

A photograph of a green roof installation. The foreground and middle ground are filled with a dense carpet of green plants, including many small white flowers and taller purple and pink blossoms. A large, weathered log lies horizontally on the left side of the frame. In the background, modern multi-story buildings with glass and metal facades are visible under a cloudy sky.

The UK Green Roof Market

First Assessment

July 2017



Front cover: More London Riverside

A green roof designed specifically for biodiversity.

The authors would like to thank the following for contributing to this report

Peter Massini, Urban Greening Team Leader, Greater London Authority

Mark Harris, Chair of the Green Roof Organisation and current members

James Talman, CEO of the National Federation of Roofing Contractors and the rest of the team there, Amanda, Laura and Hilton

Blanche Cameron, Bartlett School of Architecture UCL

All participants of the research and sponsors of the report

Hazel Vidler

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NFRC

THE NATIONAL FEDERATION OF
ROOFING CONTRACTORS LIMITED

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Neil is a Landscape Management professional based in Trottiscliffe, near West Malling in Kent. Following a 30 year successful management career in defence and telecommunications, and motivated by his passion for the environment, Neil undertook a study break in 2014 to complete a BSc (Hons) in Landscape Management at the University of Greenwich.

His dissertation project examined the factors constraining the UK Green Infrastructure market and included the research which formed the basis of this Green Roof Market Report. Following graduation in 2017, Neil now runs his own Landscape Management business, as well as being a Director of Green Infrastructure Leasing Ltd.



Dusty Gedge

President of the European Federation of Green Roof and Wall Associations EFB, and Director of Livingroofs.org and the Green Infrastructure Consultancy

Dusty is the current President of the European Federation of Green Roof and Wall Associations and Director of [Livingroofs.org](https://www.livingroofs.org) and the Green Infrastructure Consultancy Ltd. He sits on the EU working group on Ecosystem Services and Green Infrastructure.

He is recognised for his work promoting the uptake of green roofs and as author of a number of green infrastructure reports in the UK. He is also a well-known international speaker on the conference circuit.

His interest in green infrastructure stems from his interest in nature in the urban realm. However, he is increasingly interested how vegetation on buildings can help make our cities more resilient. Through his consultancy, he has designed many green roofs in London specifically for biodiversity.



Principal Sponsors

Robert Speroni
Managing Director
Radmat Building Products Ltd



Radmat is pleased to support this Green Roof Report, the most comprehensive of its type to date. Having been involved with green roofing for many years, working on such projects as GCHQ and The Scottish Parliament pre the Millennium, innovative projects such as Cross Rail Canary Wharf, the 'Sky Garden' in the Walkie Talkie Building and the Parliamentary Education Centre post the millennium, and everything in between Green Roofing has become a part of our daily business life. We are proud to have been a part of the development of this exciting industry and are equally excited about its future.

David Rutherford
Executive Chairman
Sky Garden Ltd



As a premier player in the industry Sky Gardens are pleased to be so closely associated with the 'UK Green roof market report'. This report is a major step forward in the rapidly developing yet still fledgling green roof industry. Although growth in our market is very welcome, we are increasingly placing emphasis on the quality of the plantings installed and their subsequent maintenance. Our industry will ultimately be judged by the quality of our work and we hope that the launch of this report will represent an opportunity for much needed focus on the 'green' element of a green roof.

Andrew Mackenzie
Managing Director
Bauder Ltd



Bauder is delighted to be a Principal Sponsor of the Green Roof Report and to have been a part of the market since the beginning as the first major manufacturer-supplier in the UK. We have seen the market mature in the last 40 years to expand its abilities and reach even greater heights than were originally projected. The vision of today's designers of rooftop green spaces is admirable and with the ever-increasing demand for urban space, the areas created by green roofs will become even more important havens for wildlife and retreats for people. We are proud to be a strong part of this future.

"This Market Report is extremely important for our business to help us understand the growth and uptake in green roofs. With such a fast moving and dynamic market, it's essential that we absorb and interpret all the data available to ensure we offer the best products and service to the industry."

- Nigel Wraxall, Wraxalls Ltd

Forewords



Shirley Rodrigues

**London Deputy Mayor for
Environment and Energy**

London is home to an impressive array of green roofs – from roofs that capture rainwater to prevent flooding, to roofs that provide wildlife habitats or roof-top gardens.

In cities, where space is at a premium, green roofs are helping to make the most of the space we do have. They not only make the city a more attractive place to live and work, but also help buffer the impacts of climate change and contribute to improving health and well-being.

Through good planning policy, we are aiming to build on our success to date in London. The Mayor's ambition is to make more than 50 per cent of the city green by 2050. This will require many more developments to incorporate green roofs and other features such as green walls and raingardens. We hope our action and impact, highlighted in this report, will encourage other cities to do the same. Together we can make the very best use of an industry with world-class expertise, and ensure it continues to grow in the future.



James Talman

**CEO of the National Federation
of Roofing Contractors**

Roofing is sometimes viewed in a narrow context. But the continued expansion of the green roof market plays an essential role in highlighting the diversity of the industry.

Apart from the ecological, environmental and social benefits green roofs provide, they also are important in creating rewarding careers for multi-skilled professionals.

We are pleased to support the green roof industry in its quest to see other large urban conurbations in the UK following the GLA's lead on 'greening' our cities.

"We were happy to contribute data for this important market report which shows how much the green roof market has grown. But not only that, it begins to quantify our collective efforts to improve the environmental profiles of UK cities and we are proud to be an integral part of this movement and look forward to the continued growth of this industry."

- Charles Fentiman, Shire Green Roof Substrates Ltd

Foreword



Mark Harris

Founder and Chairman, UK Green Roof Organisation GRO

The publication of this report seems an appropriate time for reflection on my near 20-year involvement in the green roof industry and the progress we as an industry and a country have made.

Without doubt the report demonstrates that, in the urban environment that is Inner and Greater London, we have collectively successfully created improved environmental conditions through biodiversity, be it enhanced, replaced or replicated habitat and better rainwater water management.

We have contributed to social improvements through the creation of outdoor amenity and a more natural visual roof scape, and we have contributed economically creating jobs and income for individuals, companies and the Treasury.

These achievements have been attained by the activities of a great many people working together: individuals, public interest groups, NGO's, Local Government, construction professionals and companies.

But without the major influence of the London Plan and Local Authority planning officers it's probably true to say we wouldn't be celebrating the success of the green roof industry in the same way today.

Looking to the future, I have high hopes that the new Mayors of Birmingham and Manchester will look at what has been achieved in the redevelopment of London and adopt, and/or strengthen, the elements of the London Plan related to green roofing. Both of these great cities face the same development challenges that London did back at the turn of the century.

The evidence contained in this report points to the significant contributions that the green roof industry can make to a city's redevelopment and growth – socially, environmentally and economically.

“The UK Green Roof Market Report is of immense benefit to the whole of the green roof industry and its stakeholders. The findings give confidence to the related companies and their investment aspirations. The report also helps to build momentum within the planning community as well as architects, and building regulators.”

- Simon Hedley, Boughton Ltd

Executive Summary

Key Findings

Green roofs are now a mainstream technology, helping adapt towns and cities to climate change, providing habitat for nature, reducing urban heat islands and indoor temperatures, managing storm water and supporting healthy and resilient communities.

But until now there has been no understanding of the value of the green roof market to the industry or the national economy. This report provides a detailed understanding of how the UK green roof industry is performing in terms of market size.

Data was gathered from major UK substrate suppliers on sales and the area of extensive and intensive green roofs implemented was assessed.

Results show a surprising annual market growth rate of 17.1%. This figure also correlates to an increase of 17.4% in the area of green roofs installed in the London Central Activity Zone. And the market baseline for the extensive green roof market was also larger than expected at £26.2M versus previous estimates of £17.5M.

London currently installs around 42% of all UK green roofs delivered, with a specific green roof planning policy driving the market. But future growth is also likely to come from strategic city and region planning policies across the UK, particularly with the election of the new 'Metro Mayors'.

The development community is also realising the value of nature-based solutions, with an increasing aspiration to provide net gains in biodiversity. In dense urban contexts, green roofs are often the solution as we are already seeing in London.

Thus, the green roof market is likely to increase year on year and shift away from a focus on London. Significant projects are happening in London and elsewhere. The market is still delivering and is likely to show an increase again this year.

Next Steps

It is hoped that this first report will be updated in 2018 and annually, and that green roofs become an indicator for urban resilience and adaptation to climate change. The following also merit investigation and assessment:

- **What impact does the green roof market have on the UK jobs market?**
- **What is the potential market for retrofitting green roofs in the UK?**
- **How can we accurately map green roofs, both existing and potential within the UK's existing urban fabric?**
- **How can skills and knowledge within the construction industry and design community be increased?**

“This report is key to demonstrating the environmental benefits that green infrastructure, in particular green roofs, can offer. As a UK-based producer of green roof substrates and products for green infrastructure, the information held in the report should be used by all major UK cities and towns to help formulate a successful urban regeneration plan in an effort to improve the environment for everybody throughout the UK.”

- Mark Wood, Green-tech Ltd

Contents

1	Introduction	15
2	The current UK green roof market	19
3	The future of the UK green roof market	23
4	Next steps	29
	Afterword	31

“The Green Roof report, and all future publications will prove invaluable to our business, ensuring a clear picture of a rapidly expanding market place and creating added investment confidence within the whole sector.”

- Stuart Bailey, Alfa Aggregates Ltd

1 Introduction

Green roofs have become a mainstream technology over the last ten to fifteen years in the construction industry. This has partly been in response to environmental concerns associated with climate change adaptation, a greener approach to construction and to a certain extent the need to consider biodiversity within the built realm.

However, until now, there has been no accurate understanding of the size or value of the green roof market in the UK. Livingroofs.org has regularly produced estimates of market size and volume of green roofs installed, most recently for the [European Green Roof Market White Paper 2015](#).

Target Country	Green Roof stock total m ² (2014)	Green Roofs new/year m ²	Ratio Extensive %	Ratio Intensive %	Yearly sales figures €
Austria	4,500,000	500,000	73%	27%	27,350,000
Germany	86,000,000	8,000,000	85%	15%	245,000,000
Hungary	1,250,000	100,000	35%	65%	5,662,500
Scandinavia (S, N, DK)		600,000	85%	15%	16,050,000
Switzerland		1,800,000	95%	5%	51,300,000
UK	3,700,000	250,000	80%	20%	28,000,000
	95,450,000	11,250,000			382,362,500

Table 1.0 Estimated market figures
(EFB European Green Roof Market Report, 2015)

Whilst the estimate above shows that the UK is on a par with Austria in terms of market value, the number of green roofs installed is far less. This is because the cost of green roof installation in the UK is currently higher than many of the more mature markets in Europe.

The table also notes the proportion of extensive to intensive green roofs, which will be a feature of this report. In general, extensive green roofs in mature markets tend to be more widely applied.

This is primarily because they are low maintenance and relatively light. Whilst they perform for a wide range of environmental benefits, they are generally not accessible to people other than for maintenance.

Intensive green roofs on the other hand tend to be higher maintenance and more heavily used. They are generally designed with people in mind as roof gardens, parks and/or for urban agriculture.

Because of the uplift in cost associated with intensive green roofs, in most mature markets they tend to make up a smaller proportion of the total volume of green roofs installed.

In 2016, to qualify these estimates, Livingroofs.org in partnership with a University of Greenwich research project and GRO set out to undertake the first in-depth analysis of the UK green roof market. This report provides a detailed understanding of how the UK green roof industry is performing in terms of market size.

Although this report focuses on the economic potential of the green roof market, it is important to consider how green roofs help to adapt our towns and cities to meet the challenges associated with climate change and the economic imperative of meeting that objective.

Scope of the report

This report lays out both the value and area of green roofs installed in the UK for the years 2015 and 2016. Furthermore, it provides an overview of what is driving the market and where the market is focused geographically.

The need for a UK green roof market report

The aim of this report is to lay out the financial size of the market and will thus be of interest to investors, the green roof industry and the wider construction industry. However, its findings will also be of interest to a broader range of stakeholders especially city planners and decision-makers.

City planners and decision-makers

Planning policy currently drives the green roof market in the UK, as will be discussed in detail later. Local and regional authorities should find this market report of interest in terms of where the market is currently focused and how the activities of planners and regional authorities may be able to help shift the market from its current primary loci of activity.

UK Committee on Climate Change

While undertaking research for this report Livingroofs.org was contacted by consultants working for the UK Committee on Climate Change (CCC). Green roofs had been identified as a potential indicator for climate change in 2016¹. That report noted a number of environmental benefits that green roofs provide:

- **Strategies to reduce urban heat islands**
- **Sustainable urban drainage systems**
- **Green infrastructure offers opportunity to deliver more sustainable solutions so that communities can thrive and people can live healthy lifestyles**
- **Reducing indoor temperatures**

Whilst these benefits are recognised by the green roof industry and interested parties, it is extremely positive that the CCC recognises the potential that green roofs can play in urban climate change adaptation.

The CCC in 2017² also reviewed a range of indicators to demonstrate how

¹ Kovats, R. S., and Osborn, D., (2016) *UK Climate Change Risk Assessment Evidence Report: Chapter 5, People and the Built Environment*.

² <https://www.theccc.org.uk/wp-content/uploads/2017/06/Updated-Indicators-of-climate-change-risk-and-adaptation-action-in-England-ADAS.pdf>

well the UK is adapting to climate change. The review of green roofs within the report notes several activities that help identify green roof delivery:

- **Green roof map of London**
- **Unpublished data by Livingroofs.org**
- **Reference to the imminent publication of this report**

However, the review also notes there are limited data on the number of green roofs installed across the UK. In regard to the robustness of existing data reviewed, the report concludes:

“The current data available is incomplete and inconsistent, predominately sourced from best estimates.

The data provided provide insight into the current area, but are not robust enough to provide a reliable representation of the area of green roofs currently installed in England.

New work by Livingroofs.org in partnership with others are undertaking the first full green roof market assessment - UK Green Roof Market Survey 2016, due to be published in 2017.

The Green Roof Map is currently being updated by an intern at the GLA who is replicating the analysis from 2013. This data will likely be available in late 2017.”

Whilst the CCC recognises the potential for green roofs to play a pivotal role in helping cities adapt to climate change, the lack of robust data at the time meant it was unable to conclude whether green roofs could be a potential indicator in the future.

Thus it is hoped the publication of this report will change this and that in the future, green roofs can play an important role in the assessment of how the country is acting to deliver resilience to climate change in urban areas.

Furthermore, the industry (Livingroofs.org, GRO, NFRC and others) will be motivated to report annually on how the industry is responding, both in terms of the number of green roofs installed and the market size.

Academics and researchers

With the increasing need for and interest in green infrastructure as an approach to delivering healthier and more resilient cities and societies, there is considerable interest from the research world in green roofs.

By establishing a detailed baseline of how the green roof market is performing and the potential impacts of the market within the urban realm, this report will provide academics with a starting point for research and through their endeavours, help stimulate further growth in the market and the delivery of green roofs.

“These types of studies not only help to raise awareness of the positive impact of green roofs, but it also demonstrates how quickly the market is developing in the UK. The report will hopefully move green roofs even further up the construction agenda and highlight the hugely positive impact they have on the urban environment.”

- Jonathan Bourne, Bourne Amenity Ltd

2 The Current UK Green Roof Market

The extensive green roof market: assessment methodology

To assess the green roof market size, two alternative methodologies were considered: the one first one being to source point-of-sales information from suppliers of green roofs, and the second, to calculate the volume of substrate material used in UK green roof implementation.

To avoid duplication of sales information from multiple points in the supply chain, the second methodology, calculation of volume of substrate, was chosen.

The research followed standard practice as established by the German Green Roof Association which primarily focuses on the volume of substrate sold each year. In partnership with the NFRC, a request for data was sent to UK substrate suppliers listed by the NFRC and GRO.

The results were then assessed by analogy to the average depth of substrate installed for extensive green roofs, and a mean installed area in m² was calculated from this figure.

The market size in sales value terms was inferred using a typical average price per square metre. The commercial metrics were based on information from Livingroofs.org, GRO, and an approximate weighted average of selling price data obtained from the major suppliers.

There are two main types of green roofs installed on buildings: '*extensive*' and '*intensive*'. Intensive green roofs present a greater challenge in determining market size.

The types of substrates used to deliver such green roofs are not as specialised as extensive. Extensive green roofs are blended supplied by a small group of suppliers in the UK. Therefore, this report uses the verified extensive green roof market data.

Thus, detailed results represent the amount of extensive green roofs installed in the UK. However, using information from substrate suppliers and an assessment of the proportion of intensive green roofs in the London area (which have been mapped in detail for both extensive and intensive green roofs), the report also extrapolates a total projection of both intensive and extensive green roofs in terms of area installed and the total value of the market in the UK in 2015 and 2016. The value of the market itself is assessed in detail below.

Parallel methodology

As outlined above, the Greater London Authority has published a map of green roofs in the Central Activity Zone of London. This map was created by the Green Infrastructure Consultancy (formerly the Green Roof Consultancy) and mapped for the year 2013.

Furthermore, using the same techniques, this map has been updated (as yet unpublished) for green roofs installed in 2014 and 2015.

The maps categorise the type, area and location. Using this data, we were able to assess the proportion of intensive to extensive green roofs and the yearly increase in the number of green roofs installed in 2013, 2014 and 2015.

The green roof market: substrate sold

The total confirmed volume of substrate shipped in 2015 was 22,094.22m³ for extensive roofs and 10,462.53m³ for intensive roofs (figures are summarised including 2016 data in Table 2.0 below).

The extensive green roof figures comprise the entire market supply as these materials are provided by a small number of specialist suppliers, as previously explained, and direct correlation to the market proportion was possible.

To calculate a figure for the surface area of extensive green roofs installed, a depth of 80mm was used, based on advice from industry experts and a separate survey of installers.

This figure, when rounded to the nearest thousand indicates that 276,000m² of extensive green roofs were installed during 2015.

The time lag between substrate supply and green roof installation was not factored into calculations as this lag was agreed by survey respondents to be a constant factor.

While as previously discussed, intensive green roofs typically comprise a mixture of substrates from a wide range of sources, it was possible to verify the ratio of extensive to intensive roofs using the survey data.

This was achieved by extrapolating the known intensive green roof substrate as a proportion of the total, based on industry advice. First, ratios of surface area of known substrate shipments were calculated, using a 350mm depth for intensive as agreed by the green roof industry.

The total surface area was then determined using a calculation of known reported substrates to unknown of 25%, i.e. multiplying the known figure by 4. The resulting calculation showed a ratio of extensive to intensive surface areas of 30.2%, hence verifying the 70% to 30% ratio used in this report to infer total volumes and market value.

Market: installed price

Once the total volumes of extensive substrates sold in 2015 and 2016 had been established, the next step was to contact installers to obtain average installed prices for extensive and intensive installations.

As previously indicated, these data were factored by approximate market share to provide conservative weighted average figures of £52/m² and £100/m² for extensive and intensive roofs respectively.

The overall calculations revealed by the survey and summarised below and in the graph on the right indicate a total green roof market value of £26.2M in 2015 and £30.7M in 2016, representing year-on-year market growth of 17.1%. Of this total, the proportions for extensive and intensive roofs are as follows:

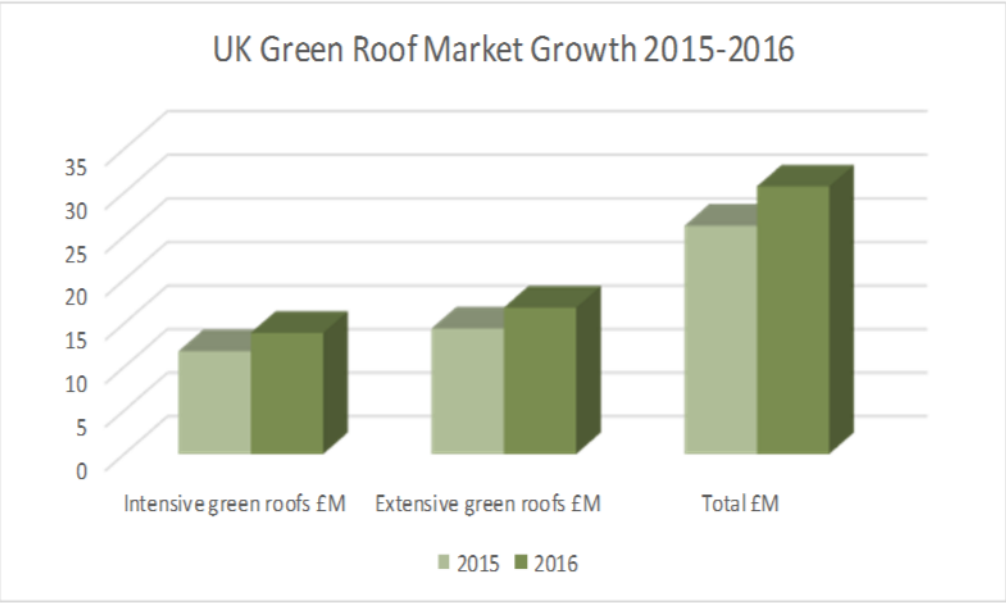
	2015	2016	Growth %	Sub-strate vol. m ³ 2015	Equiv. area m ² 2015	Sub-strate vol. m ³ 2016	Equiv. area m ² 2016
Extensive	£14.4M	£16.8M	17.4%	22,094	276,178	25,907	323,832
Intensive	£11.8M	£13.9M	16.9%	10,462	118,362*	11,499	138,785*
Total	£26.2M	£30.7M	17.1%	32,556	394,540	37,406	462,617

Table 2.0 Green roof market figures for 2015 and 2016
(Green Roof Market Survey, 2016)

This 17% increase in the market UK-wide also correlates to the increase in the area of green roofs installed between the end of 2014 and end of 2015 in the London Central Activity Zone (Table 3.0).

London CAZ green roof area installed	Area of green roofs installed m ²
End of 2014	175,000
End of 2015	205,000
Increase in green roof area installed	17.4%

Table 3.0 London Central Activity Zone green roof area installed
(London Green Roof Map, GLA)



3 The future of the UK green roof market

How will the green roof market keep growing?

Currently, the green roof market is focused in London with around 42% of all UK green roofs delivered. As London has a specific policy for green roofs and walls, planning policies drive the market in the capital.

This is augmented by architects and consultants designing to sustainability criteria such as BREEAM and LEED. BREEAM and other such assessment methods are also driving the market elsewhere but a lack of specific policies is probably the primary reason other urban areas are behind London in terms of green roof implementation. However, as can be seen with the winner and finalists of the NFRC's Roofing Awards 2017³, there is considerable interest in green roofs beyond the capital.

It is worth noting that one of the finalist's green roofs was delivered in Southampton. This was also a result of Southampton Council's Green Space Factor planning tool⁴. There are other areas delivering green roofs, notably Sheffield and Brighton & Hove. Both these local authorities proactively promote green roof delivery through a range of processes. However, currently London is the only urban area to have such a specific policy.

³ <https://www.nfrc.co.uk/uk-roofing-awards/2017-finalists>

⁴ <https://www.southampton.gov.uk/planning/planning-permission/sustainability-checklist.aspx>

The role of the 'Metro Mayors'

Following the 2017 election of the 'Metro Mayors' with specific powers regarding strategic planning, there is potential for these new authorities to mirror the Greater London Authority's success in delivering green roofs.

Urban green infrastructure for climate change adaptation is likely to become an important policy area across the UK and should lead to a wider policy programme to help increase the total market.

Such approaches will also shift the quantity of green roofs installed away from its current primary focus in the London area, to provide a greater spread of installed systems across the whole of the UK.

Increasingly, the development community are also recognising the value of nature-based solutions such as green roofs and walls in the way they market their products. One of the most interesting development commitments in 2017 is Berkeley Homes' aspiration to provide developments that provide a net gain in terms of biodiversity:

'We are committed to developing and applying an approach to ensure that all our new developments create a net biodiversity gain.'

In many developments in urban areas of cities, this will include green roofs as a significant element in delivering the aspiration. This is already the case in a number of developments by Berkeley Homes in the Royal Borough of

Greenwich (Kidbrooke Park) and the London Borough of Hackney (Woodberry Down).

Whilst the delivery of green roofs will have been driven by local and regional planning policies, this commitment by the developer shows a shift towards greener housing developments generally. Such a commitment can also be seen in other developments in the capital and it is surely not long before developers outside the capital recognise the value of green roofs as part of the green infrastructure story in selling properties.

Ongoing assessment of growth in the UK green roof market

Over the last thirteen years, Livingroofs.org has been aware that many in the building design world have considered green roofs as a trend that would probably fade away.

However, as can be seen from the results of the research and the potential for new policy initiatives on the horizon, along with a more receptive development community, the green roof market is likely to increase year on year and shift away from a focus on London.

Thus, whilst this report shows how the green roof market has performed in 2015 and 2016, the authors and many of the companies involved are aware of significant projects currently happening both in London and elsewhere in

the UK. There is no doubt that in 2017 the market is still delivering and it is probably on a trajectory to increase again in percentage terms this year.

It is hoped that this first report will be updated in 2018 and in years to come. In doing so, it would be hoped that green roofs become an indicator for urban resilience in future reports on climate change adaptation by the UK Committee on Climate Change.

NFRC UK Green Roofing Awards 2017

Winner

Macallan Distillery Aberlour, Scotland - Sky Garden Ltd

Finalists

Centenary Quay Southampton - Axter Ltd

Bransholme Pumping Station Hull - Bridgman & Bridgman LLP with Optigreen Ltd

CSC Building Nottingham University - ICB (Waterproofing) Ltd



Macallan Distillery

The Macallan stands for quality, craftsmanship and luxury. The eye-catching roof for their distillery certainly instils these brand qualities. The contractor was selected by landscape architects to assist with the design in 2014 and were delighted to see this prestigious project all the way through to its impressive fulfilment.



Centenary Quay

New homes development within Southampton riverside rejuvenation, incorporating robust waterproofing and bespoke living roof designed to enhance flora and fauna diversity in this harsh environment. Comprising coastal grassland growing medium and seed mix capable of thriving in this exposed site and salt-laden winds.



Bransholme Pumping Station

Bridgman & Bridgman installed the first fully removable green roof in the UK on a flood water pumping station in Hull, which prevents the City and 17,000 homes from flooding. The 30-degree pitched wildflower roof has 42 crane-lifted sections which enable access to the storm water pumps within the building.

4 Next steps

As a first UK market report, the research and assessment of the results leads Livingroofs.org, GRO and the NFRC to consider what the next steps could or should be. The following represent some of the issues to be considered:

- **What impact does the green roof market have on the UK jobs market?**
- **What is the potential market for retrofitting green roofs in the UK?**
- **How can we accurately map green roofs, both existing and potential within the UK's existing urban fabric?**
- **How can skills and knowledge within the construction industry and design community be increased?**

The impact of green roofs on the jobs market

One element of the market to research next is the number of direct and indirect jobs the green roof market provides to the economy each year. Whilst there are green roof suppliers and installers, green roofs also have an indirect employment sector, with associated professions in planning, design and maintenance of green roofs as well as their implementation.

Assessment of this aspect of the market is likely to be quite complex. However, the European Federation of Green Roof and Walls Associations (EFB) of which Livingroofs.org is a member, is looking to take forward

research to assess the impact of green roofs on the jobs market in Europe. Therefore, it is hoped in 2018 to provide an understanding of the jobs created by the UK green roof market, both in terms of direct and indirect employment. We will be taking an active role in understanding not only the current impact of the green roof market in the UK but also its potential over the coming years.

And we will be looking at assessment methodologies with our European partners to provide meaningful figures to present the industry as a potential vehicle to take forward the economy in the urban realm in the United Kingdom.

What is the potential size of the UK green roof retrofit market? And how can we map UK green roofs more accurately?

Whilst the focus of this report has been on the delivery of green roofs on new developments, there is a need to understand the potential to retrofit green roofs on existing buildings.

Research in London through the green infrastructure audit process suggests that potentially between 25% and 32% of the land area of central London could be retrofitted with green roofs without significant change to the existing building.

What would the likely impact be on the total UK market size and what impact would it have on jobs within the sector?

And what could an assessment of such potential achieve?

What models could be developed and adopted to facilitate the uptake of green roofs on existing buildings?

A recent project funded by the Future Cities Catapult developed software to not only identify existing green roofs in urban areas in the UK, but also to identify potential roofs that could be retrofitted immediately.

This software was produced by The Behaviouralist and the Green Infrastructure Consultancy (GIC) who are currently looking to take this forward strategically⁵.

Being able to map smartly and quickly will help stimulate greater interest in green roofs in urban areas across the UK. The artificial intelligence was developed from techniques used by GIC to map London's existing green roofs for the Greater London Authority's Green Roof Map⁶ and for potential green roofs using techniques developed whilst working on several green infrastructure audits in London.

⁵ <http://futurecities.catapult.org.uk/2017/03/28/blog-green-infrastructure-smart-city-agenda/>

⁶ <https://www.london.gov.uk/WHAT-WE-DO/environment/parks-green-spaces-and-biodiversity/green-roof-map>

Such smart technology approaches will be important in the coming years to ensure that green infrastructure and green roofs can be linked to other 'smart city' processes.

Upskilling: how can knowledge and skills in the design community and construction industry be increased?

With an annual increase of 17% across the UK, the green roof industry is a growing market. The NFRC and GRO are actively working on upskilling across the sector to meet the needs of the industry.

This is an important priority for the construction industry as whole, and an issue the NFRC sees as core to the future of the sector, through the official recognition of the skills and excellence provided by roofing professionals, and consequently to it being seen as an aspirational career choice.

However, it is not only in the construction industry with regard to suppliers and installers where skills and knowledge need to focus. Professional designers and consultants also need to engage in knowledge and skills development on delivering green roofs in new developments and refurbishment as this is clearly a growth industry.

Afterword



Dusty Gedge

President of the European Federation of Green Roof and Wall Associations EFB, and Director of Livingroofs.org and the Green Infrastructure Consultancy

Whilst I am an author of this report, I have also been involved in promoting green roofs in the UK for many years, and for the last ten years as President of the European Federation of Green Roof and Wall Associations (the EFB). This first assessment of the UK green roof market is an important contribution to how the cities of the future should embrace both green roofs and the wider green infrastructure approach.

Whilst current political uncertainty around Brexit may temper views regarding our continental partners, countries like Germany, Austria and Switzerland have been at the forefront of the development of green roofs globally. The UK's embrace of green roofs is not fully appreciated, both within the country itself and around the world. The market is developing rapidly and there are many signs that suggest it will continue to grow substantially year on year.

I hope that this report will stimulate greater interest in the industry and what it can deliver, both to the environment and the economy.

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