

- www.building-green.org.uk
Brighton's own green roof organisation




- World Green Roof Congress
London 2008
www.worldgreenroofcongress.com



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www.livingroofs.org

GREEN ROOFS




Dusty Gedge
Green roof consultancy
Livingroofs.org

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Green Roofs

- Types
- Barriers
- Benefits

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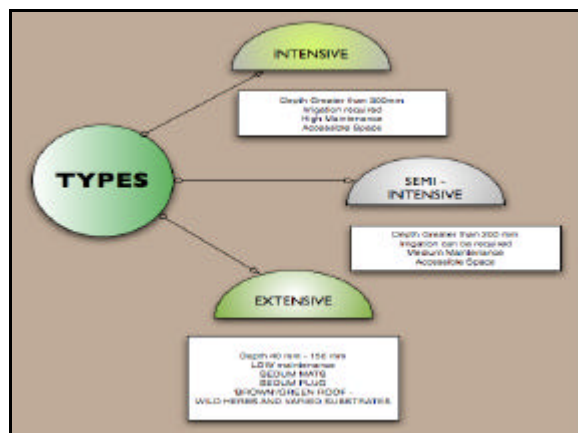


Not a sedum in sight

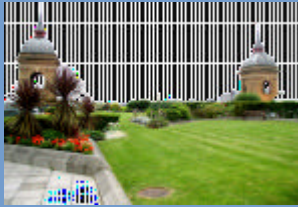
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- LIVINGS.ORG*
- The first independent green roof organisation in the UK
 - Promote, campaign and provide advice on green roofs
 - Not for profit organisation
 - No funding except sponsorship from manufacturers
 - BUILDING GREENER - co wrote, soon to be published by CIRIA
 - Campaigned for a strong Living roof policy in the New London Plan
 - Livingroofs sits on European and International Green Roof Panel
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- The Green Roof Consultancy*
- **Transdisciplinary** Consultancy
 - Combining Ecology Drainage and Green roof expertise
 - Currently providing design and strategic advice on green roofs to a number of clients including GLA, M&S and working on projects in Manchester and Leeds
 - Providing training courses for professionals at the Green Roof Centre of Excellence in Sheffield and with CIRIA
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Cannon St, London Intensive



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GALLIE CRAIG, STRANRAER semi intensive



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EDINGBURGH
Sedum blanket



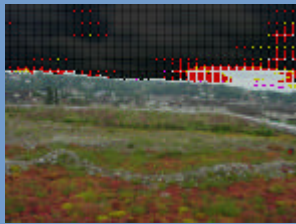
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SWITZERLAND
Sedum plug



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BASEL, SWITZERLAND
'brown' roof



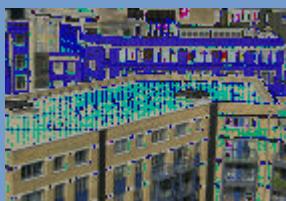
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ZURICH
'brown' roof



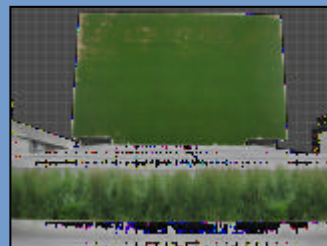
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LONDON
ballasted roof

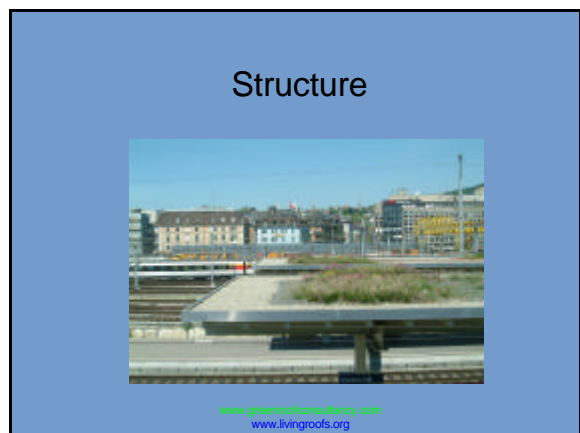
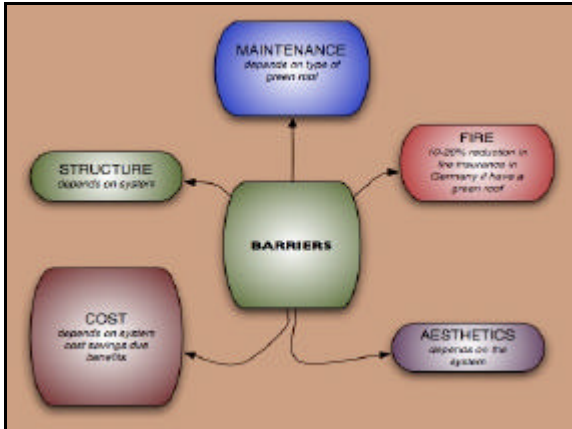


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Beware Art!



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Structure

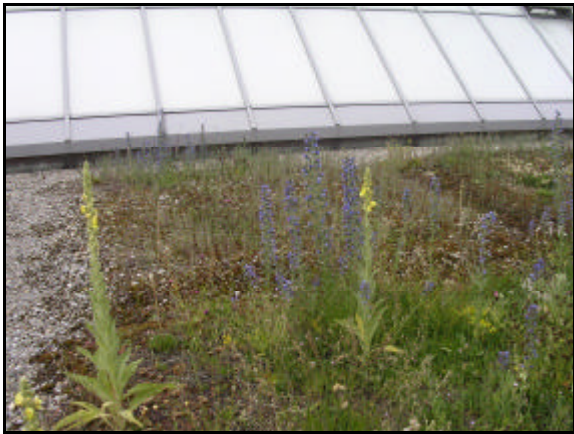
Lightweight sedum mat	90kg/m ²
Substrate based extensive green roof	120 -150 kg/m ²
Paving/shingle	120 kg/m ²
Semi intensive	200 -250 kg/m ²
Intensive	300 kg/m ²

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Structure/Retrofit

Sedum Blanket	55kg/m ²
Sedum blanket on substrate	90 kg/m ²
Substrate Based green roof	120 kg/m ²

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Will they leak?

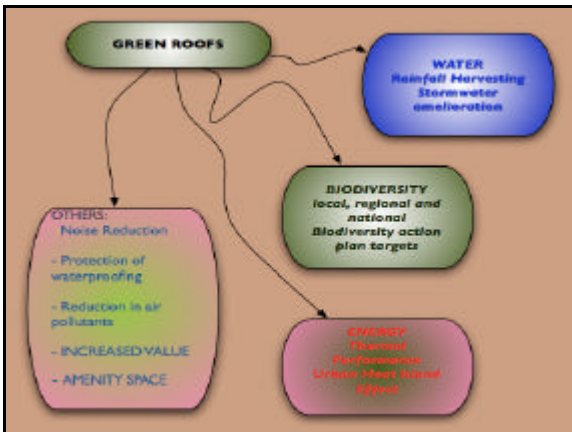
- VORSPRUNG DURCH TECHNIK!!
- Green roofs protect waterproofing from the elements [frost, UV etc]

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Costs

COST [installed] /m ²	TYPE OF BUILD UP
£55	Warm roof [non green roof]
£95	Warm roof [sedum blanket]
£60	Inverted [shingle]
£65	Inverted [paving]
£90	Inverted [Greenroof]
£100 -120	Semi intensive
£120 -130	Intensive

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BIODIVERSITY

GREEN ROOFS ARE GOOD FOR WILDLIFE!!!

BUT WHAT WILDLIFE???

HOW CAN THEY MEET CAMDEN BIODIVERSITY PARTNERSHIP TARGETS?

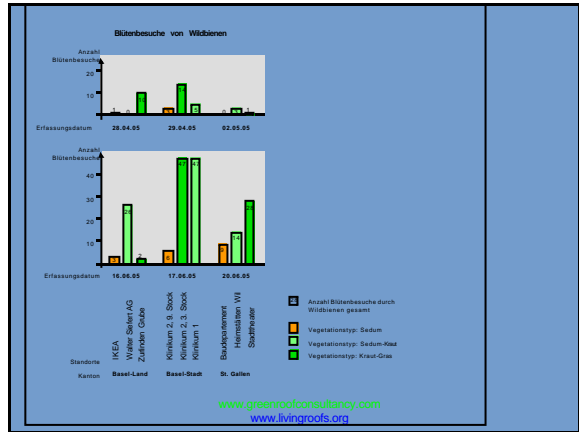
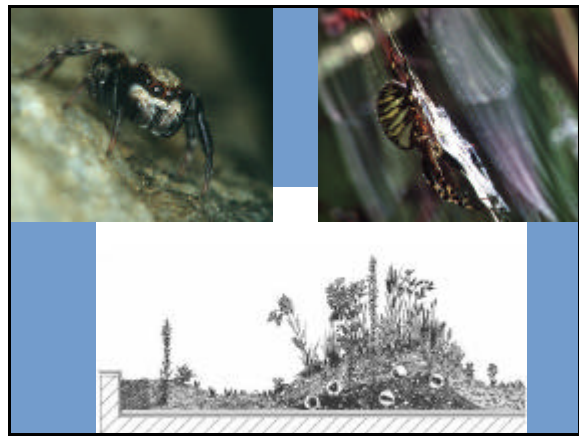


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Biodiversity

- London and Thames Gateway an interest in brownfields
- Brownfields are low nutrient and well drained
- Extensive green roofs are essentially well drained and low nutrient
- UK BAP habitat since 2007
- Proprietary systems will not necessarily act as mitigation/enhancement as will not have flora associated with good brownfield sites
- Therefore there is a need for 'ecological' design input

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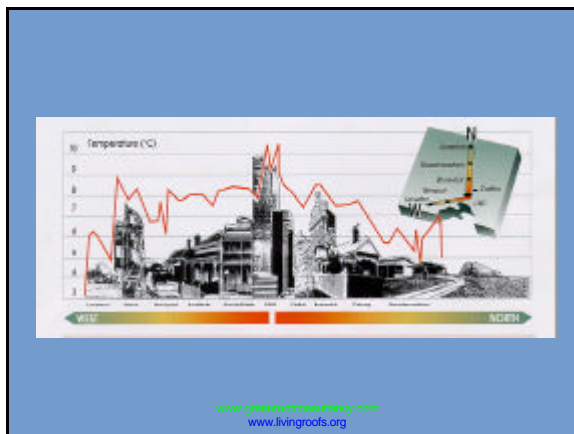
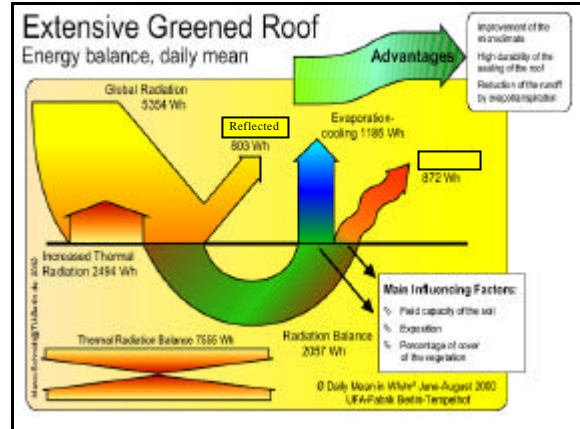
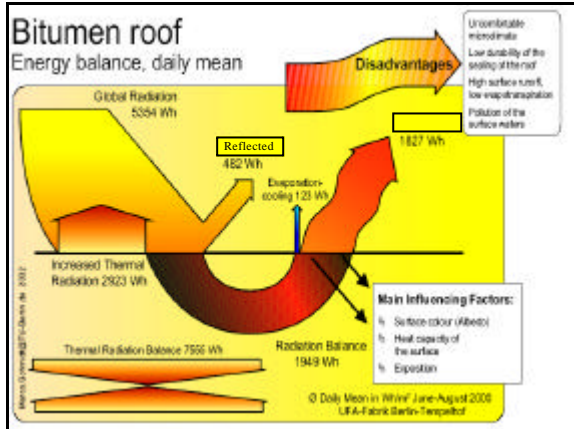




THERMAL

- Reduction in Urban Heat Island Effect
- Reduction in the use of air conditioning costs
- Some reduction in fuel costs during the winter but this dependent on rainfall

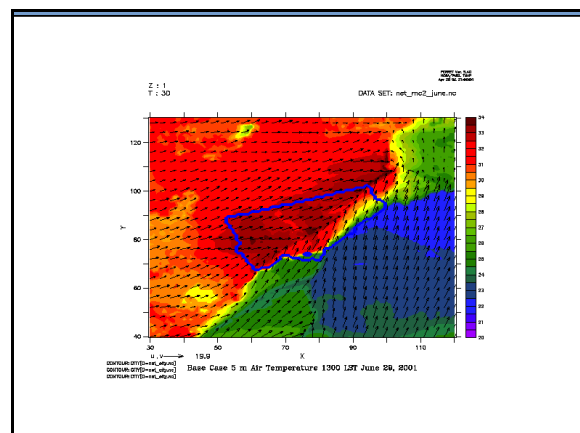
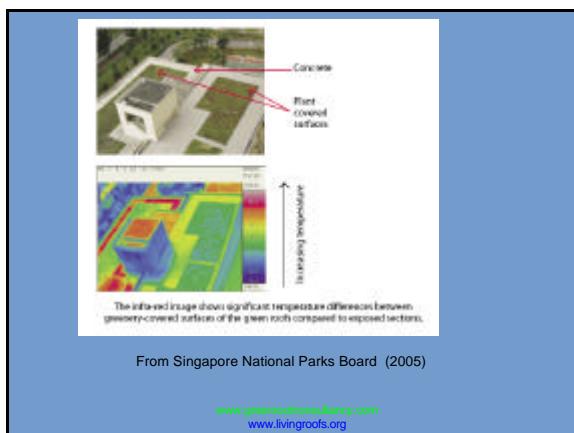
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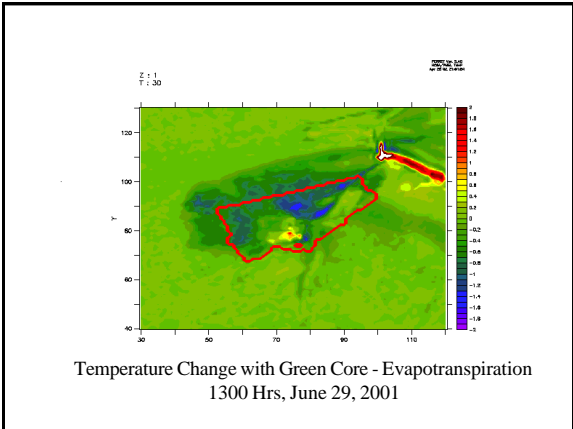


REDUCTION IN TEMPERATURE VARIANCE AT MEMBRANE LEVEL

- Numerous studies show that there is a significant reduction in temperature variance under a green roof
- This reduction temperature fluctuation protects membrane
- Reduces energy flow into building
- 100mm green roof can provide 6 -2 kWh/m²/yr [Kohler 2006] saving in winter
- 100mm can provide 4.15 kWh/m²/yr summer cooling [Bass 2006]

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Toronto Study 2005

- Toronto Study 2005
- Energy Consumption reduced by \$22m = 24.15kWh/sqm
- Cost due to reduced demand \$68m
- Urban Heat Island reduction of between 0.5–2.0 degrees Celsius
- Citywide savings from reduced energy for cooling for cooling \$12m = 2.37kWh/msq
- Cost avoided due to reduced demand at peak times of \$80m

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INSULTATION

- Difficult to give a U value to green roof systems
- Germany – 2 litres of fuel oil per m² is saved through the use of green roofs
- Germany recent studied 6 - 2 kWh/ m²/yr saving annually [Study undertaken in Berlin/Mecklenburg]

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BUILDING, CANARY WHARF London

- Retrofitting 850 m² green roofs to commercial centre provided an opportunity to measure before and after heating costs.
- Savings of 25,920 kW per year were made (equivalent to 11 CO₂e tonnes/ yr) or £ 5,000 per year

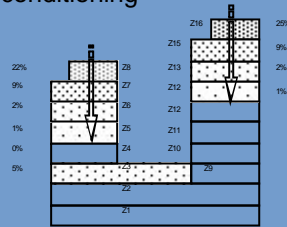
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Reference Building

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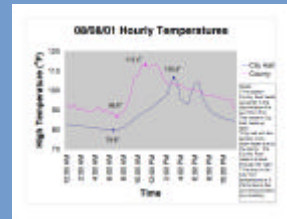
Summer Reductions with Green Roof

- 4.15 Kwh/m²/yr reduction due to reduce air conditioning



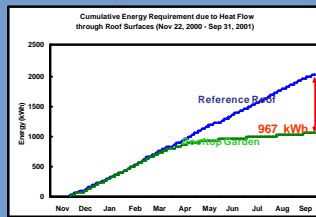
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- Indian Institute of Technology's Centre for Energy Studies – Yamuna Nagar – green roof maintains building interior at 26°C when outdoors is high 30s °C
- Chicago City Hall - continuous monitoring allows comparison with un-vegetated adjacent County Hall.
- Similar to Paradise Park, Islington
- If Chicago wide could save \$100m (720mW) of electricity each summer



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Energy Requirement Comparison



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WATER

- REDUCE FLOW RATE
- STORE RAIN WATER AT SOURCE
- IMPROVED WATER QUALITY
- POTENTIAL FOR HARVESTING

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RUN OFF VOLUME REDUCTION

- Standard non green roof 81% annual runoff
- Green roof 50mm of substrate 50% annual runoff
- Green roof 100mm substrate 45% annual runoff
- Green roof 150mm substrate 40% annual runoff

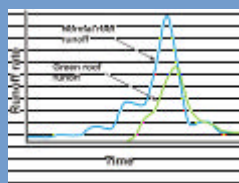
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VOLUME STORED

- Green roof 50mm of substrate 19 litres/m²
- Green roof 100mm substrate 29 litres/m²
- Green roof 150mm substrate 39 litres/m²

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RAINFALL ATTENUATION



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WATER QUALITY

- AIR BORNE POLLUTANTS FILTERED OUT
- POLLUTANTS ASSOCIATED WITH RUN OFF FORM ROOF FILTERED OUT
- WATER RUN OFF FORM GREEN ROOFS AS REDUCED HEAVY METALS AND OTHER POLLUTANTS

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POTSDAMMERPLATZ BERLIN

- Zero Discharge Rate
- Once in last 5 years permitted to discharge
- All water stored or recycled
- Roofs at all levels including roof 'lake'
- All toilet flush water derived from recycled rainwater

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Development Zones for Black redstarts

- Silver Quays
- Battersea Power Station
- Greenwich Peninsula
- Bishopsgate Goodsyrd
- Mast Quay
- Peruvian Wharf
- Plus many more!

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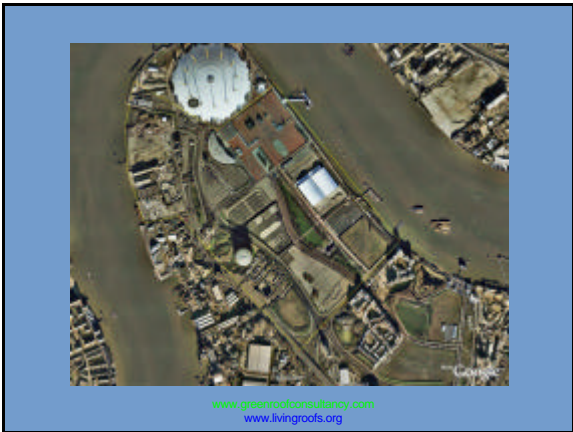


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- Key to achieving this have been
 - The Environment Agency, most roofs are beside the Thames
 - London Boroughs of Islington, Camden, Lewisham, Wandsworth and Tower Hamlets

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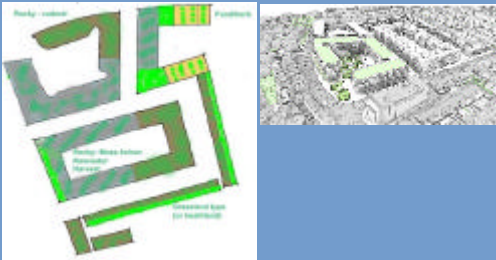


Since visit to Switzerland
Aspiration for 100% green roofs
For amenity and biodiversity

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HEART OF EAST GREENWICH

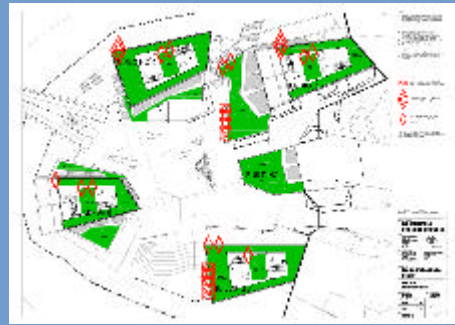


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LEAMOUTH



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LONDON - The New Policy



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- New London Plan
- New Living roof and wall policy
- Expectation that all major developments and refurbishments to have green roofs
- Technical report to support the policy

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Brighton's own green roof organisation



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- John Little of grass roof company and Dusty Gedge writing a **DIY pdf**
- Will be available end of march
- Running our first DIY workshop in Brighton in May for **Building Green**

A BRIEF SUMMARY

- Green roofs are here to stay - they are not a FAD
- Green roofs need to be designed
- Should be considered as part of ecosystem services and ecological engineering solution within the built environment
- Multi-functionality is the key
- A unique opportunity to include a range of disciplines to provide long lasting benefit to the both urban and rural environment
- Before designing a building DECIDE what is needed.
- All to often structural decisions limited performance of a green roof

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GREEN ROOFS

Camden

- King's Cross Development 15-20% target - Pavilion has a detailed design plan
- At least one large development Covent Garden large green roof for visual amelioration and biodiversity due to planning department
- Komodo Dragon/ Kangaroo House
- Grays Inn Road and LILLI project [Kentish Town]

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GREEN ROOFS

Camden - some thoughts

- Assess current building stock - potential for retrofitting
- Engage private sector to retrofit especially in the southern urban core
- Insist green roofs on schools and insist they are accessible to students
- Champion the installation of green roofs on Borough buildings as demonstration for developers
- Set a target
- Don't forget the Camden Biodiversity Partnerships targets
- Be specific what the borough wants

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THE FUTURE

- A Stronger Policy In London in 2008
- Manchester, Sheffield and Birmingham are developing Green Roof Strategies
- 'Building Greener' a detailed guidance document on green roofs has recently been published by CIRIA
- GRC/CIRIA and National Green Roof Centre is providing a variety of training

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THANK YOU

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Skylarks/Ground Nesting Birds

- 15 pairs nest on Munich BMW Factory
- Several pairs nest on Rolls Royce Factory
- UK Priority BAP Species
- In large scale designs design in features and habitat provision for Skylarks and other ground nesting birds
- GRC are involved in designing 3 roofs for skyparks
- Meadow Pipit
- Lapwing, Little Ringed and Ringed Plover
- Oystercatcher
- Involved in designing 2 roofs at present



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A blue rectangular box containing text and an image. The text is a bulleted list of facts about skylark and ground nesting birds. To the right of the text is a photograph of tall, dry grasses with some red flowers. At the bottom of the box are two website URLs.