



THE GREEN SKYLINE

Green roofs are no longer the preserve of the sandal brigade and environmental education centres. Amid concerns regarding climate change adaptation and our ability to achieve sustainable development, we are focussing on pursuing solutions that present real economic, environmental and social benefits. In my previous job with the Environment Agency in London, and in my current position, I have been working to ensure that environmental issues are considered in all new development. One significant component of this was the promotion of green roofs. My London-based work showed real benefits in delivering a greener skyline.

Green roofs are, simply, intentionally vegetated roofs. They are nothing new, but the approach and initiative required to secure them is. We have a number of planning, architectural and engineering professionals in New Zealand who are aware of the benefits of green roofs, and eager to promote their use. Although there are no legal frameworks, financial grants or policy incentives, a number of green roofs have been installed here. Examples of extensive green roofs can be found at Auckland University's School of Engineering building, Waitakere City Council's Offices, Woollaston Estates Winery in Mahana and Environment Canterbury in Christchurch.

Green roofs have numerous benefits: they help us adapt to climate change; provide a sanctuary for wildlife; alleviate flash flooding; reduce diffuse stormwater pollution; enhance bio-diversity; provide public and residential amenity space; and reduce the urban heat island effect of our cities.

There are different types of green roofs, including extensive, semi-extensive and intensive – terms that refer to the depth of substrates, and the types of plants or trees appropriate to those depths. All will have different loading implications for a structure where the saturated weight must be used to calculate structural loads.

The insulation benefits of green roofs have been appreciated for many years in Scandinavia, mainland Europe, and Africa. Green roof systems provide opportunities to achieve greener buildings whilst at the same time increasing returns on

investment. They protect the roof membrane from UV and weather damage and can double or triple the roof life. The incorporation of living roofs can add to property values by providing additional living space and more marketable floor space. It is also possible to reuse materials, such as aggregates for the green roof substrate, on site, thereby saving on some development costs. Moreover, the use of these systems can increase Green Star environmental ratings, and support the growth of new environmental industries.

Studies at the University of Toronto show that buildings with green roofs can save a significant amount of energy through reducing heating and cooling bills by insulating the building, and reducing energy expenditure and carbon emissions. "For a one storey building, the savings during the summer can be 20%. Higher savings might be possible for peak demand scenarios, but not for the average. Green roofs that have some texture, either through terrain variations or shrubs or trees, will provide savings during the winter in the absence of snow. This research is still preliminary. Our own preliminary work came up with an estimated 8-10% savings, but that is under large uncertainty."¹

With global temperatures changing, these systems also offer a cheap way of reducing the urban heat island effect. This is the effect of a metropolitan area being significantly warmer than its surrounding rural areas due to urban development and waste heat generated by energy usage. Green roofs can reduce noise levels entering and leaving the building by up to 18 decibels (dB) and reflective noise by 3dB or more. They filter dust and pollution from the air and water which is something we could all appreciate in our cities.

Historically we have designed stormwater systems to remove rainwater as quickly as possible from individual sites. As development has increased this approach to managing stormwater has caused problems with flooding and diffuse pollution. Green roofs are a form of sustainable drainage, replicating natural drainage patterns, reducing stormwater runoff and flash flooding. "Green roofs reduce the annual volume of runoff by between 50 and 85

Green roof projects in Europe:

01 The offices of Allen and Overy, London.

02 Bere House, Islington, London.

Photographs courtesy of LivingRoofs.org



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per cent depending on their construction.”² This can have a big impact on reducing flooding as stormwater is soaked up by the soil and vegetation, and gradually released back into the atmosphere and drainage system. Green roofs also help reduce the effects of stormwater runoff, flushing oils, debris and other contaminants into urban rivers and streams. The New Zealand Regional Council’s planning policy highlights the importance of “at source” sustainable drainage systems such as green roofs.³

Urban areas are important for bio-diversity, and the preservation and enhancement of our cities’ ecology is a significant challenge. The regeneration of brownfield land can result in loss of important habitats for plant and animal species. “Greener” schemes can replicate high value urban habitats. We need to recognise that opportunities should be provided for wildlife habitat enhancement through appropriate management of existing habitats and through the creation of new or enlarged habitats.

Alongside the environmental and economic benefits, green roofs also provide social benefits to communities. They provide valuable public amenity for local residents and workers, and can even provide space for sporting activities. Another important advantage in New Zealand’s cities is that green roofs can improve views from surrounding buildings by providing aesthetic space. Importantly for developers, the roofs exhibit a company’s green credentials and declare corporate social responsibility. Both green roofs and sustainable drainage systems reduce the urban heat island effect by lowering the temperature around buildings through evapotranspiration that in turn lowers smog production. They also contribute to adapting to climate change.

Over the last few years in London a number of developers have realised the environmental, social and economic benefits of incorporating such forward thinking initiatives into schemes. I regularly negotiated with developers to incorporate green roofs to mitigate adverse environmental effects and as a mechanism of ecological enhancement. There is no requirement for the provision of green roofs in New Zealand. However, the economic

benefits of the roofs will ensure that their installation will become more common.

Green roofs must be designed for their localities, as local solutions for local environments. Within London there are excellent examples of green roofs, such as that at Barclays’ head office in Canary Wharf (at 160 metres it is the highest green roof in Europe). London Zoo, the Laban Dance Centre in Deptford, the Inn at The Park in St James’ Park, and the Jubilee Gardens in Canary Wharf are other examples of green roof designs creating small havens for people and wildlife in the centre of a thriving city.

Germany and Switzerland, and the cities of Linz, Vienna, Toronto, Portland and London, all have legislation requiring the installation of green roofs on certain developments. New Zealand, as an innovative and environmentally aware country should be embracing this technology. Green roofs could be promoted by architects because they reduce the impact of a development on its local environment, improve urban design, and help us adapt to the effects of climate change.

We are beginning to see that our rooftops are under-utilised assets which we can be used to help us adapt to climate change. We are also realising our roofs can provide oases for wildlife, act as a teaching resource for bio-diversity, alleviate flash flooding, provide public amenity space, and reduce the urban heat island effect of our cities. If you’ve not already seen a green roof I recommend you visit one soon; if you want to learn more about green roofs please contact me at Resource Management Solutions (zoe@rms.co.nz). **Zoë Cooper**

Endnotes

1. Dr B. Bass, cited in an Environment Canada Adaptation and Impacts Research Group 2008 publication. (Reference details not supplied; for those details contact the author of this article).
2. J. Newton, D. Gedge, P. Early, S. Wilson, *Building Greener: Guidance on the Use of Green Roofs, Green Walls and Complementary Features on Buildings*, CIRIA, London, 2007.
3. Refer to ‘Design Guideline Manual, Stormwater Treatment Devices’, Auckland Regional Council, Technical Publication 10, 2003, chapter 12.

03 Tram station, Zurich.
04 A green roof in Freiburg, Germany.
05 Moss Filtration Plant, Zurich (built 1914).
Photographs courtesy of LivingRoofs.org

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