

Roofing for nature

Green roofs are increasingly important in the face of climate change. **Dusty Gedge** puts the case for using them to green the concrete jungle and considers the opportunities they bring.



Dusty Gedge has travelled all over the world to research green roofs and has campaigned for their adoption in major developments in London and elsewhere in the UK, and for regulations to ensure that they are adopted as a legal requirement in London and the rest of the UK. For this work he was awarded the Andrew Lees Memorial Award at the British Environmental and Media Awards 2004.

In 2004 he co-founded Living Roofs – the first independent green roof organisation in the UK. He is an international speaker on the topic and works closely with colleagues in Switzerland, Germany, Austria, Sweden, Canada and the US.

He is an external advisor on two PhDs regarding green roofs based at Royal Holloway, University of London and is a consultant for the Green Roof Consultancy. A professional naturalist/ecologist/ornithologist specialising in brownfields, Dusty has been published in scientific journals at both national and international level.

He recently authored a leaflet for English Nature (Natural England) called *Living Roofs* and is co-author of *Building Greener*, a comprehensive guidance on green roofs and green walls in the UK, soon to be published by the Construction Information and Research Association (CIRIA). He also co-authored the latest report on Living Roofs for the Greater London Authority.

He is currently working on a number of major schemes in London and projects in Birmingham, Manchester and Essex. Dusty is President of the European Green Roof Association and is a presenter on the Channel 4 programme *Wildthing - I love you*.

"Everything under the heavens that is horizontal belongs to nature. One must be persistent in the quest to green, or forest, all rooftops so that from a bird's eye view, one would only recognize a natural green landscape. When one creates green roofs, one doesn't need to fear the so-called paving of the landscape: the houses themselves become part of the landscape. People must use the roofs to return to nature what we unlawfully took from her by constructing our homes and buildings - the layer of earth for grasses and trees."

Freidensreich Hundertwasser (1928-2000)
Austrian artist, architect and philosopher

Take a bird's eye view of a city on Google Earth. It is not a pleasant sight. A plateau of concrete, asphalt, industrial plant and corrugated steel. This plateau is the fifth dimension of the built environment, far from view and forgotten. Yet, over the last few years the fifth dimension has attracted the eye of environmentalists, ecologists and horticulturists. By following Hundertwasser's vision perhaps our cities, our buildings and our environment can be improved by

'soiling' the city and planting vegetation in the sky.

This idea is not new. There have been roof gardens in London since Victorian times. What is relatively new in the UK is the idea of wholesale greening of major urban developments, using technologies and systems developed in Germany in the late 20th century. And this is not down to the whim of individual house owners, but is being driven by local authorities and city governments. And the reason, the implications of climate change, whether it be for storing rainwater, increasing nature, improving the wider environment in terms of cooling and reduction of air particles or to increase access to green space in dense urban developments. In the ten years I have been involved with green roofs, demand is increasing and more and more local governments are pushing to ensure that new developments include the provision of vegetation and soil at roof level.

Climate Change

The effects of climate change are well documented, whether one agrees or not, and it is increasingly likely that cities in North Western Europe are going to suffer from increased summer temperatures. In the UK our buildings are designed to insulate against severe winter temperatures. In London there is increasing concern that our buildings will be too hot as summer temperatures increase. This was certainly true in the summers of 2005 and 2006 when in London, an air conditioning fan was sold every minute as people sought to cool their houses and offices.

Climate change is predicted to lead to more intense rainfall, which in urban areas will lead to the likelihood of more flash floods, such as were experienced in Sheffield and Hull in 2007.

To face these changes and their effects on



Okowerk Environmental Centre has one of the original German sand roofs built in the late 1890s that is now colonised with mosses and lichens.

Photo: livingroofs.org

our cities, a new thinking will be needed. A recent study by Manchester University *Adapting to climate change in the built environment*, stated categorically that cities in the UK will need a 10% increase in green space in order to adapt to climate change. The obvious solution to this will be to increase urban trees, parks and nature reserves. Unfortunately the majority of space within the central cores of our cities is already taken up by concrete and tarmac and there is limited space for ground level vegetation.

History

Vegetation on buildings is not new. In fact it is as old as the first buildings. Stone age encampments were built into hillsides and covered with soil and vegetation to provide protection from the elements. The sod/turf roofs of North Western Europe in Ireland, Scotland and Norway are a classic use of a local material being readily available, useful and easy to install.

After the Second World War ecologists in West Berlin noticed that old tenement blocks built in the late 1800s, which had been covered with sand to protect the waterproofing, were covered in plants. Sedums and mosses, wild flowers and grasses flourished amidst the dense social housing of yesterday.

By the 1980s green roofs were enshrined in law within West Germany. In 1983 the City of Linz in Austria made green roofs mandatory on new buildings followed in late 1990s by Switzerland.

In the UK, both London and Sheffield are developing distinct policies on green roofs that will come into effect in 2008. Other cities are also considering policies or mechanisms to encourage green roofs. It is safe to say that green roofs have stepped up from the margins, where they were confined to the enlightened and the 'hippy fringes', and are being embraced into the mainstream construction culture. And as it does so, the number of suppliers are increasing and there are opportunities within the horticultural and landscaping contractor industry to develop systems and plants for this burgeoning industry.

Greening the sky

A green roof is an intentionally vegetated roof surface – they can be described as gardens, parks and meadows. There are different types of green roofs depending on the depth of soil and amount of water that can be retained on the roof. These factors will influence the choice of plants. There are three recognised and distinct types of green roofs:

Intensive – these have deep substrates over 300mm in depth. These types of green roofs are often referred to as roof gardens. They can be planted with trees, shrubs and lawns and require intensive maintenance.

Semi-intensive green roofs – have shallower soils but can hold plants such as heather, lavender and low growing



Tunic flower, Canary Wharf, London.



A garden roof in Berlin in spring.



A herb-rich roofscape in Switzerland.

shrubs/bushes such as hazel, hawthorn and the like.

Extensive green roofs – have even shallower soils and consist of drought- and wind-tolerant plants. They can vary in depth from 150-100mm dry meadows to 80-40mm sedum-based systems.

To green or not to green

New buildings can be designed to take the load of any given system. Weight is the governing factor. Other factors include the need for specialist waterproofing with root protection, the ability for excess rainfall to drain from the roof and consideration of function. The planting system will depend on whether it is for people or for wildlife, or both, or whether it is primarily there as an ecological function or for amenity and accessibility.

There is also increasing interest in retrofitting green roofs onto existing buildings. Again weight is the limiting factor, but many buildings can have extensive green roofs installed depending on the state of the waterproofing. In many cases waterproofing will need to be either upgraded or some form of root protection laid to protect the waterproofing from root penetration.

Although much of the focus has been on new developments, there is great scope within urban areas to retrofit extensive green roofs on existing buildings.

As a London Leader, I am currently in the process of encouraging businesses with flat roofs in the centre of London to consider greening roofs. Many roofs have paving slabs or shingle ballast finishes. Such roofs can be greened with a relatively good extensive green roof system.

The benefits

Green roofs are one of the few 'green technologies' that provide multiple benefits. They are multi-functional, providing a range of benefits to both the owner and the wider environmental needs of the immediate neighbourhood and city as a whole.

Green roofs mimic natural green spaces and in doing so provide a source control mechanism with the sustainable management train. The soils and vegetation store rainwater at roof level and in most cases this water is evaporated back to the atmosphere. However, even in extreme rainfall events they provide an initial buffer and slow the rate of rainfall running into urban drainage systems.

Soil and vegetation provide thermal mass and, although it is difficult to give a U-value to a green roof system there is substantial evidence that they ensure buildings remain cooler in summer, thus reducing the need for air conditioning. This will become an increasingly important consideration as urban temperatures increase due to climate change.

Urban developments take land away from the landscape. The value of that land is often of high nature-conservation value. In fact much of the work undertaken in London has



Intensive garden roof plantings in London (above and top).



Wildflowers on a tram shed roof in Zurich, Switzerland.

been driven by concern for nature conservation. Returning the land to the roof can balance the need for social and economical regeneration with the needs of nature. Furthermore, as we build denser and denser urban developments, there is a need to provide amenity space for tenants of new developments at roof level, whether they are communal park areas or private gardens.

Vegetation and soil also filter air particles and other pollutants from the atmosphere, provide good sound insulation and also protect waterproofing from the elements. In fact if installed well, it is likely that the life of a membrane can be doubled and in many cases be protected indefinitely.

The challenge

We are fortunate in the UK in that much of the technology and understanding of green roofs derives from Northern Germany. Many companies and suppliers have been influenced or are partnered with German green-roof companies. However, there is an opportunity to develop plants, seeds and carpet solutions in the UK, that appeal to the vagaries of our climate and meet the needs of various stakeholders, whether they be gardeners or the nature conservation sector.

Many green roofs are being established in London specifically for biodiversity. We need to develop appropriate seed mixes and plug plants that are native to ensure that such systems fulfil the requirements laid out in planning applications. A number of native seed suppliers are being specified by consultants, like myself, but specific seed mixes need to be refined to meet this growing market and to respond to the agenda set by stakeholders, such as local authorities, in terms of native provenance and biodiversity.

In my experience native wild flower plugs are rarely used on the Continent due to cost. But there is an opportunity for growers and designers to consider native plugs of common wild flowers to provide immediate vegetation and colour in substrate-based systems.

There are opportunities and a need to develop species associated with a dry Mediterranean climate for semi-intensive and intensive roof gardens. The important thing here is to balance the desire for colour and style with the need to reduce maintenance in terms of irrigation and nutrients.

At Sheffield University Dr Nigel Dunnett is researching plants that would suit the middle range of green roofs – the semi-intensive garden. He is looking at what plants are best suited, and require the least maintenance to ensure the roofs provide the visual impact of a garden but use the least amount of resources.

A number of companies are looking at



Raising the roof in celebration.

developing wildflower turfs and blanket systems with more diverse plantings. Lindum and Coronet Turf are two such companies working on products to fill this niche. Many companies already supplying

sedum blankets are now offering such systems pre-seeded with selected wildflowers to increase the diversity of the systems.

There are opportunities to develop other methods of planting green roofs. The development and selection of bulbs for extensive and intensive

systems offers opportunities. I discovered a spontaneous green roof in Budapest a few years ago. In April it was covered in greater hyacinth. By August the roof was no doubt parched brown due to the high summer temperatures in central Europe, but the next year I visited there were the hyacinths again.

Being a nature conservationist, I personally am less inclined to the creation of ornate gardens with an array of non-native but

attractive plants. We do have a range of plants traditionally found in gardens that work across the range of green roof types; however green roofs are not the preserve of any particular sector and clearly horticulturists and garden designers can view green roofs as another dimension for their skills and creativity.

Here to stay

Green roofs are not a fad. They are here to stay. I am certain that the need to adapt to climate change will ensure that the technology will be used on an ever-increasing scale, throughout the UK. The opportunity for the horticultural world to embrace them and invent new methods of planting, designing and delivering green roofs will be constant. As our climate changes and rainfall and temperature fluctuate in unfamiliar ways we will need to respond.

And as Hundertwasser envisaged, I am sure our cities at all levels will demand vegetation and that there is room for nature conservationists, plantspeople and gardeners to engage and create the green cities of the 21st Century. □

Events and information

Livingroofs.org with CIRIA is organising the London World Green Roof Congress (www.worldgreenroofcongress.com) in London, 17-18 September 2008.

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Dusty Gedge is a consultant to the Green Roof Consultancy (www.greenroofconsultancy.com)

European Green Roof Association (efb-greenroof.eu)

Visit www.livingroofs.org and go to www.livingroofs.org/livingpages/greenroofsdomestic for a copy of Living Roofs (leaflet for Natural England).

Construction Information and research Association (CIRIA) or visit www.ciria.org.uk