

Investing in green roofs for climate adaptation



GREATER MANCHESTER
DOING THINGS DIFFERENTLY



European Union
European Regional Development Fund

Introduction

The IGNITION project, funded by the European Union's Urban Innovative Actions (UIA) fund, brought together twelve partners to accelerate investment in urban nature-based solutions across Greater Manchester. Since 2019, IGNITION has compiled evidence, researched finance solutions, developed business cases and identified priority areas for investment.

To accelerate investment in nature, IGNITION explored the potential of different urban greening interventions across Greater Manchester and created pilots that help inform the business case for investment.

This document is part of a suite of toolkits that provide a snapshot of IGNITION's work, summarising the key investment models investigated and the potential for replication.

This work also features in this webinar: [Changing the real estate landscape](#).

Green roofs

Green space will play a key role in how we adapt the city-region to climate change.

However, finding land for new greenspaces can be hard in urban environments where land is scarce and 80% of the buildings that will exist by 2050 have already been built.



Roof space offers a unique opportunity to transform underutilised spaces to support nature and climate adaptation. Roof space accounts for 40-50% of the impermeable surface of urban areas, and some roofs are already structurally capable of safely hosting a green roof. Roofs represent a great opportunity to make Greater Manchester greener but are currently relatively rare in the city region. A review of existing green roofs showed that just 3% of buildings in Manchester city centre and 2% in Salford city centre have a green roof. However, these existing roofs provide over 18,000m² of additional green space, an area equivalent to 69 tennis courts.

The case for innovative financing for green roofs

Installing a green roof is more expensive than a conventional roof. However, green roofs can offer a range of financial and wider benefits to property owners thinking about investing. Historically, investment ^[1] in green roofs has been driven through corporate social responsibility or to achieve green building certification, with little insight into the financial benefits.

IGNITION has sought to encourage investment in green roofs through collating evidence and trialling tools which highlight the range of benefits green roofs can deliver. Investing in a green roof can provide **financial benefits** for commercial property owners:

- **5%** total energy savings for space directly below a green roof through thermal benefit
- **23 years increased roof lifespan** (compared to conventional flat roof lifespan of 20 years)
- **73%** rainwater runoff retention on an extensive green roof, which can result in a discount on wastewater bills¹
- **7%** property value uplift for an accessible green roof



On top of that, installing green roofs can provide environmental and social benefits that also improve reputational benefits for businesses and property owners such as:

- **11db noise reduction**
- **1°C** air temperature reduction
- **80%** reduction in nitrates due to water filtration
- **14%** reduction of particulate matter concentrations (PM10)
- **1.3kg** of annual carbon sequestered per m2 for extensive green roof
- New habitats, refuge and food for biodiversity in urban areas

These multiple benefits can help make a case for investment to building owners and occupiers. However, the prevalence of public subsidies for green roofs across Europe and numerous studies² suggest that the private financial benefits are either not sufficiently well known or attractive enough to incentivise investment³.

Communicating this value is a vital first step towards driving investment. This will help build understanding of the conditions where green roofs are most likely to deliver financial benefits and in turn help identify policies to encourage investment.

The [IGNITION nature-based solution living lab](#) is researching the thermal and hydrological impact of green roofs, alongside benefits for biodiversity on different types of green roof (meadow, sedum, brown, semi-intensive). Data from the lab is publicly available to review [here](#).

To understand the value of investing in a green roof in more depth, the IGNITION team identified buildings with potential to install a green roof and analysed recent green roof investments. This

¹ United Utilities offer a waste water bills discount for property with a green roof, where the green roof covers more than 10% of the total chargeable.

² Carter, T., & Keeler, A. (2008). Life-cycle cost-benefit analysis of extensive vegetated roof systems. *Journal of Environmental Management*, 87(3), 350–363. <https://doi.org/10.1016/j.jenvman.2007.01.024>

³ Toxeopeus and Polzin (2017) Characterising nature-based solutions from a business model and financing perspective, Naturvation.

https://naturvation.eu/sites/default/files/news/files/naturvation_characterizing_nature-based_solutions_from_a_business_model_and_financing_perspective.pdf

work helped to build the [IGNITION Green Roof benefits calculator](#), as well as a greater understanding of the actions needed to encourage wider investment into green roofs from local authorities and property owners and managers.

Manchester and Salford pipeline potential

The below gives an insight into the potential for this model within Manchester and Salford, the same methodology is replicable for the city region and beyond, to green this particular kind of urban space.

Understanding where green roofs could be easily installed can help to encourage investment, target engagement efforts, and inform planning decisions during re-developments. Three criteria were used by the IGNITION project to identify a potential pipeline of buildings in Manchester and Salford city centres with high potential to retrofit a green roof:

- Roof angle - A flat roof between 0-5°
- Structural load bearing capacity - A very high structural load bearing capacity⁴ (denoted by buildings with ballasted roofs⁵)
- Amount of industrial plant - A low amount of industrial plant or structures across the roof surface (e.g., air conditioning equipment, pipes, and ducts)

By applying these criteria to aerial imagery, remote sensing specialists were able to identify and map:

- **127 buildings which could be retrofitted with green roofs.** As shown below
- **Installing green roofs on these buildings would equate to 11.6 hectares of new green space**, equivalent to 16.5 football pitches or 449 tennis courts.
- Additionally **23 multistorey car parks**⁶ in Manchester and Salford city centres were identified as suitable due to high weight loading capacity. Installing green roofs on these would provide a *further* 7.8 hectares of new green space.

Potential pipeline of green roofs across Manchester and Salford city centre

	Manchester city centre	Salford city centre	Total (m ²)
Number of buildings assessed	1907	726	2,633
Number of buildings assessed as suitable	73	54	127
Percentage of buildings assessed as suitable	3%	7%	11%
Equivalent area of new green space (m ²)	64,263	52,614	116,877

This pipeline does not represent all the buildings that can install a green roof in Manchester and Salford City centres but those which could most easily, with minimal constraints on design and without additional costs of roof strengthening requirements. The pipeline is conservative but enables high confidence in technical feasibility. The approach taken could be replicable across the country with the appropriate support from remote sensing experts.

The pilots and business case

To understand the benefits that green roofs can deliver and the investment models that could support them, four pilot buildings were chosen for analysis:

⁴ Retrofitting a green roof is much easier, and lower cost, on roofs which already have a high structural loadbearing capacity. Working with green roof experts, ballasted roofs, where the shingle or paving can be removed and replaced with a green roof of equivalent saturated weight, were identified as having sufficient structural load bearing capacity to very easily hold a green roof.

⁵ Ballasted roofs are not unique to Greater Manchester but a common roof type in built up urban areas across the UK and Europe.

⁶ Car parks have also been included as their upper stories have significant load bearing capacity (500-1000kg m²) and could easily be retrofitted with a green roof with little in the way of loadbearing restrictions.

- Unicorn Grocery, a 2-story grocery store in Chorlton, owned and occupied by Unicorn Cooperative (retrospective analysis for existing green roof)
- City Centre West Premier Inn, a 7-story hotel in Salford, owned by Whitbread PLC.
- Spectrum Apartments, a 6-story apartment building in Salford, owned and rented by Dandara Living.
- Bloc, a 3-story office building in Manchester city centre, owned and managed by Bruntwood (retrospective analysis for existing green roof)

Benefits were quantified for the pilot buildings using findings from the [IGNITION Green Roof evidence base](#). Across the 4 buildings the benefits were found to include:

Benefit		Lifetime Value ⁷	Beneficiary	Cashable
Energy	5.5%	£4,000 - £17,000	Occupier	Cash saving
Carbon	1000-3700 kg	£4,700 - £17,500 ⁸	Owner	No
Water	£600 - £1,200	£10,000 - £20,000	Occupier	Cash saving
Biodiversity	0.14-0.29 credits ⁹	£1,500 - £3,200	Owner	No
Property Uplift	<i>Not estimated</i>	<i>Not estimated</i>	Owner	Requires sale or re-mortgaging
Rental Uplift	<i>Not estimated</i>	<i>Not estimated</i>	Owner	Yes
Solar	1,000-£3,500	£25,000 - £55,000	Owner	Yes
Roof Longevity	>40-50years	<i>Not estimated</i>	Owner	Cash saving
Air Quality	100-220 kg	£4000-8000	Occupier	No
Total		£31,500 - £95,200		

Green roofs can deliver a raft of financial benefits, from savings on energy and wastewater bills, which can collectively help pay back the higher cost of a green roof.

- Direct savings through reduced wastewater and electricity bills
- Indirect savings through improved employee wellbeing and reduced absenteeism
- Income through increased rent or enhanced amenities
- Mitigated risk by increasing resilience to climate change, getting ahead of new regulations, and lowering the risk of stranded assets.

If solar panels are prioritised within these replacement plans, the revenue generated can payback the increased capital investment as well as providing decarbonising benefits.

Install and maintenance costs for the pilot buildings are:

- £66,400 – average cost of green roof installation on the pilot buildings
- £1-9 per m² annual maintenance cost for extensive green roof
- £8-£14 per m² annual maintenance cost for intensive green roof

To create a business case report for a green roof using your property specification, containing a holistic view of aggregated returns and benefits, use the [IGNITION Green Roof benefits calculator](#).

Following cashflow analysis utilising the green roof benefits calculator, it was found that the payback periods for the pilot buildings was between 12-22 years. Through this process planned expenditure on a roof replacement and uplift in property value were key factors in achieving a return on investment.

Due to the dependency of planned roof replacement to create a feasible investment case for a green roof, work needs to be done to support property or building owners identified from the

⁷ Based on a conventional roof life span of 25 years.

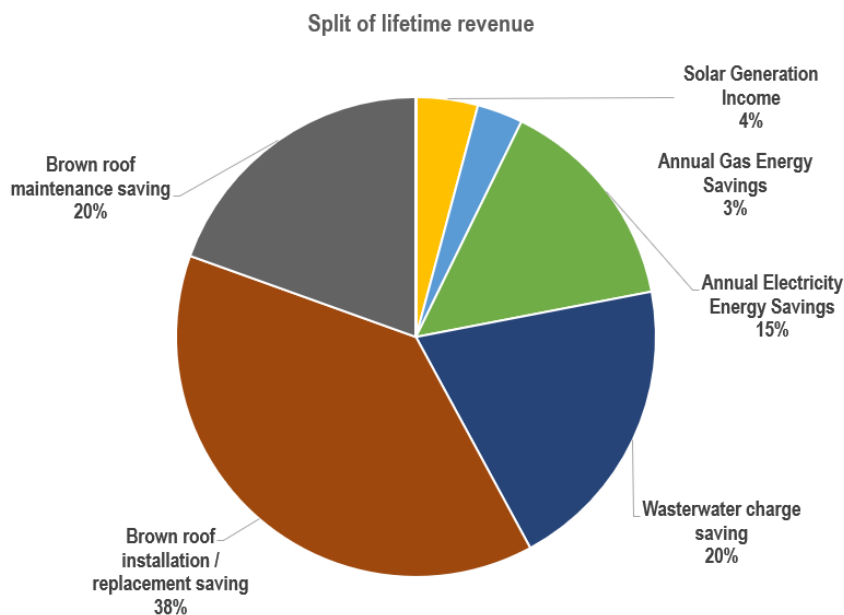
⁸ Carbon has been valued based on the combined benefits of avoided carbon emissions from energy savings and carbon sequestration in green roof biomass. The UK government BEIS carbon values (2021) have been used to value avoided emissions over a 25 year period.

⁹ Valued based on Defra metric 3.0 assuming moderate condition is achieved, monetary value assumes biodiversity unit value of £11,000

pipeline identification to understand their regeneration plans and the potential for green roofs on their sites. The [IGNITION Green Roof benefits calculator](#) will be a key engagement tool to provide initial insight.

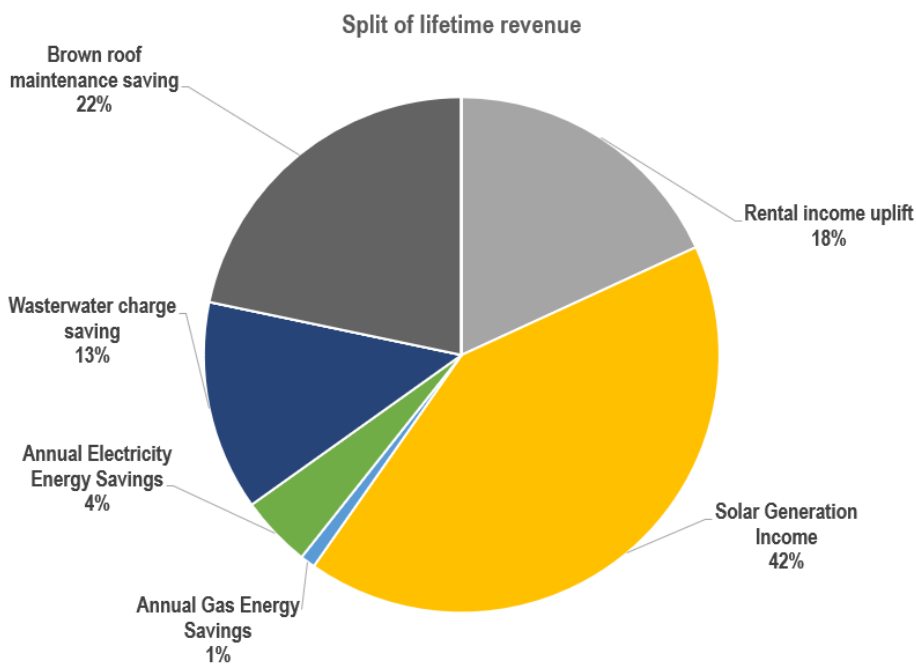
A cost benefit analysis for each pilot site was created using average benefit data that creates a holistic understanding of the green roof investment, as actual performance data for each site and each benefit is not available. The analysis is as follows:

Unicorn Grocery, Manchester	
Size of green roof	600
Type of green roof	Mixed
Property	Grocery
Solar pv	3.2 kw
Property uplift	Not included
Roof replacement	Yes
CAPEX	£69,800
OPEX	£1,900 yr.
Return	6%
Payback period	14 years
NPV of the Project (5% Cost of Capital)	£1,858



Roof insulation was required for this property and estimates for insulation have been used instead of the cost of roof replacement. Capital installation cost were kept low by Unicorn Grocery as they did not use a specialist supplier and had a small solar array. The roof was designed to be maintained by volunteers reducing annual maintenance cost. Property uplift was not included as this is an owner occupied building with no intention of sale.

Spectrum Apartments, Salford	
Size of green roof	300 m2
Type of green roof	Extensive
Property	Apartments
Solar pv	25 kw
Property uplift	No
Rental uplift	Yes
Roof replacement	No
CAPEX	£69,960
OPEX	£2,366
Return	1%
Payback period	22yr.
NPV of the Project (5% Cost of Capital)	-£22,000

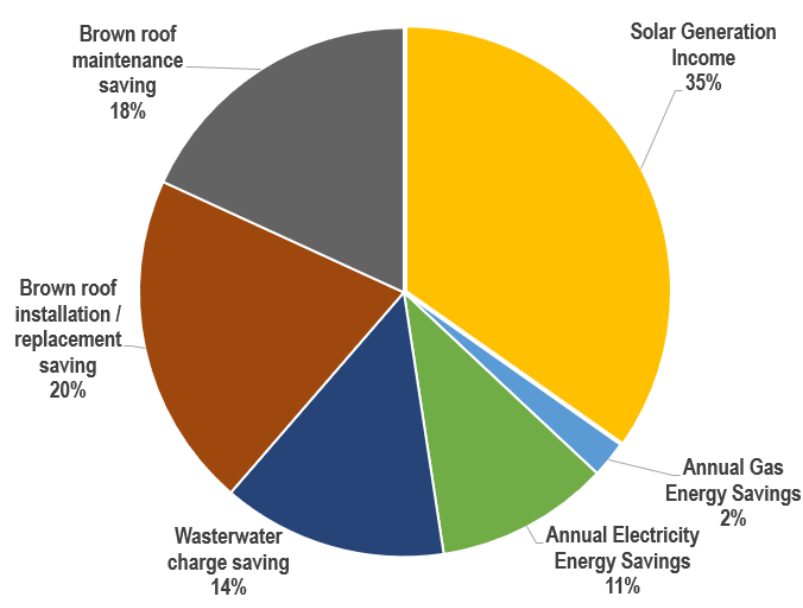


Relatively new apartment building and therefore roof replacement was not included. If roof replacement included would boost IRR to 4%. Rental uplift was included to reflect that the roof would provide a view of greenspace for residents in surrounding apartment blocks but would be a traded-off with rental value uplift. If property value uplift was included this would boost IRR to 3%.

City Centre West Premier Inn	
Size of green roof	240 m2
Type of green roof	Extensive
Property	Hotel
Solar pv	20kW
Property uplift	Not included
Roof replacement	Assumed

CAPEX	£55,968
OPEX	£1,893 yr
Return	3%
Payback period	18 years
NPV of the Project (5% Cost of Capital)	-£5,411

Split of lifetime revenue

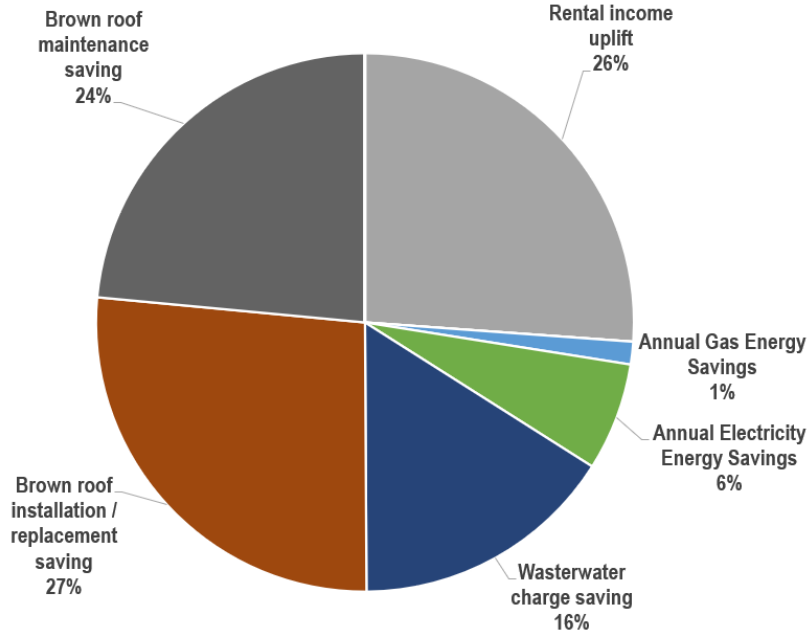


Excluding assumed roof replacement drops return on investment below 0% over 25 years. Including property value uplift increase return on investment over 5%. Property value uplift is not cashable and should be used with caution.

Bloc Building, Manchester	
Size of green roof	525 m2
Type of green roof	Semi-extensive
Property	Office
Solar pv	No
Property uplift	No
Rental uplift	Yes
Roof replacement	Yes

CAPEX	£69,930
OPEX	£3,260
Return	7%
Payback period	12
NPV of the Project (5% Cost of Capital)	£12,300

Split of lifetime revenue



Renovated city centre office with high rental value per m2. If average rental value for GM are used then the project does not deliver a return on investment. Property value not included as property is owned and managed by Bruntwood as a portfolio of rental offices.

Considerations

- **Split incentives** – as many commercial buildings are not owner-occupied, some financial savings such as reduced energy and wastewater bills do not always accrue to the investor (the owner) but to the buildings bill payer (the occupier). To address this challenge a mechanism is needed to recoup these benefits, with current solutions varying from on-bill finance mechanisms to green leases¹⁰. This was avoided by two of our pilots (Unicorn Grocery and Bloc Building) as they are owner-occupiers who will see 100% of the returns and rewards.
- **Cashable benefits** - some financial benefits, such as a rise in property value, are not cashable until a property sale and therefore cannot be used to payback investments in the short term.
- **High capital costs** - the capital costs of a green roof are much higher than a conventional roof. Therefore, the multiple benefits and returns associated with green roofs need to be emphasised early on.
- **Structural loadbearing capacity** - some roof types will already have sufficiently high structural load bearing capacity to easily take the additional weight of a green roof. However, other roof types require additional costs to cover strengthening.
- **Design** - green roofs are generally designed by a specialist supplier or landscape architect which adds an additional cost.
- **Planning permission** - whether planning permission is required for a green roof is often unclear, creating uncertainty for building owners.
- **Accessibility** – health and safety restrictions on roof access in most buildings limit the social benefits of an installation, as well as possible commercial appeal.

Beyond IGNITION: Progressing investment in green roofs

To accelerate the uptake of green roofs, it is important to recognise, promote, and engage building owners with the non-financial benefits, as well as building an understanding of the conditions where a return on investment is possible. IGNITION sought to address both of these issues by collating and creating data on green roof performance, scoping a sample urban environment for green roof potential, and modelling the green roof benefit calculator on the pilot sites.

Businesses should seek to engage with their Local Authority on installing green roofs. As well as providing clarity on planning requirements, some authorities may have subsidies or grants in place to further incentivise investment. If no subsidy programme is in place, outlining your businesses' openness to the idea might help to start a conversation locally and with other businesses and building owners in the area.

Recommended actions for **Local Authorities** are:

- **Upskill planners** - to ensure they promote the inclusion of green roofs in redevelopments and developments where possible.
- **Clarity on planning requirements** - for green roofs across all Greater Manchester Local Authorities.
- **Subsidies** – subsidies or grants would increase competition between green roof suppliers and reduce installation costs
- **Planning policy instruments** - planning levers could incentivise the installation of green roofs during redevelopment of buildings, such as Biodiversity Net Gain or an Urban Greening Factor

¹⁰ [ECEE Practice to overcome split incentives in the EU building stock](#)

which place quantitative greening targets during building re-development and recognise the value of installing a green roof.

- **Align with low carbon grants** – explore opportunities for the formal inclusion of green roofs and walls in grants for property retrofit to achieve carbon reduction targets.
- **Understand potential** – Utilise aerial mapping and AI to identify potential for green roofs (This process was completed by Gentian for the IGNITION project)

Recommended actions **property owners or managers** are:

- **Get a holistic view of a green roof install** – generate a site-specific report on the green roof benefits using the [IGNITION Green Roof benefits calculator](#).
- **Inspire** – investment through engagement ‘seeing is believing’ projects, such as the [IGNITION nature-based solutions living lab](#).
- **Engage estates managers** – to reduce barriers to roof access and provide confidence enabling public access in a safe way to roof spaces.

The source of this summary toolkit is an extensive technical report authored by [Rachel Morrison at Greater Manchester Combined Authority](#).

Key resources

- Read about the business benefits of nature-based solution in the [Nature-Based Solutions to the climate emergency: The benefits to business and society report](#)
- Determine the individual benefits to your business using our interactive [Green Roof Benefits Calculator](#)
- Discover the multiple ways that businesses can introduce nature-based solutions into their workspace in [BITC’s Guide to Greening Your Workspace](#)
- [Watch a virtual tour of the IGNITION nature-based solutions living lab’s green roof](#) at the University of Salford
- [View live thermal and hydrological data](#) from the IGNITION nature-based solutions living lab’s green roof
- Seek support and resources from [UK Green Building Council](#)
- Watch this webinar on [changing the real estate landscape](#)

More information

Find out more about the IGNITION project by visiting the project website:
www.IGNITIONgm.com.



