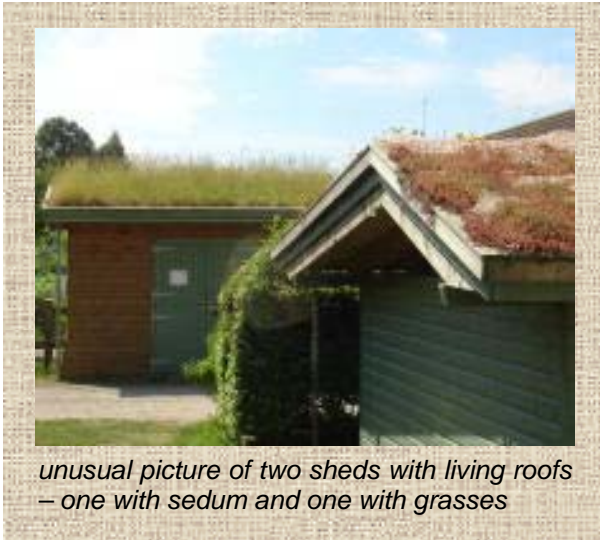




living roofs



unusual picture of two sheds with living roofs – one with sedum and one with grasses

what are they?

A living roof is a roof with some sort of soil and vegetation on it. In Europe, there is a centuries-old tradition of turf roofs on the Atlantic coasts of Ireland and Scandinavia, for practical reasons – to keep the roof on where Atlantic gales would have blown off tiles or slates. Waterproofing was provided by a birch bark layer, overlain with turf.

The modern green roof movement also started for practical reasons. In the early 20th century, German roofs were waterproofed with wet bitumen, which is highly flammable. So a 6cm layer of sand was added on top for fire protection. The sand was colonised by plants – usually sedum, which normally grows on rocks, and so didn't mind the poor nutrition provided by sand.

After WWII, ecologists started to see the value of these roofs for nature, especially in urban areas. Interest grew with the German green movement in the 60s and 70s, and in 1985, regulations were introduced to encourage green roofs – people who incorporated living roofs onto their buildings got some sort of financial reward. Again, this was largely for practical reasons. In Stuttgart, floods were common, and green roofs slowed down the runoff of rainwater. Now the construction codes for many cities in German-speaking countries include requirements for roofs over a certain size to be green, as well as providing grants.

In the UK, interest in living roofs was stimulated by architects specifying them in their designs. In 2004, living roofs began to be officially encouraged in London. Up until then, about 70,000m² of green roofs were known to have been installed in the city, but from 2004-2008 over 165,000m² were installed, and Sheffield and several other cities now have policies to

encourage green roofs. The largest green roof in the UK is 40,000m², on the Rolls Royce factory near Chichester. The two main types of living roof are:

- extensive – usually smaller roofs, with low-growing herbs and a substrate of 50-150mm
- intensive – usually larger roofs, roof gardens, mini-parks and possibly veg growing, with a substrate of 150mm-2m

what are the benefits?

water retention: a living roof can hold 60% of the precipitation that falls on it, which is then used by plants or evaporates. This slows the speed of runoff, and helps prevent flash floods.

thermal benefit: there is a cooling benefit for buildings in summer (increasingly important with climate change), which reduces the need for air conditioning and associated energy inputs. There is some insulation benefit, but it is difficult to quantify; when wet, the benefit is low, but when dry, it can be significant.

urban heat island effect: cities are hot, and climate change will accentuate this. Living roofs help to cool cities, via evaporation of the rainwater they collect. The Tyndall Centre for Climate Change Research recommend a 10% increase in the area of green spaces in cities to mitigate the effects of climate change. Of course there is not enough land in our cities to accommodate this – which is where roofs come in.

climate: take in CO₂, the main greenhouse gas.

biodiversity: there are many rare invertebrates that like dry meadows – a habitat that is being lost rapidly. Roofs can replace this habitat, and provide a home for those invertebrates, and the



waterproof layer with drainage hole



birds that eat them.

acoustics: living roofs provide good sound-proofing.

air quality: plants can absorb heavy metals and other pollutants.

aesthetics: they look good, and replace the green space that is taken up by the building itself.

horticulture: roofs can provide much-needed space in cities to grow herbs and vegetables.

plus: they are new, visible, and can create a debate about environmental issues.

what can I do?

Ideally, if you want a green roof, the pitch will be 12° or less, although up to and even over 35° is still possible, but it becomes more expensive the steeper the pitch.

There are two things you definitely don't want with a green roof (or any roof for that matter) – you don't want the roof to be so heavy that it collapses, and you don't want it to leak. So you need to talk to a structural engineer to understand what load you can have on your roof. There are two components – dead load (the constant load), and the imposed load (the extra weight of people who might stand on it, and snow). These two figures dictate how deep the soil can be, and what kind of plants you can use. You need to know that your roof is waterproof and root protected – i.e. plant roots won't be able to breach your waterproof layer. The addition of a green roof will usually include a waterproof layer and a root protection layer. There also needs to be a permeable layer to allow your roof to drain, but without taking all the finer particles of soil with it.

If you have a living roof installed professionally, the whole system, including waterproofing, root protection, drainage, soil and plants will cost around £100-120 per m² (or around £40 less if your roof is already completely waterproofed). Installers can be found on our links page.

But it is something you can do yourself relatively easily if you are handy. It's not something that can be explained in a factsheet, but you could attend a course, or have a look at the DIY guide created by our course tutors (see resources). Both include costs and sources of materials.

Check with your local planning authority, but an important thing to keep in mind is that some authorities, on hearing that you intend to install a

living roof, will assume that you are going to use it as a garden, and will be able to overlook other properties, or see into windows. You have to assure them that it's not going to be a garden, and that it is largely inaccessible to people. No grants are currently available for living roofs.

Finally, if you intend to install a green roof, don't be intimidated. If you abide by basic principles regarding load and waterproofing, you will be fine. If something goes wrong with the soil or the plants, it can be changed. If it's not completely perfect, it will still provide a good habitat, and it will be too out of the way to be an eyesore.

resources

- LILI have a course, links to installers & suppliers, and a range of books, including:
- *Green Roof Plants: a resource & planting guide*, E & L Snodgrass
- *Green Roofs: ecological design & construction*, William McDonough
- *Planting Green Roofs & Living Walls*, Nigel Dunnett & Noel Kingsbury
- livingroofs.org - UK not-for profit set up to promote green roofs - case studies, speakers, tours, plus a very good DIY guide
- The Green Roof Centre, Sheffield; tours, consultancy, training, information - thegreenroofcentre.co.uk, 0114 263 6425
- International Green Roof Association; global networking for green roofs – igra-world.com



not a flower meadow, but our course tutor John's roof 10 years after installation, during which time he's done precisely nothing to it; you can tell it's a roof from the flue pipes!

Contact us or visit our website to find out more about our factsheets, books, courses, online shop, links, forum, events and volunteering on organic farms. You can also become a 'Friend of LILI', and receive our e-newsletter, discounts on our courses, and help us to make a difference.

Low-impact Living Initiative (LILI), Redfield Community, Winslow, Bucks, MK18 3LZ

tel: +44 (0)1296 714184 email: lili@lowimpact.org web: lowimpact.org

Registered in England. Company Ltd. by Guarantee no: 4205021