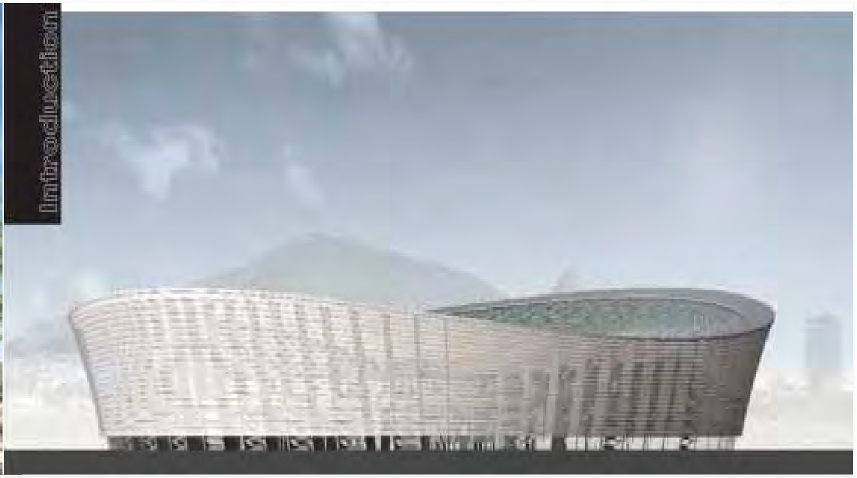


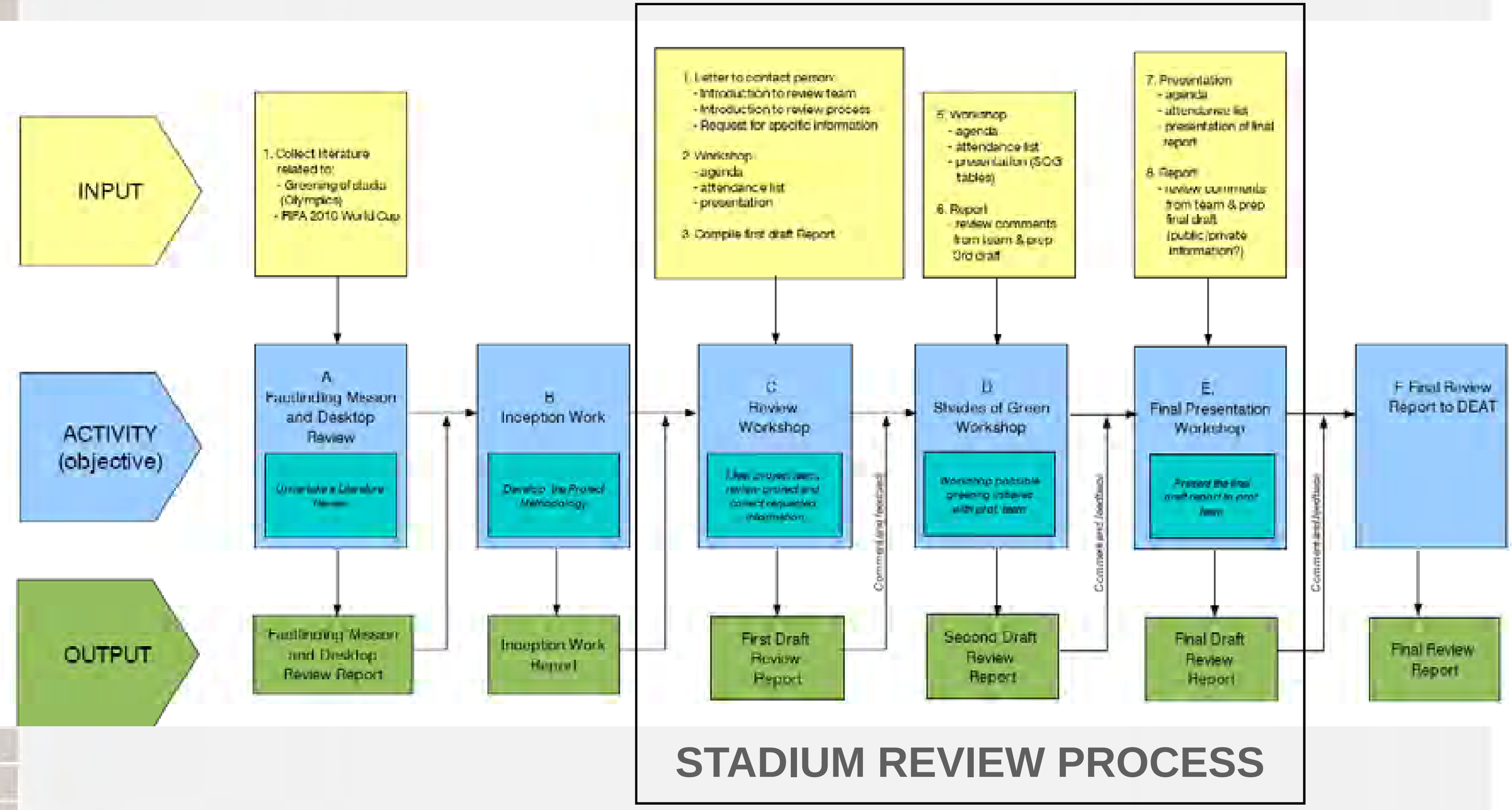
Review of the Greening Status the 2010 World Cup Stadia

UEMP 20 May 2009
Marloes Reinink
WSP GREEN by DESIGN

Review of the Greening the 2010 World Cup Stadia Project

- **Purpose:**
  - To record initiatives undertaken
  - To share good practice
  - To identify opportunities for improved performance
- **Partners:**
  - Green by Design, Paul Carew Consulting and the CSIR
- **Stadia reviewed:**
  - Green Point
  - Athlone
  - Moses Mabhida
  - Rustenburg (in process)
  - Polokwane (in process)

Project process – highlights & key stages

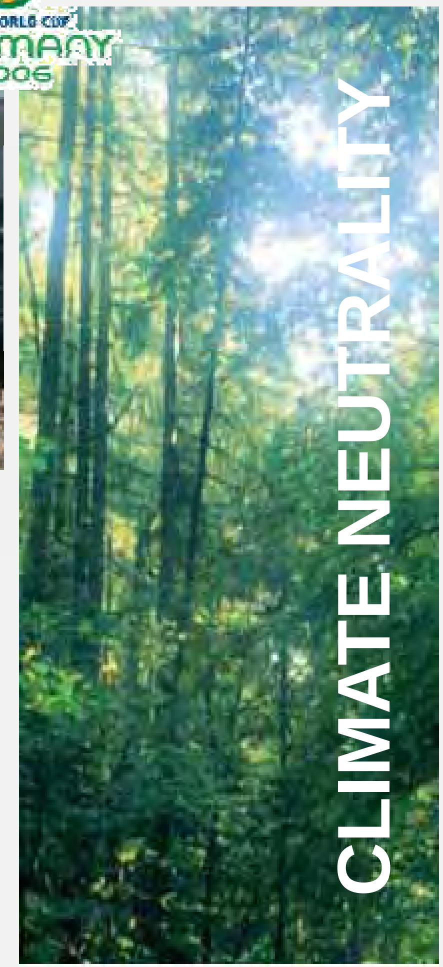


Stadia Greening Frameworks

- 1994 Lillehammer Olympics: IOC / UNEP Cooperative Agreement signed - aims to raise awareness and educate people on environmental issues in sport
- 1999 Agenda 21: Sport for Sustainable Development adopted by IOC
- 2000 Sidney: Development of Olympic and Paralympic Games Environmental Benchmarks
- 2006 Torino Olympics: Use of the GRI Sustainability Reporting Framework
- 2006 FIFA World Cup Germany: Development of Green Goal Initiative: **2006 FIFA World Cup** Green Goal ensured that *Environmental Protection* was at the forefront of the event
- 2008 Review of Greening of the 2010 World Cup Stadia: Selected benchmarks and SBAT Stadia
- 2012 London Olympics: Sustainability Policy and BREEAM bespoke

Green Goal Germany 2006

FIFA WORLD CUP GERMANY 2006



Stadia Review South Africa

TOOLS:

- SBAT Assessment
- Shades of Green

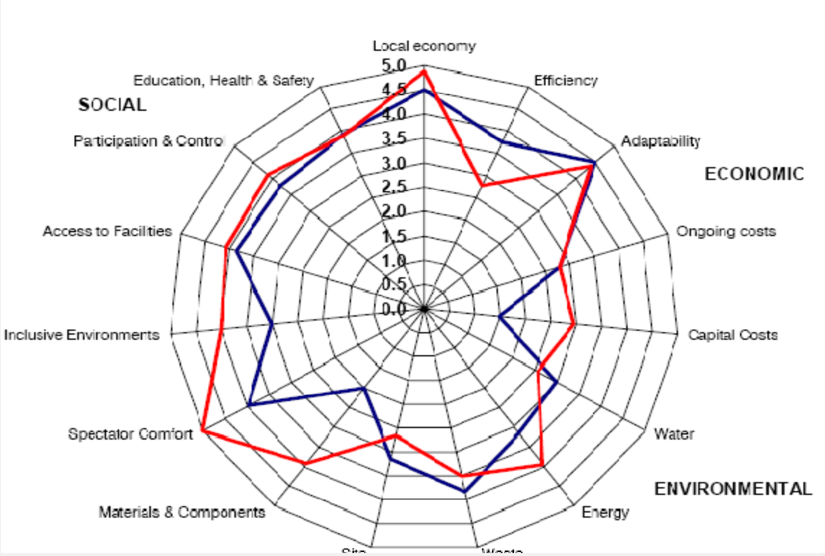
DETAILED ISSUES:

- Water
- Energy
- Materials
- Waste

- scope limited to the actual stadia

Sustainable Building Assessment Tool (SBAT)

Developed to support the construction of more sustainable buildings within South Africa's developing country context



15 sets of objectives under the headings:

- Economic
- Environmental
- Social

Sustainable Building Assessment Tool (SBAT)

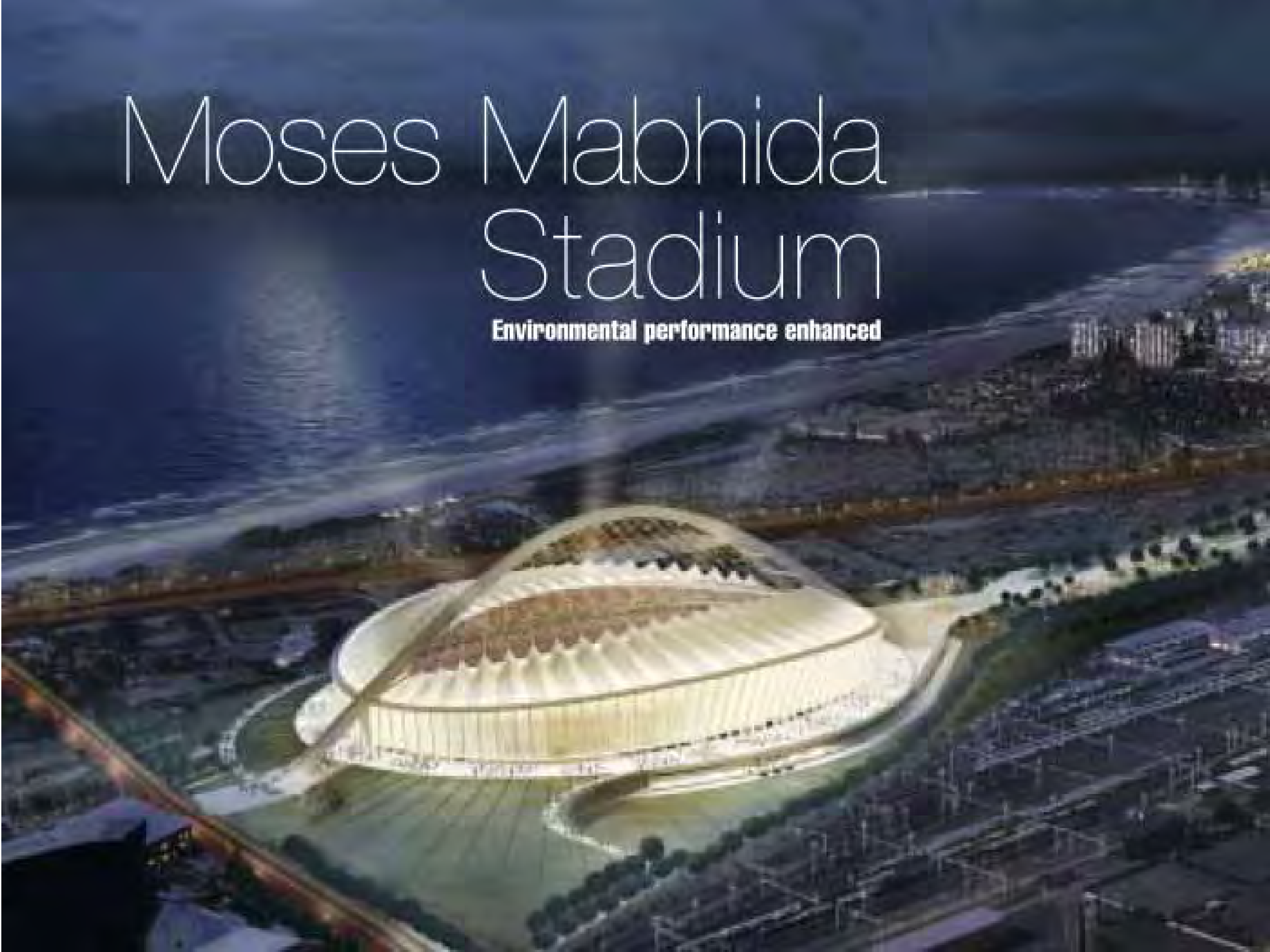
Economy:	Environment:	Social:
local economy Local labour, local building materials, local components and fittings, local furniture, as well as maintenance.	**water** Rainwater, water efficiency, run-off, greywater and planting.	**occupant comfort** Shading, ventilation, large screen and crowding, proximity.
efficiency Capacity, occupancy, space per occupant, shared parking and multiple use.	**energy** Location, passive environmental control, energy efficiency, control and BMS, and renewable energy.	**inclusive environments** Transport, 'way finding,' space, toilets and distribution.
adaptability Alternative uses, external space, services, as well as media and suite flexibility.	**waste** Waste-management facilities, waste minimisation, demolition and construction waste.	**access to facilities** Accommodation, banking, pedestrian and cycle routes, food and drink, other entertainment.
ongoing costs Water and energy consumption, cost centres, maintenance and cleaning, and facilities management.	**site** Brownfield site, neighbouring buildings, vegetation, construction process and landscape inputs.	**participation and control** Environmental control, role players, social spaces, sharing access and local community.
capital costs Training, labour intensity, support of small, medium and macro enterprises, sustainable technology, and private-sector funding.	**materials and components** Roof, concrete, roof efficiency, superstructure efficiency and hazardous materials.	**education, health and safety** Education, website, health, safety and security.

Basic Structure of the SBAT

Sustainability aspect	Criteria	Sub-Criteria	Indicator
EC **ECONOMIC**	EC1 Capital Costs	EC5.1 Training	Proportion of capital value of project allowed for site worker training
		EC5.2 Labour Intensity	No. of person days of direct employment created through the stadium construction
		EC5.3 SMME Support	Proportion of capital value of project undertaken by SMMEs (<R5million)
		EC5.4 Sustainability technology	Proportion of capital value of project allowed for sustainable technologies
		EC5.5 Private Sector Funding	Proportion of capital value of project leveraged from private funding
3 Sustainability aspects in total	15 criteria in total	75 sub-criteria in total	75 indicators in total

Moses Mabhida Stadium

Environmental performance enhanced

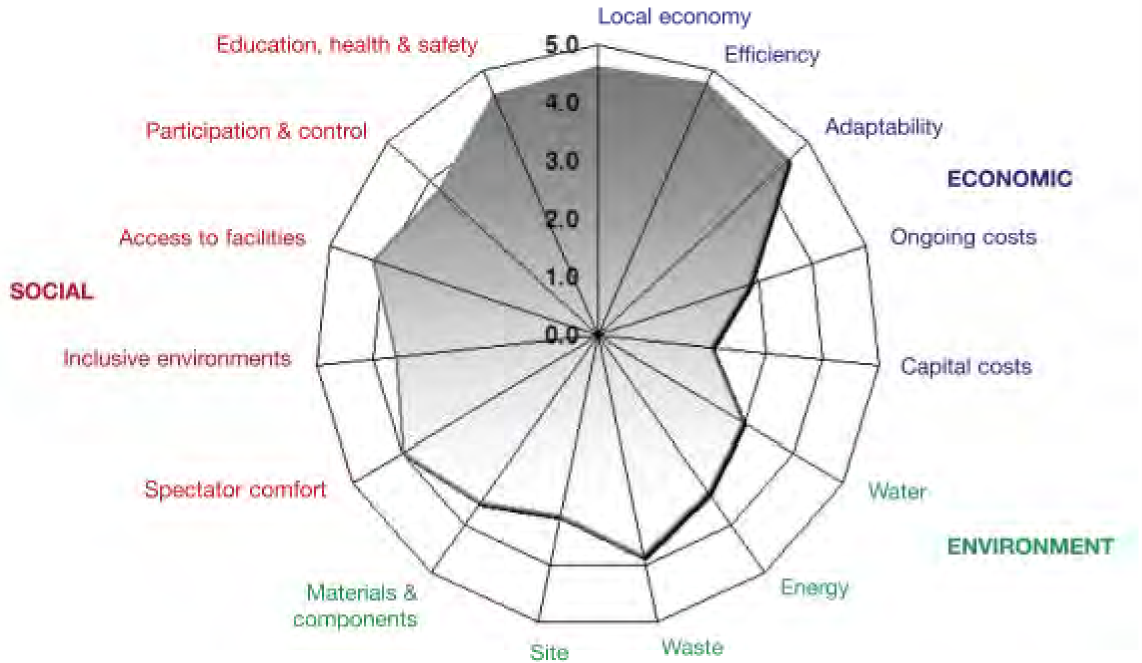


Sustainable Building Assessment Tool (SBAT)

Overall sustainability of the stadium is GOOD

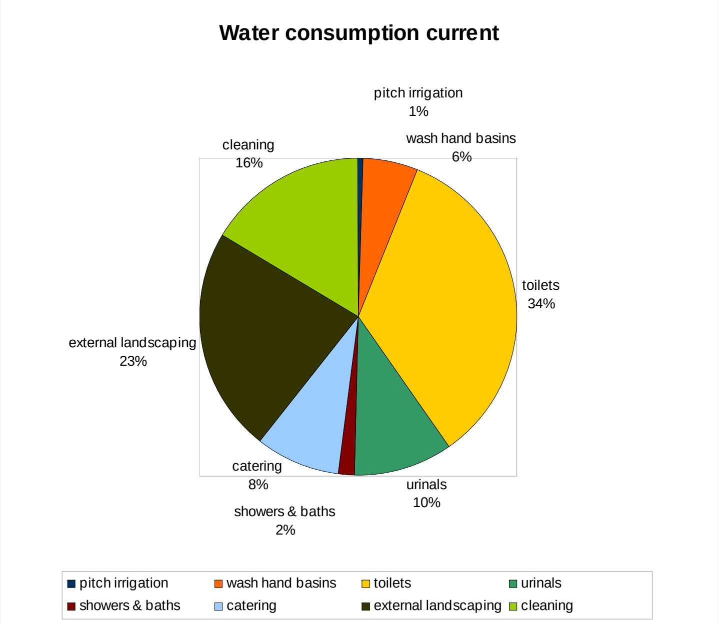
Well performing areas:

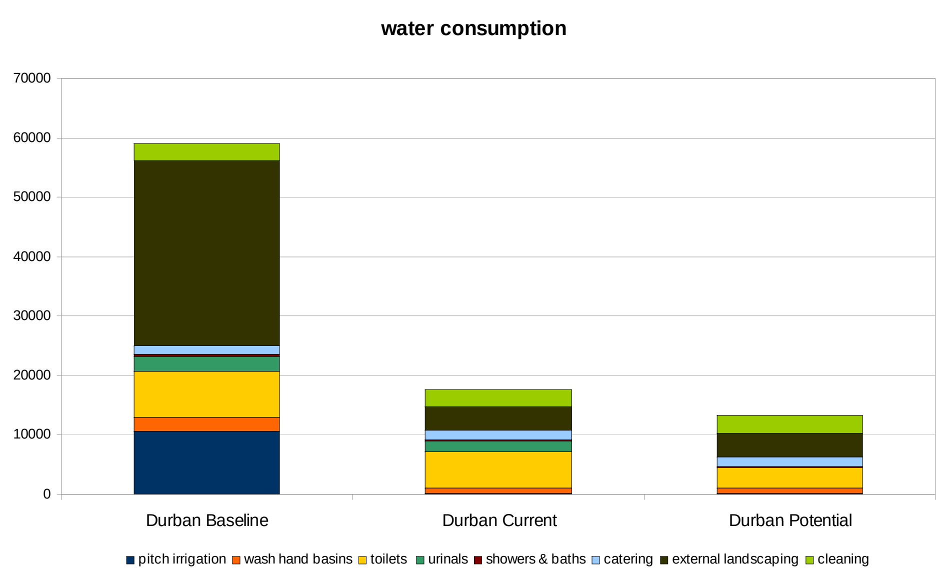
- Water consumption reduced
- Energy efficiency ensured
- Waste recycled
- Local economy
- Health & Safety



Water

- Estimated savings 6,000m^3/year over conventional approach
- Water efficient fittings inc low flow showerheads (10L/minute), low flush WCs and urinals
- 80% endemic vegetation species, drip irrigation
- Rainwater harvesting: 700 m^3 storage tank

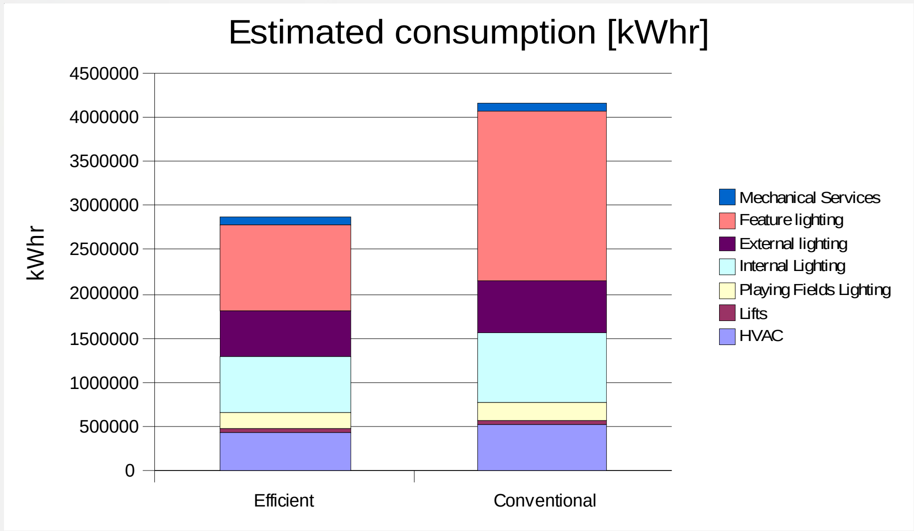


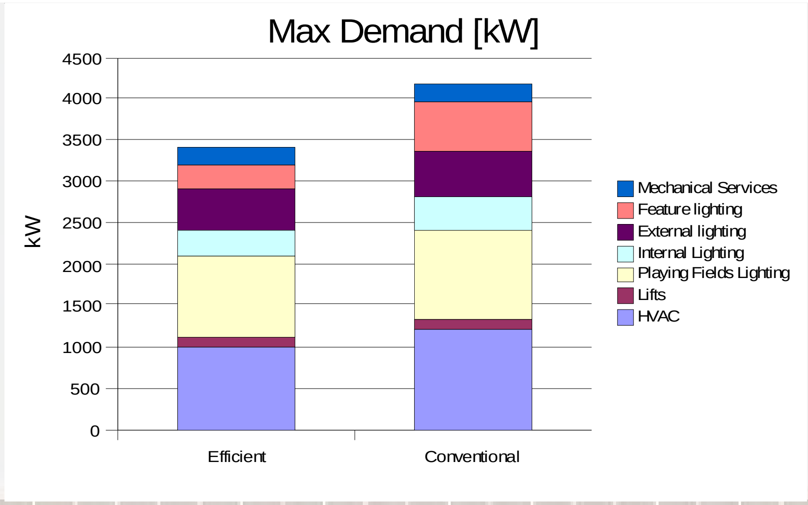


Water

Cutting-edge	Best-practice interventions	Good-practice interventions
• **Intelligent irrigation system** The installation of an intelligent irrigation system would result in a 30% reduction in demand for irrigation water. • **Rainwater harvesting** Two rainwater tanks of 400 m³ will collect rainwater off the roof and residual water off the pitch. This would eliminate the use of potable water for external landscaping and result in an annual saving on potable water-consumption costs of R2,5-million.	• **Metering valves and aerators for wash-hand basis** Implementation of this technology results in a saving of R22 350 per annum in potable water costs. • **Dual-flush toilets for VIP facilities** This achieves an additional, but minimal, reduction in water consumption. • **Low-flush toilets for public facilities** By installing toilets that use only 7 ℓ per flush, a 2,57% reduction in potable water consumption is achieved. This equates to a saving of R25 770 per annum. • **Low-flow shower heads** The fitting of all showers with low-flow heads (10 ℓ/minute) and flow regulators (9 ℓ/minute) results in a 0,1% reduction of potable water consumption. • **Waterwise, indigenous landscaping** As much as 20% less water is needed for irrigation in the case of indigenous landscaping when compared to the planting of exotic species. • **Drip irrigation** Through the use of drip irrigation for trees, 15% less water is needed for the irrigation of external landscaping.	• **Individual bath tubs** By installing individual bath tubs, rather than a communal spa jacuzzi, 0,2% less potable water is consumed.

Energy





- Estimated energy savings over conventional approach 30% (1.2million kWh per annum)
- Natural ventilation: façade and roof design
- Energy efficient lighting
- Lighting controls system
- Building management system (BMS)
- No hot water for washrooms
- Gas used for cooking

Energy

Cutting-edge	Best-practice interventions	Good-practice interventions
• **Carbon footprint determined** As the stadium authority calculated the carbon footprint of the proposed stadium, it was possible to determine the most effective interventions that would reduce carbon emissions. • **Promotion of energy efficiency in broadcasting, hospitality, catering** Much of the energy consumption during the World Cup will relate to "fringe" events rather than the staging of the actual matches. A communication campaign to ensure that all aspects of 2010 share similar green goals is essential.	• **Light-emitting diodes (LEDs) as lighting on stadium arch** Because of its long running time, feature lighting can be a significant consumer of electricity in a stadium. By using LEDs, these intensively-used lights will consume much less energy and require less maintenance. • **Heat pumps for water heating** Because hot water will only be required intermittently, heat pumps provide an energy-efficient heating option. • **Time switches for feature lighting** By reducing the running time of feature lights and through staged switching, significant energy savings can be achieved.	• **No hot water for basins in rest rooms** This means no energy-consuming geysers are required for spectators' ablutions. • **Lighting systems enable localised control** Areas that are not being used can be switched off to save energy.

Energy

Cutting-edge	Best-practice interventions	Good-practice interventions
	• **Centralised-chiller air-conditioning system** Through central control, efficient compressors and pumps, additional energy is conserved. • **Gas as energy source for cooking in kiosks and kitchens** This is a more efficient energy source for cooking. • **Variable speed drives or soft starts on motors** With these technologies, it is possible for motors and pumps to draw only as much power as they need without reduced efficiency.	• **Central control room** All electrical systems can be managed from a central location, which facilitates effective management.

Materials

Cutting-edge	Best-practice interventions	Good-practice interventions
• **Monitoring and measuring CO^2 emissions** The City of eThekwini has calculated the carbon footprint of the stadium, including the footprint of the materials.	• **Minimisation of waste sent to landfill** Fly-ash, ordinarily destined for landfill, is used in the concrete mix	• **Use of local materials** As much as 85% of material is sourced locally, thereby reducing the need for transport while boosting the local economy . • **Construction waste reused and recycled** The amount of waste sent to landfill is reduced; the use of PVC in waste pipes is avoided.

Green Point Stadium

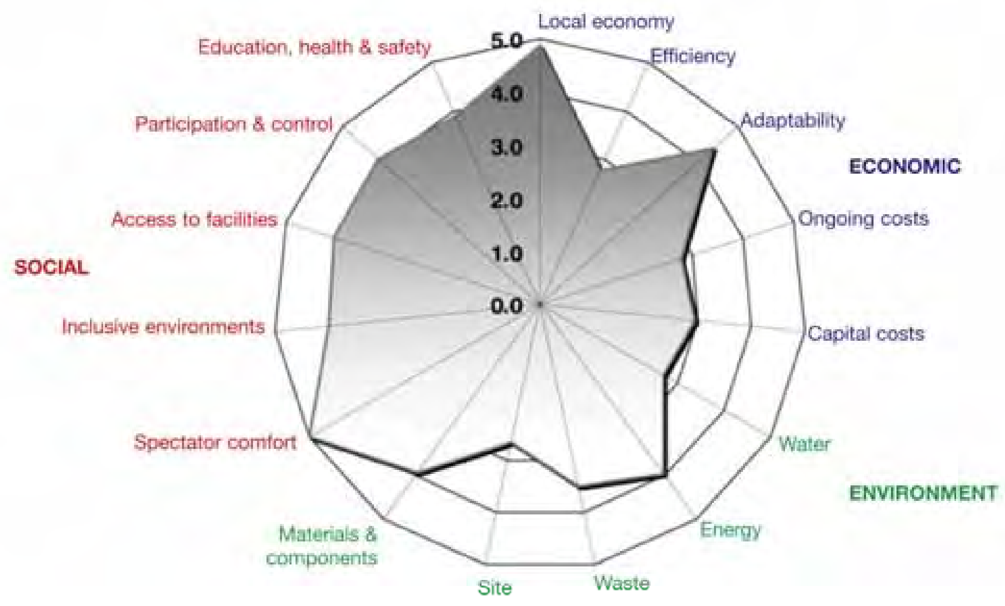
Environmental performance enhanced

Sustainable Building Assessment Tool (SBAT)

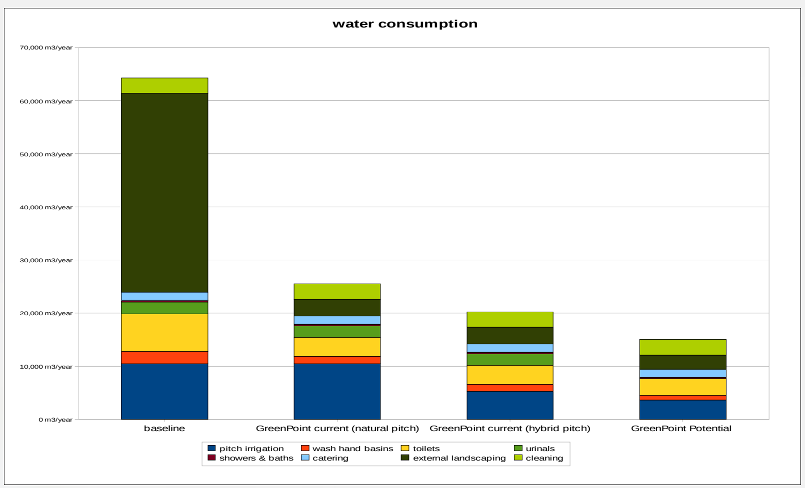
Overall sustainability of the stadium is GOOD

Well performing areas:

- local economy
- adaptability
- materials & components
- spectator comfort



Water



- Roof design that enables 100% of rainwater to be collected
- Rain/storm water directed to retention pond on neighboring golf course, used to reduce potable water consumption
- water efficient delivery devices, self closing valves
- Indigenous species used in landscaping
- Intelligent drip irrigation

Water

Best-practice interventions

- **Dual-flush toilets**
  Implementation of this simple technology results in a 5,5% reduction in potable water consumption; equating to a saving of R53 160 per annum in water costs while the upfront capital cost for installation is R140 000.

- **Low-flow shower heads**
  The fitting of all showers with low-flow heads results in a 1% reduction of potable water consumption. This equates to a saving of R6 000 per annum in water costs.

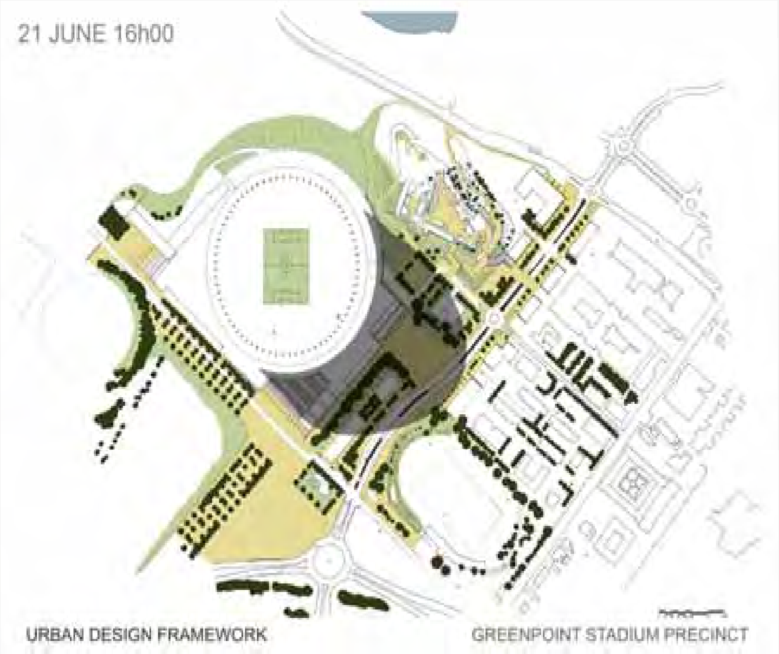
Good-practice interventions

- **Metering valves and tap aerators**
  These technologies result in a 3% reduction in potable water consumption; equating to an annual saving of R20 500 in water costs. The upfront capital cost of the installation is R170 000.

- **Waterwise and indigenous landscaping**
  By planting drought-resistant, indigenous plants, as much as 20% less water is required for irrigation. This results in a saving of R187 725 per annum off water costs.

- **Dust control by 'recycled' water**
  In keeping with a City of Cape Town by-law, water for dust control on the construction site is sourced from harvested stormwater, wheel-washing water, and batch-plant water.

Energy



- Passive design: raked design promotes self shading, façade fabric enables breezes to pass through but not strong winds or gusts
- Lighting requirements reduced through translucent roof
- Energy efficient lighting
- Hot water systems etc can be switched using BMS
- Option to purchase 'Green Power from Darling Wind Farm

Energy

Cutting-edge interventions

- **Water-cooled variable refrigerant-volume cooling system**
  This technology is used for the first time in a South African application and involves a central system with individual cooling units for spaces requiring cooling only at a given time.

- **CO monitors in parking garage**
  Ventilation fans in the parking garages are only turned on by these monitoring devices once a certain level of CO is detected. The ventilation system in the parking garage consists of two systems, one supplying fresh air and the other exhausting stale air. Under times of very low usage, the operator could switch off the supply system.
- The parking garage in the podium is only fitted with an air supply system in the deep areas away from the perimeter. The remainder of the parking in this area is naturally ventilated, saving considerable power in that there are no fans.

Best-practice interventions

- **Mesh fabric façade**
  The entire stadium will be clad in a light, silver mesh fabric façade. It allows only 30% of natural light and thus significantly reduces thermal radiation and glare while providing natural ventilation and cooling for spectators in the stadium bowl. The capital cost of the cladding amounts to R206-million. The cladding has another important environmental function; that of reducing visual clutter by creating an even outer façade that respects the surrounding historic urban fabric.

- **Translucent roof**
  The roof allows natural lighting through and reduces reliance on artificial lights.

- **Insulation panels behind fabric façade**
  These panels further reduce the need for artificial cooling. The capital cost for installation is R2,7-million.
- **Green energy purchased from Darling Wind Farm**
  The City of Cape Town is considering the purchase of wind energy from the Darling Wind Farm for the stadium during the 2010 FIFA World Cup.

Good-practice interventions

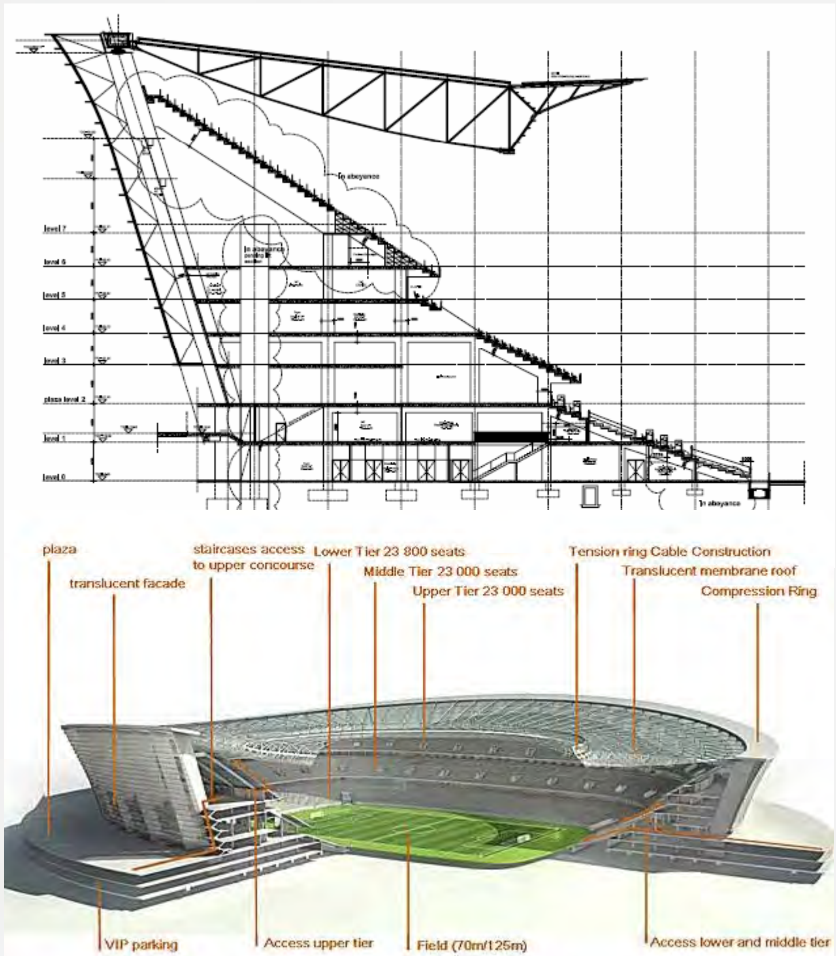
- **Open concourse, gap between inner and outer façade**
  The open concourse at podium level facilitates natural, wind-driven ventilation while a gap between the inner and outer liners of the façade leaves space for passive ventilation through the stack effect. This reduces reliance on fan-powered ventilation.

- **Fluorescent and compact fluorescent lighting**
  Use of energy-efficient light bulbs reduces consumption of coal-fired electricity.

- **Building zones for individual control**
  By allowing for individual control of spaces and systems, it is possible to reduce the running times of systems.

- **Centralised control for air-conditioning and lighting**
  It is possible to completely shut down these systems when the stadium is not in use.

Waste



- Design to match cut and fill, avoidance of imported material: top soil stockpiled and reused
- Approx 95% of materials from old stadium reused: part of a local network of construction sites, stockpiling and sharing waste enabling landfill waste to be minimised
- Concrete mixes have up to 50% fly ash content
- Planning for waste sorting, storage and recycling – estimate +/- 11 tonnes of waste produced per event

Waste

Best-practice interventions	Good-practice interventions
• **Integrated Waste Management Policy** The operator of the stadium will have to adhere to the City of Cape Town's official policy on waste minimisation. • **Demolition waste reused** By reusing demolition waste as aggregate for the construction of haul roads, waste to landfill is reduced considerably. • **Waste to landfill logged** By closely monitoring what is sent to landfill, the total volume of waste to landfill is also reduced.	• **Space provided for waste collection** This ensures the operator is able to minimise waste through a management strategy. • **Topsoil rescued** A valuable source of organic growth material is preserved for landscaping and rehabilitation purposes. • **Cut-and-fill material balanced** By balancing the cutting away of earth and filling up of areas in order to create flat podiums for construction purposes, the production of waste material is avoided. • **Rubble from other sites used for fill** Waste to landfill is further reduced by sourcing fill material from the construction waste produced at nearby building sites. • **Site waste separated** During construction WasteMan sorts and separates all waste on site. • **Environmental Management Plan followed** By following this plan, during the construction process, the overall environmental impact of the stadium is reduced.

Conclusions and Recommendations

- **Current initiatives:**
  - Low hanging fruits were already implemented in both stadia
  - other initiatives to support greening have been already explored, some implemented other discarded because of cost
- **Further initiatives:**
  - either capital costs are prohibiting implementation
  - not cost effective due to limiting savings

Thank you