2010
FIFA World Cup

Moses Mabhida Stadium

Environmental performance enhanced

By August 2008, construction of the giant arch at Moses Mabhida Stadium was progressing rapidly. However few people were aware of the behind-the-scenes efforts to ensure Durban's signature stadium would meet the highest environmental standards.

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As one of South Africa's 2010 FIFA World Cup match venues, Moses Mabhida Stadium is an impressive structure. Towering more than 100 m over the Durban skyline, the stadium's structural arch forms an iconic image.

As is the case with all 2010 match and training venues, members of the project team for Moses Mabhida Stadium have gone out of their way to design an appropriate facility; boasting cutting-edge and environmentally appropriate features. But are these stadia meeting best environmental performance standards? Are they designed in line with "green building" principles?

To answer these questions, the South African Department of Environmental Affairs, through the Urban Environmental Programme (UEMP), which is funded by the Royal Danish Embassy, commissioned a review of the greening status of the FIFA World Cup stadia (the official match stadia and training venues). Not only would this establish how green the stadium designs were, it would also give the design teams the opportunity to enhance some green aspects of their designs. At the same time, this review would summarise the lessons learned for the benefit of other stadium designers and operators.

Five of South Africa's FIFA World Cup match and training venues participated in the review:

1. Green Point Stadium (Cape Town)
2. Moses Mabhida Stadium (Durban)
3. Athlone Stadium (Cape Town)
4. Royal Bafokeng Stadium (Rustenburg)
5. Peter Mokaba Stadium (Polokwane)

This booklet tells the story of Moses Mabhida Stadium.

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Moses Mabhida goes green

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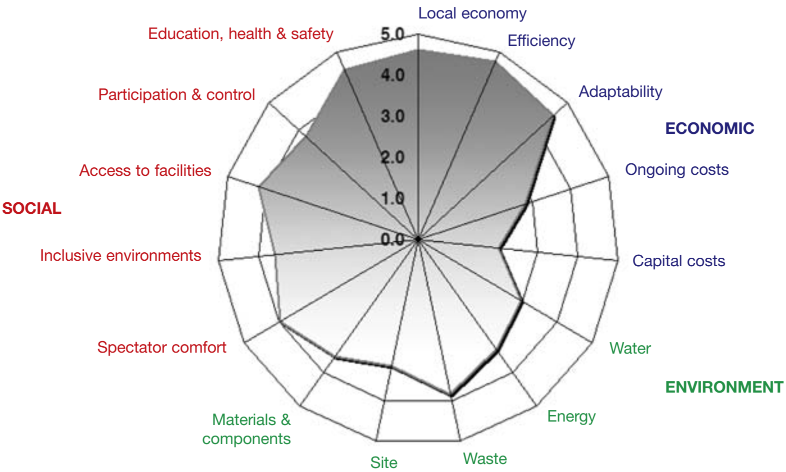
4 key interventions but why?

Following an extensive review of the environmental performance of Moses Mabhida Stadium, the review team identified four "low-hanging fruits"; termed "must have" interventions as they would achieve significant results. The "must haves" entailed water sub-metering, winter setback of cooling tower temperatures, energy sub-metering and specification of low-emitting finishes (products containing low levels of volatile organic compounds).

In addition, it was recommended that the stadium invests in an enhanced building-management system (BMS). Other "should have" interventions identified were leak detection of refrigerants, high fly-ash content in concrete, high post-consumer content in steel and seating made from recycled plastic. Waterless urinals, dual-flush toilets for public use and photovoltaics for walkways were classified as "nice to haves" but not essential. More "nice to haves" entailed on-site renewable-energy projects, low-GWP refrigerants and PVC minimisation in the ducting of electric cables.

The sustainability review team utilised the Sustainable Building Assessment Tool (SBAT) and a "shades of green" analysis process to determine whether or not Moses Mabhida meets sustainability performance benchmarks. These tools were, in turn, used to identify the key interventions required for the stadium to become truly green.



Triple-bottom-line approach

In terms of the SBAT, the performance of Moses Mabhida was measured in relation to social, economic and environmental criteria. The overall sustainability performance of the stadium was found to be good and well-balanced across the three measured areas although higher scores were achieved in relation to social criteria and lower scores for economic criteria.

Stadium **performance** assessed

To reach their conclusions, the review team members assessed the Moses Mabhida Stadium in accordance with the CSIR's Sustainable Building Assessment Tool (SBAT). As sustainability deals not only with environmental performance but also social and economic issues, the SBAT tool embraces the triple-bottom-line approach. This is significantly different from the approach followed in 2006. Then Germany's Green Goal initiative for the 2006 FIFA World Cup focused exclusively on environmental issues.

Positive performance

With regard to the SBAT, Moses Mabhida Stadium performed well in terms of environmental, social and economic criteria.

1. Environment protected

In a review of the design proposals for Moses Mabhida Stadium, it was found to perform well in terms of water, energy, waste and site criteria.

Water consumption reduced

- provision of rainwater capture and pitch-water recycling systems, as well as water-efficient fittings
- indigenous, waterwise plants used in 80% of the landscaping
- intelligent-pitch irrigation system reduces water consumption

Energy efficiency ensured

- close proximity of the stadium to transport facilities (train and bus)
- efficient heating and cooling within the stadium bowl
- BMS and central controls
- efficient lighting throughout all facilities

Waste recycled

- demolished components of the old King's Park Ground recycled or reused

Site disturbances minimised

- constructed on a brownfield site
- negative impacts on site and surrounding areas reduced and mitigated

Hugo Barnard

In close proximity to Moses Mabhida Stadium is Durban's city centre with its well-known International Convention Centre. Durban citizens have benefited from the stadium project as almost all labour (90%) has been sourced from the city itself.

2. Local economy enhanced

The citizens of Durban, and businesses based within the geographic area governed by the eThekwini Municipality, are seeing significant economic benefits resulting from the construction of the Moses Mabhida Stadium.

Local resources optimised

- local labour (90%), local building materials (85%), local furniture (90%)
- the intention is to use local small and medium-sized businesses for 70% of maintenance and repair tasks
- 30% of capital value of project undertaken by small and medium-sized enterprises

Labour intensity achieved

- 1,2 person years of labour for each R1-million of capital cost

3. Spectators and community considered

The design of Moses Mabhida Stadium is cognisant of spectators' comfort while the community is considered in the design and construction processes.

Comfortable spectators

- 100% shading of seating area at midday
- design encourages air movement within stadium bowl

Disabilities considered

- design meets standards for people with disabilities (elevators to all levels; toilets no more than 50 m from seating)

Community enhanced

- local community and role players meet on monthly basis
- possible shared access for local sporting codes
- all site workers have received HIV/Aids training

SBAT criteria

The key performance areas measured against the SBAT tool comprised:

Economy:

local economy
Local labour, local building materials, local components and fittings, local furniture, as well as maintenance.

efficiency
Capacity, occupancy, space per occupant, shared parking and multiple use.

adaptability
Alternative uses, external space, services, as well as media and suite flexibility.

ongoing costs
Water and energy consumption, cost centres, maintenance and cleaning, and facilities management.

capital costs
Training, labour intensity, support of small, medium and macro enterprises, sustainable technology, and private-sector funding.

Environment:

water
Rainwater, water efficiency, run-off, greywater and planting.

energy
Location, passive environmental control, energy efficiency, control and BMS, and renewable energy.

waste
Waste-management facilities, waste minimisation, demolition and construction waste.

site
Brownfield site, neighbouring buildings, vegetation, construction process and landscape inputs.

materials and components
Roof, concrete, roof efficiency, superstructure efficiency and hazardous materials.

Social:

occupant comfort
Shading, ventilation, large screen, crowding and proximity.

inclusive environments
Transport, 'way finding,' space, toilets and distribution.

access to facilities
Accommodation, banking, pedestrian and cycle routes and food and drink.

participation and control
Environmental control, role players, social spaces, sharing access and local community.

education, health and safety
Education, website, health, safety and security.

Water consumption minimised

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Interventions implemented

Positive water-saving features incorporated into Moses Mabhida Stadium's initial design included:

- metering valves and aerators for hand basins
- dual-flush toilets in VIP facilities
- low-flush toilets (7 ℓ/flush) in public facilities
- low-flow shower heads
- individual bath tubs in players' facilities rather than a shared pool
- waterwise, indigenous landscaping
- intelligent pitch-irrigation system minimises water consumption
- drip irrigation for trees
- rainwater harvested off a third of the stadium roof, as well as the pitch, reused for irrigation

Additional interventions proposed

Additional water-saving interventions proposed by the sustainability review team included:

- waterless urinals
- permeable hard landscaping to reduce impact of stormwater run-off
- facilities-management strategy and contract to ensure efficient water management, including the use of air-blow cleaning as opposed to water-blow cleaning

As Moses Mabhida Stadium is situated in a landscaped park, the designers realised that landscape and pitch irrigation could consume large amounts of precious, potable water. So interventions to reduce water demand were top of mind.

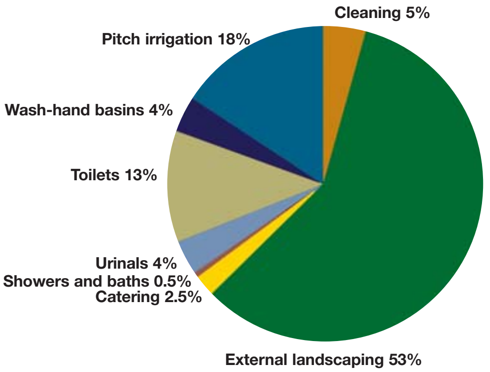
Water model assumptions

The baseline scenario for a stadium with capacity to host 60 000 spectators predicts annual water consumption of 59 112 m³/year.

Water consumption by:

Pitch irrigation	10 530 m³/year	17.81%
Wash-hand basins	2 484 m³/year	4.20%
Toilets	7 731 m³/year	13.08%
Urinals	2 422 m³/year	4.10%
Showers and baths	345 m³/year	0.58%
Catering	1 500 m³/year	2.54%
External landscaping	31 200 m³/year	52.78%
Cleaning	2 900 m³/year	4.91%
Total water consumption:	59 112 m³/year	100.00%

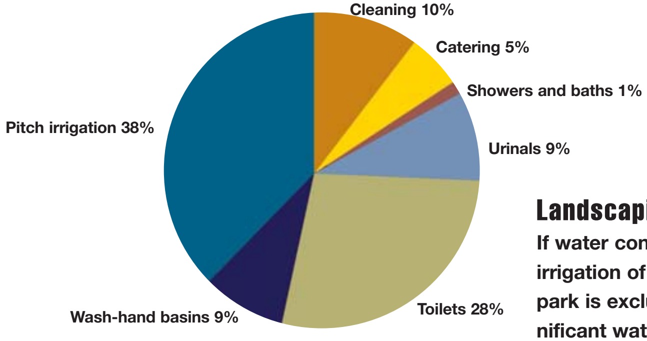
Water consumption baseline



Significant water consumers

In the case of Moses Mabhida, if it was designed in accordance with the baseline (opposite page), the surrounding landscaped park would consume 53% of total water use, the pitch 18% and sanitary fittings (toilets and urinals) 17%.

Water consumption baseline (excluding landscaping)



Landscaping excluded

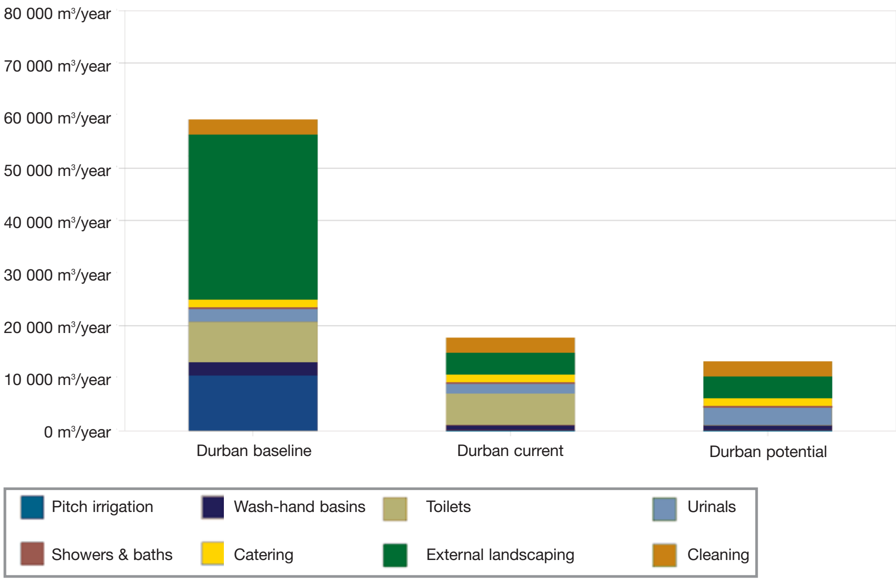
If water consumption for the irrigation of the surrounding park is excluded, the most significant water consumers are pitch irrigation and toilets.

Comparison of the scenarios

	Durban baseline	Durban current	Durban potential
Pitch irrigation	10 530 m³/year	106 m³/year	106 m³/year
Wash-hand basins	2 484 m³/year	994 m³/year	894 m³/year
Toilets	7 731 m³/year	6 013 m³/year	3 479 m³/year
Urinals	2 422 m³/year	1 816 m³/year	0 m³/year
Showers and baths	345 m³/year	288 m³/year	259 m³/year
Catering	1 500 m³/year	1 500 m³/year	1 500 m³/year
External landscaping	31 200 m³/year	4 100 m³/year	4 100 m³/year
Cleaning	2 900 m³/year	2 900 m³/year	2 900 m³/year
Total water consumption:	59 112 *m³/year*	*17 717 m³/year*	*13 238 m³/year*

Taking into account the water-saving measures specified by the designers of Moses Mabhida Stadium, a 70% saving on annual water consumption would be achieved. Annual consumption would be 17 717 m³/year as opposed to 59 112 m³/year in the case of the baseline. This water saving equals 17 Olympic-size swimming pools per annum and is mostly achieved due to the use of an intelligent pitch-irrigation system, tap aerators, water-efficient toilets and urinals, rain- and pitch-water harvesting, as well as using non-potable water for irrigation of the waterwise external landscape.

Water consumption

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Once operational, Moses Mabhida Stadium will seat 60 000 spectators. Annual water consumption for a stadium of this size is benchmarked at 59 112 m³/year. However, in the case of Moses Mabhida, this will be reduced to 17 717 m³/year.

Water consumption: final findings

A 70% water saving has been achieved by the stadium's designers. This is mainly due to the specification of efficient fixtures and fittings, an intelligent pitch-irrigation system and the collection and reuse of rainwater and residual irrigation water off the roof and pitch.

Initiatives to further improve the water efficiency of the stadium will have significant capital cost implications. The resultant long payback periods would render such interventions economically unviable.

Shades of green

Water-saving initiatives at Moses Mabhida Stadium can be categorised as cutting-edge (representing new thinking and technologies), best practice (initiatives implemented elsewhere and now a desired standard) and good practice (methods used widely for many years).

Cutting-edge

- **Intelligent irrigation system**
  The installation of an intelligent irrigation system would result in a 30% reduction in demand for irrigation water.

- **Rainwater harvesting**
  A rainwater tank of 700 m^3 will collect rainwater off the roof and residual water off the pitch. This will eliminate the use of potable water for external landscaping and result in an annual saving on potable water-consumption costs of R2,5-million.

- **Hybrid soccer pitch**
  The installation of a hi-tech fibre-and-grass combination soccer pitch – as specified by the stadium design team – results in a significant reduction in the consumption of potable water.

Best-practice interventions

- **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 2,6% 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 in potable water consumption.

- **Waterwise, indigenous landscaping**
  As much as 20% less water is needed for irrigation of indigenous landscaping compared to 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.

Good-practice interventions

- **Individual bath tubs**
  By installing individual bath tubs, rather than a communal spa jacuzzi, 0,2% less potable water is consumed.

Energy efficiency

Interventions implemented

Positive energy-saving features incorporated into Moses Mabhida Stadium's initial design:

- natural ventilation is facilitated by punched corrugated metal sheeting behind the facade
- natural lighting and a light-coloured roof reduce energy demand while the shade provided by the roof ensures spectator comfort
- energy-efficient luminaires, and associated lamps and control gear, are specified as well as T5 lighting and electronic ballasts for floodlights
- LED technology and timing controls for feature lighting
- heat pumps for heating water
- centralised chiller air-conditioning systems minimise energy consumption
- wash-hand basins in rest rooms do not have hot-water taps
- gas rather than electricity in kiosks and kitchens
- equipment and systems carefully controlled to enable localised switching on and off of lights while mechanical system loads are reduced by variable speed drives and soft starts on motors
- central control room housing the BMS, which enables accurate measurement of energy consumption
- the stadium's carbon footprint has been calculated; climate neutrality will be achieved through carbon emission-reduction initiatives in other areas of the municipality's functions and through carbon-sequestration projects (including community reforestation initiatives)
- not only has the stadium's carbon footprint been calculated, it is also being offset completely; making Moses Mabhida Stadium the only carbon-neutral stadium in South Africa – carbon-offset projects include a community reforestation project at the Buffelsdraai landfill site where 650 000 trees are being planted on 650 ha of former sugar-cane land in the buffer zone around a new regional landfill site; it has been estimated that the trees will be able to sink up to 100 000 t of carbon dioxide (CO_2); other projects comprise a range of biogas interventions at municipal wastewater-treatment works, which will not only offset CO_2 emissions but also generate green energy

Additional interventions proposed

Additional energy-saving interventions proposed by the green review team included:

- because of Durban's humid climate, wind lobbies and vapour barriers in areas that would normally require air-conditioning
- heat recovery in ambient air-conditioning systems
- in line with an enhanced building-management strategy, cooling-tower temperatures should be set back during winter while dimmers and timers should be added to control lighting and HVAC equipment; energy consumption for different systems and zones should be measured separately
- traditional wind power (wind pumps) could be used for water pumping as an icon

achieved

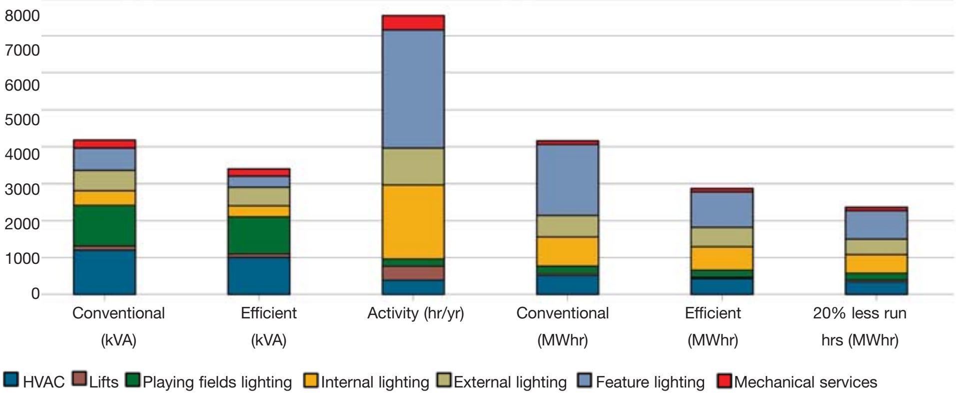
Because feature lighting is energy-intensive, the stadium designers have specified a building-management system with separate switching to ensure that energy-hungry systems are switched off when not in use. This is deemed more effective than reducing the installed capacity of specific systems.

- in support of the stadium's climate neutral strategy, flag poles could be replaced by wind generators while providing an opportunity for advertising or branding
- photovoltaic installations could be linked to the grid although this would require additional funding; these installations could also be used for street and walkway lighting although the cost may be prohibitive (as much as R10 000 per unit)
- choice of refrigerant in the air-conditioning and refrigeration systems should comply with the Montreal Protocol (CFC-free); management of servicing should provide for leak detection and safe disposal of refrigerant

Systems switched off selectively

While floodlights are energy-hungry, they are only used for limited periods of time. Feature lighting, although it has a much lower installed capacity, could, therefore, account for more energy consumption due to lights running for many more hours. When the installed capacity of a conventional stadium (first bar) and an efficient stadium (second bar) is compared in terms of running hours of the various services (third bar), it is clear that floodlights consume less overall energy than lighting (fourth and fifth bars). If the running hours of non-match systems, such as heating, ventilation and air-conditioning, as well as external lighting are reduced by 20%, significant overall energy savings can be achieved (sixth bar). The ability to turn systems off when they are not needed or operate at reduced levels is, therefore, of utmost importance.

Installed vs consumption



Energy savings: final findings

As a stadium is only used intermittently, greater savings can be achieved through the reduction of running hours rather than installed capacity. Interventions adopted by the stadium's design team, which focused on running hours and installed capacity, have already reduced the facility's energy footprint by 30% – equivalent to 1,2-million kWh per annum.

Shades of green

As is the case with water-saving practices (see page 15), energy-saving initiatives at Moses Mabhida Stadium can be categorised as cutting-edge, best practice or good practice.

Cutting-edge

- **Carbon footprint determined**
  As the Greening Durban 2010 Programme calculated the carbon footprint of the proposed stadium upfront, 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.

Best-practice interventions

- **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.

- **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.

Good-practice interventions

- **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.

- **Central control room**
  All electrical systems can be managed from a central location, which facilitates effective management.

Waste minimised

Interventions implemented

Positive waste-reducing features incorporated into Moses Mabhida Stadium's initial design included:

- sufficient and appropriate space for waste collection, separation and transportation off site
- specific depot for the collection of organic waste to be composted by an external service provider
- much of the waste that resulted from the demolition of the Kings Park Stadium – which made way for Moses Mabhida Stadium – was reused and recycled and thus diverted from landfill
- topsoil was rescued for reuse during the landscaping phase
- an environmental management plan is being followed on site

Additional interventions proposed

Additional waste-management interventions proposed by the sustainability review team included:

- vermiculture (earthworm farming) to complement the composting initiative
- further methods to divert plastics, paper and steel from landfill over and above the requirements stipulated by the environmental management plan
- procurement policies should state the reduction of packaging and, therefore, waste as a goal

Materials and components to the value of almost R1-million were salvaged in the process of demolishing the Kings Park soccer stadium. For instance, concrete was crushed and reused for the substructure and foundations while bricks were donated to home builders. Recovered pre-cast seating was donated to local schools.

Shades of green

As is the case with water- and energy-saving practices (see pages 15 and 19), waste-management at Moses Mabhida Stadium can be categorised as cutting-edge, best practice or good practice.

Best-practice interventions

- **Recycling of demolition waste**
  When the old stadium was demolished, waste was reused rather than sent to landfill.

- **Topsoil stockpiled for reuse**
  This will significantly improve the growth of new plants once the landscaping is done.

- **Balanced cut-and-fill**
  By ensuring that only as much land is cut as can be filled, surplus soil does not have to be sent to landfill.

Good-practice interventions

- **Sufficient and appropriate space for separation, storage, collection and transportation of waste**
  This space provides the opportunity to, for instance, compost organic waste.

Appropriate materials specified

Interventions implemented

Positive interventions regarding construction materials incorporated into Moses Mabhida Stadium's initial design:

- 85% of materials are sourced locally and 15% imported
- some fly ash, emanating from post-consumer sources, is used in the concrete mix
- construction and demolition waste was reused for earthworks, such as the construction of berms
- eThekwini Municipality has calculated the stadium's carbon footprint; indicating awareness of the need to reduce the stadium's environmental impact
- the use of PVC for waste pipes and gutters is avoided

Additional interventions proposed

Additional interventions regarding the use of materials proposed by the sustainability review team:

- thorough accounting and recording of sources and quantities should be pursued
- specification of increased fly-ash content in concrete
- specification of steel with a high recycled content
- stadium seats to be manufactured from recycled plastic
- non-woven geotextile specified for the stabilisation of embankments to be manufactured from recycled PET bottles
- avoid the use of materials with high embodied energies
- paints, adhesives, sealants, coatings and carpets should contain low levels of volatile organic compounds.
- favour composite wood and agri-fibre products with low formaldehyde content
- the use of composite materials should be avoided to allow for disassembly and recycling at the end of component life cycle
- PVC minimisation: avoid the use of PVC in electrical ducting and cabling as PVC contains toxins that are released into the environment at all stages of the product's life cycle.

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The waste sent to landfill was reduced by reusing and recycling demolition waste.

Shades of green

As is the case with water, energy and waste-management practices (pages 15, 19 and 21), material specifications at Moses Mabhida Stadium can be categorised as cutting-edge, best practice or good practice.

Cutting-edge	Best-practice interventions	Good-practice interventions
• **Monitoring and measuring CO_2 emissions** The eThekwini Municipality 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** Construction waste was reused for earthworks and berms; the use of PVC products is avoided. • **Hazardous materials avoided**

Additional interventions

Following the extensive design review of Moses Mabhida Stadium, making use of the SBAT, shades of green and modelling studies, the sustainability review team identified various "must have", "should have" and "nice-to-have" initiatives that would further enhance sustainability of the stadium.

4 'low-hanging fruits' – the 'must haves'

Four "low-hanging-fruit" initiatives should be implemented immediately. The sustainability review team argued that these initiatives made financial sense and that it would be a missed opportunity if they were not implemented. These comprise:

1. water sub-metering
2. winter set-back of cooling tower temperatures
3. measurement of energy consumption for individual zones
4. finishes that emit low levels of volatile organic compounds

1. Water sub-metering

The installation of sub-meters to measure water consumption for different systems, areas and applications, would be invaluable assistance for the facilities manager by making it possible to measure the effectiveness of water-saving initiatives. It would also play a prominent role in detecting leaks early on. At least the largest water consumers, such as irrigation, ablutions, wash-down systems, rainwater storage and pitch residual storage, should be sub-metered.

2. Winter set-back of cooling-tower temperatures

Because the wet-bulb temperature in winter is lower than it is in summer, setting back cooling towers in winter would allow the heating, ventilation and air-conditioning system to function more efficiently. This would require no additional cost as long as the required controller is specified for inclusion with the BMS.

3. Measurement of energy consumption for individual zones

Meters that measure electricity consumption in specific areas would enable the facilities manager to monitor the effectiveness of energy-efficiency initiatives. Meters cost about R12 000 each. The benefit would become evident only once the operation patterns of the stadium are measured.

4. Finishes that emit low levels of VOCs

Through the specification of finishes that contain low levels of volatile organic compounds (VOCs), the levels of indoor pollution will be reduced. The paint sector, in particular, is moving towards low-VOC products, this recommendation is easily achievable.

recommended

Many 'should haves'

Many additional options exist to achieve energy and water savings at Moses Mabhida Stadium. The sustainability review team recommended six interventions as "should haves" for the stadium (with the four most significant detailed).

1. hybrid pitch
2. leak detection of refrigerants
3. enhanced BMS
4. high fly-ash content in concrete
5. high post-consumer, recycled content in steel
6. seats of recycled plastic

1. Hybrid pitch

If a hybrid pitch was installed, the requirement for irrigation would be at least 40% lower than in the case of a natural pitch. This would mean the water collected in the rainwater tanks meant for pitch irrigation could be redirected for landscape irrigation. Although the capital costs to install a hybrid pitch would be high, the potential savings in water and maintenance could be significant. However FIFA regulations have only allowed for the installation of a hi-tech combination fibre-and-grass pitch for 2010 and not a complete hybrid pitch.

2. Leak detection of refrigerants

To reduce the potential impact on global warming by leaking refrigerants, leak detectors should be fitted on cooling equipment.

3. Enhanced BMS

As a stadium is only used intermittently, more energy savings can be achieved by reducing the running period of systems rather than reducing the energy demand of specific equipment. By providing dimmers, timers and occupant sensors, systems only need to be on when a specific section of the building is occupied.

4. High fly-ash content in concrete

More than 50% of cement could be substituted by flyash (a by-product of coal-fired electricity generation) in a concrete mix without jeopardising the strength of the concrete. As cement is a major contributor to emissions, the carbon footprint of Moses Mabhida Stadium could be significantly lowered by using flyash rather than cement wherever possible.

Some 'nice to haves'

Six more opportunities exist to reduce water and energy consumption. However the sustainability review team categorised these as "nice to haves". While their incorporation would make a difference, the impact would be far less than is the case with "must haves" (the five most significant are detailed).

1. waterless urinals
2. dual-flush toilets in public ablution facilities
3. on-site renewable-energy projects
4. photovoltaic lights for walkways
5. refrigerants with low potential for global warming
6. PVC minimisation in ducting and cabling

1. Waterless urinals

By switching the 450 urinals to waterless technology, an additional 3% saving in overall water consumption for the stadium could be achieved. However, at an additional cost of R1,8-million), the annual saving in water charges of R27 240 would be difficult to justify.

2. Dual-flush toilets in public ablution facilities

By changing the 660 toilets in the stadium to dual-flush technology, an additional 4% saving in water consumption could be achieved at Moses Mabhida Stadium. However the additional cost of R660 000 (R1 000 per toilet) is not necessarily enough to justify when compared with a water saving of R63 780 per annum.

3. On-site renewable-energy projects

As the stadium will only be used intermittently, the generation of renewable electricity on site would only be possible if large electrical storage equipment is provided. Any funding available for renewable-energy projects would be better spent in off-grid communities.

4. Photovoltaic lights for walkways and streets

As these lights would burn for many hours (every night), the impact on energy consumption could be significant. However the cost of electricity generated from photovoltaics, measured over a period of 20 years in Durban, is calculated as R2/kWh. It is, therefore, not feasible from an economic perspective. In addition, the batteries associated with this technology could have a negative impact on the environment. The sustainability review team is of the opinion that it would be more beneficial to invest in carbon-offset programmes elsewhere.

Architectural masterpiece

Moses Mabhida Stadium is not only "green" but also magnificent. A cable car travelling up the iconic arch will offer spectacular views over the city, harbour and ocean.

The professional design team

Client:

eThekwini Municipality

Lead consultants:

Architecture and engineering:
Von Gerkan Marg & Partners
Structural engineering:
Schlaich Bergermann & Partners
Engineering and management:
BKS
Specialist consultants:
TJ Ambro-Afrique, Iyer Rothaug Collaboration, Lechmiah Daya Mandindi, Iliso Consulting Engineers, Singatha Afrika Management Services, Ibuya Consulting Engineers, LSG International

Sub-consultants:

Architecture:
Osmond Lange Architects, NSM Designs, Mthulisi Msimang
Structural and civil engineering:
Goba, PD Naidoo & Associates, SLB Consulting
Quantity surveying:
Davis Langdon, Vaughan Charles & Associates, Felix Msomi, Malata & Associates
Electrical engineering:
Igoda Projects, Khanyisa Africa, Palace Consulting
Mechanical engineering:
Mahesh Khoosal & Associates, Emanzi Consulting Engineers

Specialist consultants:

Acoustic design:
Acoustic Design Ahnert
Risk, safety and security:
Imvula Risk Management
Overlay stadium specialist:
Nussli International
Consulting corrosion engineer:
CATS
Concrete technology specialist:
Structural Diagnostics

Contractor:

Group Five/ WBHO/Pandev Joint Venture

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For a copy of this booklet:
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