Barking Riverside Green Roof Ecomimicry Experiment

Year of issue

2025

Summary

Barking Riverside piloted an ecomimicry approach to green roofs to conserve a regionally important brownfield invertebrate community, including target species such as the brown-banded carder bee (Bombus humilis) and Gymnosoma nitens. Roof test bays reproduced open-mosaic niches (varied substrate depths, recycled aggregates, ephemeral pools), and monitoring showed these designs could retain pre-development biodiversity while delivering connectivity and ecosystem services. Since then, the method has been formalised in guidance and peer-reviewed research and used to inform wider green infrastructure across the development. At borough scale, by end-2017 Barking & Dagenham hosted 51,658 m² of green roofs, with over 25,000 m² at Barking Riverside (nearly half the borough total), evidencing roll-out beyond the initial trials. Current planning documents continue to mandate ecologically sensitive roofs, with Stage 2 South (2023) targeting 40% of total roof area as green roofs and 10% as brown roofs, and the 2024 Local Plan reinforcing green/brown roofs and locally appropriate planting. Early delivery included ~50 homes (≈20 m² each) and a 2,100 m² roof (1,500 m² vegetated), preceding the broader programme.

Photo Gallery



Location

51.520402, 0.118587

Project

NWRM

National ID

UK_7

Sector

Urban

Installation Date

2013-2014

Implementation status

Completed

Contact

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Overview

Location of the project

Barking Riverside, London Borough of Barking & Dagenham, UK
Post-industrial brownfield site that supported important biodiversity now being redeveloped to provide 11,000 homes

Country

United Kingdom

NUTS2 Code

Outer London

Sponge measures implemented in the case study

Green Roofs

Objectives

Create green roofs that support ≥53 invertebrate species including nationally rare taxa.
Achieve vegetation cover supporting >110 plant species, with spontaneous colonisation.
Retain stormwater up to 80 mm temporarily.
Match or exceed the water retention of standard sedum roofs.
Improve floral and faunal richness over two years of monitoring

Involved partners

Authority type	Authority name	Authority role	Comments	Authority responsibility
Other	Barking Riverside Ltd	Initiation of the measure	Developer; coordinated implementation	Responsible
Research institute / University	University of East London	Monitoring	Scientific lead for research and monitoring.	Supporting
Local water authority	London Borough of Barking and Dagenham	Implementation	Local authority; involved in planning and governance.	Responsible
Local water authority	Greater London Authority (GLA)	Implementation	Strategic oversight; partner in public-private cooperation.	Responsible
Research institute / University	Institute for Sustainability	Determination of design details of the measure	Provided sustainability expertise.	Supporting
Architects / Engineers	Green Infrastructure Consultancy	Determination of design details of the measure	Design specialists for GI integration.	Supporting
Architects / Engineers	Hertalan UK	Determination of design details of the measure	Provided roofing membrane expertise.	Supporting
Architects / Engineers	Shire Aggregates Ltd	Implementation	Supplied substrates mimicking local soil conditions.	Supporting
Other	European Commission (DG Research and Innovation)	Financing	Major funder via FP7/TURAS	Supporting

Documents

ecomimicry_barking_riverside-en-vf.pdf (1.48 MB)

Site Information

Climate Zone

Cool temperate moist

Temperature (°C)

11.00 °C

Elevation range

6 m

Slope range

1-2%

Vegetation class

The vegetation mimics early successional brownfield habitats and includes both dry and wetland species. Examples: Lotus corniculatus, Leucanthemum vulgare, Juncus effusus, Lythrum salicaria, etc. This forms a diverse assemblage reflecting open mosaic habitats.

WFD Ecological status

Moderate

WFD Chemical status

Good

Water quality status

Tidal Thames around Barking: all water bodies fail chemical status; ecological potential mostly moderate. Key pressures: physical modifications, urban/transport diffuse pollution, and wastewater discharges.

Design and Implementation

Project scale

Micro

Project scale specifications

The Barking Riverside development covers 443 acres, aiming to build 10,800 homes, schools, and infrastructure for 25,000 residents. Green infrastructure, including green roofs, is implemented across 40% of buildings and 40% of the land area.

Project area

179

Project area specifications

Total Barking Riverside development: 443 acres (~179 ha)
Green roofs installed on 40% of buildings (exact m² not specified)
Each test green roof: 6 × 3 m, with 9 test roofs in the experiment

Principles

The project was based on the principle of ecomimicry—designing green roofs to mimic the ecological functions of the original brownfield Open Mosaic Habitat. It also followed principles of multifunctional green infrastructure, climate resilience, biodiversity conservation, and urban sustainability. The aim was to preserve ecosystem services and regional biodiversity, especially rare invertebrates, by replicating their natural habitats on roofs. Additionally, it integrated SuDS principles and promoted co-creation between scientists, developers, and planners.

Constraints

Potential risks include roof load-bearing capacity limitations due to added water and substrate, risk of waterproof membrane failure if water pooling systems fail, and possible drought stress during dry seasons without irrigation.

Favourable preconditions

Pre-existing brownfield biodiversity and habitat diversity serving as ecomimicry templates.
No intensive vegetation management historically, enabling colonisation by rare species.

Financing

Total cost information

Experimental setup (9 green roofs on containers): €45,000
PhD studentship (3 years): €70,000

Information on Economic costs - income loss

No income loss is reported. The green roofs were cost-comparable or cheaper than standard systems, and land use changes did not displace economic activity that would result in losses.

Financing authorities

Authority name	Type of funding	Comments
European Union	EU-funds: LIFE+	FP7 TURAS €45,000 for experimental setup
University of East London	—	€70,000 PhD funding

Compensations

No

Policy and Governance

Policy description

Mitigates habitat loss from urbanisation and stormwater runoff impacts. Also addresses urban biodiversity fragmentation and ecosystem service degradation.

Land ownership

Barking Riverside Limited (BRL) holds the site freehold.

Policy targets

Improved Biodiversity

Runoff control

Increase Water Storage

Oher Societal Benefits

Target remarks

The design was multifunctional, embedding ecomimicry to mimic the regionally important habitats and their services. Biodiversity and runoff control were equally emphasized, with novel drainage designs enabling enhanced habitat variety and hydrological performance.

Policy pressure

Directive	Relevant pressure
WFD identified pressure	Pressure from urban development and hydromorphological changes.
WFD identified pressure	Risk of pluvial and fluvial flooding in urbanised London.
Other non-EU	Biodiversity Strategy for England & UK BAP: Protection of Open Mosaic Habitat.

Pressure remarks

Policy pressures shaped both the functional goals (flood mitigation, biodiversity conservation) and procedural requirements (e.g. planning consent mandates) for the project.

Policy impact

Directive	Relevant impact
WFD identified pressure	Supports better ecological status through diffuse pollution mitigation.
Floods Directive identified pressure	Reduced runoff volumes and flood risk.
Other non-EU	UK Biodiversity Action Plan: Mitigation for loss of Open Mosaic Habitat.

Directive	Relevant impact
Other non-EU	Climate Adaptation Policy: Contributes to urban cooling and water retention.

Impact remarks

The project responds to multiple interconnected goals across scales—local planning, national biodiversity priorities, and EU-wide GI strategies. It shows synergy in responding to multiple policy drivers simultaneously.

Requirement directive

Requirement directive	Specification
WFD-mitigation of significant pressure	Urban runoff
Floods Directive-mitigating Flood Risk	—

Part of a wider plan

Yes

Wider plan

Wider plan type	Wider plan focus	Name	Comments
National	Urban	National Planning Policy Framework (UK)	Urban regeneration & brownfield reuse.
Regional	Urban	London Plan	Regional policy for sustainable development and green infrastructure.
—	Urban	TURAS FP7	EU-funded urban sustainability programme.

Public consultation

No

Has contractual arrangements

No

Impacts and Monitoring

Monitoring System

Monitoring parameters

Plant diversity and structure via quadrats and transects.
Invertebrate community composition using pitfall traps.
Seasonal and spatial variation in vegetation development.

Maintenance

Maintenance requirements

Minimal. The biodiverse green roofs were designed to reduce management requirements compared to traditional landscaping. The use of drought-tolerant species and design that limits the need for irrigation or fertilization supports low-maintenance operation

Impact Assessment Methodology

Performance impact estimation information

The design compared three roof treatments with different drainage configurations to study biodiversity outcomes and hydrological dynamics.

Biophysical impact assessment method

Botanical and invertebrate surveys, habitat mapping, species richness/evenness calculations, and seasonal variation monitoring were used.

Cost assessment method

No formal cost assessment methodology is described beyond mentioning comparable costs to standard systems.

Socio-economic Impacts

Direct benefits

Reduced construction costs: Green roofs cost less than standard sedum roofs due to removal of drainage layers.
Improved local microclimate: Urban cooling benefits from increased evapotranspiration.
Compliance with planning conditions: Enabled development approval.
Research and innovation opportunities: Hosted PhDs and research funding.
Local engagement: Enhanced community value through aesthetic and nature-connected spaces.

Ancillary benefits information

Supports climate change adaptation (stormwater buffering, cooling).
Increases habitat connectivity for urban biodiversity.
Raises awareness and engagement around nature in urban development.
Enhances academic-practice partnerships and supports educational use.

Biophysical impacts: Hydrology

Hydrological effects

Slows down stormwater runoff using substrate saturation and surface pooling, enhances water retention at roof level, promotes evapotranspiration, reduces immediate runoff into SuDS infrastructure.

Information on retained water

Treatment 3 retained up to 80 mm of rainwater temporarily via elevated drainage.
Roofs retained water in substrate and surface pools. Geotextiles at base also held and gradually released water.

Information on runoff reduction

Ecomimicry roofs matched or outperformed standard sedum roofs in stormwater attenuation, with slower drainage from pooled designs.

Ecosystem water supply

No measurable change in supply.

Biophysical impacts: Biodiversity

Improved biodiversity

Yes

Information on improved biodiversity

Habitat creation: Mimics ephemeral wetland, ruderal, and scrub habitats.
Plant species: 114 species recorded (36 planted, 78 spontaneously colonised). Many colonisers were characteristic of high-quality brownfield sites.
Invertebrates: 53 species recorded, including Scybalicus oblongiusculus (RDB1), Bombus humilis (UKBAP), and Lasioglossum pauperatum (RDB3).
Community benefits: Created habitat heterogeneity with mounds, wet and dry areas, and bare ground, supporting a wide range of taxa.
Soil fauna and benthos: Not assessed due to rooftop context, but surface biodiversity was strong.
This confirms the effectiveness of ecomimicry for rare and conservation-priority species.

Biophysical impacts: Water & Soil Quality

Water quality overall improvements

N/A info

Information on water quality overall

Water quality effects are likely positive due to filtration by substrate and retention of pollutants in runoff, but no empirical water quality measurements are reported for Barking Riverside.

Information on soil quality overall improvements

No evidence of soil pollution reduction or carbon storage, but soil-like substrates were ecologically functional.

Information on soil quality, overall soil nutrients

Substrates were designed using low-nutrient aggregates to mimic brownfield soils, aiming to limit nutrient loading and support high biodiversity.

Information on soil quality, overall soil physical properties

Physical properties such as friability and heterogeneity were intentionally recreated using PFA and recycled materials to support early successional species.

Biophysical impacts: Others

Information on ecosystem impact climate regulation

Thermal insulation benefits were observed. Biodiverse roofs performed as well or better than standard sedum roofs in reducing building heat gain and promoting urban cooling through evapotranspiration, contributing to climate regulation

Increased evapotranspiration information

Evapotranspiration increased due to the use of deeper and moisture-retentive substrates. However, there is no quantified data.

Information on mitigation other biophysical impacts

Thermal insulation improvement, reducing urban heat island effects.
Habitat connectivity at roof level, acting as a “stepping stone” for species movement.
Microtopography impacts (mounds, slopes, depressions) enhanced diversity of niches.

Lessons Learned

Key lessons

Ecomimicry successfully replicated brownfield habitats on green roofs. Design must include microhabitat diversity and local ecological knowledge. Pooling design can be integrated without damaging the waterproof membrane. Industry standardisation limits biodiversity; flexibility and co-creation improve outcomes.Long-term monitoring is needed, but even short-term results showed high colonisation.
The partnership model between academia, developers, and public bodies was crucial.

Success factors

Success factor type	Success factor role	Comments
Attitude of relevant stakeholders	Main factor	Positive, with collaborative engagement.
Available support tools	Secondary factor	TURAS FP7 provided structure.

Cost effectiveness

Biodiverse green roofs were found to be as cost-effective, or even cheaper, than industry-standard sedum systems. They provided additional ecological benefits without increasing construction costs due to elimination of separate drainage layers.

Flexibility / Adaptability

Roof design allowed for variable drainage depths and substrate types.
Design adapted over phases to improve habitat simulation.
The system could revert to standard green roof function if pooling layer failed.
The project was designed to be context-sensitive, allowing other regions to adapt similar principles to different habitats.

Transferability

Transferable Elements:
- The ecomimicry approach (using local habitat templates) is universally applicable.
- Modular roof design adaptable to different species and substrates.
Challenges:
- Requires site-specific ecological knowledge and design expertise.
- Architects may resist standing water unless managed carefully.
- Must ensure drainage does not compromise roofing infrastructure.
Opportunities:
- Suited to urban redevelopment with biodiversity goals.
- Strong potential where brownfield land is being lost