

Climate Response Expo



3 Climate Response Expo

The DEA organised an exemplary and memorable Expo as part of COP17/CMP7, bringing to life the tangible ways in which South Africa and other countries are and could be responding to climate change adaptation and mitigation. Apart from the riveting array of exhibitions and side-events, the way in which the Climate Change Response Expo (CCR Expo) was organised provided an opportunity to showcase a variety of sustainable options to consider in staging future events of this nature. COP17/CMP7 aimed to be a low carbon event based on sound event greening principles and the approach to the greening of the CCR Expo is outlined below.

The site for the Expo was the Centrum Car Park adjacent to the ICC. The Expo consumed 20,000m² of the surface area. The car park was transformed into a modern, multifunctional and dynamic space providing an array of facilities and amenities to delegates and visitors to accommodate all their physical, social and intellectual requirements including catering services, space and facilities for relaxation and socialisation, meeting and networking, and an extensive indoor and outdoor exhibition. It was a universal space that could be accessed and enjoyed by all as it was centrally located. For more information on the events that took place within the CCR Expo, please refer to Section 8.3.1.

3.1 CCR Expo Greening Strategy

The CCR Expo Greening Strategy comprised the following nine major elements:

- 1 Encouraging event greening behaviours by organisers and exhibitors;
- 2 Waste Management by attention to the fundamentals of the waste management hierarchy and dealing with the organic fraction by means of composting to return nutrients to the environment;
- 3 Energy management by means of energy conservation, efficient use of energy, consumption monitoring, and sourcing of renewable energy;
- 4 Protection and enhancement of biodiversity through responsible landscaping and sourcing of indigenous plants;
- 5 Water management through the promotion of rainwater harvesting, consumption of tap water, and safe sanitation;
- 6 Eco-procurement by encouraging the procurement of local produce, attention to food miles, and green supply chain management;
- 7 Green design and the principles of green exhibitions;
- 8 Education and outreach, recognition of effective implementation of greening principles; and
- 9 Ensuring a positive legacy through the redistribution and re-use of Expo materials and stock.

3.2 Encouraging event greening behaviours

Event greening principles were included into the planning and preparation of the Expo from the outset. This influenced the design of the Expo, the procurement of goods and services, resource management and leaving a positive legacy. The first step was the development of an Exhibition Greening Guideline (Annexure 2) to encourage the curators managing and exhibitors participating in the CCR Expo to produce green exhibitions through a practical selection of greening actions. These guidelines were made available to exhibitors at stakeholder briefings and were published on the CCR Expo portal. Four stakeholder briefings were held in the run-up to CCR Expo and one of these stakeholder briefings emphasised greening tips for exhibitors.

Thereafter a Responsible Exhibitor Charter (Annexure 3) was compiled, which exhibitors were required to sign before finalising their exhibitor contract. It underpinned the intention to ensure that the Expo not only showcased greening, but that it was implemented in a responsible manner with a genuine focus on sustainability. The charter was not closely monitored or enforced but where gross violations were detected, exhibitors were requested to correct the offensive behaviour. Exhibitors were also discouraged from producing large quantities of printed materials and handouts, a practice that is strongly engrained in exhibit culture.

Exhibitors were also requested to provide background information regarding their products or services to determine whether compliance with the criteria to showcase local eco-solutions and initiatives were indeed being addressed. The CCR Expo Green Stand Awards acknowledged those exhibitors that had excelled in the incorporation of green design principles to their stand. Please refer to Appendix 4 to view the judging criteria and list of winners.

The CCR Expo Green Stand showcased the green interventions at the Expo for visitors who wanted more information on initiatives undertaken and the rationale behind each of the greening actions.

3.3 Green Design and Green Exhibitions

From the outset, the goal was to incorporate thermal design and innovative features to reduce the energy consumption through using natural light and ventilation where practical.

Green canopy

A canopy made from wild banana leaves (*Strelitzia Nicolai*) and alien vegetation provided shade across a large section of the Expo area including the food court and the performance area. It is a 60m x 40m canopy of almost 20,000 wild banana leaves hanging from their approximately 1.5m long stems at 8.5m off the ground. Support for the structure was provided by raw *Eucalyptus* timber beams, which, although alien species, were grown in a sustainably managed FSC forest for woodpulp production but had grown too large to be processed by the pulping machinery.

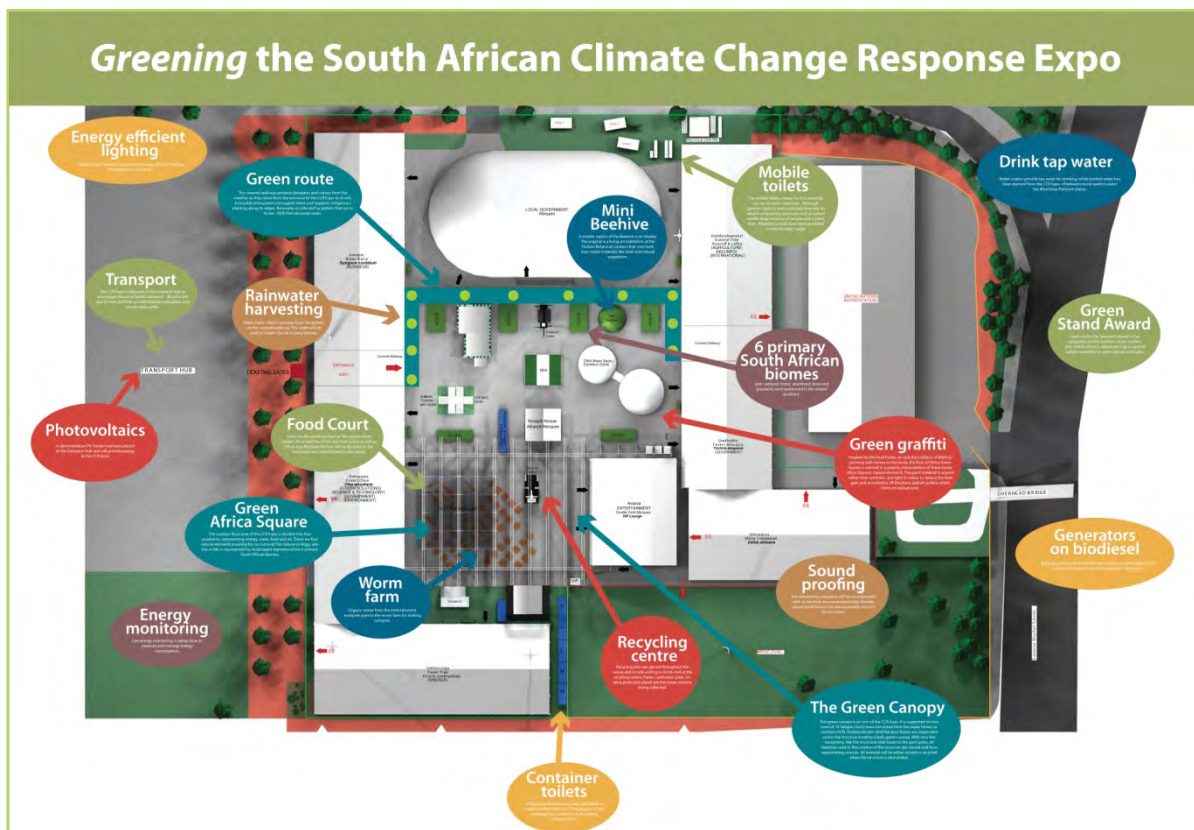


Figure 4: Greening the South African Climate Change Response Expo floor plan.

The canopy itself was created by the leaves from rope netting strung between the beams. The result was to produce an appealing area, cool and with dappled shade, evocative of a KZN coastal forest with white noise produced by the rustling of the leaves dampening the noise of the city. The end use of materials used throughout the exhibition was an important consideration: the poles were allocated to legacy projects, described in Section 3.11, the leaves were composted and the rope was repurposed. Construction of the canopy was severely impacted by rain during the erection phase with the result that the full quantity of banana leaves specified in the design could not be installed in time. The result was that the coverage provided was slightly less comprehensive than initially intended. However, no excessively hot days occurred during the Expo, so the deficiency was not serious.

Green stand option for exhibitors

Standard exhibition stands as they are currently offered by the exhibition industry are not very energy efficient. However, the Expo offered built-in LED lighting to their standard offering and provided all exhibitors with the option to choose a “green stand package”. This option, rapidly gaining traction with exhibitors, included LED lighting, reusable branded fabric backdrop and biodegradable carpeting. All other elements of the shell scheme, i.e. the aluminium frames, boards and furnishings, were reusable products supplied locally. Uptake of the green option was reasonable (21 out of 55 exhibitors) although the green profile of this option was diluted by the inability to install LED lamps customised for these stands



Figure 5: Organic printed murals on tarmac.



Figure 6: A canopy made from wild banana leaves (*Strelitzia Nicotia*).

in time. As a result, many stands were not as green as intended by exhibitors and organisers alike, and hoped-for energy saving resulting from this initiative was less than initially envisaged.

Eco-friendly soundproof walling & ceilings

Sound-proofing of meeting rooms is a vexing problem in permanent structures, and more so in temporary marquee-type buildings. The networking and media facilities were housed in a soft-walled marquee, partitioned into meeting rooms and briefing areas by means of removable dry-walling supported by lightweight aluminium and steel framing. Magnaboard, an eco-friendly Magnesium Oxide-based drywall product, was used in a double-skin construction. This was highly effective at containing sound in addition to its insulating and fire-proof qualities.

Eco-friendly paint murals

Organic paint was used to adorn the tar in the outdoor areas of the CCR Expo with decorative, non-permanent stencilling: Stylised and decorated calabashes, leaves, water droplets, arranged in a form reminiscent of the 1960s paisley pattern. The result was attractive and the light colour of the paint helped to reduce the heat gain on the dark tarmac.

3.4 Sustainable Energy

The CCR Expo's primary power requirement was to supply lighting and air-conditioning inside the marquees. Exhibitors required power for their stands and caterers needed power for cooking and refrigeration. Grid connected power was made available by eThekweni Municipality.

Power supply to the large, temporary venue (i.e. the CCR Expo) was challenging and thus energy efficiency was a crucial part of the planning and implementation. The Wild Banana Leaf canopy, a 80m x 40m, 8m high canopy installed over the food area, which also served as an effective, informal gathering and networking space, aimed to reduce the need for air-conditioning. Furthermore, energy efficient lighting was installed in all the venues.

Assurance of supply was guaranteed through back-up generators that were supplied with biodiesel (B50) sourced from used cooking oil. The supply of electricity to the Expo was completely reliable as a result the backup generators were never required during the entire period.

Live energy monitoring, utilising sensors placed on each phase of each mini-substation, supplying the venue, and communicating data in real-time to servers in Gauteng was implemented on-site and used in the calculation of the footprint of the venue.

A demonstration PV Tracker was placed at the Central Transport Hub to demonstrate how clean, renewable energy for general consumption can be generated and was used to run a nearby street light for the COP17/CMP7 demonstration.



Figure 7: A demonstration PV Tracker.

3.4.1 Energy Use

eThekweni Municipality provided the energy to the site and installed bulk meters at each of the mini-substations serving the site. Overall consumption figures for the build-up, operational and break-down phases were obtained from the installed bulk meters.

Table 9: Summary of electricity consumed at CCR Expo

Electricity consumed	KWh
Electricity consumed during exhibition days - 28 Nov to 9 Dec	146,086 KWh
Electricity consumed during build-up and break-down activities	36,774 KWh
Total electricity consumed for full period	182,860 KWh
Amount of coal used to produce energy consumed (0.56kg of coal per 1KWh of electricity) ²	102,401.6kg

Daily variation of electricity consumption was primarily due to the air-conditioning load and could be roughly correlated to weather conditions. After the initial heavy rains, a period of high humidity and temperature was experienced, which explained the peak consumption on 01 December 2011. Windy, gusty conditions were experienced between 03 to 04 December 2011. Security staff closed and secured a select number of doors during this period and ensured that others were closed after people had passed through, keeping the cool air inside and reducing the load on the air-conditioning equipment and achieving a significant saving.

Electricity from the main supply was disconnected shortly after closure of the Expo. This resulted in a large proportion of electricity being obtained from portable fossil-fuel powered generators during breakdown of the Expo.

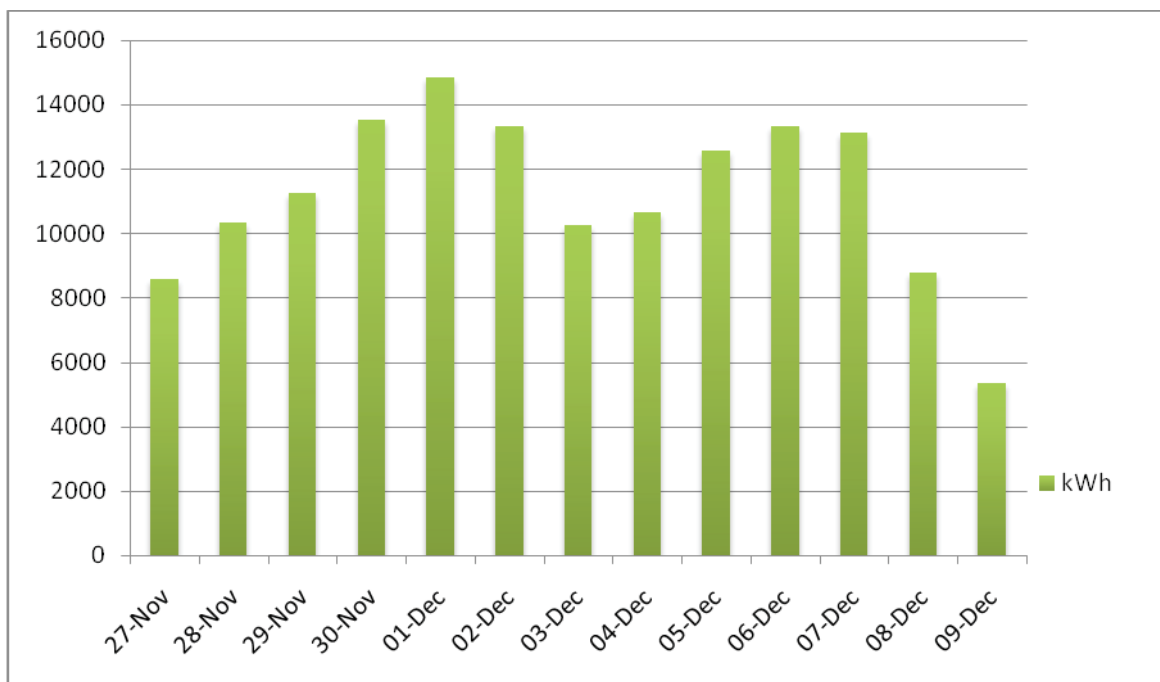


Figure 8. Daily electricity consumption at CCR Expo site during event days

3.4.2 Energy Conservation

Natural lighting

With the exception of the networking and media marquee where glass frontage was not practical, glass-fronted marquees were used to unify outside and inside spaces. The glass fronting also served to allow natural daylight into the marquees, reducing the need for artificial illumination.

Night time power down

Exhibitors were informed that all power would be shut down at night and were advised to make appropriate arrangements, but this proved impractical. Therefore only the lighting was switched off after hours. This was reflected by the live monitoring and although the air-conditioning was not switched off, most units were able to switch to low power usage once the marquees had cooled down. The majority of exhibitors shut down equipment on their stands as

requested, thereby further reducing the after-hours load. The overnight consumption was considerably lower than day-time consumption. Since Durban in December is almost as warm at night as by day, natural venting of buildings and passive cooling by night air is not always feasible. However, it could be considered as an energy-saving option if planned and implemented on nights forecasted to be cooler.

Powering down the lights after hours resulted in a saving of 1,290KWh.

Energy efficiency

Energy efficient lighting was installed in all the marquees. A total of 200 T5 fittings were installed in all the marquees (with the exception of the networking/media marquee which was equipped with LED lighting). This amounted to a 1411.2kWh savings as presented in Table 10.

Table 10. A comparison of output due to energy efficiency

	Product	Wattage	Total Wattage	Savings (kWh)
Conventional	T8 double-open channel fittings	112 watts per unit	22,400w	
Energy efficient	T5 d double-open channel fittings	70 watts per unit	14,000w	8.4kWh

The energy-saving T5 fluorescent tubes used have 70% less mercury vapour, 40% less glass content, double the life of conventional tubes, instant cold start (no flickering) and low heat generation, thereby leaving a much smaller carbon footprint than their predecessors while yielding comparable lux levels.

A total of 136 LED lights were installed in the networking/media marquee, 14 of which used solar power. This resulted in a 3,222.24kWh saving as demonstrated in Table 11.

Table 11. A comparison of output due to energy efficiency

	Product	Wattage	Total Wattage	Savings (kWh)
Conventional	Halogen lights	150 watts per unit	20,400w	
Energy efficient	LED lights	10 watts per unit	1,220w	3,222.24

Renewable Energy

Hot water for the catering kitchen was provided by two 200 litre solar water heaters, which were locally manufactured. These were prominently installed on top of the shipping container toilet units adjacent to the stage. Thus all hot water used by the caterers was heated by the use of a renewable resource.

A total of 4,740.44kWh was saved through a combination of interventions as summarised in Table 12.

Table 12. CCR Expo savings

Intervention	Energy savings (kWh)
200 T5 light fittings for T8 light fittings	1,411.2 kWh
LED light bulbs for Halogen light bulbs	3,222.24kWh
Solar Water Heaters	107kWh
Total	4,740.44kWh

3.4.3 Consumption monitoring

Near real-time monitoring capacity was provided and the results were linked to the CCR Expo website and displayed on a large monitor on the CCR Expo Greening stand. These results were used to obtain a precise figure for energy consumption during the operational phase of the Expo. Bulk metering, implemented by eThekweni Municipality, was used to determine consumption figures for the build-up and break-down phases. Communication of live data, from sensors installed in the on-site mini-sub to remote application servers and back to the live display, was

hampered by patchy GSM availability in the vicinity of the Expo site. Arrangements were in place to enhance GSM availability in expectation of high usage but demand exceeded supply. This meant that data was delayed and therefore not real-time as intended. Although it served as an effective tool for creating awareness of electricity consumption, it was not as effective as it could have been. Highly detailed data was provided after the event, which was useful in determining the precise quantity of electricity consumed. This information was also used in the determination of the overall carbon footprint of the event.



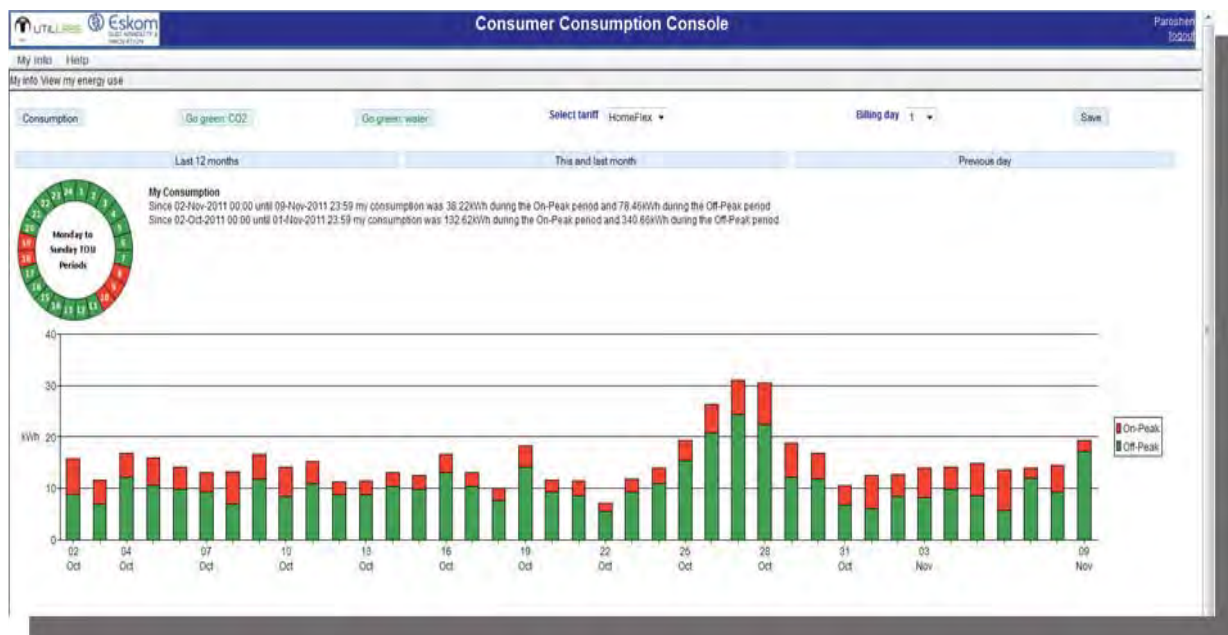


Figure 9. Monitoring of Energy Consumption.

3.5 Water Management and Sanitation

Water was required at the Expo for sanitation (i.e. toilet and urinal flushing, hand basins), catering (i.e. dishwashing and cleaning), cleaning (i.e. all Expo cleaning activities), irrigation (i.e. watering of the planted landscapes and installations such as mini beehive, food and herb garden) and hydration (i.e. provision of safe, palatable drinking water for delegates, exhibitors, visitors).

The eThekweni Municipality provided the site with access to municipal water. Planning for water efficiency concentrated on rainwater collection for irrigation and the provision of drinking water from the municipal supply, filtered and chilled, in preference to bottled water. A communication campaign was designed to promote the consumption of tap water. Alternative sanitation solutions were investigated but deemed unworkable due to the restrictions of the site.

3.5.1 Water Supply

eThekweni Municipality provided water on site by means of the "cap and tap" method, utilising five existing roadside standpipes, with a meter and stopcock installed and then reticulated as required by means of surface piping. Installation took place at site hand-over on 31 October 2011 and the meters were read before removal on 12 December 2011. The results thus reflect water consumption for the entire process including build-up, event and break-down and this was 843 kilolitres. The average consumption of attendees is calculated by dividing the total number of litres consumed by the total number of attendees as follows:

Table 13. Water consumption per visit

Total quantity of water consumed	Total number of visits	Average consumption
853 kilolitres	189,570	4.45 litres

3.5.2 Promoting the consumption of tap water

Visitors to the CCR Expo were encouraged to drink eThekweni Municipality's Blue Drop certified potable water, as no bottled water was sold at the CCR Expo. There were water coolers throughout the venue, with cool, clean and filtered drinking water sourced directly from the municipal supply and filtered. Plastic cups were provided at the coolers and recycled through the on-site waste management system. However, participants were encouraged to use re-useable water bottles instead of disposable cups.



Figure 10: Mobile dispenser.

Water conservation messages focused on the importance of water, water scarcity and assurance that eThekweni Municipality's water, having achieved Blue Drop quality status, was indeed safe to drink. Coolers were kept supplied with filtered tap water by the cleaning staff. The volume of water used to refill the bottles was metered with a dedicated sub-meter expressly installed for the purpose. Approximately 15,000 litres of municipal water was consumed by visitors at the drinking fountains, during the Expo, thus displacing more than 40,000 bottles (375 ml) from the waste stream and avoiding the transport footprint of more than 15 tonnes of product.

3.5.3 Rainwater harvesting

Rainwater harvesting was promoted through the installation of a demonstration system comprising ten rainwater tanks with guttering and downpipes to direct rainwater, which fell onto the covered walkway to the tanks. The installation was visually striking with bright green tanks and white downpipes and effectively created awareness of the idea. The amount of catchment area relative to the quantity of tanks was too low for the tanks to successfully collect a usable amount of water in the short duration of the event. The high density of tanks was important and acted as an effective point of interest.

The installation was creatively designed to provide shade as well as rain protection. In addition, it was used to convey the message of the importance of water and the wisdom of rainwater harvesting. These objectives were very successfully achieved.

The Cape Town Climate Smart exhibit harvested rainwater, filtered it and used it to refill the water coolers as well as make tea and coffee for visitors.

3.5.4 Sanitation

Due to the fact that the CCR Expo was hosted in a car park with no built-in amenities, temporary toilets were required to handle the anticipated numbers of people attending the CCR Expo. This was expected to be in excess of 10,000 people daily.

Alternative sanitation solutions were explored as a first option. However, it was decided that, due to the number of people expected over such a short time, the alternative approaches would not have the required carrying capacity. Therefore, the most appropriate option, under the circumstances, was to avoid the use of chemicals containing formaldehyde. Instead, a product derived from biodegradable natural organic food sources would be used and without compromising the facility's health and safety standards. The material safety data sheet for this product was scrutinised and found to be a suitable alternative to conventional cleaning chemicals.



Figure 11: Rainwater harvesting.

Five self-contained toilet units, providing 14 toilets, were installed in recycled shipping containers supplied by eThekweni Municipality. They were connected to the municipal sewerage disposal system and received water from the municipal supply on-site. The units were equipped with the smallest available cisterns, reducing flushing volumes, but no further water saving features were incorporated.

Seventeen supplementary mobile toilets were hired. Environmentally-friendly, formaldehyde-free chemicals were specified. The mobile toilets for men were equipped with waterless urinals for water-efficiency. Two of the toilets also catered for wheelchair access.

After the event, the containers toilets were installed by eThekweni Municipality in informal areas lacking suitable sanitary facilities.

3.6 Waste Management

Waste resulting from an event of the type and size of the CCR Expo typically varied considerably as the event moves through the three phases of build-up, operational (public days) and breaking down.

During build-up, activities include site preparation and construction of event infrastructure; waste was to a larger extent comprised of construction materials, off-cuts, damaged material, packaging and containers for consumables such as paint, adhesives, sealants, cardboard cores from adhesive tape and vinyl branding. Equipment and exhibition materials which were brought on site, wrapped in protective packaging such as bubble wrap, was discarded.

During the operational phase, on public days, the actual operation of the Expo produced a distinctly different waste profile characterised particularly by catering waste; disposable food packaging, cutlery, serviettes/napkins, beverage containers, food waste. Paper waste was also prevalent during this phase as well as decorating materials used for once-off events which take place at various venues. This type of waste, particularly beverage containers and plastic waste has a high re-sale value and a ready market exists for the re-claimed raw materials, thus established recycling/separating practice results in good rates of extraction of usable materials and a high level of effectiveness.

Breaking down resulted in the largest quantity of waste. Exhibitors typically abandoned branding, leftover marketing materials, pamphlets, novelty items, etc. This resulted in the production of large quantities of paper waste and various plastics. Breaking down of display stands resulted in the disposal of very large amounts (by weight) of used, and usually damaged or unsellable construction materials (dense, heavy material such as particle-board) as well as vast areas of slightly used carpeting. Dismantling of landscaping produces soil, rocks, plants, plastics and other substrates. Vast quantities of protective packaging (bubble-wrap) were used to wrap furniture, equipment, etc., for onward transportation, resulting in the disposal of cardboard cores and remnants and off-cuts.



Figure 12: Waste separation at source.

Table 14 summarises the amount of waste produced by the CCR Expo. It does not factor in the weight of the products/goods that may have gone to landfill but were redistributed for future and/or alternative uses (refer to section 3.6.3).

Table 14: Summary of waste generated at CCR Expo

Waste Type	Total (kg)
Waste avoided – 40,000 PET bottles	200
Re-use – banners (25 banners)	Minimal
Food distributed	2,638
Composting	Minimal
Recyclables	7,672
Landfill	50,207
Total	57,879

The approach to reduction of waste produced at the CCR Expo was based on the application of methods for waste avoidance, re-use and recycling, with disposal treated as a last resort. The goal was to reduce the amount of waste disposed of at landfill as this is poor environmental practice and contributes to an escalating environmental challenge. This manner in which this approach was applied to the CCR Expo is described below.

3.6.1 Waste Minimisation

It was a priority to reduce the amount of waste generated at the Expo, primarily by raising awareness on greening and the need to be more conscious of the impact of such an event on the environment. For example, it was requested that the catering suppliers use minimal packaging when serving food; the Responsible Exhibitor Charter (Annexure 3) requested that exhibitors commit to using minimal packaging, reducing printed hand-outs at their stands and designing re-usable branding that would have a lifespan beyond the Expo. The intervention with the greatest impact was the banning of bottled water and it is estimated that this resulted in a diversion of approximately 40,000 Polyethylene Terephthalate (PET) bottles from the waste stream.

3.6.2 Re-use

Ways to re-use waste generated at the Expo were explored before recycling or disposal were considered. One of the interventions was the donation of unwanted branding to Woza Moya, an income-generating project for the Hillcrest AIDS Trust Centre to be repurposed into craft items for sale. (More detail and other examples are to be found in the Legacy section of this report.) Twenty-five banners of varying sizes were collected by Woza Moya. No banners went to landfill. At an event of this size, a far larger quantity of (non-re-usable) banners is usually generated, all of which is abandoned afterwards. As a result of the 'reduce'

component of the 'reduce, re-use, recycle' messaging campaign, which encouraged exhibitors to design re-usable branding that would have a lifespan beyond the Expo, this type of wastage was avoided.

3.6.3 Redistribution

Two service-providers sold food at the CCR Expo, and both arranged to donate excess food to the FoodBank, a non-profit organisation, which redistributed it to community projects for the benefit of impoverished people.

'Eat Greek Catering' prepared hot foods at the double-decker marquee kitchen to serve the restaurant and VIP lounge, and also catered for functions and events on-site. In total, Eat Greek contributed 2,638 kg of fresh, healthy and edible food to the Food Bank.

In addition to the redistribution of food, used carpeting, tables, benches, construction materials, timber beams are other examples of useful and re-usable objects and materials that were successfully redistributed for further use. The destinations of materials salvaged are listed in the legacy section of this report. No facility was available for weighing or recording the weight of materials redirected in this way. However, these included: 2000 plants, 7875m² carpeting, branded vinyl banners, marketing material, 24 saligna poles (each weighing several tonnes), rope, wood, chipboard, walkway roofing, tables and benches, 62 wheelie bins, 52 recycling bins and more.

During break down, a notable quantity of used construction materials, particularly wood and particle-board used for the construction of exhibition stands, was abandoned by exhibitors. This mixed material, all odd sizes and damaged in various ways, was of no real value to the recycling contractor, who was also managing the sorting of materials on-site. These materials were placed in a skip for transportation to the landfill and overlooked by people who came to collect re-usable materials. Thus, a large mass of wood and particle board ended up in landfill. Since record-keeping was done by weight, and particle board is particularly dense, the ratio of recyclables to landfill for build-up and breakdown was far less than expected.

3.6.4 Recycling

In line with international eventing best practice, a twin-bin system was implemented, where recyclables and non-recyclables were separated at-source. On-site waste management staff sorted the recyclables into various grades of paper, cardboard, plastic, glass and tin, which were distributed to appropriate recycling markets. Durban Solid Waste collected the non-recyclable fraction of residual waste on demand and disposed of it at Bisasar Road Landfill, a permitted site.



Figure 13: Waste management hierarchy.

The community projects that benefited from the redistribution of healthy and safe food were as follows:

- **I Care Rehabilitation Centre:** A rehabilitation centre for street children, situated in the Durban Central Business District and catering for 20 children.
- **Ottawa Boys Home:** A Mount Edgecombe shelter for about 30 boys ranging from 12 to 16 years of age.
- **Cato Manor Masibambisane Women's Organisation:** An organisation working to empower the community in Cato Manor.
- **Zamani Children's Shelter:** A shelter catering for 35 children, located west of Durban in Newlands East.



All waste processed by the on-site sorting was recorded by weight. The overall results, including build-up and strike, reflected that 13.25% (by weight) of the waste from the bins on-site at the Expo was recycled and 86.75% (by weight) of the waste went to landfill. As shown in the Table 15, more than 7 ½ tonnes of material diverted from landfill.

Material which could be re-purposed, was removed from the site by beneficiaries before reaching the on-site waste management facility. It was therefore neither weighed nor measured in any way and is thus not reflected in the data. Thus, the ratio of waste recycled versus waste landfilled was somewhat skewed, since all waste sent to landfill was quantified, but a large amount of material diverted and re-used does not feature in the data provided.

Table 15: Summary of waste generated at CCR Expo

Waste Type	Total (kg)	%
Recyclables	7,672	13,25
Landfill	50,207	88,75
Total	57,879	100

Figure 14 presents the composition of the recyclables, which were further processed into sellable raw materials or cleaned, baled and marketed to manufacturers for use as raw materials. An informal survey of a small sample of manufacturers purchasing recovered materials indicated a high level of satisfaction with the purity and quality of recovered plastics purchased.

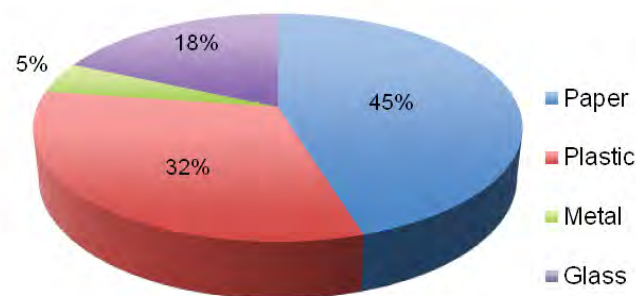


Figure 14: Composition of recyclables at the CCR Expo.

Whilst Figure 14 presents the broad composition of the recyclables, Table 16 reflects the specific recyclables recovered for both the duration of the CCR expo and per each phase.

Table 16. Specific recyclables recovered during the different phases

	Recyclable	Build up (kg)	Operational (kg)	Break-down (kg)	Total (kg)
Paper	Scrap C/board	855.95	2048.2	399.95	3304.1
	White paper	5.7	0	0	5.7
	Scrap cores	0	0	7.6	7.6
	Tetrapak	0	0	3.8	3.8
	IMW	58.9	0.00	5.7	64.6
	CMW	8.55	16.15	59.86	84.56
Subtotal		929.1	2064.35	476.91	3470.36
Plastic	LD	472.15	645.05	59.85	1177.05
	HD	0	87.4	0	87.4
	PET	55.1	654.55	30.4	740.05
	Shrink wrap	56.05	139.65	0	195.7
	Foam	16.15	0	0	16.15
	Polystyrene	0	97.85	0	97.85
	PVC	0	31.35	0	31.35
	Polyprop	0	112.1	0	112.1
Subtotal		599.45	1767.95	90.25	2457.65
Metal	Cans	0	336.3	4.75	341.05
Glass	Glass	0	1250.2	152	1402.2
Total		1528.55	5418.8	723.91	7671.26

As can be seen in Table 16, the rates of recycling and disposal varied significantly during the build-up, operational, and break-down phases as presented in Figure 15.

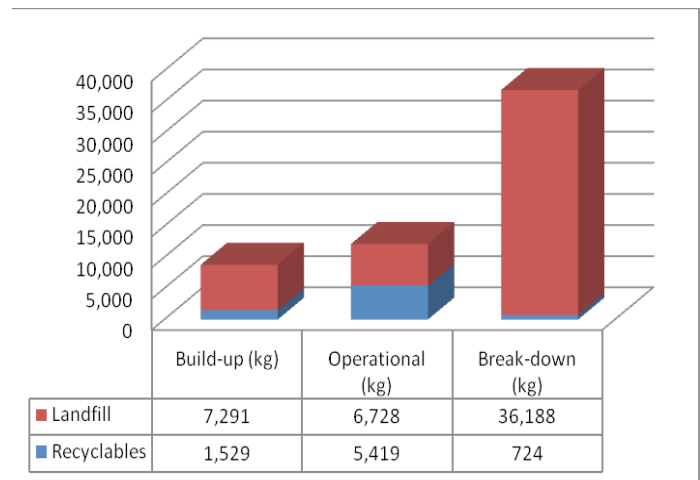


Figure 15: Waste volumes during build-up.

During build-up, 8,820kg of waste resulted, of which 1,529kg of usable recyclables were extracted. The remaining amount of 7,291kg was transported to landfill. Much of the mass of the residual waste that went to landfill comprised heavy soil, chipboard and wet construction materials used in building operations on site. The heavy rains experienced during the build-up phase rendered materials such as wood and particle-board unusable as they became waterlogged.

During the operational phase when the Expo was open to visitors (i.e. excluding build-up and break-down periods) the waste separation of recyclables to non-recyclables achieved was far higher than the build-up phase at 44.6%, mainly due to the recycling of paper and plastic.

During break-down, 36,912kg of waste reached the sorting and recycling centre of which 36,188kg was sent to landfill and 724kg was recycled.

3.6.5 Composting

Organic waste was disposed of through composting by means of a large commercial worm farm. Only a minimal amount of organic waste was produced at the Expo for the worms, as potential food waste was minimised due to the Food Bank donations, and much of the other organic waste such as chipboard from stands could not be used.

The worm farm was installed and set up on site on the day before the opening and was manned throughout the Expo to ensure that only the correct organic waste was fed to the worms and to allow visitors the opportunity to ask questions and learn more about the process. The worm leachate generated on-site was used to fertilise the plants in the landscaping displays and the demonstration food gardens at the CCR Expo. The worm farm was donated to the Association for the Aged and once properly established, the worm population is able to consume 20kg to 30kg of organic waste daily.



Figure 16: Demonstration of a worm farm.



Figure 17: Red worm (*Eisenia fetida*).

3.7 Protecting and enhancing biodiversity

All plants used at the CCR Expo were sourced locally and, after the event, with the assistance of the eThekweni Municipality and the Wildlands Conservation Trust, they were donated to a community in Inanda where a much-needed park has been established adjacent to a community hall. The project is being managed in conjunction with the CEBA project (refer to section 4.6.1) as part of a long-term sustainability and ownership process, generating jobs maintaining and caring for the plants.

Accurate, living representations of KZN biomes (wetland, woodland, grassland, forest, dune and river) were on display to raise awareness while indigenous tree and river names were used for identification of venues at the Expo (Water Berry Willow, Forest Olive Tree, Fever Tree, White Stinkwood, Forest Mahogany and Quinine Trees). Signage explained how each biome is adapted to efficiently exploit its biological niche and described the biology and uses of the tree species. This provided an opportunity for visitors and delegates to gain an appreciation of KZN biodiversity and its importance.

A miniature replica of the Living Beehive project (refer to section 8.7), created at Durban Botanical Gardens, was set up at the CCR Expo to draw attention, in a creative, artistic way to the complex and important interactions between innovation, ecosystems and engineering in the creation of a low carbon sustainable future. Plant material used for the mini-beehive was on loan from Durban Botanical Gardens and was returned to be planted out after the Expo.



Figure 18: Demonstration of a Grasslands ecosystem during the Climate Change Response Expo.



Figure 19: Demonstration of a beehive.

3.8 Eco-procurement

Much of the organisation and running of the CCR Expo was outsourced and it was therefore necessary to ensure that suppliers complied with stipulated environmental specifications and that exhibitors committed themselves to green exhibiting practice. This commitment to organising a green Expo was driven by the fact that the country had committed itself to hosting a low-carbon event and that the event itself was a testimony to appropriate climate-friendly solutions. Thus its design and curatorship was compelled to adhere to the very principles and practices that gave rise to its origin.

The achievement of the objectives of eco-procurement was managed by a team of dedicated staff who ensured that eco-procurement was applied wherever possible. Environmental specifications were factored into terms of reference and the team scrutinised bids to ensure that only companies that clearly demonstrated compliance with these environmental specifications (for example, the supply of Material Safety Data Sheets) were appointed. They also ensured that suppliers and exhibitors received the appropriate support and guidance to put greening principles and practices into effect.

In addition to eco-procurement, the organisation of the event ensured that as much of the procurement favoured local suppliers. Up to 65% of goods and services procured were sourced locally and the balance from beyond the province.

3.8.1 Guidelines

The point of departure was the development of **Green Procurement Guidelines** prepared by DEA for use by any stakeholders planning to ensure that their procurement practices were sustainable (refer to Annexure 4). In support of these guidelines was the development of **Exhibition Greening Guidelines** (see Annexure 2), which stipulates that one of the objectives of hosting a low-carbon event is to "ensure that the procurement of goods and services is done in a sustainable manner, including the use of local products that have a minimal negative effect on the environment and to deliver increased performance of social responsibility." These two guidelines were taken a step further through the development of a **Responsible Exhibitor Charter**, which each exhibitor was required to sign. Lastly, Section F of **Exhibitor Manual** (refer to Annexure 5) provided comprehensive greening guidelines to all the exhibitors with practical tips for every aspect of the exhibition.

3.8.2 Green infrastructure

The networking marquees were soundproofed with an environmentally-friendly sound-proof board that was sourced for the event. An organic canopy was constructed from wild banana leaves that were composted after the event and raw *Eucalyptus* timber beams, which, although alien species, were grown in a sustainably managed FSC forest. These poles were repurposed

Responsible Exhibitor Charter

Eco-Procurement

We understand that organic and locally produced food, drink, and arts and crafts generally have a smaller carbon and ecological footprint than imported products. We therefore commit to procuring sustainable goods and services whenever possible such as products that are locally produced, and/or environmentally-friendly.

Green Shell Scheme Package

- ✓ Reusable seamless fabric walling
- ✓ LED Lighting
- ✓ Biodegradable carpeting
- ✓ Option to brand shell panels with environmentally-friendly, chloride free, removable and re-usable printed substrate
- ✓ Option to brand walls with removable and re-usable hanging banners.

after the event into children's play equipment. A considerable amount of infrastructure was re-usable including the marquees, shell schemes and sound-dampened meeting room structures, lighting, audiovisual equipment, air-conditioning systems, furniture, modulbox info kiosks, and Mo5 information booths, and stage and sound equipment.

3.8.3 Green exhibitions

There were two facets to ensuring that the exhibitors supported greening initiatives. On the one hand, they were given comprehensive guidance on how to ensure their participation in the CCR Expo yielded a minimal environmental footprint reinforced with the signing of the Responsible Exhibitor Charter. On the other hand, particular products and services were supplied to the exhibitor through the **Services Manual** and here provision was made for environmentally-sound options as follows:

- A green shell scheme package
- Indigenous outdoor plants
- Brochures printed on Triple Green Paper
- Bamboo display range (including brochure tables and stands and pull-up banners)
- Bamboo gifting range (including ecopens, stationary packs, and shopper bags).

3.8.4 Banning of bottled water

Due to the negative environmental impact of plastic bottles, the procurement and supply of bottled water was prohibited within the CCR Expo.

3.8.5 Cleaning

The company appointed to provide cleaning services was required to use environmentally-friendly chemicals. The chemicals used for the cleaning of the sanitation facilities and general cleaning were approved only once the material safety data sheet for these product was scrutinised and found to be suitable alternatives to conventional cleaning chemicals. The experience gained during the CCR Expo in the use of these chemicals has influenced this company to make use of these chemicals in its current and future cleaning sites.

3.8.6 Catering

Environmental specifications were included into the terms of reference for the caterers to ensure that the highest quality, least negative impact products and services were provided. Caterers were requested to source only local produce, with an emphasis on seasonal and organic food with a low carbon footprint.

Vendors were in full compliance with the following stipulated criteria:

- Sourcing local, organic and/or ethical, sustainable produce and flavours wherever possible;
- Reducing packaging wherever possible, and use of recyclable or re-usable packaging where necessary; and
- Reducing the quantities of meat served, providing a higher proportion of vegetarian meal options to those containing meat.



'Eat Greek' sourced its produce from a locally managed food market made up of 60 local producers. These producers supplied over 80% of the required inputs. Furthermore, only fresh fruit and vegetables were used and ordered on a daily basis.

3.9 Transport

The CCR Expo was situated adjacent to the Central Transport Hub to ensure efficiency and accessibility. Private vehicle parking was not provided to discourage the use of Durban's effective and efficient public transport, the Congress Shuttle system and/or the park-and-ride system. GEF/UNIDO and the National Department of Transport (DoT) supplied 650 bicycles for the duration of the event. Bicycles were made available at bike stations within easy cycling distance of the venue. Please refer to section 7.4.2 for more information.

Food and other provisions were sourced locally as specified and as described in the procurement section. This had the effect of reducing the food miles associated with each item and hence reduced the associated fuel consumption and greenhouse gas production, while supporting local food producers and protecting jobs. Suppliers were bound to comply and although they were not officially audited, an informal investigation indicated that the local sourcing requirement had been taken seriously.



3.10 Communication and Education

3.10.1 Awareness and training

Throughout the process the suppliers and sub-contractors were informed of the importance of event greening and what they could do to contribute. Presentations were given at the various stakeholder sessions and incorporated into the exhibition manual (refer to Annexure 5) that empowered the exhibitors to make greener decisions as they planned for and then managed their exhibition space.

Educational sessions were held on-site with the cleaning and catering staff to ensure that they understood the recycling system, the rationale for banning bottled water and the context for the Expo and importance of their actions in relation to resource management. Staff at all levels attended these hour-long sessions where they engaged actively with the information presented to them. There is a clear need for this kind of information to be shared with those that provide ancillary services at a wide range of events since they typically have little idea of the event's objectives as well as the implications of undermining the overall messages that the event wishes to communicate. Awareness and educational sessions focusing on the sustainability aspects for service staff should be a standard feature of future high profile "green" events.

The training of student volunteers who were appointed as chaperones for the Expo focused on the greening initiatives implemented at the Expo. Students who exhibited most interest in the greening initiatives were deployed to the CCR Expo Green Stand and the Event Greening Forum stand.

3.10.2 Communicating the greening of the CCR Expo

An exhibition greening stand was set up to showcase how event greening principles and practices were applied to the design of CCR Expo with a map of where different initiatives could be seen. The stand also provided information on the CCR Expo's legacy and the CEBA initiative. Visitors were encouraged to off-set their environmental footprint by purchasing CEBA credits (www.durban.ceba.org). Real-time data from live monitoring of electrical



Figure 21: Engagement with school on environmental education.



Figure 20: Environmental Education Session with expo stakeholders.

consumption on the CCR Expo site was prominently displayed, which reflected both the energy consumption of individual venues as well as overall energy usage. There were also a select number of demonstration projects including a solar PV tracker, rainwater harvesting, worm farm composting and on-site recycling centre.

3.10.3 School tours

Schools tours were organised through Earth Organisation, educating children about recycling. Tour groups were taken to visit the on-site recycling centre where recycle materials were separated from non-recyclable waste and sorted into the different recyclable materials. The CCR Expo funded the following eight disadvantaged schools to take these tours:

The schools involved in the educational programme are captured in Table 17.

Table 17. Schools involved in the CCR Expo School Tours

School	Number of children
Bantuvukani Primary School	120
Blooming Bud pre-school	23
Clairwood Boys School	60
Collingwood Primary	160
Dloko High School	163
Eden College	29
Emthetweni Senior Primary	110
Sukuma Primary School	60
Umbogintwini	100
TOTAL	825

A total of 825 children participated in these tours over the duration of the event.

3.10.4 Green Stand Awards

The Green Stand Awards gave recognition to the organisations that took environmental principles into consideration in the design, structure and communication of their stands across five categories. An awards evening was held. Certificates were handed out in recognition of those exhibitors who had demonstrated their commitment, and put the Responsible Exhibitor Charter into effect. Please refer to Appendix 4 for the judging criteria and outcomes.

3.10.5 Attendance

Visitor numbers were captured by use of a clicker system at the Expo's entrances and exits. The CCR Expo experienced approximately 190,000 visits between 29 November and 9 December 2011. However, the number of unique visits may be lower since the results do not factor in repeat visitors or delegates that were walking through the Expo from the Central Transport Hub to reach the UN Precinct.

The graph below presents the daily entries recorded at the CCR Expo.

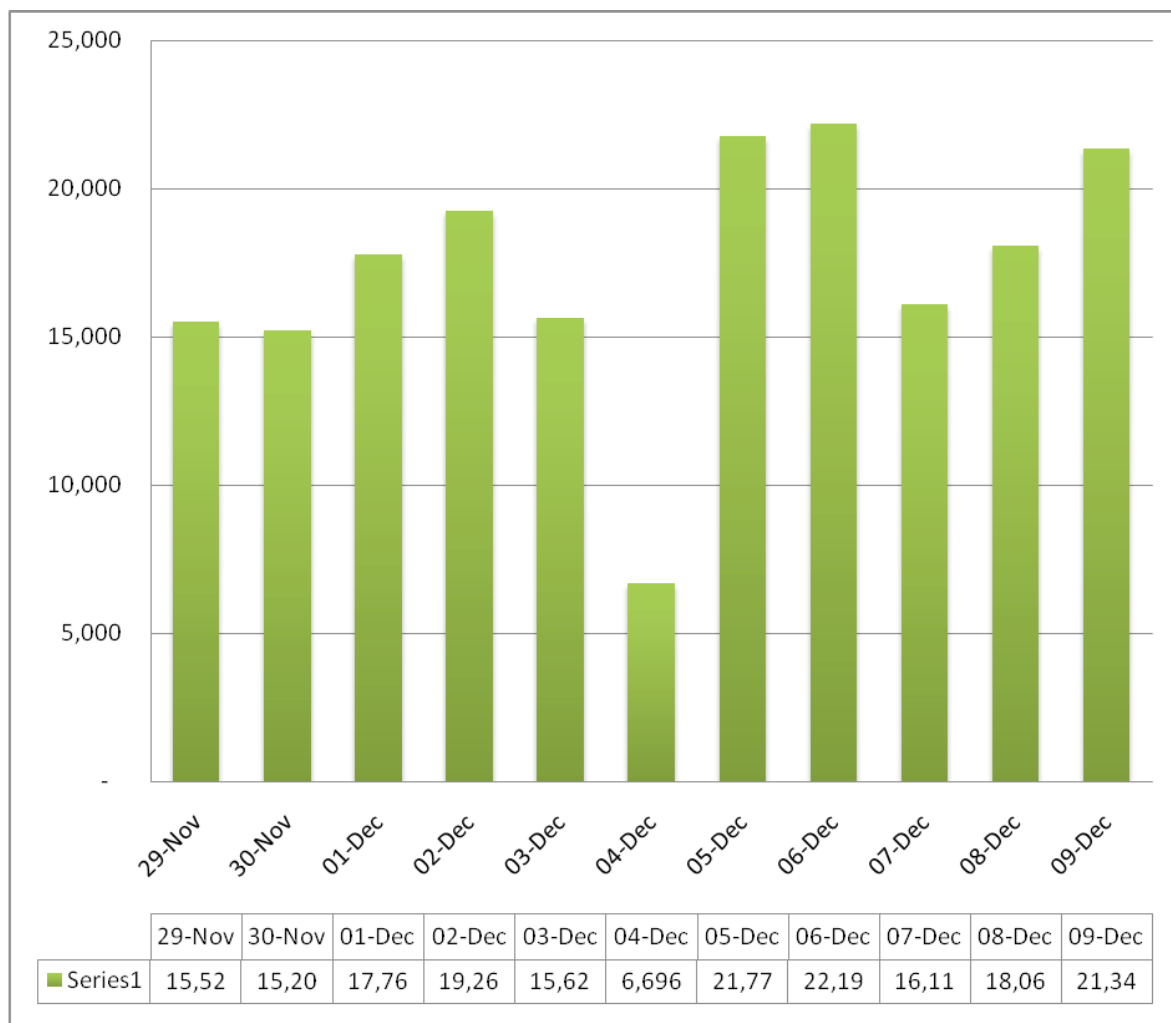


Figure 22. CCR Expo Daily Entry Figuresa

3.10.6 Feedback

The main form of feedback on the CCR Expo was a Visitor's survey. This survey was administered to delegates and visitors to determine their awareness, uptake and opinion of greening initiatives put in place for the COP17/CMP7. Please refer to section 8.10 for the results of the survey and Appendix 8 for the questionnaire.

3.11 CCR Expo Legacy

The CCR Expo created a positive legacy through the donation of physical assets and in-kind contributions to the host city and its stakeholders. Legacy is also illustrated through social elements such as job creation, use of chaperones and school tours to the CCR Expo. This section provides a summary of the physical and awareness-raising legacies.

3.11.1 Redistribution

Recycling bins

The following ten schools in and around Durban received 114 recycling bins (52 x 75 litre bins and 62 x 210 litre bins):

- Collingwood Primary School
- Dloko High School
- Emthethweni Senior Primary School
- Mankonjane Primary School
- Mbeki Secondary School
- Menzi High School
- Mqhawe Secondary School
- Mvaba Secondary School
- Thibane Combined School
- Villa Maria Primary School

With the support of the Earth Organisation, these schools are engaged in recycling projects. The bins will thus assist them to manage their projects more effectively.

Indigenous plants

A total of 4,716 plants (a mix of trees, shrubs and grasses) were used to beautify the CCR Expo's outdoor space and to demonstrate characteristic KZN biomes. After the event, these plants were donated to the Inanda community to create a community park adjacent to an existing community hall. The site is on Ingonyama Trust land directly adjacent to Inanda Dam and is considered an important social node in spite of limited facilities.

The development of the park is being facilitated by the Wildlands Conservation Trust in consultation with the traditional leaders and local government representatives. The Trust runs a "greenpreneur" programme, which creates temporary employment for community members who collect waste material for recycling, plant indigenous trees, and grow vegetables for consumption. The Trust will include the new community park in this programme and appoint a number of local community members to maintain and tend it, generating further employment opportunities.

Worm farm and organic food gardens

One large, commercial worm farm and two organic food gardens were donated to the Association for the Aged (TAFTA) and sent to a TAFTA community project in Amanzimtoti where paw-paws, bananas and avocados are grown. The head gardener and his team received basic training on how to care for the worm farm. A subsequent follow-up visit has indicated that the donated items are doing well and have been effectively integrated into the daily gardening activities.

Gum tree poles & rope

The gum (*Saligna*) poles and ropes, which were used to build the Wild Banana Leaf canopy, were donated to the Bluff Environmental Society and Liv Village Children's home. The Bluff Environmental Society gave both poles and ropes to two schools to build play areas, while some poles were used at its Eco Park to create a play area and obstacle course. Liv Village also plans to build jungle gyms for the children they care for.

Carpeting

The CCR Expo used 7,875m² of rolled carpeting. Approximately 85% of the carpeting was donated to community projects for reuse with the remaining 15% rendered unsuitable for re-use due to rain damage. The beneficiary projects were:

- Abalindi Welfare Society in Inanda for the pre-school, orphanages and frail care.
- Mother of Peace Communities in Illovo for children's rooms and permaculture projects.
- Sista Sista Social Club for crèches in and around the area of Umkhumbane, Chesterville and Wiggins.
- Zakhe Place of Safety in KwaDabeka for the crèche and dormitories.

Wooden tables and benches

Tables and benches from the outdoor food court were donated to Mother of Peace Communities, a non-profit organisation situated in Illovo, Durban, which provides caring, teaching and nurturing for orphaned and abandoned children.

3.11.2 Repurposing

Branding

Woza Moya, an income-generating project of the Hillcrest Aids Trust Centre, enables people infected with or affected by HIV to learn crafts and earn an income through the sale of handcrafted products. All unwanted branding as well as some roofing materials was donated to the project. Woza Moya received 25 banners thereby ensuring that no banners went to landfill. Some of the exterior banners that could not be repurposed due to the porous

nature of the fabric were used as shade cloth for vegetable gardens and the balance were repurposed into roof tiles. The interior banners were painted with fabric paint and repurposed into shopper bags.

Brochures

Many exhibitors left brochures and printouts behind on their stands when the Expo ended. The Earth Organisation collected 255kg of such materials, which were to be distributed as educational resource materials to the schools that they work with as part of their recycling project in the South Durban Basin.

Another community crafting project collected approximately 200kg of magazines to use in future crafting projects.

Custom stand elements

During break-down, some custom stand elements were discarded such as chipboard and medium density fibreboard. Mother of Peace was collected some of the material for reuse. Luda Heart Studios collected approximately 130kg of waste materials (predominantly, but not exclusively, unwanted wood and board) to create artworks.

3.11.32 Human Capacity Legacy

Work opportunities

The cleaning company appointed to provide cleansing services to the CCR Expo created a training and employment opportunity for members of the local community. The cleaning company employed 74 people, who were unemployed at the time of their appointment.

As part of their employment, they were trained on the following:

- The purpose of SA Climate Change Response Expo 2011
- Customer care
- Code of Conduct
- Grooming
- Personal Hygiene
- Safety
- Cleaning science and technology
- Specific use of green cleaning methods
- Use of environment-friendly chemicals.

Five of the staff are now permanently employed at one of the company's new sites and the others are on a standby as relief staff for when permanent workers are absent. The training and exposure obtained through the temporary employment has provided opportunity for their future employment.

Use of chaperones

CCR Expo employed 26 environmental studies students as chaperones to orientate visitors and provide them with information related to the Expo. These students were provided with an opportunity to gain experience and network for the duration of their employment at the CCR Expo.



Figure 23: Image 2 Example of a repurposed banner from the CCR Expo

Educational school tours

As discussed in 3.10.3, eight schools from previously disadvantaged communities were funded to attend educational tours at the CCR Expo. The Earth Organisation managed the tours and produced the content for them, with a specific focus on recycling. The Expo curators worked with the Earth Organisation to design and print the educational display boards used in teaching. These boards were donated to the Earth Organisation for continued use after the Expo.

GRI Indicator: LA2 Total number and rate of new employee hires and volunteers recruited and employee and volunteer turnover by age group, gender and region

Table 18 indicates the total number of new employees and volunteers hired for the CCR Expo, broken down by age group and gender. These employees and volunteers were not appointed by DEA but by a combination of the companies appointed to organise and curate the CCR Expo and their service-providers. The employees were all temporary and all employees and chaperones were sourced from KwaZulu-Natal. Furthermore, the majority of the appointees would be classified as historically disadvantaged individuals.

The table provides a summary of the recruits by Global Conferences, Scan/Interactive and one of Scan/Interactive's service-providers, Ikhayelihle Cleaning Services (it does not include other service-providers' recruits). It shows that more women were appointed than men as 66% of the recruits were women and that close to four-fifths of the recruits (77%) were under the age of 30, ensuring employment opportunities and exposure for an age cohort that finds

Table 18. Overview of age and gender of CCR Expo temporary employees and volunteers

	Age	Female	Male	Total
Temporary employees	<30	22	14	36
Chaperones		16	10	26
Cleaning staff		25	15	40
Sub-total		63	39	102
Temporary employees	30-50	3		2
Cleaning staff		21	7	28
		24	7	30
Total		87	46	132

3.12 Lessons Learnt

3.12.1 Electricity and water data

Sub-metering can provide useful data if monitored in real-time. Consumption data can be used to inform pro-active responses to spikes and anomalies and to confirm the effectiveness of energy and water saving interventions. It also provides accurate

information for carbon footprint calculation once data has been analysed.

Water and electricity sub-meters should be installed well before the commencement of the build-up phase and should be left in place until breakdown is completed in order to determine usage patterns and footprint values for the duration of the event.

Table 19. Overview of water saving interventions

Intervention	Description	Approximate cost
On-demand flushing / multi-flush	A system which saves water by only flushing while the lever is depressed. Users flush only until the bowl is empty.	R750 installed as retrofit (unit alone approximately R300)
Waterless urinals	Use a one-way valve to exclude unpleasant odours, require only a few litres of water for cleaning, and can save thousands of litres daily.	R500 installed R200ea (unit alone approximately R200)
Press-button, self-closing, low-flow faucets	Taps on hand-wash basins deliver aerated water at a low flow rate, which provides sufficient wetness for effective and hygienic hand-washing but minimises the amount of water used. The tap is activated by the push of a button and delivers water for a controlled period before closing.	Faucets can be installed at R400 per faucet

3.12.2 Water consumption

The container toilets provided by eThekweni Municipality were made available at short notice and were installed in deserving communities after the event, providing people with effective and hygienic facilities where there previously were none. At a high profile green event such as the CCR Expo, this was a missed opportunity to showcase water efficient sanitation. Simple water-saving interventions could have been incorporated as presented in Table 19.

been made even more effective by placing stronger emphasis on people having their own reusable containers. A quantity of sponsored and branded plastic water bottles were distributed.

3.12.3 Bottled water

The ban on sales of bottled water in the CCR Expo kept a large quantity of PET out of the system and effectively conveyed the message on the use of bottled water. However, this could have

3.12.4 Re-usable materials

A large quantity of roofing, timber, plywood, guttering and other building materials was successfully redistributed with the assistance of NGO partners yet excessive amounts of slightly damaged materials were landfilled. Exhibitors were asked to keep stands simple and to make use of re-usable displays. However, many of the exhibitors constructed elaborate once-off structures, which were broken down afterwards and the materials abandoned. The materials were unsellable being of irregular shapes and odd sizes, or painted or otherwise damaged. These materials, which could

have been of use to communities housed in informal structures, could have been removed and successfully re-purposed. The lesson learnt is that the process needs to be managed carefully during break-down in order to ensure that those in need have access to abandoned materials. In so doing, much of the material can be diverted from landfill.

The waste and recycling data was distorted by the removal of some re-usable materials by NGO beneficiaries without recording quantities. For future events, which have many customised exhibitions, it is recommended that a service-provider be appointed to quantify (by estimation or quantification) and record the amount of material removed by channels other than official recycling and waste management. Furthermore, dedicated planning for the redistribution and re-purposing of these materials to organisations and communities that could make practical use of these abandoned materials is recommended.

3.12.5 Communications

It is important to ensure that visitors are aware of green initiatives/solutions/technologies/alternatives, which are in place in a high profile green event such as the COP17/CMP7. The opportunity to highlight and showcase the benefits of green interventions should be maximised. Design professionals believe that a certain level of signage is excessive, which may be the case for a conventional event but not for an event that has been extensively greened and where participants are yet to understand or fully appreciate event greening concepts. Signage should communicate that it is a green exhibition, exhibiting green technologies and solutions.

Exhibitors were also requested to keep their handouts, typically marketing material, to a minimum and to rather rely on electronic distribution of and access to information. However, this pervasive trend remained intact and in future, greater attention needs to be paid to this area of greening.

Chapter three elaborated on greening measures put in place in hosting the CCR Expo, which offered unhindered access to a vibrant, multi-functional space catering to the varying intellectual, physical and social needs of its visitors. Both the manner in which the Expo was conceptualised, constructed and managed as well as its content presented a holistic message about the wealth of opportunities for climate-friendly development and climate change responses. Greening principles and practices were applied to every element of the Expo and this was communicated to its visitors. The Expo also left behind a positive legacy with invaluable and immeasurable awareness and educational impacts as well as physical impacts through the redistribution of useful materials and sufficient plants to landscape a new park for a historically deprived community.



This certificate acknowledges that
THE SOUTH AFRICAN DEPARTMENT OF ENVIRONMENTAL AFFAIRS
Purchased 550* CEBA credits

in support of the Durban CEBA initiative to cover the ecological footprint of the South African COP17/CMP7 delegation

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4 April 2012

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CEO, WILDALNDS CONSERVATION TRUST

Each CEBA credit that you buy will employ one local community member for a day, to undertake a range of climate protection work, such as invasive alien plant (IAP) clearing, ecosystem restoration or community recycling. This work is directed towards both reducing climate change impacts through carbon sequestration and emissions reductions, and in building resilience and adaptability to climate change in vulnerable communities.



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