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Several Nature-based Solutions contribute to Liverpool's climate resilience

Urban Greening Actions to tackle flood risk, urban heat and improve citizen well-being in the UK

The city of Liverpool is boosting its efforts to improve urban green and blue infrastructure to achieve climate and socio-economic resilience.

Key Learnings

- **Coordination improves reach, efficiency, and effectiveness**: Coordinating targeted, small-scale, and low-cost Nature-based Solutions within an overarching strategy across four pillars increases their effectiveness, efficiency, and reach.
- **Interdisciplinarity improves adaptation outcomes**: Involving an interdisciplinary project team – from engineers to nature conservation departments and NGOs – in such a process leads to effective climate change adaptation.
- **Awareness raising pays off**: Making awareness raising an essential part of any project rather than an accompanying measure pays off. The reward is local support and synergies with local and regional stakeholders.

About the region

Liverpool, a coastal city located in northwest England, spans approximately 112 km² and is home to around 484,500 (2025) inhabitants. The city features a diverse landscape, including urban areas, waterfronts along the River Mersey, and various green spaces. Liverpool has committed to enhancing its climate resilience and committed to improving green infrastructure and environmentally conscious urban planning with the “Liverpool City Green Infrastructure Strategy”.

Climate Hazards

Flooding, Extreme Heat, Sea Level Rise, Storms

Sector

Water Management, Coastal Areas, Urban, Biodiversity protection

Key system

Water Management, Ecosystem and Nature Based Solution

Figure 1: Location of Liverpool. Image Credit: Maps.

Climate Threats

Liverpool faces significant climate-related challenges, such as an increased risk of extreme weather events and flooding due to rising sea levels and more intense rainfall. The coastal city’s key concerns include coastal and urban water management, threatening the city's infrastructure and public health facilities, and weakening the city’s economy. In parallel, urban densification and expansion lead to redevelopments, conversions or fragmentation of Liverpool’s (interconnected) urban green spaces. A major challenge is to ensure strong interconnectivity between people, their homes or workplaces, and essential services. Urban depopulation has worsened the problem of poor open spaces, leading to environmental degradation that threatens human health and quality of life. Maintaining vital ecosystem functions, such as supporting, provisioning, and regulating natural resources and ensuring good air quality, is becoming increasingly difficult.

A Broad Spectrum of Nature-based Solutions Supports Urban Climate Resilience

The “Liverpool City Green Infrastructure Strategy” foresees several actions to tackle the city’s climate challenges. Guided by this strategy, Liverpool joined URBAN GreenUP and implemented more than 40 innovative Nature-based Solutions to strengthen urban climate resilience, following four intervention pillars: green routes, water interventions, stand-alone green infrastructure and non-technical interventions.

New green routes for pedestrians and cyclists, spanning 4.3 km, with trees cooling air temperatures by 2 to 4°C and improving air quality within the city, benefit up to 160,000 citizens. In addition, the trees and shrubs reduce carbon emissions by capturing carbon. The new green routes improve accessibility,

connectivity, air quality and road safety. The interventions required stakeholder and landowner cooperation due to different ownership structures across city sites.

Water interventions – the city installed a Sustainable Drainage System, which reduced the flood risk, stored 1,500 m^3 of rainwater, enhanced water quality, and provided ecological benefits. Urban catchment forestry with rain gardens and water retention ponds (Figure 2) as part of the Sustainable Drainage System contributes to flood prevention because it regulates stormwater runoff. Besides reducing flood risk, these measures also reduce the heat within the city.

Figure 2: Water retention pond realised at Otterspool Park, Liverpool. Source: URBAN GreenUP. Image Credit: Julite Staples.

As a part of the urban catchment forestry, Dawn Redwood tree plantings along roads, combined with sustainable urban drainage, reduce excess highway water. So-called silva cells – a modular underground solution preventing soil compaction – support root growth, drainage and stormwater management. As part of the measures, bird and bat boxes mounted on the trees improve biodiversity near the water retention ponds.

Stand-alone green infrastructure, such as green walls and roofs, enhances soil functionality and biodiversity, promoting areas for pollinators. Mobile and floating gardens complement the city's green areas. It reduces urban heat and visibly promotes greener cities by drawing public attention (Figure 3). A similar intervention was implemented at St. John's. It covers about 200 m^2 and is 65m high, which makes it one of the highest green walls in the UK.

Large trees and hedges act as natural filters for urban pollutants, improve natural plant growth and the effectiveness of Nature-based Solutions.

Figure 3: Green wall implemented at Parr Street, Liverpool. Source: URBAN GreenUP. Image Credit: Julite Staples.

Non-technical interventions, like educational, engagement, and awareness activities for citizens, as well as support activities for implementing Nature-based Solutions, are also part of the project. The project team introduced a Forest School concept and developed a bio app for identifying local biodiversity to engage the local community. A new platform to provide a project overview facilitates citizen and company engagement and provides mentorship by Liverpool City Partners. The non-technical interventions resulted in broad citizen and partner engagement. The school concept and the bio app raised local awareness for flora and fauna, as well as the citizens' ability to identify local species. The app also benefited local biological records. These non-technical interventions positively impacted well-being and even mental health among citizens.

Governance and Financing Nature-based Solutions in Liverpool

The Liverpool City Council funded the measures with about € 21 million, supported by the Horizon Project Urban GreenUP with € 350,000. Local stakeholders, broad citizen engagement, city authorities, supported by expert knowledge, formed the Governance. Liverpool's Green Space Review outlines the Council's approach to green spaces. Additionally, the Local Plan sets out policy on green infrastructure and describes Green Infrastructure as can be read in the following:

> *"The collaborative approach fostered strong partnerships between cities, research institutions and private companies, ensuring the long-term sustainability and replication of the adaptation efforts.",*
>
> *Raúl Sánchez (Source: European Commission)*

The plan's neighbourhood-level focus is strengthening community stewardship of green spaces. Liverpool City Council has implemented 40 interventions with a total budget of approximately € 2.3 million.

Lessons Learned from Implementing Nature-based Solutions to achieve Climate Resilience

For documenting and ensuring impact, the project team monitored the Nature-based Solutions, using key performance indicators. The outcomes demonstrate that the measures are instrumental in achieving significant results. The Nature-based Solutions positively impact the following key performance indicators:

- Carbon storage and sequestration
- Air quality
- Reductions in city temperatures and risk of urban heat waves
- Urban biodiversity, with positive effects on various insect and plant species
- Citizen health and well-being
- Citizen engagement with Nature-based Solutions

Summary

Targeted distribution of small-scale interventions across four pillars – green routes, water measures, stand-alone solutions, and non-technical actions – feeds into a wider urban greening strategy that enhances Liverpool's liveability. Awareness-raising and educational activities help residents better understand biodiversity, Nature-based Solutions, climate change, and available adaptation options. These interventions bring multiple benefits: they help manage stormwater and reduce flood risk, lower urban temperatures, support biodiversity, and make the city a more attractive, healthier place to live.

Further information

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- https://networknature.eu/casestudy/29484
- https://cordis.europa.eu/project/id/730426/results

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