

# Environment in Crisis

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# Durban's Green Roof Pilot Project



Climate change is upon us and predictions indicate that temperatures will increase, storms will become more frequent and intense and there will be longer periods of drought and more floods. So, what can be done to combat this phenomenon? Well, it is essential that innovative and meaningful solutions are developed to help us cope with a constantly changing future. One such innovation is green roofs, the benefits of which go way beyond adapting to climate change and reducing the greenhouse gases that are responsible for climate change. Green roofs are rooftops planted with vegetation; plants can be placed in trays (modular application) or onto the roof itself, once it has been protected (direct application). Benefits of these roofs include reducing the amount of water surging into our stormwater system, bringing nature back into the city, enhancing urban biodiversity and giving city residents something other than concrete and tarmac to look at.

Green roofs originated in Germany in the 1960s and now have widespread applications across the world. The Durban Green Roof Pilot Project is testing, for the first time, the use of green roofs in Durban; the project is endorsed by the city's Municipal Climate Protection Programme, which works towards embedding climate change into everyday municipal decisions.

*Above: Signboard on the green roof.*

*Below: Specialized green roof containers make green roof implementation easier.*

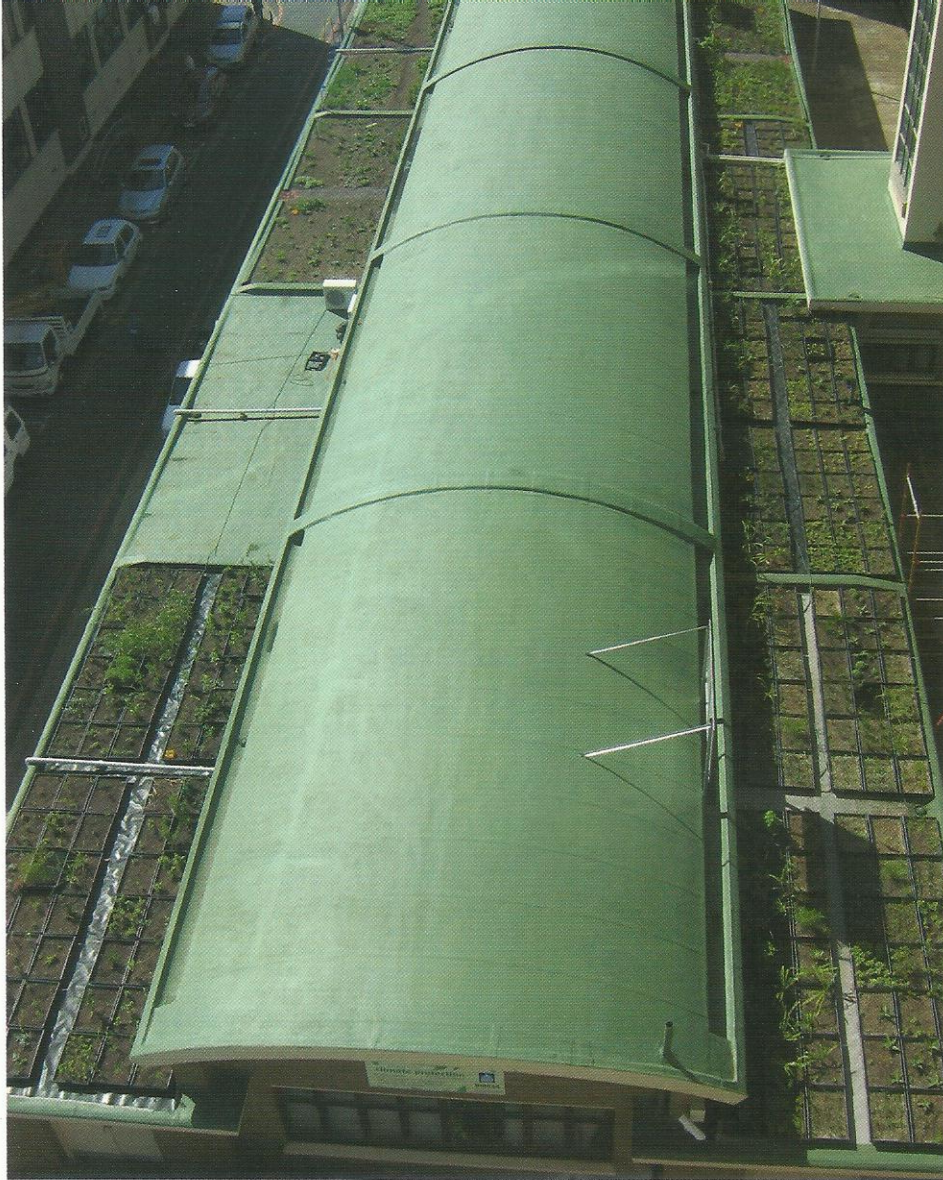


## DURBAN UNDER CLIMATE CHANGE CONDITIONS

Research commissioned by the Environmental Planning and Climate Protection Department (EPCPD) of eThekweni Municipality indicates that Durban under climate change conditions will be warmer (by 3-4°C by 2100), with longer dry periods interspersed with shorter, more intense wet periods. Durban is likely to receive the same amount or slightly more rainfall than at present, but the key change is that it will occur over shorter periods of time and so the capture and storage of water will become more difficult and water more scarce.

What does this mean for Durban's residents? Well, the young, old and sickly are likely to suffer from heat stress and the distribution of malaria and cholera may increase. Traditional crops are also likely to take a knock, with one of the more worrying predictions being that maize yields in KwaZulu-Natal may be reduced in the near future. Contemplating the consumption of alternative crops like sorghum, cassava and madumbies may not be too far away. By far the climate change impact with the most media attention is sea-level rise, and here Durban does not go unscathed, with predictions that sea-level will rise by 20-30 cm by the end of the century. The implications of sea-level rise are that homes will be washed away, estuaries' salinity will be altered and natural buffering environments will be destroyed.





*eThekweni Municipality's first green roof.*

These impacts have large implications for Durban's urban areas that already experience high temperatures and excessive surface run-off due to the nature of the city's surfaces. Climate change is set to exacerbate these impacts, and hence green roofs are key interventions that must be investigated in the Durban context as they diminish these impacts.

### BENEFITS OF GREEN ROOFS

So how do green roofs help this situation? Green roofs have many benefits, the first of which is the reduction in temperature of buildings; plants cool buildings through evaporation, shading of the roof and increased reflection of sunlight. This means that there is a reduced need for airconditioners, and therefore energy saving benefits for the building. Green roofs also reduce the amount of water that runs off buildings, decreasing the impact of the already over-worked storm water system and decreasing the risk of floods in the city. Green roofs are also being

touted to improve the food security in the city, by growing food crops on these often empty spaces. The biodiversity benefits of green roofs are also noteworthy. A biodiversity study done by the Natural Science Museum (NSM) revealed that over the same period of time 1448 insects were captured on the pilot green roof and 55 insects were captured on the blank roof, indicating that a healthy ecosystem was developing (see p 15). Green roofs therefore bring bees, birds and butterflies back into the city centre and enhance the image of the city, appealing to our spiritual connection with nature and making the city a more attractive place to live.

One of the greatest benefits of green roofs, though, goes beyond climate change mitigation and adaptation or biodiversity enhancement, and this is environmental advocacy. It is a project that has stirred admiration, interest and criticism like no other. It makes those of us who are held within the structures of the double C, Capitalism and



*Clive Greenstone*

*The wonderful biodiversity that green roofs attract.*

Consumerism, ask challenging questions about the way we and others do things and if there may be a better way.

### THE AIMS OF THE GREEN ROOF PILOT PROJECT

The EPCPD of eThekweni Municipality has initiated a Green Roof Pilot Project, located in the City Engineers Complex, where over 100 indigenous plant species and different soil media are being tested. Also being tested are the exact benefits of green roofs. Measurements thus far have consistently shown that the pilot green roof is 20°C cooler than the blank roof. Surface run-off measurements have revealed that the green roof absorbs rain water and allows it to enter the stormwater system at a more manageable pace. Some measurements show a 115 litre reduction in surface run-off under the green roof versus the blank roof.

Before Durban can become the green hub of Africa though, the details of green roof application need to be determined. Durban has a unique climate and biodiversity and hence, unique conditions that must be studied before green roof guidelines for Durban can be produced. Beyond developing a generic procedure for green roof installation in Durban though, it must be noted that every roof is different and often it's just about getting out there and establishing your own green roof.

The first step is determining the soil medium. This will be standardized for Durban and is being sourced and documented by the pilot project. Then it's





*Succulent plants grow well on green roofs.*

the plants, and in this regard a species palette of around 20 potential green roof plants best suited to Durban's harsh roof top conditions is being developed. Another exciting avenue of the project is looking at food crops and how to enhance their yield. Greywater and rainwater harvesting systems are also being

explored, ensuring that green roofs survive with as little environmental impact and effort as possible.

This kind of work needs a wide range of skills and so this project has spurred a bunch of the more eccentric and forward thinking individuals from the EPCPD, the

NSM, the Architecture Department and the Coastal, Stormwater and Catchment Management Department, to work together with the consultants to develop this project.

## CONCLUSION

If climate change is truly to be mitigated and adapted to, then projects like this need to be endorsed and pursued. The costs, barriers and obstacles to such a project must be borne in mind, with the realization that nothing innovative and visionary is easy. It is these kinds of projects that get individuals talking and promote a different way of developing and seeing the world. Through this project, it is the hope of the green roof team to create a market for green roofs in Durban and across South Africa. Our vision is to produce the required materials locally and to stimulate an enlightened private sector to begin instituting such projects. In this way we aspire to entice all individuals to broaden their horizons and begin to make more environmentally conscious decisions towards green design and green living.

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Protection Department  
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*The official launch of the Green Roof Pilot Project. From left to right: Clive Greenstone, Mike Hickman, City Manager, Dr Michael Sutcliffe, His Worship the Mayor, Cllr Obed Mlaba, Dr Debra Roberts and Geoff Nichols.*

All Photographs by EPCPD - eThekweni Municipality



# Biodiversity of Green Roofs

The Environmental Planning and Climate Protection Department (EPCPD) of eThekweni Municipality approached the Natural Science Museum (NSM) to investigate the attractiveness of green roofs to insects. As the entomologist at the NSM I designed a simple experiment to show whether or not insects were attracted to green roofs.

Eight yellow pan traps were placed at regular intervals on the green roof. They were half filled with water containing a small amount of dishwashing liquid to break the surface tension of the water so the insects would fall into the water and not just sit on it. The traps were left out for between three and seven days at a time. The water was drained through a strainer to collect the insects which were then put into a collection bottle containing 70% ethanol to preserve them. The insects were then identified to morphospecies (insects with different morphologies are considered to be different species). The trapping was conducted from the 9<sup>th</sup> of April 2009 to the 14<sup>th</sup> of May 2009. During the second half of the experiment, two pan traps were placed on the parking area roof of the NSM Research Centre to act as controls.

A total of 1448 insects were caught during the survey period. This total was made up of 66 different morphospecies from six different orders of insects (see figure 1). The order with the most species was Diptera (flies) which had 23 different species, followed by 17 species of Hemiptera (true bugs), 14 Hymenoptera (wasps, bees & ants), 8 Lepidoptera (butterflies & moths), 3 Coleoptera (beetles) and 1 Thysanoptera (thrips).

The control traps caught a total of 55 insects while the treatment traps caught 612 insects in the same time (see figure 2).

This pilot study shows that insects are attracted to green roofs and that a healthy ecosystem is developing on the green roof of the EPCPD. By working with the EPCPD we are helping to make Durban a greener place for its citizens.

Kirstin Williams  
Curator: Entomology  
Durban Natural Science Museum



Clive Greenstone



Clive Greenstone

A dragonfly (left) and butterflies (above) visiting the rooftop garden.

Figure 1: Total number of insects collected per order

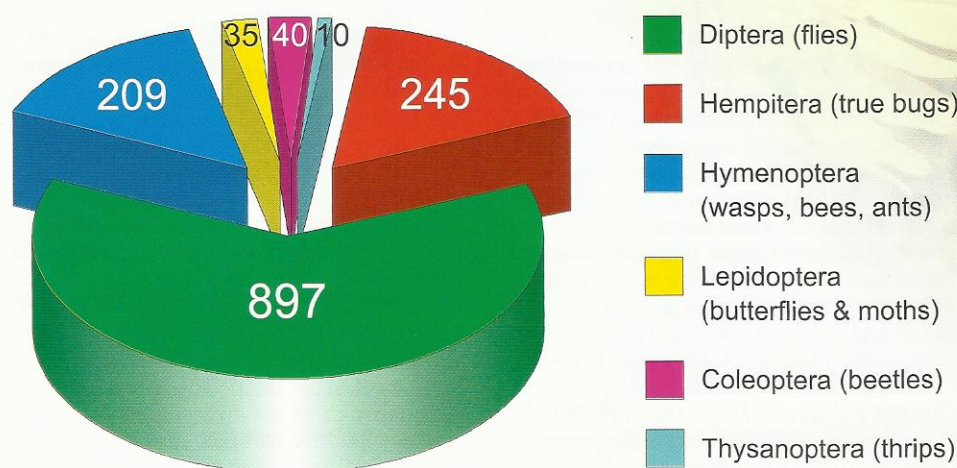


Figure 2: Treatment versus controls

