERGY

South Africa is endowed with abundant deposits of coal which is mainly used for power generation. The cost of purchasing energy in South Africa is relatively cheap because coal is abundant and is cheaply mined in the local fields. As indicated in the chart below, approximately 90% of electricity is generated from coal plants. Future energy costing is likely to internalize the cost of environmental damages resulting from its generation and therefore lead to a price increase.



The South African National Energy Association (SANEA2003) estimates that greater energy efficiency could reduce current consumption by between 10% and 20% and in turn lead to an increase of between 1.5% and 3% in the Gross Domestic Product. SANEA further states that to achieve the above gains, the critical barriers that hinder the uptake of such technologies, such as inappropriate economic signals, lack of public and official awareness, and the high capital costs involved must be tackled.

Structures to influence energy efficiency in South Africa were initiated through the White Paper on Energy Policy (1998) and the Energy Act (2008). The aim of the Energy Policy was to provide the nation with wider access to energy while ensuring that environmental impacts of energy conversion and use are minimized as much as possible.

For the FIFA 2010 World Cup™ energy efficiency was to be attained through technological improvement, organizational and behavioural change for reducing energy consumption. Further, the use of renewable energy was to be promoted wherever possible and feasible.

5.1 Environmental Objectives for Energy Efficiency

Energy efficiency through retrofitting and energy management measures were to be implemented during the event to ensure that energy consumption was reduced by at least 20%.

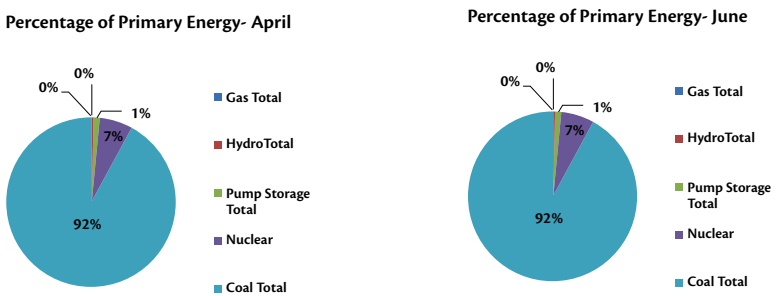
The Green Goal 2010 Minimum Environmental Standards for energy efficiency and renewable energy included:

- Implementing building management systems to control peak load and optimise energy use;
- Designing new buildings to include passive solar principles;
- Intelligent and Energy efficient lighting in stadiums and offices;
- Efficient Heating, ventilation and air conditioning (HVAC) systems;
- Efficient water heating systems;
- Procurement and use of energy efficient equipment;
- Use of solar water heaters;
- Demonstration of solar PV, wind generation or other renewable in each host city;
- 100% of total electricity used by the stadiums during the event to be 'green electricity'.

5.2 Energy supply during the World Cup

In terms of primary energy generation by provider Eskom, the overall mix of sources remained the same prior to and during the FIFA 2010 World Cup™, as can be seen in the charts below.

Primary Energy Generation April and June 2010



Source: Eskom Energy

As a result of previous power outages during the 2009 Confederations Cup™, FIFA required the use of independent generators to ensure an uninterrupted supply of power. This resulted in the use of diesel power generators for the stadiums during the FIFA 2010 World Cup™.

Individual host cities were mandated to realise the Green Goal 2010 programme, in conjunction with stadium management. In general, most stadiums incorporated design provisions for energy efficiency, contributing to an estimated reduction in energy use of 30 per cent across all stadiums.

These initiatives included:

- Installing a Building Management System to control and monitor air conditioning and lighting;
- Designing to facilitate natural light, rather than use artificial lighting;
- Provision of intelligent lighting systems with motion sensors, and energy efficient light bulbs;
- Installation of demonstration renewable energy projects.

Some excellent examples of stadiums which incorporated these measures include:

- **Green Point Stadium, Cape Town:** Designed with natural ventilation systems, highly efficient HVAC and intelligent lighting systems. The generators used in the stadium are biodiesel-compatible to allow future use of renewable bio-fuels, and carbon dioxide monitors in the parking garage controlled the ventilation fans, switching the fans off when not required.
- **Moses Mabhida Stadium, Durban:** Designed with energy efficient and intelligent lighting incorporating motion sensors, timers and flood lighting control; installation of heat-pumps; and an enhanced Building Management System including monitoring cooling equipment. Training venues for the stadium also incorporated the same provisions.
- **Mbombela Stadium, Nelspruit Municipality:** In addition to energy efficiency measures, a solar demonstration project was installed within the stadium, consisting of 33 PV panels which generated 8.2Kva energy fed into the stadium line.
- **Nelson Mandela Bay Stadium, Port Elizabeth:** In addition to energy efficiency measures, wind energy was fed into the municipal grid to compensate for the additional stadium energy demands during the event.

5.3 Comments and Recommendations

South Africa is endowed with abundant coal resources, resulting in relatively cheap energy generation and an economy heavily dependent on energy. The combination of the two scenarios, abundance of coal and intensive dependence on its use results in high emissions due to energy generation. Given this, some recommendations include:

- Full implementation of the national energy policy would be an important step for Africa because South Africa consumes 40 per cent of the total electricity consumed within the continent (DME, 2005).
- Demonstration projects should be initiated as soon as possible, so as to be planned and implemented by the commencement of a large event, such as the FIFA 2010 World Cup™. For example, the Department of Environmental Affairs / host cities solar energy demonstration projects were targeted to positively influence host cities, residents and spectators on use of solar energy. However, many were not completed in time for the event.

SIX

INTEGRATED WASTE MANAGEMENT

South Africa's national waste management strategy emphasises waste prevention and minimisation at source before seeking options for reuse, recycling or composting. Waste disposal into landfills is considered only in situations where no other upstream integrated waste management options are available.

The Green Goal 2010 programme was widely seen as an opportunity to influence real change in behaviours by raising public awareness and implementation of waste prevention and segregation, separating recyclables from non-recyclables.

South Africa National Waste Management Strategy Hierarchy

Waste Management Strategy Hierarchy	
Cleaner production	Prevention
	Minimisation
Recycling	Re-use
	Recovery
	Composting
Treatment	Physical
	Chemical
	Destruction
Disposal	Landfill

In accordance with the national waste management hierarchy, waste prevention and minimization was to be prioritized from the onset of planning for the FIFA 2010 World Cup™. The overall planning for waste management targeted re-use, take-back and recycling and/or composting. The generation of non-reusable and/or non-recyclable/compostable waste was to be kept to an absolute minimum and the waste was to be disposed of in the appropriate and most environmentally responsive manner in designated landfills.

6.1 Environmental objectives for integrated waste management

The Green Goal 2010 Minimum Environmental Standards included:

- General Integrated Waste Management planning, education and awareness – and targets of reducing waste generation by 10%, and reducing waste to landfill by 30%;
- Waste audits;
- Waste avoidance – especially with regards to food and beverage containers;
- Waste re-use and recycling – separate collection of recyclables from non-recyclable waste, re-use of construction demolition materials;
- Efficient waste transportation and disposal;
- Contracts with vendors and suppliers, waste management service providers, enforcement and implementation;
- Leave a lasting legacy of stadiums with waste minimisation strategies post-World Cup.

6.2 Waste reduction and processing

In response to Green Goal 2010 the following technological options were proposed:

- Promote recycling so as to reduce waste volumes directed to landfills by provision of a nationally standardized 2-bin collection system for recyclable and non-recyclable items in the public areas and 5-bin system (glass, paper, plastics, tin, biowaste) for catering facilities, fan shops, offices etc;
- Waste that cannot be avoided or recovered for re-use, recycling and/or composting to be kept to an absolute minimum and be disposed of in an environmentally sound manner;

- Wherever possible and feasible technological, organizational and behavioural changes to be employed in all aspects of event planning, operation, management, maintenance and decommissioning to avoid, minimize and reduce waste at source; and
- Monitoring and evaluation of any waste reduction intervention to be done along the entire life-cycle of a product or service.

Initiatives implemented in response to Green Goal 2010 included:

- 2 and 5 bin systems were provided in most spectator and catering areas – the 2 bin system collected 'wet' and 'dry' waste, while the 5 bin system collected glass, paper, plastics, organic and general waste;
- Encouraging visitors to consume tap water to reduce PET plastic bottles, by the City of Cape Town;
- Providing paper towels or recyclable packaging for food and drinks in most stadiums;
- Reuse of demolition materials for the construction of a number of stadiums.

Some interesting examples include:

- In Green Point Stadium, Cape Town, 95 per cent of demolition waste was recovered and reused from the old stadium, reducing demand for virgin material and emissions related to its production and transportation, and creating savings. The DEA reports that of the 27 different types of concrete mixes used at Green Point Stadium, some contain as much as 50 per cent fly-ash[3] content;
- 400 tonnes of steel, 40,00 bricks, masts, control gear, topsoil and pre-cast seating were salvaged from old Kings Park Stadium for use in Moses Mabhida Stadium, Durban and other projects in the city;
- Moses Mabhida Stadium, Durban provided a 2 bin waste collection system, resulting in the venue collecting 737 tonnes of waste, of which 24 per cent was recycled, exceeding the Greening Durban 2010 target by 4 per cent;

3 *A product of coal combustion, and can be used as a substitute for Portland cement and sand*

- More than 70 per cent of building rubble from the old stadium structure was crushed and reused in the construction of the new Soccer City Stadium, Johannesburg.

6.3 Comments and Recommendations

Efforts were clearly made to lay plans to minimise waste generation and maximise its recovery and reuse, followed by recycling. However, not all host cities and stadiums were able to enforce proper segregation of waste, and did not all have contracts with waste management firms who would recycle, rather than landfill, the waste collected. A number of private entrepreneurs and scavengers often made use of the recyclables themselves.

Following the introduction of waste segregation during the FIFA 2010 World Cup™ it is in the interest of the South African Government to take advantage of the waste segregation momentum and scale it up in all the host cities. As a prerequisite, the following gaps should be addressed:

- Develop policy on waste separation at source;
- Develop public interest in waste segregation at source;
- Expand the scope of waste recovery into a formal arrangement with the local authorities.

In addition, in line with South Africa's policy of improving the livelihoods of the poor and the value of waste materials as resources, the government recognised that there was potential to create jobs and support local entrepreneurs in recovering waste so as to generate hitherto untapped income streams, and reduce littering.

A coherent and comprehensive waste separation and recycling programme could be one of the most important legacy projects for South Africa.

SEVEN

WATER CONSERVATION AND MANAGEMENT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Efficient water demand management, efficient water technologies and alternative water supplies formed the basis for setting standards for water conservation and management. The Green Goal 2010 aim was to reduce potable water use for irrigation and other areas that do not require stringent water quality standards.

7.1 Environmental objectives for water

- Reduce demand of potable water by 20 per cent through the use of efficient fixtures, controlled irrigation, use of alternative sources of water for pitch irrigation, and public awareness;
- Re-use of water by promoting reuse of grey-water in uses that do not require stringent water quality standards;
- Protection of water resources from pollution/contamination through the use of environment-friendly materials, wherever possible, to clean the stadiums and maintain the pitches;
- Minimize the sealing of natural ground to allow natural rainwater cycle, through the use of permeable materials for construction of surfaces, pitches and walkways.

7.2 Efficient water use

For the FIFA 2010 World Cup™, efficient water technologies were incorporated into the design of most of the stadiums. These included:

- Use of dual flush system;
- Installation of motion detectors in the urinals;
- Use of spring (from boreholes) and rainwater for irrigation.
- Installation of low-flow shower heads and aerated taps;
- Use of dry urinals;

The challenge for water management was the ability of the stadium management to integrate efficient fixtures and use alternative sources of water for irrigation and ablution needs. Monitoring of water usage was also a challenge.

Some effective measures implemented by the venues included:

- Green Point Stadium, Cape Town achieved the Green Goal 2010 target of reducing potable water use by 10% through water saving technologies in the stadium design, the roof was designed to collect rainwater, and the landscaping around the stadium included water-wise plants and water-efficient irrigation systems (drip irrigation). In addition to measures mentioned above, low-flow showerheads and aerated taps were also used.
- In Moses Mabhida Stadium, water metering was conducted for the stadium, in addition to the water wise fittings and rainwater harvesting into a 700 m^3 underground storage, and intelligent irrigation, resulting in 74% reduction of potable water.
- There was monitoring of water quality to meet the national Blue Drop Standard at the Free State Stadium, Manguang, to ensure that water is of drinking quality, and people were encouraged to drink tap water.

7.3 Comments and Recommendations

Generally, the use of water wise fittings, intelligent irrigation and some extra measures for harvesting rain and borehole water were positive initiatives by the stadiums and host cities. The space for improvement would be in ensuring that all stadiums met, and regularly, exceeded the minimum water standards.

An important aspect of water conservation is the metering of water, and water audits. Thus a recommendation would be for utilities to install service-meters for every point of use within the stadium and apportion water use for each activity so that one can calculate water savings and benchmark performance for each area.

EIGHT

SUSTAINABLE PROCUREMENT

All procurement procedures were to follow sustainability principles based on environmental impact mitigation of products and services into the relevant tender documents. Preferred green procurement minimum standards include; locally manufactured materials that are non-toxic, re-usable and recyclable, and extended producer responsibility (EPR) in addition to the black economic empowerment principles.

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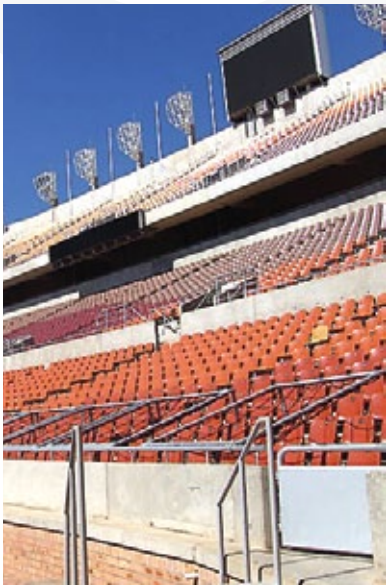

8.1 Environmental objectives for sustainable procurement

The following were the objectives of the procurement standards:

- Ensure that relevant and available environment and technology standards for best product choice and service practice (corresponding to established internationally certified product eco-label performances) are included into the tender documents wherever possible and available;
- Promote local economic development through preferential procurement of suitable local goods and services within the host city region;
- Reduce the overall negative environmental impact of catering at events by promoting the use of local, organic material and resource efficient products and services;
- Reduce the overall environmental and social negative impact of the manufacturing of clothes, gear and other merchandise sold and used at the FIFA 2010 World Cup™ by giving preference to manufacturers and suppliers offering fair-trade and fair labour working principles;
- Promote a "sustainable sponsorship" model for the event which encourages large sponsors to comply with the sustainable procurement principles and adhere to its minimum environmental standards;
- Ensure full transparency along the entire procurement decision-making process.

8.2 Comments and Recommendations

By the time the Green Goal 2010 programme was being conceptualized, most of the construction works were ongoing. It was therefore not possible to include green procurement standards in the construction of the stadiums. Due to improvements in technology and general global influence over environmental products some green products were acquired. This is demonstrated by the type of fixtures that were installed in the new stadiums. However, a key recommendation for mass sporting events would be to develop plans and strategies earlier in order to maximise opportunities to influence change in associated processes and strategies.

NINE

SUSTAINABLE TRANSPORT

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The public transport system in South Africa is generally underdeveloped. Almost 50% of public transport users are dissatisfied with travel times, and only 10% of commuters have a choice of three modes (Department of Transport, 1998). South Africa's public transport is relatively high cost when compared with international benchmarks: services cost users 32% more than world averages, primarily because of the distance they travel. The result is higher system costs, deteriorating infrastructure, higher user costs, and poorer service for those users who are captive to the system.

An inefficient public transport system severely restricts human mobility, reduces worker productivity, and impedes social integration. Between 1972 and 1996, the number of cars in South Africa increased by 72%, and forecasts indicated that it was expected to increase by another 64% between 1996 and 2020. A poor public transport system is one of the factors contributing to increase in the use of private motor vehicles for transport. It was the objective of the South Africa Government to use the momentum of the FIFA 2010 World Cup™ to encourage South Africans to embrace the use of public transport as the desired means of transport.

The South Africa Government transportation strategy for 2010 was to transform public transport into a user-friendly, municipal controlled, fully integrated, mass rapid public transport network. Public transportation was to undergo a phased overhaul (from 2007-2020), becoming an Integrated Rapid Public Transport Network option for all, including car users.

In order to make transport more accessible, efficient and appealing for private vehicle owners the following were to be considered:

- Operational plans were to include strategies for minimising travel needs arising from the event and host city activities from the outset of designing the event;
- Local Public Transport (*including all environmental-friendly means of transportation e.g. bus shuttles or bicycles*) was to account for at least 50% of all travel to and fro stadia and was to be integrated with Park-and-Ride facilities to encourage public transport use;

"Provision of Park-and-Ride and fan walks, to reduce use of **private motor vehicles** and encourage public transport use

- Suitable non-motorised transport infrastructure including walkways, pedestrian crossings, appropriate surfacing, sufficient lighting, among other things, were to be in place around the stadiums to encourage walking to events;
- Maintenance of air quality was to be achieved through minimization of air pollution by limiting motorized transport (including aeroplanes) and using cleaner and renewable energy wherever possible;
- The sponsored vehicles, as well as public transport vehicles purchased as part of the public transport upgrades, were to meet the most appropriate standards for fuel efficiency and CO2 emissions and ideally be propelled by engines running on bio fuel, solar or electric systems as opposed to hydrocarbon based fuels.

9.1 Transport during FIFA 2010 World Cup™

The Department of Transport, nine host cities and the LOC were key players in delivering transport during the event.

The following demonstrations were undertaken with the objective of streamlining public transport and making it appealing to commuters:

- Construction of a 94 km Bus Rapid Transport (BRT) network in Johannesburg, 33.4km of BRT in Nelson Mandela Bay, 9 km of high-occupancy vehicle (HOV) lanes in Mbombela, and of cycle paths and walkways in Polokwane (55.5 km), Mangaung (3.8 km) and Rustenburg (10 km);
- Provision of Park-and-Ride and fan walks, to reduce use of private motor vehicles and encourage public transport use (provision of buses from the Park-and-Ride stops);

A positive outcome for public transport was expansion of infrastructure so as to support public transport – Bus Rapid Transport and High Occupancy Vehicles. The infrastructure is likely to facilitate public transport and therefore encourage more commuters to use public transport.

9.2 Comments and Recommendations

The improved transport system should be considered the main legacy project of FIFA 2010 World Cup™ in South Africa.

Other areas that would be important to be addressed for future sustainability of public transport in South Africa include the following:

- Ensure roadworthy public service vehicles for improved safety so as to encourage commuters to use public transport – it is necessary to tackle this at the government policy level;
- Create more access to the stadiums by public transport, currently most stadiums are located in remote areas and are not easily accessible by public means. In the future, location of stadiums should take into consideration sites that are accessible by public means;
- Expand public transport network. This is in line with the Department of Transport's Public Transport Strategy of March 2007 which aims to have 85 per cent of South Africa's metropolitan city's population within 1km of an Integrated Rapid Public Transport Network trunk (road and rail) or feeder (road) corridor;
- Establish comprehensive route lines to encourage foreigners to use public transport – South African commuter routes are not readily available in the public domain;
- Improve the image of public transport – which is often alleged to be unsafe, dangerous and unreliable (Addressed in Phase I, 2007 -2010 Accelerated Recovery & Catalytic Projects (up to 12 cities & 6 districts - Safety and Security Enforcement on Public Transport).

Most of the initiatives on transportation were undertaken so as to meet the FIFA guarantee for transport.

TEN

RESPONSIBLE TOURISM & ACCOMMODATION


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Accommodation facilities were required to create awareness on their environmental footprint and provide guests with technological, organizational and behavioural options for a less polluting and more resource efficient stay. Accommodation facilities were encouraged to establish and implement an environmental policy and obtain an official green rating. Activities were to be focused on effective resource management (energy, water, waste reduction) and promotion of socially responsible investment benefiting local communities.

10.1 Environmental objectives for accommodation

- Ensure a commitment by the management of the hospitality sector on environmental performance;
- Educate staff and assist them with implementation of energy efficiency and water conservation principles and practices.
- Create awareness and assist in the implementation of waste avoidance, recycling and green procurement initiatives;
- Reduce the use of harmful chemicals and advise on suitable non-toxic alternatives;
- Promote the establishment of indigenous and water wise gardens that will support the protection of the local biodiversity, flora and fauna;
- Introduce green building design and construction principles for new buildings or renovations;
- Encourage establishments to promote social responsible investment, as well as local economic development by engaging with the local community.

10.2 Promoting responsible tourism

Green rating of the hotels was not done; discerning tourists were therefore not provided with lodging options in terms of environmental performance. There was no green criterion for choosing venues (hotels, conference facilities) and transport (buses, airport transfers).

10.3 Comments and Recommendations

Minimum standards should have established for the hospitality industry. This would have encouraged more hotels to participate and would also have left a pro-green legacy for the hospitality industry.

Future Green Goal initiatives should seek to develop and implement programmes to rate hotels on the basis of their environment performance. This will encourage organizers to promote and market green hotels.

ELEVEN

BIODIVERSITY

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South Africa has a well developed policy and legislative framework for biodiversity which provides a strong basis for the conservation and sustainable use of biodiversity. The South Africa National Biodiversity Institute (SANBI) was formed in September 2004 through the National Environmental Management, Biodiversity Act, 2004 (No. 10 of 2004).

Mandated by this Act, the Institute is responsible for the broad management of South Africa's biodiversity, while continuing to build upon the internationally agreed programmes in conservation, research, education and other programmes developed over the past century by the former National Botanical Institute.

2010 was the United Nations International Year of Biodiversity through which the world was urged to safeguard the diversity of life on earth. South Africa is party to the Convention on Biological Diversity since 1995 by ratification. In April 2002, the Parties of the Convention committed themselves to achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on Earth. It is against this background that the South Africa National Biodiversity Institute together with other national institutions has embarked on an extensive programme to conserve and regenerate the national biodiversity product.

In sum, there were several programmes in South Africa around the 2010 FIFA World Cup that targeted biodiversity enhancement. Some of the biodiversity projects that were ongoing in the host cities during this assessment were not associated with Green Goal 2010. They were programmes conceptualized back in 2005 through the South Africa's National Biodiversity Strategy and Action Plan. The Rehabilitation of Kliprivier/Klipspruit was within the provision of the Johannesburg City's Integrated Development Plan (IDP in line with the legislative requirements of the Municipal Systems Act, (Act 32 of 2000). This project was budgeted for within the Programme for Improving Water Courses of the City. Rehabilitation of the Klip River and Greening of Soweto 2010 were projects jointly implemented by the International Union for Nature and Conservation (IUCN) and the Johannesburg City Parks.

The Green Goal 2010 Minimum Environmental Standards for biodiversity were:

- Any negative impacts on biodiversity or the natural environment should be minimized during the planning and hosting of the event;
- Host cities should promote local biodiversity by using local vegetation for the landscaping around the venues.

Several host cities implemented some interesting biodiversity initiatives in response to the global focus on biodiversity in 2010.

11.1 Biodiversity initiatives in Durban

The City of Durban developed a Green Landscaping Guideline which covers Biodiversity and other benefits of greener landscaping. Durban's reclamation and reforestation of Buffelsdraai Landfill Site involved regeneration of indigenous plant species therefore enhancing biodiversity.

The Green Hub building in Durban was developed to showcase innovative yet simple green building approaches, such as natural lighting and ventilation, harvesting of rainwater from the roof for flushing toilets, and solar powered lighting. This contributes to enhancement of biodiversity by reducing use of biomass for construction, cutting down on energy use thus less emissions and reduction of potable water usage.

11.2 Biodiversity Initiatives in Cape Town

The Green Point Park adjacent to Green Point Stadium was converted into a new public park open to residents and visitors. The park was being developed according to ecological principles, with

energy and water efficiency, multi-purpose spaces and indigenous landscaping incorporated into the design. A section of the Green Point Park is earmarked for the development of a biodiversity garden for indigenous, water-wise plants that display the region s biodiversity, and demonstrate responsible environmental horticultural practices.

A specialist consultant trained in botany and horticulture, and experienced in the development of interpretive signage, was contracted to work with the Green Point Park's landscape architects to develop the garden. The biodiversity garden is one of the City of Cape Town's 'Local Action for Biodiversity; projects and was used to promote biodiversity awareness during 2010.

11.3 Biodiversity Initiatives in Johannesburg

As part of the celebrations of the International Year of Biodiversity, the Johannesburg City Parks Environment Conservation Department through The Environmental Education Unit and its partners such as Rand Water, Johannesburg Zoo, City of Johannesburg, Department of Forestry and Fisheries, Gauteng Department of Agriculture and Rural Development and Delta EE Centre identified programmes and projects to be implemented as part of addressing biodiversity issues in the City for the year 2010.

These programmes contributed to some extent to the biodiversity chapter of the Green Goal 2010, and include:

- A programme for awareness creation on biodiversity in schools.
- Community Engagement, Education and Awareness at Kaalspruit River, including awareness programme on water pollution, and an exhibition on biodiversity.

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"Overall electricity **consumption reduction** (24-hour reduction) through installation of energy efficient equipment and optimization of industrial processes

TWELVE

INITIATIVES OUTSIDE THE VENUES

12.1 Energy Efficiency

During the FIFA 2010 World Cup™, Eskom continued with its electricity Demand Side Management Campaign which was officially initiated in the last quarter of 2002. Demand side management focuses on instituting measures to influence efficient domestic and industrial energy usage. This initiative was implemented in collaboration with the Department of Minerals and Energy (DME) and the National Electricity Regulator (NER).

The strategy involved:

- Reducing electricity demand at peak periods (07:00-10:00 and 18:00-20:00);
- Shifting load to off-peak periods; and
- Overall electricity consumption reduction (24-hour reduction) through installation of energy efficient equipment and optimization of industrial processes.

A list of other energy efficient initiatives that were implemented are listed in the table below:

Institution	Initiative
Port Elizabeth	■ Installation of solar water heaters in the community. This project was ongoing with over 50 solar water heaters installed in households by the end of 2010. ■ A 1.8 Mega Watt wind turbine at Coega Industrial Development Zone Port Elizabeth was completed by the time of World Cup. This project was funded by the Central Energy Fund of South Africa. The wind farm donated energy into the municipal grid. ■ Retrofitting of a number of streetlights with energy saving bulbs. ■ Natural gas extraction from landfill sites; this project was to be rolled out at Arlington and Koedoeskloof Waste Disposal Sites. It is estimated that the project will generate 4 - 8 Mega Watts. Project feasibility study is completed by the end of 2010 but the project has not yet been implemented.
Cape Town	■ Taxi drivers servicing the Park-and-Ride points were trained in eco-driving. Eco driving is acclaimed for reducing fuel consumption and emissions by up to 20 per cent; ■ Retrofitting of streetlights along protocol routes to provide low energy illumination; ■ Retrofitting of traffic lights along protocol routes with LED lights; ■ Plan to install a hydroelectric turbine to generate electricity from spring water in the Green Point Park; ■ Retrofitting of a council-owned building with energy saving lighting; ■ Installation of energy-efficient floodlights and electricity sub-meters at Philippi Stadium (training venue for the FIFA 2010 World Cup™); ■ Installation of solar water heaters for low-income households.
SAFA House - Central Energy Fund	■ Turning the South Africa Football Association (SAFA) House into an energy efficient (green) building. ■ SAFA House was lit for 24 hours and 7 days of the week throughout the World Cup. This was a concern but also presented a great opportunity for saving energy and implementing the national call for reducing energy consumption. Efforts included: ■ Replacement of dichroic lights with Compact Fluorescent Lamps, ■ Installation of motion sensors which contributed to a 50 per cent reduction of energy used for lighting the basement (Funded by the Central Energy Fund).

12.2 Climate Change

The exploration of options for making the event a low carbon one on a national basis was initiated in a workshop on carbon offsets in Cape Town in December 2007, attended by the then Department of Environmental Affairs and Tourism, the Local Organizing Committee (LOC) and other stakeholders.

The Carbon Offset Working Group was established as a sub-committee of the LOC's Environmental Forum.

Through collaboration between the then Department of Environmental Affairs and Tourism, UNEP, the Local Organizing Committee and host cities, Terms of Reference for a feasibility study to assess possible carbon offset projects in South Africa were prepared. The Norwegian government funded a national baseline assessment of the carbon footprint in each host city, to inform mitigation strategies and offset options.

The German government provided support through capacity and skills transfers to leverage the learning from the FIFA 2006 World Cup™, and proposed climate change related carbon offset projects related to the FIFA 2010 World Cup™. Potential offset projects were not to be confined to host cities of the FIFA 2010 World Cup™. Projects in other Southern Africa Development Cooperation (SADC) countries were to be considered.

The Department of Environmental Affairs (DEA) coordinated the low carbon emission programmes. The main initiatives by the Government involved planting of trees, which were expected to act as carbon sinks. Two hundred thousand trees were planted in Johannesburg, 83,000 in Durban, while those planted in other host cities were not recorded. This was fulfilled through the Expanded Work Programme thus, creating jobs for the unemployed.

DEA identified five projects for offsetting carbon emissions resulting from the FIFA 2010 World Cup™ event. These projects were attached to a carbon calculator initiated through a partnership with UNEP and GEF.

The Carbon Calculator enables interested parties to determine their carbon footprint and offset the emissions against a project of their choice as presented below:

Solar Cookers, by Sunfire Solutions – these solar stoves allow households to move away from traditional/ordinary stoves which require enormous amounts of wood or coal, thus reducing the amount of fuel burned, carbon emissions and costs to the household.

Soil Composting by Soil & More Reliance – uses municipal green waste and alien vegetation that threatens the indigenous flora of the Western Cape (one of the World's most fragile floral kingdoms) for compost/organic manure to substitute synthetic fertilizers.

LED energy efficient lighting retrofit programme, by Lemnis Lighting – demonstrates the use of clean technology through large scale retrofitting of ordinary bulbs with energy efficient LED lights, reducing carbon emissions by 5.6 million tonnes CO_2e and achieving energy savings of up to 90 per cent.

Wind energy, by Mainstream – this wind energy project contributes to improved energy stability and security of supply. Located in the Eastern Cape near Jeffrey's Bay, the energy created by the wind turbines is positively impacting on the overall economic development of the area by providing electric energy to this largely rural farming region.

Domestic fire lighting – BasaNgeMagogo Project, by the Nova Institute – Large numbers of low income families live in shanty towns and use coal for domestic energy, causing serious health impacts to the young and old. This project introduces an alternative ignition technique that leads to efficient and clean burning of coal that results in more than 80% reduction in pollutants and 30-50 per cent reduction in the amount of coal used.

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The Department also received US$1 million worth of financing from the Global Environment Facility (GEF) and UNEP to implement demonstrative projects on solar energy.

- Installation of sample solar powered street lights, traffic lights and billboards around the stadium in the six host cities – City of Tshwane (Pretoria), Johannesburg Metropolitan Municipality, Nelson Mandela Metropolitan Municipality (Port Elizabeth), Polokwane Local Municipality, Rustenburg Local Municipality and Manguang Local Municipality (Bloemfontein) in total, twelve solar powered billboards – two in each city – along with 60 traffic lights and 78 streetlights across the six host cities.

Two host cities, Cape Town and Durban carried out studies to determine their individual city carbon footprints and developed programmes for offsetting the resulting emissions.

Cape Town

Cape Town aimed to host a low-carbon event and implemented projects that minimized carbon emissions rather than direct offsets. Cape Town's World Cup™ related carbon footprint was estimated at 150,000 tCO_2e. In January 2009, the Royal Danish Embassy and DANIDA advanced R7 million to the City of Cape Town and the Provincial Government of the Western Cape (PGWC) for the mitigation of carbon emissions resulting from the FIFA 2010 World Cup™. With sponsorship from the Konrad

Adenauer Foundation (Konrad-Adenauer-Stiftung (KAS), the city convened a carbon workshop in February 2009 to review potential projects that could be implemented with this grant.

The following projects were subsequently approved for funding:

- Retrofitting of streetlights along protocol routes with low energy luminaries (CoCT Energy and Climate Change Strategy priority);
- Retrofitting of traffic lights along protocol routes with LED lights (CoCT Energy and Climate Change Strategy priority);
- Installation of a hydroelectric turbine to generate electricity from spring water in the Green Point Park (awareness-raising opportunity);
- Retrofitting of a council-owned building with energy efficiency fixtures;
- Installation of energy-efficient floodlights and electricity sub-meters at Philippi Stadium;
- Installation of solar water heaters for low-income households (extension of existing project).

These projects were to be implemented from August 2009 to December 2010.

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Durban

The carbon emissions associated with the construction of the stadium was calculated at 190,000 tons CO_2. This was to be completely neutralized through a range of local reforestation projects for carbon sequestration, and renewable energy projects that reduce CO_2 emissions into the atmosphere. One such project was the reclamation of the Buffelsdraai landfill through introduction of indigenous vegetation. The project was implemented by the Wildlands Conservation Trust - an organization with experience in implementing community-based carbon sink projects in the KwaZulu-Natal province where Durban is located.

The following outputs have been realized by the project:

- 104,000 trees were planted;
- 436 Treepreneurs were established in Buffelsdraai, Osindisweni, KwaMashu, Ndwedwe communities;
- 9 permanent jobs (facilitators, tree planting team supervisor) were created.

A group of up to 60 temporary workers were hired for a 3-4 days stretch to assist with digging holes and planting trees when necessary. This assisted in substantially increasing the numbers of local community members benefitting from the project and injecting additional revenue into these communities.

Four renewable energy projects were identified, which after being implemented would result in sufficient carbon credits to offset the total carbon footprint of the FIFA 2010 World Cup™ in Durban (307,208 tons CO2), and create additional carbon credits. The additional credits were to generate a new revenue stream for the municipality. These projects were also meant to generate electricity and revenue for the municipality and to assist with establishing a secure renewable energy resource within the city.

The projects were on a business plan level during the World Cup™ and include:

- Western Aqueduct Hydropower Scheme to feed into Durban electricity grid;
- Mini-hydropower turbines on municipal reservoirs;
- Marianhill Landfill Site Composting;
- Southern Wastewater Treatment Works Biogas.

Climate plans for Green Goal 2010:

Scope	Initiative
National (through Carbon Offset Working Group and UNEP initiatives)	The following projects were shortlisted for carbon offsets: A biogas digester that will offset about 100,000 tonnes of CO_2e over a period of five years A scrap tyre to fuel projects with a capacity to offset approximately 200 000 tCO_2e over a three year period. The Central Energy Fund, through Karebo Group carried out retrofitting of LED lights in building owned by the selected commercial affiliates. This project aimed at retrofitting one million lamps and 55,000 carbon credits were to be donated to the Organising Committee.
Tshwane	**Planting of trees on road reserves** – 20,029 trees were planted; **Plant a tree for every goal scored at Loftus Stadium** - three sites identified (to be implemented after the World Cup); **Trees for Homes** - 600 trees were planted in Olievenhoutbosch, 500 trees still to be planted during environment week and 32 trees to be planted in the Fountain Circle
Johannesburg	120,000 trees were planted in and around the city against a Green Goal 2010 target of 200,000 trees .
Nelson Mandela Bay	**Natural gas extraction from landfill sites:** This project was rolled out at Arlington and Koedoeskloof Waste Disposal Sites and is currently ongoing. It is estimated that the project will generate 4 - 8 mw.

12.3 Transportation

Transport was one of the seventeen guarantees for hosting the FIFA 2010 World Cup™, it was therefore mandatory to provide adequate and reliable transport for the FIFA Family, the teams, and spectators. The memorandum included the following:

- The Department of Transport (DoT) and the Passenger Rail Agency of South Africa (PRASA) to assist the Local Organizing Committee with the provision of coach and bus transport to the FIFA family and the participating teams through the PRASA-owned Autopax, which operates both Translux and City to City bus services, as well as from the private sector.
- The Government assured FIFA that the Department of Transport would provide adequate coach and bus transportation services to the event to facilitate the movement of FIFA officials, as well as spectator groups that had purchased event hospitality packages.

While planning for transport, it became apparent that access to the various stadiums was going to be difficult unless urgent measures were implemented in time. The availability of transport services to provide access to stadiums and other host cities was of paramount importance.

The main strategy developed for accessibility to the stadiums was to construct new roads and expand existing ones, it also included:

- A Park-and-Ride initiative which eased congestion on the roads while contributing to reduction of vehicular emissions at the venues and their precincts.
- Fan Parks were strategically located to encourage access by foot.
- Additional pedestrian and cycling lanes were constructed in most cities.
- In Cape Town several railway stations were renovated.
- A demonstration on non-motorized forms of transport was exhibited in Rustenburg.

While all these measures were important steps towards creating adequate and accessible transport, a number of challenges were faced by the planners because some of the initiatives were out of the control of the municipal agencies and most of the public transport system was privately run.

Highlights of transportation measures included the following in select host cities:

Cape Town

The City of Cape Town introduced an Integrated Rapid Transit (IRT) system and additional rail services on match days so as to meet the Local Organizing Committee's target of having at least 50 per cent of fans travel to the stadia using public transport. The Integrated Rapid Transit system consisted of an airport bus shuttle and match-day bus shuttle services between the stadium and the main transport hub in Hertzog Boulevard.

Other initiatives for transport included:

- Upgrading of the rail stations so as to encourage rail-based Park-and-Ride during the World Cup™. Additional parking, security and lighting was put in place at these stations;
- The sidewalk of Somerset Road was widened to accommodate a bicycle lane and additional walkway. This was the designated walkway for fans between the Central Business District and Green Point Stadium during the FIFA 2010 World Cup™.
- A new cycling route and pedestrian walkway was constructed around the stadium precincts and around Green Point Common. This new cycling route is to link up with existing cycling and pedestrian routes along the Mouille Point and Sea Point promenades, as well as with walkways leading to the central business district. A long term strategy for non motorized transport is to establish a bicycle rental service.
- An eco-driving manual was developed for use in the training of professional taxi drivers.

Durban

The City of Durban implemented a number of transport initiatives, including:

- Constructing rapid bus transit (dedicated bus lanes) on its major freeways;
- Marking out dedicated cycling lanes on roads in and around the Moses Mabhida stadium;
- Upgrading the beachfront promenade and creating a pedestrian link between the promenade and the Moses Mabhida Sports precinct.
- Upgrading of pavements throughout the city to 'designated walking routes' through the city and between key points.
- A public bus system called the "people mover system" was used for inner city transport during the World Cup™.
- For the Park-and-Ride system, minibus taxis were hired from local taxi operators to provide the transit service.

Besides the transport measures implemented in the host cities, Cape Town and Durban, the Department of Transport and the remaining eight host cities also implemented options for streamlining transport and cutting down on carbon emissions.

Transport Measures by the Department of Transport and the other host cities

Institution	Initiatives
Department of Transport	■ The OR Tampo Johannesburg International Airport was expanded; ■ Rapid Bus Transit system for Johannesburg and Nelson Mandela Bay: This system was designed to reduce traffic and promote use of public transport. It implementation would have significant environmental benefits as less cars on the roads translates into reduced carbon emissions; ■ Initially there were only 15-seater buses, but during the World Cup the government introduced 35-seater buses to increase efficiency; ■ A dedicated High Occupancy Vehicle lane was created in Mbombela: this is likely to reduce number of personal vehicles in the city and therefore reduce carbon emissions.
Department of Transport (& Global Environment Facility)	■ Introduced non-motorised transport in Mangaung (cycling), Polokwane& Rustenburg. The rollout of these projects would promote the use of bicycles which is likely to have significant reduction of carbon emissions.
Mbombela, Nelspruit	The Department of Transport in the municipality created: ■ A High Occupancy Vehicle (HOV) lane and pedestrian walk lanes in the city. ■ The long term plan is to get more buses because currently there is no public transport.
Royal Bafokeng, Rustenburg	The Royal Bafokeng Stadium is located in Phokeng, approximately 15 kilometres from Rustenburg City, a situation that makes its access by walking difficult. Due to lack of adequate accommodation within Phokeng, it was not possible for pedestrians coming from Rustenburg to reach the stadium without the use of motorized transport. Some of the initiatives implemented included; ■ Closing some lanes to vehicles so as to free them for walking. The distance of travel from the city to fan festival was 1.1 km and vehicles were not allowed within this perimeter. ■ Three non-motorized bicycles were acquired and used during the World Cup along the fan walks as a demonstration on use of non-motorized means of transport.
Polokwane	■ Park-and-Ride was used to reduce the number of vehicles accessing event site so as to reduce congestion and minimize carbon emissions. Fan walks were created with the average distance the stadium being 2km. No data was available on number of vehicles that used Park-and Ride and number of people who walked up to the stadium.

Nelson Mandela Bay	■ Non-motorised transport: Cycle tracks and walkways (80%) - covered under Department of Transport/GEF project
Tshwane	■ New bicycle lanes were constructed in Attredgeville (West of Pretoria) so as to make cycling attractive and convenient for the city dwellers.

12.4 Biodiversity

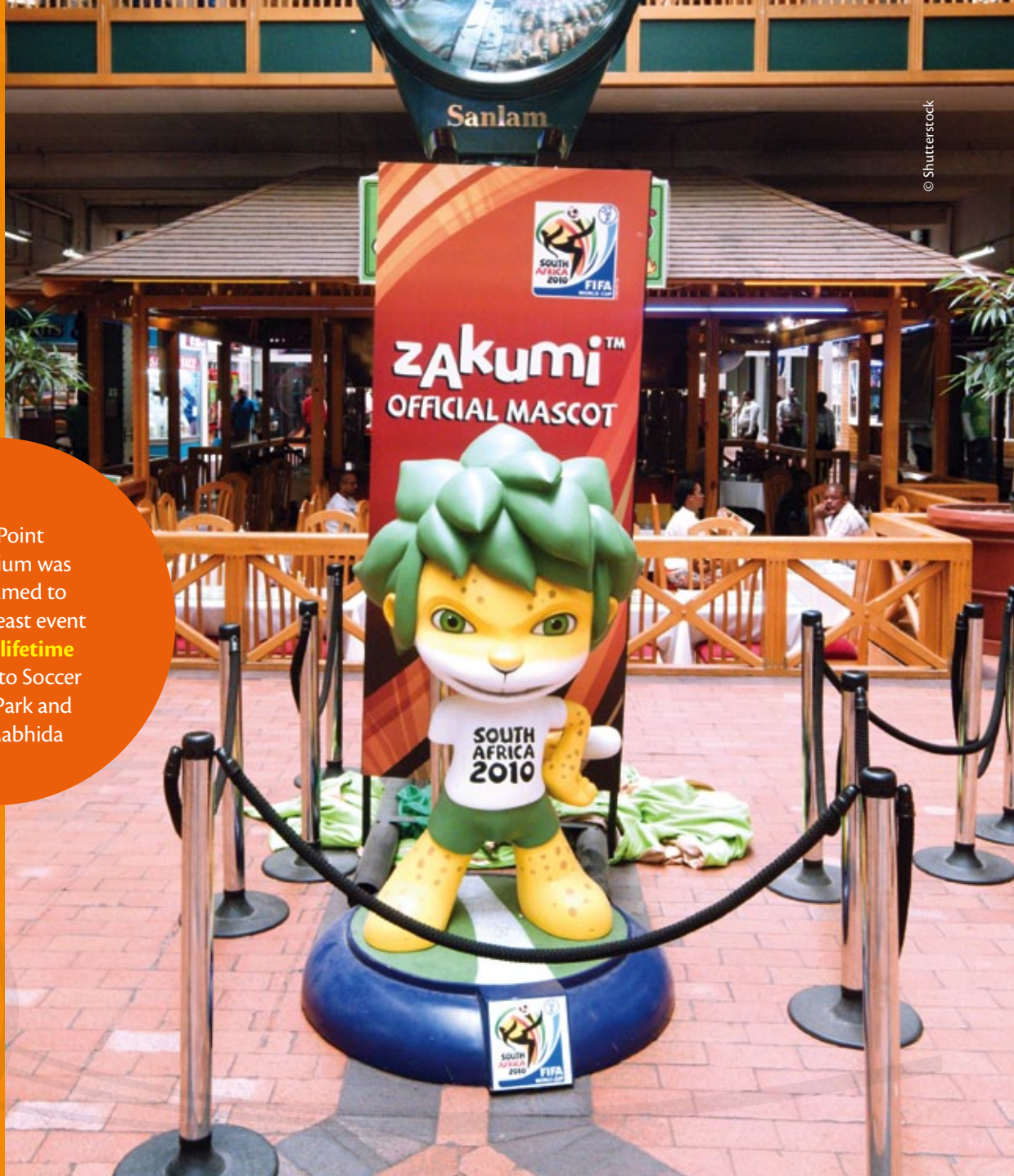
Biodiversity was an evident priority because each host city put in place a programme for removal of alien species and replanting with indigenous ones. All cities seized the FIFA 2010 World Cup™ momentum and reintroduced indigenous species in large numbers.

Half of the stadiums had been newly built, implying a significant disruption of flora and fauna. There had been need for environmental impact assessments before the construction of the new stadia. Plans for conservation of biodiversity would encompass relocation of mature trees and maintaining the biodiversity at around the venues to levels similar or close to that before the disruptions.

Cape Town: The Green Point Park was developed adjacent to the Green Point Stadium. The park was designed according to ecological principles, with energy and water efficiency, multi-purpose spaces and indigenous landscaping incorporated into it. A section of the Green Point Park was developed into a biodiversity showcase garden of indigenous, water-wise plants that displayed the region's biodiversity, and demonstrated environmentally responsible gardening/horticultural practices. The biodiversity showcase is planned to be one of the focus areas of the City of Cape Town's campaign to promote biodiversity awareness during 2010, the International Year of Biodiversity.

Mbombela: The greening programme included removal of alien species of vegetation, removal of waste from wetlands, creation of awareness amongst local communities, restoration, cleaning, tree planting, rehabilitation of streams with gabions and the stabilizing of banks, the building of walkways and bird hides, re–vegetation for trees and other wetlands plant species, as well as continuous monitoring and maintenance. Replanting of trees outside the stadium was also carried out.

> "Biodiversity was an evident priority because each host city put in place a programme for removal of **alien species and replanting** with indigenous ones



"Green Point stadium was assumed to have least event days **over lifetime** compared to Soccer City, Ellis Park and Moses Mabhida

THIRTEEN

COMMUNICATION

13.1 Green Passports Initiative

The Department of Environmental Affairs, UNEP and the Global Environment Facility launched the Green Passport Campaign aimed at encouraging visitors to make responsible travel choices whilst visiting South Africa for the FIFA 2010 World Cup™. The Green Passport 2010 was an international initiative by UNEP and was rolled out in South Africa during the World Cup and as part of the legacy component of the Department of Environment's national greening initiative.

The Department also implemented a Short Message Service (SMS) campaign together with the carbon calculator and the chosen offset projects continued until December 2010 to allow participants, travellers to South Africa and both international and domestic spectators to offset their carbon emissions. By the end of December 2010, the SMS campaign to raise funds for offsetting carbon emissions had not been successful.

13.2 Volunteering

The Local Organizing Committee and the Department of Environment Affairs hired and trained volunteers and deployed them at strategic areas within the stadiums and their precincts to oversee implementation of the Green Goal initiatives. The Department engaged 432 environmental volunteers through the Expanded Work Programme to conduct advocacy for the environment in all the host cities while the Local Organizing Committee recruited 2,000 volunteers to disseminate information on waste segregation.

The volunteers were provided with distinctive branded clothing displaying the slogan 'Come play green with us". Volunteers were placed in all nine host cities between the 7th June and the 16th July 2010 in areas within and outside the official FIFA venues, and in some cases within the official fan parks.

13.3 Print Media

The Department of Environmental Affairs National Greening programme produced a series of six cartoon strips carrying environmental messages in Sotho, Zulu, English and Afrikaans. The cartoons were printed in national newspapers, and were also screened on the national television broadcaster, in June and July 2010. This communications campaign carried messages pertaining to Greening 2010 actions: what was being done and why; as well as a means to influencing the long-term environmental awareness of locals and visitors beyond matches, fan parks and other formal events. The use of cartoons made the information campaign more accessible to youngsters, ensuring a focus on educating the youth of the country on environmental issues.

13.4 Green Hubs

Host Cities of Durban and Cape Town demonstrated their focus on raising awareness among the general public through the development of "green education centres", namely the uMgeni River Estuary Green Hub in Durban and the Eco Centre in Cape Town.

13.5 Environmental Guidelines

The Greening Durban 2010 programme, led by the eThekwini Municipality's Environmental Planning and Climate Protection Department (EPCPD), prepared a series of guidelines aimed at ensuring that the FIFA 2010 World Cup™ was hosted in an environmentally sustainable manner. In addition, the eThekwini Municipality produced a Guide to Durban's Nature Attractions and Outdoor Experiences.

Mbombela undertook several communications and promotional initiatives around sustainability. These included the production of a green leaflet educating people on the sustainability of the projects initiated.

Other forms of communications were advertisements in the local dailies and use of other items such as branded t-shirts and fliers. In addition to the above initiatives, all host cities highlighted their greening plans in their internet websites.

13.6 Other initiatives

The Department of Environmental Affairs invested significantly in advertising the greening of the event. Use of cartoons in the local print media and radio adverts contributed immensely to disseminating the Green Goal concept.

The Local Organizing Committee successfully carried out demonstration for source segregation of waste by placing innovatively labelled waste bins. The bins were properly displayed and strategically located for dumping of waste within the stadiums and their precincts.

A successful collaboration in publicizing the green agenda globally was between the Department of Environmental Affairs, UNEP and the Global Environment Facility (GEF), through which the Green Passport was launched. The Green Passport was a UNEP initiative which used both the print media and the internet for advocating for the green agenda. The Green Passport campaign was aimed at raising tourists' awareness of their potential to contribute positively towards sustainable social and economic development by following simple measures provided in the passport.

FOURTEEN

LESSONS

14.1 Lessons Learnt through Green Goal 2010

This environmental assessment has looked at conceptualization of the Green Goal 2010 Programme, its development and implementation. This report has identified both successes and challenges of the Green Goal 2010 programme which form the basis for improvement of future greening of large sporting events, especially the FIFA World Cup™

The following are recommendations from lessons learnt:

1. Due to the omission of environmental consideration as one of the seventeen FIFA guarantees for hosting the FIFA World Cup™, not enough effort was placed on environmental management because whether they were addressed or not, the FIFA World Cup™ would still take place. This is an issue that merits serious consideration by FIFA;
2. Environmental guidelines should be clear and legally binding. Specific benchmarks must be non-negotiable, measurable and backed by law;
3. FIFA should consider offsetting its own carbon footprint and encourage its partners to do the same;
4. A written and publicly declared commitment by all key stakeholders towards the greening of the event is essential;
5. Good working relationship between all stakeholders involved in the greening process is vital to its success;
6. Host cities should be encouraged to establish practical and implementable projects in their business plan. There is no need to direct energy towards developing expansive business plans that are not feasible due to limited human and financial resources;
7. Funding opportunities for greening initiatives should be explored earlier to avoid situations where planned programmes are not implemented due to lack of funds;

8. Clause 6.7 of the Host City Agreement with FIFA should be clearer on what host cities should do with regards to sustainability issues. Due to the vague definition of sustainability within this clause, the integration of environmental and sustainable development issues in the staging of the FIFA World Cup™ was not binding;
9. Environmental Impacts Assessments of new facilities and major upgrades should be mandatory. Environmental Impact Assessments are known to contain environmental monitoring plans which would ensure better implementation and monitoring of the environmental performance of the facilities;
10. Organizers should seek to integrate the best available environmentally-friendly technologies in all new and refurbished facilities;
11. The organizing committee should allocate more resource to greening initiatives. It would be practically beneficial to the greening programme if the Local Organising Committee recruits sufficient staff to support the greening programme;
12. The Organizing committee should consider having respected personalities or football stars to promote the greening programme. This can enhance opportunities for generating funds and public interest;
13. Generation of environmental data is important for benchmarking performance. The absence of environmental data in the games in South Africa made it difficult to assess the impact of the greening initiatives.

INTERNET SOURCES

All Africa
http://allafrica.com/

BBC
http://www.bbc.co.uk

City of Cape Town
http://www.capetown.gov.za

Department of Tourism Republic of South Africa
http://www.tourism.gov.za

Eskom
http://www.eskom.co.za

EThekwini Municipality
http://www.durban.gov.za/

Fédération Internationale de Football Association
www.fifa.com

Gautrain
http://www.gautrain.co.za/

GlobalPost
http://www.globalpost.com/

Green Passport
http://www.greenpassport.co.za/

Independent Online
http://www.iol.co.za/

Mbombela Local Municipality
http://www.mbombela.gov.za/

Mpumalanga Provincial Government
http://www.mpumalanga.gov.za/2010/

News24
http://www.news24.com

Rustenburg Municipality
http://www.rustenburg.gov.za/

South African website for the 2010 FIFA World Cup
www.sa2010.gov.za

Sowetan Live
http://www.sowetanlive.co.za

The Guardian
http://www.guardian.co.uk/

The Herald
http://www.theherald.co.za/

The Independent
http://www.independent.co.uk

The Los Angeles Times
http://www.latimes.com/

The New York Times
www.nytimes.com

Time
http://www.time.com

United Nations Environment Programme
www.unep.org

Our Planet, Greening the Olympics. Online July, 15, 2010
http://www.unep.org/ourplanet/imgversn/82/myrholt.html

Earthlife Africa, Braamfontein, Johannesburg, Online: September 8, 2010
http://www.earthlife.org.za

Trade and Environment Database (TED), Online: December 21, 2010
http://www1.american.edu/TED/lille.htm

Media Club South Africa
http://www.mediaclubsouthafrica.com/index.php?option=com_content&view=article&id=93:world-cup-stadiums&catid=39:2010bg#mbombela

BIBLIOGRAPHY

>ERC 2006, Energy policies for sustainable development in South Africa, Options for the future. *Energy Research Centre, University of Cape Town, April 2006*

>DME 2003, White paper on renewable energy, Department of minerals and energy, Republic of South Africa, November 2003.

>DME 1998, White paper on the energy policy of the republic of South Africa, *Department of Minerals and Energy, Republic of South Africa, December 1998.*

>DME 2005, Energy Efficiency Strategy of the Republic of South Africa, Department of Minerals and Energy, March 2005.

>DME 2009, National Energy Efficiency Strategy of the Republic of South Africa, Department of Mineral and Energy, Government Gazette No.32342, Pretoria, 26 June 2009.

>RSA 2008, National Energy Act, No. 34 of 2008, Republic of South Africa

>DT 2006, Transport Action Plan for 2010. Action Plan for ensuring Operational Success and Establishing a Legacy of Improvement from the Investment towards the 2010 FIFA World Cup Version Year 2006

>NRDC 2007, Coal in a changing climate, Natural Resources Defence Council (NRDC) Issue Paper, February 2007

>DT 2007, Public transport strategy, Department of Transport, Republic of South Africa, March 2007.

>DEA 2009, Feasibility study for a carbon Neutral 2010 FIFA World Cup in South Africa, Report by Econ Pöyry, Commissioned by Department of Environmental Affairs and Norwegian Government, February 2009.

>Business Report, South Africa's National Financial Daily, Monday June 28, 2010.

>*Leaving a' Greening Legacy: Guidelines for Event Greening*, World Conservation Union (IUCN), the United Nations Commission on Sustainable Development, Department of Agriculture, South Africa, Global Environmental Facility, Gauteng Provincial Government, 2002.

>Roper Tom (2006), Producing Environmentally Sustainable Olympic Games and Greening Major Public Events. Global Urban Development Volume 2 Issue 1 March 2006.

>Eskom's Weekly FIFA World Cup Electricity Performance Report 15 June 2010 – 21 June 2010

>RSA 2010, State of the Nation Address by His Excellency J.G. Zuma, President of the Republic of South Africa, at the Joint Sitting of Parliament, Cape Town, 11 February 2010

>DT 1998, , A Transport Strategy for South Africa, the final draft Report, Moving South Africa, Department of Transport, September 1998

>Greenpeace (2000), How green the games; Greenpeace's Environmental Assessment of the Sydney 2000 Olympics.

APPENDICES

MINIMUM ENVIRONMENTAL STANDARDS FOR GREEN GOAL 2010

Minimum environmental standards for Climate Change

Category	Minimum standard to be implemented
Carbon neutrality	■ Offset all carbon emissions resulting from the event
Reducing carbon emissions	■ Implementation of Energy Standard (*Renewable Energy and Energy Efficiency*) ■ Implementation of Transport Standard
Carbon reduction through waste generation reduction at source and waste to landfill minimization	■ Implementation of Waste Standard
Carbon reduction through reduced sewage production	■ Implementation of Water Standard
Carbon offset – national initiative	■ Gold Standard voluntary projects (*including stringent social criteria and environmental impact assessments*) to offset remaining carbon to result in carbon neutral event ■ Establishment of a registry of projects for carbon monitoring and accounting ■ Establish a levy to raise funds for carbon offset projects (*e.g. on international flights*).
Carbon offset – local initiative	■ Host cities to identify and implement at least one voluntary offset project with minimum offset potential of 1,000 tons of carbon and with clear social benefits

Minimum Environmental Standards for Energy

Category	Minimum standard to be implemented
Energy Efficiency	
General	Building Management Systems (BMS) were to be implemented in all stadiums to control peak load and optimize energy use
	Stadium and other buildings were to carry out energy audits to identify savings opportunities
Passive solar design (new stadia and other new buildings)	Design of new buildings to include passive solar principles, including orientation, shading, day lighting, natural airflow, amongst others
Lighting – stadia floodlights	Energy efficient floodlights be installed in new stadiums and be retrofitted on old stadiums
Lighting – general	All lighting to be efficient (*e.g. T5-technology, Compact Fluorescent Lamps (CFL), Light Emitting Diode (LED)*, metal halide except where specific conditions prevent their use (e.g. where use of dimmers is essential). The following efficiency interventions to be applied where feasible: ■ Movement/occupancy sensors ■ Timers (optimally set) relevant internal & external lighting ■ Lighting levels to be optimized.
Heating, ventilation and air conditioning (HVAC)	HVAC systems to incorporate at least one efficiency feature, e.g. : ■ Variable speed fans ■ Occupancy sensors ■ Disaggregation of system ■ Thermostat control settings optimized ■ Economy cycles (*use ambient air where possible*)
Energy efficient equipment (*links with Procurement Standard*)	New equipment purchases to include most energy efficiency criteria (*e.g. office equipment, electrical appliances, catering equipment etc.*)

Efficient water heating system	Hot water systems to be well insulated The following to be included where feasible (*generally new buildings or substantial retrofits*): ■ Minimum piping runs ■ Solar water heaters (*see Renewable Energy*) or use of heat pumps rather than conventional resistive heating ■ Small cylinders, intelligently switched via building management system
Renewable Energy	
Solar water heaters (stadia, clubhouses, accommodation)	Solar water heaters to be used in the following cases: ■ Where facilities are regularly used ■ Where physical structure allows for their use (*e.g. roof structure, or very long piping runs may prohibit*)
Solar PV, wind generation	Demonstration of solar PV, wind generation or other renewable energy generation to be at each host city.
Purchase of green electricity	100% of total electricity used during the event by host city stadia to be 'Green electricity', purchased from accredited sources and registered with the South African Tradable Renewable Energy Certification body (*potential sources include: Solar PV, Wind, Small hydro, Biogas from sewage, and Landfill derived methane gas*)

Minimum environmental standards for waste

Category	Minimum standard to be implemented
General Integrated Waste Management Planning, Education and Awareness	An integrated waste management action plan to be compiled and implemented for each event location so as to maximize recovery, re-use, recycling and/or composting potential of any waste type generated
	Awareness creation on waste recovery and recycling and proper use of the provided waste separation bins
	That a reduction of at least 10% of waste generation is attained
	To reduce by at least 30%, the volume of waste that could be destined to the landfill

Measuring of waste volumes, characterization of waste types	That the total weight and volume of waste generated is measured and recorded for each event
	That a full waste characterization study is done of all wastes types generated, and their volumes, at each event
	That the total weight and volume of recyclables recovered from the event be measured
Waste Avoidance	That all food is served in a roll or serviette That multi-use and recyclable containers with deposit-refund be used for all beverages and drinks served
	That bulk dispensers be used in place of single pack condiments.
	Ensure a paper-wise office and media centre
	Reusable ceramic crockery and cutlery in the hospitality areas.
	That electric hand-dryers or reusable towels are used in place of paper wipes
	That the use of polystyrene containers, tetra-pak and any other packaging material that is not fully recyclable in South Africa is avoided where possible
Waste reduction	Minimize use of newspaper single-use ad boards and promotional materials by 80%
Waste Re-Use and Recycling	That any waste generated at the event which has the potential for re-use, recycling of composting be collected separately to enhance recovery and minimize landfill
	Reuse of construction demolition materials
	Ensure materials used in setting up temporary facilities such as the International Broadcasting Centre are reusable
	Ensure there is no improper mixing of waste by implementing waste separation at source
	That goods with recycled contents are purchased to strengthen the demand side of the local recycling economy
Waste Transportation and Disposal	That the waste types and volumes that are to be transported to landfill are kept to a minimum
	That waste is only transported by an authorized waste management service provider with the appropriate equipment

Contract with vendors and suppliers of products and services for the 2010 World Cup™	Service providers to adhere to procedures on waste management hierarchy
Contract with Waste Management Service Provider	That a pay-as-you-throw (PAYT) contract is requested from the waste service providers (Only pay for the waste volume that is to be landfilled)
	That any recyclables recovered on behalf of the client are temporarily stored and sold off-site by waste contractor
	That the service provider offers the client with the infrastructure required to ensure proper source separation of waste.
	Source separation facilities provided to be able to segregate hazardous waste from non-hazardous waste at any identified hazardous waste generation points
Enforcement and Implementation	Ensure vendors/official partners attend a briefing session on waste minimization
Legacy	Ensure stadiums continue with waste minimization strategies after 2010 World Cup ™.

Minimum environmental standards for water

Category	Minimum standard to be implemented
Reduce water consumption	That a water conservation plan is compiled and implemented as part of the Environmental Management System (EMS)
	Minimum standard: all toilets to be fitted with 6-litre or lower capacity water cisterns.
	At least 80% of the showers to be fitted with low flow shower heads available in the market
	Minimum standard: Install push type self-closing water faucets 100% of the taps be installed with flow restrictors to a flow rate of 3 to 4 litre/minute All fixtures to meet most efficient available technology in South Africa
	That all automated continuous flow urinals are replaced with a push button or waterless system or automated (*via BMS urinal flow system*)
	That water wise and indigenous landscaping be provided in 50% of landscaped area
	That efficient irrigation practice be adopted for the landscape irrigation (*e.g. drip, properly set timers, etc.*)
	That the therapeutic baths are only filled with water when required to avoid the use of filter equipment and water storage
Re-use of water	Separate grey and black water
Protection of water resources	That environmental friendly agents are used for cleaning to avoid any ground water contamination.
	That environmentally friendly fertilizer and pest control is used to avoid any water pollution (*cross-links with Procurement standard*)
Natural rainwater management	That permeable paving/surfaces be provided where feasible, greened roofs for the harvesting of rain water or other measures are in place which assist natural rainwater management and facilitate natural groundwater recharging (*as opposed to storm water runoff*)

Minimum environmental standards for sustainable procurement

Category	Minimum standard to be implemented
Tender documents	Procurement decisions need to consider empowerment of the economically disadvantaged and price of goods. ■ Shift tender award criteria away from "Lowest Price" towards "Economically Most Advantageous" as the latter offers a whole set of sub criteria including price, quality, environmental performance, date of completion of a service requested etc. ■ The entire Life Cycle Cost needs to be put into account in order to identify the most economically advantageous product and this includes the following considerations ■ **Purchase costs**- including any extras needed, installation, delivery costs etc., ■ **Maintenance costs**, cost of spares, energy consumption of equipment, ■ **End of Life Cost**- decommissioning, removal. ■ Tenders to be performance based, based on durability and proven minimum life span. Consider proven performance records with regards to energy efficiency, water conservation and waste reduction; and prioritise goods manufactured locally – firstly within the region where the event is being hosted and secondly to be South African
	That clear environmental selection criteria such as eco-labels or other internationally accepted environmental ratings or standards are scored against
Local economic development	Build the economic competitiveness of a local area to improve its economic prospects and quality of life for all
	That specific effort is made (e.g. through the scoring of tenders and preferential points for local bidders) to encourage the use of local business as a practical way to promote local industry.

Catering	That the use of disposable tableware and specifically items that cannot be easily re-used, recycled and/or composted such as polystyrene cups are avoided where possible and that the use of refundable, re-usable, recyclable and/or biodegradable items is promoted
	That reduced packaging and take-back of resulting packaging waste is requested from suppliers as part of their delivery service as well from their extended product responsibility when selling those products That multi-use systems that can be re-used are chosen in any aspect of service delivery rather than single-use disposable items That the use of individual packaging is avoided giving preference to bulk deliveries and bulk products
	That regional food products be considered as a mechanism to support local economic development as it promotes the regional economy and its distinctive specialties, prevents a monopoly position for food and beverage supplies from a few global corporate only and decreases emission through food transportation
	That the purchase of environmentally friendly (organic), anti-animal cruelty and fair trade products are given preference where possible
Sports clothes, gear and merchandise	That the manufacturers and suppliers of clothing, advertising and merchandising products of all kinds should be carefully selected to ensure that existing global labour exploitation and environmental destruction as a result of cheap imports from unethical firms is kept at a minimum Compliance with international social standards (e.g. non-use child labour) is also an important aspect of the selection of suppliers
	That environmental and social standards are complied with during the entire production manufacturing processes from materials extraction, to material processing, manufacturing and final assembly
	Avoid the use of disposable items
Sponsorship	Ensure environmental principles are included in the criteria for selecting sponsors and in issuance of corresponding contracts.
	That the sponsor commits to maintain a good environmental public image and supply environmentally friendly products for the games. Work with sponsors in the creation and realization of the Green Goal.
	Ensure that goods and services provided through sponsorship deals are also subject to environmental standards.
Transparency	That a fair and transparent procurement process is followed from decision-making to the execution of contracts.

Minimum environmental standards for Sustainable Transport

Category	Minimum standard to be implemented
Minimize Travel Needs	Eco-driving training for drivers of the Local Organizing Committee fleet and bus driver but potentially also for taxi and minibuses Use higher seating-capacity vehicles such as vans instead of cars for more efficient transportation Develop transport operational plans for the FIFA family that are based on intelligent travel plans i.e. ensure that unnecessary travel / trips are avoided through structured planning of related events.
	Link event planning to games, so that the FIFA family are not required to travel to multiple events throughout the day in order to attend all relevant events
	Adjust school and tertiary education holidays in order to reduce traffic on match days
Promote Public Transport Travel	Local Public Transport (including all environmental-friendly means of transportation e.g. bus shuttles or bicycles) should account for at least 50% of all travel to stadia and should be integrated with Park 'n Ride facilities to encourage public transport use
	The frequency of public transport to and from stadiums should be available at least every 5 minutes for 2 hours before and after the match event
	Travellers should not walk for more than 1 km to access public transport services
	Provide environment-friendly, safe, secure and comfortable means of transportation
Promotion of non-motorized transport	Non-motorized transport should account for a minimum of 10% of travel to and from the stadium on match day
	An area of 1km around the stadium precinct should be designated pedestrian friendly areas (i.e. only essential-service vehicles should be given access) Setting up attractive routes from city centre to stadia for visitors on foot
	All pedestrian walkways should be equipped with appropriate surfaces, to enable easy walking by all pedestrians, including those with disabilities and should be well-lit and maintained.

Use of Cleaner and Renewable Fuel sources	Biofuels, preferably from waste products, should account for at least 8% of fuel used by official vehicles
	A carbon-offset programme should be developed to offset the greenhouse gas emissions from flights from the FIFA Family as a minimum
Appropriate fuel efficiency and emissions standards	FIFA Family fleet vehicles should meet as a minimum Euro III standards for fuel efficiency and emissions
	At least 50% of new Public Transport Vehicles purchased should meet as a minimum Euro III standards for fuel efficiency and emissions

Minimum environmental standards for accommodation

The following standards were developed as a guideline for an environmentally responsive hospitality industry.

Category	Minimum standard recommended
Environmental Management	Compliance with all national environmental legislation. Environmental Policy developed and implemented for hotels and other lodging facilities.
Energy	Retrofitting with more energy efficient fixtures, installing energy saving bulbs
Water	All toilets to be fitted with the most efficient water fixtures available in the market
Waste	Waste to be segregation at source Evidence of reduction, reuse of waste, or recycling of organics, tins, glass, paper and some types of plastic according to local demand. Used cooking oil returned to suppliers or disposed of safely
Chemicals	Material Safety Data Sheets for all significant chemicals be acquired
Biodiversity and Gardens	Component of water-wise, indigenous garden or minimum 5% green space
Green Building	New Buildings to adhere to Green Building principles (*as per Green Building Council of South Africa's rating system*)

2

EMISSION CALCULATIONS

Acquisition of emissions data was limited due to lack of initial plans to generate data for environmental monitoring. For this reason, various assumptions and estimates have been made for concluding the final analysis of the carbon emissions of the event. The projected emissions far exceeded the actual emissions.

International travel Emissions

As feasibility study by the Department of Environment projected total carbon footprint for 2010 FIFA World Cup TM South Africa to be **2,753,250 tCO_2e** (DEA 2009), and 67.4 % of this or **1,856,589 tCO_2e** was estimated to be generated through international transport. However, using the actual figures, the international travel emissions were less than the initial estimates.

Estimated verses actual carbon footprints of International travel

Region of Origin	Predicted visitors	Actual Visitors	Average distance travelled (Kms)	Projected Carbon Footprint (tCO_2e)	Actual footprint (tCO_2e)
Africa	63,486	117,631	3,500	127,670	274,521
EU	165,064	74,293	9,000	747,740	336,547
Asia	63,486	40,242	9,500	302,130	191,512
S America	63,486	40,242	7,000	229,438	145,435
N America	50,789	34,051	13,500	334,750	216,632
Totals	**406,311**	**306,459**	**-**	**1,741,728**	**1,164,647**

Source: *National Legacy report for the greening of 2010 FIFA World Cup ™.*

The projected emissions were less by **577,081 tCO_2e**, and this is attributed to reduced number of international travellers for the World Cup TM, especially from Europe who fell short by less than half of the expected number.

Carbon Footprint from Embodied Emissions of Stadiums

Projected carbon footprint emissions from Durban (Moses Mabhida), Cape Town (Green Point) and Johannesburg (Soccer City) were based on actual materials used for the construction, while for the other stadiums it was calculated based on projected emissions resulting from the construction of stadiums based on stadium capacity. The total greenhouse gas emissions were calculated based on life cycle emissions factors for the construction materials. To estimate the life cycle emissions factors for different construction materials, the Department of Environment's Feasibility study for a Carbon Neutral World Cup study applied Global Emission Model of Integrated Systems (GEMIS) for its calculations. Results of the study are presented in the following table.

Carbon footprint for stadia construction and materials

Stadium	Seating Capacity	Embodied Emissions in Stadia(tCO_2e)	Emissions per event day over lifetime (tCO_2e)	World Cup days	Emissions for World Cup 2010 (tCO_2e)
Soccer City / Johannesburg	91,5000	244,135	119	8	952
Ellis Park / Johannesburg	62,500	189,836	119	7	833
Moses Mabhida / Durban	70,000	189,836	425	7	2972
Green Point Stadium /Cape Town	70,000	188,355	646	8	5167
Free State Stadium , Bloemfontein	45,000	129,963	193	6	1155
Mbombela /Nelspruit	46000	124,548	185	4	738
Nelson Mandela Stadium / Port Elizabeth	45, 931	129,963	193	8	1540
Loftus Versfeld/Pretoria	50,000	135,379	201	6	1203
Royal Bafokeng/Rustenburg	45,000	113,718	168	6	1011
Peter Mokaba Stadium/Polokwane	45,000	124,548	185	4	738
Total	**574,119**	**1,570,281**		**64**	**16,309**

Source: *Department of Environmental Affairs, Feasibility Study for a carbon neutral 2010 FIFA World Cup in South Africa.*

Green Point stadium was assumed to have least event days over lifetime compared to Soccer City, Ellis Park and Moses Mabhida. It was also to have minimum stadium capacity per event day over its lifetime.

This assumption implicates Green Point stadium to have the highest emission per event day **(646 tCO_2e)** over its lifetime. Using the above calculations, the overall carbon footprint from embodied emissions of stadiums construction for the 2010 FIFA World Cup TM was 1**6,309 tCO_2e.**

2.1 Emissions resulting from hosting of the event

Emissions through Park and Ride

A total of **2,681,744** spectators were moved from the Park and Ride sites to the stadiums. Modes of transport used were buses, shuttle services, intercity buses, taxi etc. To estimate the emissions emanating through movement of people to the stadiums, bus mode of transport is used for the calculations because only buses were allowed to move spectators to drop of points from where they could walk into the stadiums. To calculate emission estimates for moving people to the stadiums from the Park and Ride sites DEFRA[1]'s conversion factor of 0.16084 kg CO_2e per passenger kilometre, average local bus is used.

Emissions through Park and Ride

Stadium / City		Stadium Attendance for all matches	Passengers[2]	Average Distance travelled by Bus(Kms)	Estimate emissions for average distance travelled, return trip (t CO_2e)
Green Point - Cape Town		512,000[3]	422,000	3	407
Soccer City	Johannesburg	1,042,000	479,517	9.5	1465
Ellis Park					
Loftus Versfeld – Tshwane		234,000	99,845	3	96
Moses MabhidaEthekwini		434,000	126,000	2	81
Mbombela - Nelspruit		143,000	114,786	4	74
Free State – Mangaung		196,000	98,000[4]	3	95

1 *2010 Guidelines for the Department of Energy and Climate Change and the Department for Environment, Food and Rural Affairs (DEFRA), Greenhouse conversion factors for Company Reporting.*

2 *Number of passengers transported and the distance from stadium was sourced from the Department of Transport 2010 FIFA World Cup Close Out Reports.*

3 *18% or 90,000 walked to the stadiums, therefore 422,000 were transported by bus.*

4 *Based on total average estimate of 50% transported by bus. This is because data was not available for this city.*

Nelson Mandela Bay - Port Elizabeth	286,000	204,600	6.5	428
Royal Bafokeng – Rustenburg	194,000	109,415	6	211
Peter Mokaba – Polokwane	139,000	63,227	4.5	158
Total	**3,180,000**	**1,717,390**		**2,857**

Source of Data: *Department of Transport*

There was no data on the number of people who used fan walks (non-motorised transport) to reach the stadiums. This information would have helped in calculating the avoided emissions through walking. Park and Ride as compared to private cars did not provide a better alternative for emission management because as per the available statistics from the department of transport occupancy for each car was 3.2; therefore transporting people to the stadiums using cars could have generated fewer emissions as compared to buses.

Bus emissions compared to Car emissions, case study City of Tshwane

	People moved	No. Vehicles	Average distance (Km)	Estimated emissions (ton CO_2e)
Buses	99,845	60 Buses, 150 Mini-bus	3	96
Cars	99,845	33,279[5]	3	50
Difference in emissions[6]				46

Based on the above calculations, a combination of cars and walking could have generated fewer emissions as compared to buses.

Energy for stadiums and precincts

Carbon footprint of energy use in the stadiums and their precincts was calculated based on estimated energy demands. Green Point, Moses Mabhida and Soccer City provided detailed energy demands for the new stadiums, upon which estimates of energy demands for other stadiums was calculated. According to the (DEA 2009) feasibility study the energy demand footprint was calculated based on energy demands for the 10 stadiums and their precincts.

5 *Based on occupancy of 3.2 per car.*

6 *Calculations based on DEFRA emission guideline, Emission conversion factor Buses: 0.16084 kg CO_2e passenger kilometer; Cars: 0.24947kg CO_2e per kilometer. Car occupancy is calculated at 3.2; therefore number of cars is 33,279.*

Projected carbon footprint for stadiums and precinct energy use

Stadium	Seating Capacity	Number of matches	Elec cons per match (Mwh)	Total Elec cons (Mwh)	Emissions (tCO_2e)
Soccer City / Johannesburg	91,500	8	407	3258	3245
Ellis Park / Johannesburg	62,500	7	261	1827	1823
Moses Mabhida / Durban	70,000	7	194	1358	1353
Green Point Stadium /Cape Town	70,000	8	301	2408	2397
Free State Stadium / Bloemfontein	45,000	6	212	1272	1269
Mbombela /Nelspruit	46000	4	203	812	811
Nelson Mandela Stadium / Port Elizabeth	45,931	8	212	1696	1692
Loftus Versfeld/Pretoria	50,000	6	221	1326	1322
Royal Bafokeng/Rustenburg	45,000	6	186	1116	1110
Peter Mokaba Stadium/ Polokwane	45,000	4	203	812	811
International Broadcasting centre		64		807	804
Total				**16,692**	**16,637**

Source: *DEA 2009Feasibility study for a carbon neutral 2010 FIFA World Cup in South Africa.*

The tournament comprised of 64 matches distributed over 10 stadiums and the carbon footprint is a result of energy demand by the 10 stadiums and their precincts. Initially all electricity demands for the stadiums was planned to be supplied by the national grid, however, FIFA decided to use diesel generators so as to avoid possible power outages through use of the national grid. Due to this reason, all the energy for stadiums and their precincts was supplied using diesel generators. For this reason, the actual energy carbon footprint for the stadiums and their precincts is based on the amount of diesel consumed during the event.

BP South Africa was the sole diesel supplier, however, the Company did not disclose information on diesel consumption through the event, citing FIFA confidentiality. For this reason, estimates for fuel consumption for the event are based on information supplied by the individual stadium operators during the assessment and calculations are based on diesel engine rating and average diesel consumption at ¾ load for a minimum of 6 hours per match.

Emissions due to Stadium diesel generators

Stadium	Capacity	Generator Rating (Kva)	No. of generators	No of matches	Average fuel consumption ¾ load (litres/hr)[7]	Cons each match[8]	Diesel for all matches (l)
Mbombela	40929	1250	2	4	200	2400	9600
Free State Stadium	40911	1250	2	6	200	2400	14400
Peter Mokaba	41733	650 and 1600	2	4	100 and 250	4200	16800
Soccer City	84490	500 and 650	4 and 1	8	80 and 100	2520	20160
Royal Bafokeng	38646	2200	2	6	340	4080	24480
Ellis Park	55686	700,800 and 500	2,2,1	7	120, 120, 80	3360	23520
Loftus Versfeld	42858	300	8	6	50	2400	14400
Moses Mabhida	62760	800	3	7	120	2160	15120
Nelson Mandela	42486	2200	2	8	340	4080	32640
Green Point	64100	2000	2	8	300	5400	43200
Total				**64**			**214,320**

7 *Diesel service and supply: www.dieselserviceandsupply.com*

8 *Based on each generator running for 6 hours per match (2 hours before, 2 hours during and 2 hours after the match.*

The minimum estimated diesel used for running the power generators was **214,320 litres.** This is so because in some stadiums the generators were running for more hours, between 6-10 hours. In some instances the generators operated for longer periods.

The International Broadcasting Centre hired 16 generators each with a capacity of 1,000 Kw. Each venue also had 3, 500 kva diesel generators, 2 running parallel with a third being used as a backup.

Based on this data, the calculated amount of diesel consumed for the entire world cup period is as follows:

Emissions due to broadcasting facilities

Area	Generator Rating (kva)	Number of Generators	Hours run	Average fuel consumption ¾ load (litres/hr)	Diesel for all matches (l)
IBC	1250	16	31 days X 24hrs	200	2,380,800
Venue Generators	500	2	64 X 6hrs	80	61,440
Total					**2,442,240**

Calculated total diesel used in the stadiums, their precincts and the International Broadcasting Centre is 2,656,560 litres. Using the conversion factor of 3.1787 kg CO_2e per litre[9], the equivalent carbon emissions resulting from diesel use at the stadiums and their precincts is **8,444 tCO_2e**.

Emissions through Energy use in Accommodation

The Department of Environment's feasibility study for a carbon neutral 2010 FIFA World Cup in South Africa projected the carbon footprint resulting from accommodation to be **340,130 tCO_2e**. This calculation was based on an average of 29Kwh per person per day[10] and a 3.5 overnight stay per ticket. The overnight stay was estimated to be more than the Germany one for the reason that South Africa is a far destination for most of the participating teams and spectators, and therefore there was a likelihood of longer stays by visitors.

9 *Calculations based on DEFRA conversion factor for Company Reporting*
10 *Energy Resource Optimizers CC (2008)*

Projected Carbon footprint for Energy use in Accommodation

	Overnight stay spectators	Overnight stays special travel group	Total overnight guests	Emissions (tCO_2e)
Bloemfontein	293,247	158,616	451,863	13,179
Cape Town	124,0967	944,108	2,185,075	63,730
Durban	105,0431	834,960	1,885,391	54,990
Hub	426,030	168,963	594,993	17,354
Johannesburg	1745806	1,272,724	3,018,530	88,039
Nelspruit	214,878	140,726	355,604	10,372
Polokwane	185,823	113,849	299,672	8,740
Port Elizabeth	940,532	541,548	1,482,080	43,227
Pretoria	613,320	364,716	978,036	28,526
Rustenburg	269,434	141,059	410,493	11,973
Total	**6,980,468**	**4,681,269**	**11,661,737**	**340,130**

Source: *DEA 2009Feasibility study for a carbon neutral 2010 FIFA World Cup in South Africa.*

Based on the actual number of visitors of 309,554, an average length of stay 10.3 nights as provided by Department of Tourism South Africa, and an average of 29 Kwh per person per day [11], the total energy use for accommodation during the event is **92,463,780 Kwh**. Using the 0.911 metric tons carbon dioxide emissions per megawatt hour [12] for South Africa, the total calculated emissions for accommodation were **84,234 tCO_2e** against the projected **340,130 tCO_2e**. This was far less than the projected carbon emissions due to a small number of visitors and overnight stays for the FIFA World Cup TM event. Installation of more efficient fixtures in the accommodation sector would have further reduced the emissions due to reduced energy use per guest night.

Emission Through Landfilling

Most of the waste was dumped in the landfills due to lack of plans for recovering the recyclable wastes. However, in South Africa there are informal waste collectors who recover recyclable products downstream for reuse or sale. Informal recyclers recover products starting from the source up to the landfill site. During the World Cup TM this was not possible due to compacting of the waste at source

11 *Energy Resource Optimizers CC (2008)*

12 *US Department of Energy, Energy Information Administration, Voluntary Reporting of Greenhouse Gases Foreign Electricity Emission Factors.*

and therefore most of the materials could only be recovered at the landfill site. Based on this backdrop, the only items that were likely to be recovered consisted of waste emanating from dry waste less the paper, which at this stage was already contaminated. As per the City of Johannesburg, uncontaminated paper products are highly sort for by recycling companies.

As per the matches of Portugal – Korea, June 21 and Portugal – Spain, June 29, 2010 data as given in the Local Organising Committee closing report; the total waste generated for the two matches was 33,910 kg and the attendance was 126,600 spectators. Percentage of wet waste to the total waste was 31%. Applying this data to the rest of the stadiums, each spectator generates 268 g of waste of which 31% is wet waste. Wet waste was destined to landfills, thus most of it contributed to methane gas generations.

Total spectators for the 64 matches were 3.18 million and would therefore generate an estimated 852 tons of waste and an equivalent of 264 tons of wet waste. All wet waste was disposed of into the landfills.

Using 2010 emission conversion guidelines to DEFRA [13], the following are the net greenhouse gas emissions arising through waste landfilling during the World Cup TM and their equivalent emissions through composition and anaerobic digestion and energy recovery:

Emissions waste landfilling

Type of disposal	Amount of waste (tons)	Equivalent emissions ($tC0_2e$)
Landfilling	264	96
Composting	264	8
Anaerobic digestion	264	-26

From the above table, a minimum of 96 tons of carbon emissions were generated through the event by landfilling of wet waste. This figure would have been lowered by 90% through composting. Equally, the overall event emissions would have been reduced by 26 tons through anaerobic digestion and recovery of methane for energy. However, the total emissions would double due to the fact that most of the waste was compacted and dumped into the landfills after collection from the stadiums and their precincts.

13 *Conversion factor: 365 kg CO_2 emission per ton of kitchen and food waste landfilled; Composting: 30CO_2 emission per ton of kitchen and food waste , Anaerobic digestion: -100kg CO_2 emission per ton of kitchen and food waste anaerobically digested for energy recovery.*

"Total spectators for the 64 matches were 3.18 million and would therefore **generate an estimated 852 tons of waste** and an equivalent of 264 tons of wet waste

3

THE GREEN GOAL 2010 OBJECTIVES AND OUTCOMES

Emission Mitigation Initiatives	Implemented options	Level of success
All FIFA Family fleet vehicles and public transport vehicles should meet Euro II standards for fuel efficiency and emissions	■ Kia Motors offered 207 vehicles for official use by the FIFA 2010 World Cup ™ fraternity. ■ The Department of Transport and Passenger Rail Agency of South Africa (PRASA) committed over 50 semi-luxury buses to the Organizing Committee and 420 semi-luxury and inner-city buses to match for in particular the Tournament's Tour Operator programme. In addition, PRASA provided another 110 buses for general spectator services. ■ All the vehicles were meeting EURO II Standard	The objective was to a large extent met, however, most of the local public transport in South Africa is run by taxis which are privately owned and due to the urgency to finalize the World Cup ™; it was not possible to set and implement new standards within the planning period. Calculating equivalent emission savings through the implemented initiatives was also not possible due to lack of data on people who walked and the possible mode of transport they would have instead used
Promote the use of public transport by spectators to reduce carbon emissions.	■ public transport network was expanded ■ Bust Rapid Transport system was introduced ■ Park and Ride was introduced ■ High occupancy vehicle lanes were constructed and introduced	Was largely successful during the World Cup but its sustainability is limited due to widespread culture of private car use. Public transport security also posed a challenge

Energy		
That an energy audit / assessment covering a period of at least six months be done at the stadiums to determine the baseline and where energy savings can be made.	■ The planned energy audits were not conducted	There was lack of funds and adequate human resource to undertake the audits. This culminated in the eventual lack of data on energy consumptions during the World Cup ™ and comparative data after the World Cup ™.
That audit recommendations on energy efficiency be implemented in the stadiums.	■ The recommended audits were not done	Allegation by the Local Organising Committee that there were no funds for this exercise
That the electricity used within the stadium precinct during the event be 'renewable or green electricity', purchased from accredited sources and registered with the South African Tradable Renewable Energy Certification body (potential sources include: Solar PV, Wind, Small Hydro, Biogas from sewage, and landfill derived methane gas)	■ Port Elizabeth had green energy fed into the municipality grid	Renewable energy (solar, wind, biogas) is not yet extensively developed in South Africa. There is also lack of legislative frameworks for feed into the national grid by independent green energy generators. Some of the projects were not yet completed by the time of the World Cup ™. Electrawinds donated 1.8 mw electricity to the Nelson Mandela Municipality, this offset **1,180 tCO_2e**
Waste		
That takeaway food is served with both minimum packaging and recyclable material in the stadiums and fan-parks	■ Paper towel was used for food packaging. Recyclable packaging was used by Budweiser and Coca Cola.	Was to a large extent successful but procedures for recovery were not available and therefore limited its success
That multi-use containers / cups for drinks be used for most beverages served in the stadiums and fan-parks. A deposit-refund system will be introduced as an incentive for returning used cups.	■ Multiuse systems were not applied in any of the stadiums	Was not successful because FIFA did not endorse this as a practice for its partners in the stadiums
Promote the use of reusable material in the construction of temporary facilities.	■ Was practiced for the International Broadcasting Centre	Was successful because the contracted companies for constructing temporary structures for International broadcasting centre removed them for reuse elsewhere after the event.

That waste is separated at source by introducing a two-bin system to be used as minimum in the stadiums public areas and a multi-bin system used in the catering centres and other facilities (volunteer, media and VIP / hospitality centres) in the stadia and fan-parks to separate recyclable from non-recyclable items	■ 2 bin and 5 bin were used in the spectator areas and catering areas respectively	Most of the wastes were separated into dry and wet waste, procedures for recovery of recyclables posed a major challenge
That the multi-bin system must cater for glass bottles, paper, plastics, organic waste and general waste and the two-bin system must cater for recyclables and general waste.	■ 2 bin system was used at the spectator area and 5 bin at the catering area, for all the stadiums. Glass bottles were not used in most of the stadiums but were used for a first match in Free State Stadium, Bloemfontein	The system was fully implemented. There were adequate bins for the planned wet and dry waste separation, and for the detailed separation at the catering sections
Water		
That water consumption audit / assessment is done at the stadiums to determine the baseline and where water savings can be made.	■ The planned water audits were not conducted	There was lack of funds and adequate human resource to undertake the audits. This culminated in the eventual lack of data on water consumptions during the World Cup ™ and comparative data after the World Cup ™.
That the use of water-free urinals in toilets is promoted	■ Was implemented in some of the stadiums	Was fully implemented in the new stadiums
That the use of rain or surface water for sprinkling, toilets, urinals and cleaning in stadiums is encouraged	■ Rainwater was harvested and used for irrigation in three newly constructed stadiums	Only 3 stadiums applied this (Soccer City, Moses Mabhida and Polokwane stadiums)
Transport		
That drivers are trained on eco-driving to reduce fuel consumption	■ Only a training manual was developed	Was not fully implemented due to lack of funds and limited time

That local public transport, bicycles and other non-mechanised means of transport account for a minimum of 50 per cent travel to and from stadiums on match days	■ More buses were introduced into the public transport by the department of transport, fan walks and cycling lanes were constructed	Was fully implemented but due to long distances to South Africa stadiums many people used private cars. Due to high car occupancy of more than 3.2 emissions were reduced
Biodiversity		
That any negative impacts on biodiversity or the natural environment are minimized during the planning and hosting of the event	■ Biodiversity regeneration was promoted in most host cities. Planting of trees only involved indigenous plants.	Was fully implemented. 361,000 trees were planted, equivalent to 7,238,300 tCO_2 sequestration.
That all official venues should promote local biodiversity / vegetation in their landscaping around the venue (where relevant).	■ Was practiced in the new stadiums. Similar regeneration to before construction was not done	Was fully implemented

4

CHECKLISTS FOR ENVIRONMENTAL PERFORMANCE

Commitment by the organizing committee

Feature	Observations	Interpretation
Is the Chief Executive Officer of the LOC committed to greening of the event		
Written statements/commitments towards greening of the event: FIFA, LOC, Host City		
Business Plans for the Greening		
Number of staff dedicated to the greening ■ LOC Head Office ■ Host city ■ Stadium		
Stakeholder involvement: FIFA, Government, Host City, NGOs, Private Sector, Local community		
Identification of critical areas for optimal impact		

Communication and Promotion of the Environmental Agenda

Feature	Observation	Interpretation
Stakeholders meetings		
Workshops		
Print media		
Electronic media		
Advertisements in the venue before, during and after the event using all the above		
Use of prominent people to disseminate the greening agenda		

Supplies and Procurement

Feature	Observation	Interpretation
Availability of an environmental standard for buildings		
Availability of Procurement guideline that addresses climate change, waste, water and energy		
Requirement that all suppliers meet specified criteria for procurement		
Set an environmental star for the accommodation sector and promote it throughout the event		
Preference for an environmental management system certified supplier		

Construction of Facility

Feature	Observation	Interpretation
Undertaking of an Environmental Impact Assessment		
Due process followed for approval of the Environmental Impact Assessment		
An environmental monitoring plan for construction developed		
Use of the environmental monitoring plan during construction		
In case no EIA		
Sensitivity of the construction site e.g. a fragile ecosystem		
Relocation of people and utilities: was it properly done?		
Clearance and regeneration of biodiversity		
Provision of basic amenities for workers		
Procurement policy ■ Construction material ■ Fixtures ■ Furnishings		
Main and sub-metering for water and energy supplies to different sections		
All retrofits to meet the best available practice in water, energy and waste management standards		
Reuse of excavation material onsite		
Record keeping		

Construction of temporary structures

Use of energy efficiency materials and fixtures within the facility		
Use of water efficiency fixtures within the facility		
Use of non – toxic materials		
Reuse of the whole facility, or its components or its components readily recyclable		

Operation of Facility

Feature	Observation	Interpretation
Water		
National regulation on water quality and conservation		
Policy on water use ■ National level ■ Local level ■ Facility level		
Sources of water		
Water quality monitored		
Records on water use		
Sub-metering of water supply to different sections		
Ratings of toilets		
Ratings of showers		
Ratings of urinals		
Promotion of water efficiency		
Investment in water efficiency		

Energy		
National regulation on energy conservation		
Policy on energy use ■ National level ■ Local level ■ Facility level		
Sources of energy		
Energy usage: ■ Catering/Cooking ■ Running equipment like compressors, lifts ■ Lighting ■ Water heating		
Is energy use monitored		
Records on energy use		
Sub-metering of energy supply to different sections		
Ratings and number of bulbs		
Ratings and number of compressors		
Rating and number of escalators		
Promotion of energy efficiency		
Investment in energy efficiency		

Waste		
National policy on waste management ■ Waste recovery ■ Waste recycling		
Local bylaws on waste management		
Availability of landfills and cost of landfilling		
Type of packaging for foodstuffs		
Recycling and composting levels of the service provider		
Availability of well labelled and strategically placed bins for waste collection		
Process for generating data on volumes of each waste category		
Awareness campaigns		
Training of volunteers to champion waste minimization		
Incentives for encouraging reuse and segregation by participants		
Transport		
National policy on transport		
Emission control standards for vehicles		
General public safety		
Provision of Park and Ride		
Availability of Public transport up to within walking distance to venues		

Secure walking and cycling routes		
Incentives for using public transport		
Incentives for car pooling		
Accessible/easy routes to events venues		

Climate Change

National policy on air pollution		
Establishment of carbon footprint		
Reduction of greenhouse gas emissions: ■ Energy efficiency: venues and accommodation, ■ Waste avoidance: at venues ■ Use of bio-fuels transport and power generators ■ Eco-driving(training and practice) ■ Renewable energy projects ■ Involving the public		
Offsetting greenhouse gas emissions: ■ Planting trees ■ Start of bio digester and use of the biogas for heating		

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"100% of total electricity used during the event by host **city stadia to be 'Green electricity',** purchased from accredited sources and registered with the South African Tradable Renewable Energy Certification body

S

LOCAL ORGANISING COMMITTEE CLOSING DATA

Closing reports by Local Organising Committee volunteers on waste management in the venues.

Responsibilities of Volunteers:

- Direct and assist spectators in disposing their waste products into demarcated waste bins;
- Educate and raise awareness amongst spectators on waste management issues and initiatives;
- Advise on two-bin and multi-bin system for recycling;
- Support cleaning services and other stakeholders working around the stadium; and
- Assist service provider in identifying bins that needed to be emptied.

Stadium	Challenges	Successes
Loftus Versfeld, Pretoria	■ Inability of the cleaning service personnel to empty and replace full bins ■ Improper dumping of cartons in the waste bins by the venue kiosks therefore rendering the bins full before use by spectators ■ Inadequate staff for managing waste	■ 2 and 5 bin were used in the stadium, and a rate of 60% segregation was achieved ■ Initially spectators did not separate but once advised by volunteers they were interested to separate.
Ellis Park, Johannesburg	■ No adequate bins and this resulted into mixing of waste ■ Poor coordination between volunteers and service provider	■ Both 2 and 5 bin were used

Moses Mabhida, Durban	Only 40% rate of segregation achieved Kiosk and hospitality stockpiled at the bins sites	2 bin system and the bins were adequate Waste was collected mixed but was separated elsewhere for recycling Cooperation with cleaning staff
Free State Stadium, Bloemfontein	By filling half empty plastic bags with others the cleaners mixed the waste Poor coordination with cleaners Kiosk and hospitality stockpiled at the bins sites Inadequate number of cleaners	Both 2 bin and 5 bin were used Adequate number of bins

Data on Waste collection during FWC 2010 at Free State Stadium, Bloemfontein

	Game 10	Game 19	Game 27	Game 34	Game 48	Game 51	Total
Recyclables	2385 kg	3277 kg	1401 kg	3792 kg	2099 kg	3938	**16892kg**
Non-Recyclables	1162 kg	1453 kg	529 kg	2310 kg	1245 kg	1982 kg	**8681 kg**
Total Waste	3547 kg	4730 kg	1930 kg	6102 kg	3344 kg	5920 kg	**25573kg**

Waste data for Green Point Stadium

Analysis of Total Waste & Recyclables Generated, Match 21, June 2010		
Description	**Total (kg)**	**Rep sample %**
Pet	1773	12.72
Cans	206	1.48
Cardboard	5607	40.22
Glass	366	2.63
Common Mix	549	3.94
Plastic (Clear + Mix)	595	4.27
Non Recyclables	4,844	34.75
Total	**13,940**	**100**

Analysis of Total Waste & Recyclables Generated, Match 29, June 2010		
Description	**Total (kg)**	**Rep sample %**
Pet	1103	5.54
Cans	2995	15.04
Cardboard	5202	26.12
Glass	0	0.00
Common Mix	158	0.79
Plastic (Clear + Mix)	1576	7.91
Non Recyclables	8885	44.60
Total	**19920**	**100**

Source: *Wasteman Holdings, Cape Town, South Africa*

"Green Goal 2010 target of reducing potable water use by 10% through **water saving technologies in the stadium design**, the roof was designed to collect rainwater, and the landscaping around the stadium included water-wise plants and water-efficient irrigation systems

6

GLOSSARY OF TERMS

Adaptation:	Changes in an organism's physiological structure or function or habits that allow it to survive in new surroundings.
Anaerobic:	A life or process that occurs in, or is not destroyed by, the absence of oxygen.
Ash:	The mineral content of a product remaining after complete combustion.
Audit:	An evaluation of a system's performance against its previously known performance or best known performance (this could encompass water usage, energy usage and waste recovery)
Biodegradable:	Capable of being broken down by living organisms.
Biodiversity:	Biological diversity is the variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystems. It includes biodiversity within species (genetic diversity), among species, and within and among ecosystems.

Carbon neutral:	A zero sum calculation of carbon emissions for any process, product, business, system, event, person, or even country. In other words, having a net zero carbon footprint or climate neutral, offsets as many carbon emissions as it emits.
Carbon Sink:	Systems that remove carbon dioxide from the atmosphere either by destroying it through chemical processes or storing it in some other form. Carbon dioxide is often stored in ocean water, plants, or soils, from where it can be released at a later time.
Cleaner Production:	It is the continuous application of an integrated preventive environmental strategy to processes, products, and services to increase overall efficiency, and reduce risks to humans and the environment. Cleaner Production can be applied to the processes used in any industry, to products themselves and to various services provided in society.
Climate change:	The slow variations of climatic characteristics over time at a given place. Usually refers to the change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is, in addition to natural climate variability, observed over comparable periods.
Climate Protection:	It is the action to deliberately reduce the emission of greenhouse gasses in order to reduce the impact on our environment.

Deforestation:	The felling of trees, usually for commercial purposes.
Developed World:	Those countries that have industrialized through possessing the means and the technology to do so. Also referred to as the "North" or the "Industrialized World."
Developing World:	Those countries that are underdeveloped and are not industrialized to the extent of the developed world.
Eco Efficiency:	It is the balance reached by the delivery of competitively priced goods and services improving the quality of life while respecting the carrying and regulation capacity of Earth's ecosystem. The goods and services must progressively realize their impact on environment and resource intensity throughout the life cycle.
Eco-driving:	Eco-driving is a way of driving that reduces fuel consumption, greenhouse gas emissions and accident rates.
Ecosystem:	A dynamic and complex system of plant, animal and microorganism communities and their non-living environment all interacting as a functional unit within a defined physical location. The term may be applied to a unit as large as the entire ecosphere, but usually refers to a division thereof.

Emissions:	The release of greenhouse gases and/or their precursors into the atmosphere over a specified area and period of time.
Emission factor:	A coefficient that quantifies the emissions or removals of a gas per unit activity. Emission factors are often based on a sample of measurement data, averaged to develop a representative rate of emission for a given activity level under a given set of operating conditions.
Energy recovery:	A form of resource recovery in which the organic fraction of waste is converted to some form of usable energy. Recovery may be achieved through the combustion of processed or raw refuse to produce steam through the pyrolysis of refuse to produce oil or gas; and through the anaerobic digestion of organic wastes to produce methane gas.
Environment:	All of the external factors, conditions, and influences which affect an organism or a community. Also, everything that surrounds an organism or organisms, including both natural and human-built elements.
Environmental Impact Assessment (EIA):	The critical appraisal, both positive and negative, of the likely effects of a proposed project, development, activity or policy on the environment.

Event Greening:	This refers to hosting an event, and associated services, in such a way that it has a minimal effect on the environment and maximum benefit to the people.
Fossil fuels:	Coal, oil, petroleum, and natural gas and other hydrocarbons are called fossil fuels because they are made of fossilized, carbon-rich plant and animal remains. These remains were buried in sediments and compressed over geologic time, slowly being converted to fuel.
Fuel:	Any substance burned as a source of energy such as heat or electricity.
Green electricity:	is electricity that is generated with technology that minimises the impact on the environment and which uses primary energy sources that are renewable. This results in an electricity generation process that is carbon neutral.
Greenhouse gases:	Those gaseous constituents of the atmosphere, both natural and artificial, that absorb and reemit infrared radiation and that are responsible for global warming. The most potent greenhouse gas, carbon dioxide, is rapidly accumulating in the atmosphere due to human activities.

Grey water:	Any water that has already been used and has the potential for reuse without treatment, such as water from your bath, shower or basin.
Hazardous waste:	Refuse that could present dangers through the contamination and pollution of the environment. It requires special disposal techniques to make it harmless or less dangerous
HVAC:	An acronym that stands for "**heating, ventilating, and air conditioning**" and is sometimes referred to as **climate control**.
Hydrocarbon:	Strictly defined as molecules containing only hydrogen and carbon. The term is often used more broadly to include any molecules in petroleum which also contains molecules with S, N, or O.
Indigenous Plants:	A plant belonging naturally to or occurring naturally in a country or area.
Environmental media:	Specific environments: air, water, soil
Non-Governmental Organization (NGO):	An organization centred around a cause or causes that works outside the sphere of governments. NGOs often lobby governments in an attempt to influence policy.

On-site Waste Recovery:	The waste company utilises space within a clients' building (typically the basement where waste is traditionally stored before it gets collected for disposal) and places sorters there who sort through any rubbish received from the building for reusable and recyclable items. Recyclables are sorted, graded and collected in bags according to the various waste types and categories.
Photovoltaic:	or PV for short, is a technology that converts light directly into electricity.
Pollution:	The contamination of a natural ecosystem, especially with reference to the activity of humans.
Pollution Prevention:	**U**se of processes, practices, materials or products that avoid, reduce or control pollution, which may include recycling, treatment, process changes, control mechanisms, efficient use of resources and material substitution.
Procurement:	Acquisition of goods and/or services. Sustainable (or eco) procurement is purchasing of products that have minimal negative impact on our environment, either directly or indirectly.
Recyclable:	Refers to such products as paper, glass, plastic, oil and metals that can be reprocessed into products again instead of being disposed of as waste.

Reforestation:	The process of re-establishing a forest on previously cleared land.
Resource:	A person, thing, or action that is used to produce a desired effect or product, usually for meeting human needs or improving the quality of life.
Retrofitting:	The amendment of buildings and fittings to make it more sustainable such as changing normal light bulbs with CFL light bulbs, or using low flow taps that manage water use.
Sustainable Development:	Development that meets the needs of the present generation without compromising the ability of future generations to meet their needs.
Two Bin system:	A two bin waste system is used for the separation of dry and mixed recyclables together (e.g. paper, glass, plastics, cans) from the non-recyclable and wet rubbish fraction (e.g. including soiled paper plates, dirty paper towels and napkins, organic waste, non-recyclable packaging materials etc.).

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