urban nature-based solutions—

policy, practice and overcoming barriers to investment

Ian Mell, **Sarah Clement**, **Juliet Staples**, **Paul Nolan**, **Clare Olver** and **Fearghus O'Sullivan** draw on the experience of the Horizon 2020-funded URBAN GreenUP project in Liverpool to reflect on how best to invest in helping to make climate-resilient places through nature-based solutions

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Living green wall in Parr Street, Liverpool

Following the release of the reports from the Sixth Assessment cycle of the Intergovernmental Panel on Climate Change (IPCC) between August 2021 and April 2022 and discussions at the COP26 Climate Change Summit held in Glasgow in November 2021, there is increasing global focus on the role

of nature—and specifically the management of ecological resources—in supporting more sustainable forms of planning. The predictions outlined in the IPCC's *Climate Change 2021: The Physical Science Basis* report[1] paint a stark picture of the Earth's future without substantial changes to the ways in which we plan, manage, and develop urban areas. The IPCC sets out a view of planning that offers a contrast to the planning reforms presented by the Westminster government in 2020, the latter focused on the speed of decision-making, digitalisation of the planning profession and 'beauty' as core components of a functional planning system.[2]

The mixed reception to the outcomes of COP26 illustrate the complexity of decoupling economic growth narratives from current political thinking in order to support more ecologically focused practices.

However, the updated National Planning Policy Framework (NPPF) issued in 2021 suggests that there is potential for a greater emphasis to be placed on the role of effective environmental resource management in creating and sustaining resilient places.[3] While changes to UK planning policy continue, with a deregulatory trend, environmental considerations are increasingly being mainstreamed within urban planning practice. The emergence of concepts such green infrastructure, natural capital, ecosystem services, and, more recently, nature-based solutions has successfully permeated outwards from the environment sector into the discussions of planners, developers, and communities. Consequently, there is an emerging evidence base, supported by a suite of ecologically focused five-year EU Horizon 2020 projects[4] that are delivering research and innovation in nature-based solutions and helping to establish the socio-economic and ecological justification for the greening of our cities.[5]

Unfortunately, there remains a reluctance in some sectors of the natural and built environment profession to engage with this evidence. In practice, this has led to an ongoing 'business as usual' approach from many quarters, despite clear evidence that this is no longer sufficient. Calls for investment in urban nature are, as a consequence, becoming more frequent as the impacts of climate change become increasingly visible and disasters linked to environmental change (such as drought, flooding, wildfires) become difficult to ignore.

To address the impacts of these changes, a growing set of policies, projects and evidence is amassing on the added value that investment in urban nature can deliver. The EU-funded URBAN GreenUP,[6] Grown Green[7] and Connecting Nature[8] projects have been at the forefront of such research, working with cities, academics, communities, small- and medium-sized enterprises (SMEs) and the environment sector to rethink the ways in which we plan for socio-economic *and* ecological sustainability in our cities.

Each project has undertaken a range of practical studies, ranging from small-scale urban agriculture to neighbourhood investments, to build a more holistic understanding of implementation and outcomes. Moreover, each project seeks to implement nature-based solutions in a way that positively impacts their locale through more effective integration of socio-economic and political considerations in policy and delivery mandates.[9] This process remains difficult to achieve in all instances, but, by examining the constraints associated with delivering nature-based solutions, how policy and political changes influence this process, and examples of successful implementation, best-practice strategies can be proposed for investment in other urban areas.

'Framing such discussions is the evolving understanding of nature-based solutions both as a concept and as a framework for delivering more effective nature-based planning in urban areas'

As we move towards the end of the five-year (2017-2022) funding period of these Horizon 2020 NBS projects, we can start to examine their successes, as well as the ongoing challenges to effective delivery of nature-based solutions. A 'learning-by-doing' approach has been a crucial component of each project, as partners have been able to examine what works, what doesn't, and where changes are needed in the future. If these lessons are to be used to change the way that urban greening projects are implemented, it is important to reflect on how theoretical ideas translate into practice.

Framing such discussions is the evolving understanding of nature-based solutions both as a concept and as a framework for delivering more effective nature-based planning in urban areas. This process is supported by an academic debate that has synthesised institutional practices, policy mandates and perceptions of urban nature to call for a systematic understanding of urban nature, the benefits of nature for people and biodiversity, and the promotion of sustainable socio-economic and ecological outcomes—all linked to better communication of these benefits.[10] Moreover, there is an ongoing call for nature-based solutions development to be context specific—i.e. reflective of localised and strategic needs. Although practice can, and does, draw on evidence of innovation across geographical and climatic zones, the particular ways in which nature-based solutions are delivered must be appropriate for any given location.[11]

Using the activities of Liverpool (one of the three URBAN GreenUP 'frontrunner' cities[12]) as an example,

this article outlines prominent areas influencing the development and delivery of the project's nature-based solutions. It is important that planners, academics and practitioners reflect on how best to align nature-based solutions thinking with practice, and to consider what barriers to the delivery of investment in more climate-resilient places are still to be overcome. The following discussion focuses on the ways in which the Liverpool project team have navigated these issues to deliver the objectives of URBAN GreenUP.

Effective collaboration

A core aspect of the Horizon 2020 programme is collaboration between local government, environmental bodies, SMEs, communities, and academic institutions. Such collaborations allow for the exchange of evidence, best practice and innovation in shaping, designing and evaluating projects. And the involvement of the various sectors is aimed at enabling all the nature-based projects undertaken to implement novel solutions to climate, biodiversity and water management, while taking into consideration socio-economic, health and educational considerations. Moreover, the partnerships created to deliver the Horizon 2020 nature-based solutions agenda span diverse geographical and political systems, providing scope to test nature-based solutions in a range of environments.

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For example, URBAN GreenUP works with 'frontrunner' city partners from the UK, Spain, and Turkey, but draws on additional expertise from Australia, China, Columbia, Germany, Italy, and Vietnam, as part of the wider project team. Incorporating such a wealth of experience within the project services a broader aim to develop a transferable methodology for implementing nature-based solutions in different locations.

At the same time, it was recognised that working in such a diverse group of locations required concerted attention to political, practical and biophysical factors, to ensure that any subsequent replication considers contextual factors. Among such factors has been a recognition that supportive local government is needed to provide the political backing for each project, enabling it to move from the initial bidding stage, through tendering and design, and into implementation and evaluation. The elongated timeframes associated with such a process call for an appreciation of local government processes, and an understanding that the benefits of project delivery will be more medium term than immediate.

Political support for greening projects was of critical importance in Liverpool, as it helped to generate visibility for each project within the wider URBAN GreenUP portfolio. In general, political support generated a level of political authority to interventions, enabling partners to work with the knowledge that the proposed projects had support from each host city.[13]

Differences in working cultures and local political agendas and the problems of delivering comparable projects across distinct climatic zones during a pandemic combined to make it challenging for URBAN GreenUP project managers, and the 'frontrunner' cities, to facilitate successful partnerships. Consequently, ongoing negotiation has been needed to ensure that processes have been tailored by all partners to effectively deliver small- and strategic scale nature-based solutions in each partner city.

Moreover, a process of intra-organisational alignment has been needed to allow discussions to be driven by the benefits of investment in nature-based solutions, rather than by the historical limitations placed on project work by inter-departmental misalignment (such as highways versus environment or tree officer considerations in Liverpool City Council). Where diversity in political, financial and community support is visible, city co-ordinators have been influential in negotiating engagement and delivery, although again this has led to extended timeframes being needed to facilitate consensus. Moreover, changes in project staff over the five-year project period, as witnessed in Liverpool, required constant re-appraisal of the ways in which each city/partner developed their work packages to support delivery and evaluation.

A related area in which extensive discussion has been needed was in the setting of key performance indicators (KPIs), replicable across all locations. For example, calculations of the number of heat stress days are difficult to align across climatic zones. Liverpool's climate is temperate, and so does not mirror the Mediterranean climatic and/or temperature stresses measured in Turkey or southern Europe (in Valladolid in Spain, for example, heat stress is considered to result from daytime temperatures of over 35°C and night-time temperatures of over 18°C). Furthermore, ongoing consideration is needed to establish consensus between how hydrological and air quality KPIs are measured when the physical composition of each nature-based intervention varies in each city.

Despite URBAN GreenUP's aim to develop a portfolio of nature-based interventions that are

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Street tree intervention on The Strand, Liverpool

applicable to multiple locations, there remains a need to examine local climatic and urban contexts within these discussions. To address these issues the project co-ordinators worked extensively with city leads (and the consortia of city partners) to establish KPIs that were locally applicable, as well as replicable across partner cities. This required concessions to be made by all partners and for monitoring plans to be modified accordingly, so as to provide multi-city datasets for comparison.

Identifying strategic and local needs

Although each nature-based solutions partnership brought together collaborators from across the world, they all had to consider how best to align local needs with provision that could meet strategic objectives. In some cases, there was greater alignment between these objectives, i.e. between the effectiveness of nature-based solutions in moderating urban temperatures for citizens and overarching climate adaptation practices. Valladolid provides one such example—green walls and green awnings (topped with vegetation) have been used to provide valuable street shade during hot weather, linked to the wider city 're-naturing urban plan' associated with URBAN GreenUP. And in Liverpool attempts to address air pollution on major roads in the city were made through investment in new street layouts, street tree interventions, and green walls.

In practice this meant that nature-based solutions interventions were centred on locations that had the most visible benefit to the city, even if they may not have been situated in areas of greatest need. Although nature-based solutions are most often presented as mechanisms for addressing socio-economic and ecological problems (especially in deprived areas of cities), the reality of investment in Liverpool required that they instead act as testing grounds for innovation in places identified as strategic growth areas. Such places included the city centre (for example the green wall at St Johns shopping centre), parts of South Liverpool (for example sustainable drainage in Otterspool Park), and areas of mixed light-industrial/residential/commercial redevelopment (for example nature-based solutions investments in the Baltic Triangle area). The selection of these sites may have departed from theoretical ideas about nature-based solutions, but they represent a pragmatic consideration of how to maximise the visibility of successful nature-based interventions and provide templates for further development across the city.[14]

The Liverpool experience differed from the choices made for the Grow Green project in Manchester, for example, which centred its intervention on a site of significant socio-economic and ecological need in East Manchester, to meet both local and strategic needs.

Central to the potential mismatch between strategic and local interventions is the fact that all cities make decisions based on their existing development plans, and on the alignment of the objectives within them with the politics underpinning

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Living green wall at St Johns shopping centre, Liverpool—providing air quality benefits and visually striking, if spotted high above ground level

investment. Consequently, the identification of strategic sites for nature-based solutions faces challenges if it is at odds with the wider understanding of need within a city.

For example, a review of the analysis undertaken for the *Liverpool Green Infrastructure Strategy*[15] and the *Strategic Green and Open Spaces Review Board: Final Report*[16] illustrates a divergence in application between the two documents and the URBAN GreenUP interventions. In both documents, areas of North Liverpool were identified as being significantly more likely to suffer from surface water flooding, poor air quality, long-term ill-health, and barriers to accessing green space when compared with areas of South Liverpool. It is therefore critical for project partners to work effectively with local communities (residents, businesses, and the environment sector) to outline the rationale for each choice being made.[17] The need to explain the reasoning behind the suite of URBAN GreenUP developments has allowed the city to identify how the projects can be used as exemplars for other parts of the Liverpool, in order to generate support at the local level for further investment.

Managing expectations

An ongoing activity for partners in Liverpool has been the task of managing the expectations of both project partners and local communities regarding the delivery and added value of investment in nature-based solutions. Key stakeholders and funders have to be clear about just what can be achieved through a portfolio of interventions. Moreover, there is a need to moderate community expectations of immediate impact from nature-based solutions on local environmental quality. For example, there is a view in Liverpool, as reported in the *Strategic Green and Open Space Review Board: Final Report*,[18] that mismanagement of urban green spaces has historically led to spatial inequalities in provision between the north and south of the city—but URBAN GreenUP was not structured to address these longstanding debates. Alternatively, it was proposed as a mechanism to highlight the options that were available to Liverpool City Council (and its partners) in support of a targeted, locally specific approach to investment.

The use of green walls and floating ecosystems in Liverpool highlights the complexities involved in such decision-making. Two green walls were developed as part of the URBAN GreenUP project—the St Johns shopping centre[19] living green wall (65 metres long and designed to include over 14,000 evergreen plants) and the Parr Street[20] living green wall (132 square metres and made up of over 12,000 plants). The former aims to mitigate air pollution associated with the city's bus station. The latter offers improved aesthetics (i.e. greening of grey infrastructure) and smaller-scale air quality improvements. Both are visibly striking and offer a counterpoint to the highly urbanised areas within which they sit. However, the St Johns green wall can be easily missed as it sits high above ground, and indeed eye level, while the Parr Street intervention is not located on a main road. Both provide critical benefits in local air quality mitigation but could be invisible to members of the public not actively looking for them.

The floating ecosystem islands[21] are nature-based interventions that may appear to do little but

Juliet Staples/Liverpool City Council

Above and right: New floating ecosystem islands—nature-based interventions that may appear to do little but are perform key ecological functions

Juliet Staples/Liverpool City Council

are performing key ecological functions for the city. A 63 square metre saltwater island located in the Wapping Dock area provides additional habitat to support estuarine biodiversity. The 25 square metre freshwater floating island system in Sefton Park provides a new habitat and forage for pollinating insects and helps to improve water quality. Both projects have received a variety of both positive and negative feedback from expert interviews and from residential respondents to postal/online surveys undertaken for URBAN GreenUP, related to their location, size, composition, and aesthetic quality.

However, there has been less consideration of the ecological value of these investments within public survey responses, even with extensive communications from Liverpool City Council about their worth. Both islands are examples of projects that might not seem to immediately deliver benefits to Liverpool but are in fact adding critical habitat connectors to local biodiversity networks.

A common factor emerging from the suite of urban greening projects funded by the EU is the need to communicate and demonstrate their diverse socio-economic and ecological value to a variety of audiences—including those with knowledge of ecological systems and those who the judge the value of a location simply on amenity value or aesthetic quality.

The URBAN GreenUP team have successfully met this need by developing support from local government officials for investment through long-term engagement using the *Strategic Green and Open Spaces Review Board: Final Report*,[16] the *Liverpool Green Infrastructure Strategy*[15] and other environmental projects to communicate the added value of investing in urban nature to the local economy and Liverpool's residents. This has provided the project team with lines of communication between the council, local communities, and other partners to disseminate the 'hows' and 'whys' of the project to a wider set of stakeholders.

However, this work has not been straightforward, and the aesthetic and amenity value of the project's interventions have been questioned by residential respondents to URBAN GreenUP intervention surveys.

Scale, location, and visibility

The experience of URBAN GreenUP in Liverpool also raises the question of the scale at which nature-based solutions are best delivered. Should investment be focused on landmark projects, such as West Gorton Sponge Park in East Manchester, or make use of a suite of smaller-scale options to target specific investment in areas of need? There is no simple answer to this, but the evidence from Liverpool suggests that a middle ground between these two approaches may be the most appropriate course of action.

The nature-based solutions delivered in Liverpool worked locally with investments in 'singular' individual green infrastructure/nature-based solutions[22] (such as pollinator greening and 'moveable forests'[23] in the city centre) and strategically in larger schemes of de-culverting urban waterways in South Liverpool and the extensive planting of street trees on main thoroughfares in the city centre. URBAN GreenUP project interventions were subsequently questioned by the public, development and environmental sector advocates, and local government officials—over the location, type and scale of intervention, and whether it could deliver the breadth of benefits proposed. In response the project team have successfully linked each intervention to a series of strategic KPIs (on, for example, access and engagement with nature, air quality improvements, and perceived health improvements) to illustrate how it can meet diverse needs.

Furthermore, decision-making on the siting of nature-based interventions needs to engage with issues of provision, access, and quality, as outlined in benchmarking guidance such as the Accessible Natural Greenspace Standards (ANGSt),[24] the Fields in Trust 10-minute walk from a green space standard,[25] or the wider EU-supported EKLIPSE project framework[26]—issues that have historically been seen as controversial. The framing of URBAN GreenUP as both innovation and research provided the flexibility to enable targeted investments within the city that can subsequently be applied in other locations. Although this approach may not have met the expectations of all stakeholders in the city, it has allowed the project to work in locations where land ownership factors, community responses to alternative nature-based solutions and the costs of addressing environmental issues may be easier to address.

The project team also needed to engage with an ongoing debate on the perceived versus actual visibility of nature-based solutions. If the public cannot see or interact with a particular intervention, will they value it? If it is not visibly green, will people recognise its multiple socio-economic and ecological values? The answers to these questions are complex, and the outcomes of the Liverpool work suggest that the issue cannot be addressed with an either/or solution. Kabisch, Frantzeskaki and Hansen[10] suggest that the success of nature-based solutions in Liverpool and other cities has, more broadly, been that nature-based solutions 'are an alternative type of infrastructure that helps [in adapting to] and mitigating societal challenges in a specific local, cultural and ecological context'. Each intervention developed for Liverpool could meet this condition in so far as it is considerate and representative of the options available in the city.

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Pollinator street light—one of the Liverpool URBAN GreenUP initiatives)

Taking nature-based solutions forward

There is a wealth of evidence linking the added value to be gained from investing in urban nature and our ability to address climate change, health inequality, and the provision of more functional urban areas. However, the opportunity to use our cities as laboratories for innovation is often constrained by a lack of funding and political willingness to try something new.

The URBAN GreenUP project provided an opportunity to examine how to deliver innovative nature-based interventions in urban areas. Although this article focuses on the insights gained from one suite of projects in Liverpool, they are comparable with those emerging from URBAN GreenUP's sister projects. The funding allocated to the wider URBAN GreenUP project enabled work to be carried out over an extended timeframe—to

develop new approaches to complex urban issues; to work collaboratively to design, implement and monitor interventions; and to better understand the potential value of nature-based solutions in urban management in an era of austerity and cuts to government and environmental sector capacity. However, we should not consider nature-based solutions to be panaceas for all urban ills; rather, they are one element in a suite of approaches that can be used to frame urban development.

Reflecting on the experience of the Horizon 2020-funded URBAN GreenUP project, we can draw out lessons on how to deliver nature-based solutions effectively within urban areas:

- A suite of diverse nature-based solutions that meet local and strategic objectives need to be considered when scoping, designing and implementing interventions. The breadth of thinking embedded within nature-based solutions lends itself to addressing complex urban issues and provides opportunities to address climatic, socio-economic and health issues.[27]
- An appreciation of local context is crucial to effective investment and management.[28] Although URBAN GreenUP aimed to support transferable practices between geographical, climatic and political situations, the key outcome of the project was a more nuanced understanding of the need to think locally when applying best practice from other locations.
- It is important to programme in sufficient time and institutional capacity to develop effective delivery plans over an extended timeframe. Investing in nature-based solutions is not a short-term fix, as it requires extensive engagement with multiple stakeholders and a period of 'bedding in' to generate the socio-economic and ecological benefits sought.
- An effective communication strategy is required, to ensure that the focus, design and added value of nature-based solutions are understood by all.[10] This requires engagement and ongoing discussions with political, business and community organisations to take them on the nature-based solutions journey. A detailed communication strategy may also reduce any concerns about a lack of co-produced design and may aid engagement on site allocations with stakeholders.
- It is important to be willing and prepared to adapt. Investing in nature-based solutions in urban areas is a complex matter, and requires a level of flexibility and resilience to change (in terms of funding, staffing, and project focus)—and initiatives can fail.[17] An appreciation of alternatives that can work—and what works where—is vital in ensuring effective long-term delivery. Moreover, failure can be part of an ongoing success and can provide learning experiences that can be drawn upon in more effectively navigating barriers to investment in the future.

As with its sister Horizon 2020 projects, delivery of the URBAN GreenUP project has been challenging, especially in aligning it to the visions of the broader nature-based solutions literature. Retrofitting innovative solutions to air and water pollution issues in urban areas while also developing new habitats and addressing health and access to nature issues has proven to be a complex and difficult task.[29] However, the multi-partner approach to delivery embedded within the project has provided means to address the issues raised.[9, 13]

'An effective communication strategy is required, to ensure that the focus, design and added value of nature-based solutions are understood by all'

It will be interesting to see how the initiatives developed under URBAN GreenUP shape future environmental policy and practice, as the city attempts to address significant shifts in climate, demographics, and funding for environmental management. The Liverpool case study suggests that, although barriers remain, an upswell of support for placing innovation in nature-based solutions at the forefront of policy and practice makes a brighter and greener future is possible.

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Notes

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