

# Urban Nature-based Solutions in Scotland

## Exploring the barriers and opportunities to using nature to improve the urban environment

November 2022



*Nature-based solutions are ready-to-go, (often) low-tech and low-cost solutions for people, planet and prosperity*

United Nations Environment Programme 2021

### Introduction

In 2022 the International Panel on Climate Change (IPCC) reported that the impact of climate change in our towns and cities is amplified, stating with high confidence that “in all cities and urban areas, the risk faced by people and assets from hazards associated with climate change has increased”.<sup>1</sup> Air pollution and the urban heat-island effect mean that temperatures reach a much greater extreme in built-up areas, and the risk of flooding is more pronounced due to impermeable surfaces and poorly adapted drainage systems. The resilience of businesses will be impaired as transport, energy, communications and employee health are impacted by the changing climate and extreme weather.

Over 70% of Scotland’s population live in urban areas,<sup>2</sup> demonstrating the risk to a high proportion of people and the urgent need to adapt. Although many cities and towns have developed climate-change adaptation plans, many have not been implemented, and the massive potential for co-benefits which can be provided by well-designed urban nature-based solutions is not fully captured.

Even though the IPCC report states with robust evidence and high confidence that “*Well-functioning ecosystems can play a significant role in buffering cities, settlements, and infrastructure from climate hazards at multiple scales*”, urban nature-based solutions are still under-funded and under-appreciated in urban planning. Urban communities continue to rely heavily on hard infrastructure and conventional systems for services, but there is evidence to show that these conventions are not fit for purpose and lack resilience to cope with the changing climate.<sup>3, 4</sup>

Nature-based solutions are defined by the International Union for Conservation of Nature (IUCN) as “*actions to protect, sustainably manage, and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human wellbeing and biodiversity benefits*”.

Within an urban environment, there are many different nature-based solutions that can help us tackle a variety of human problems while also helping mitigate climate change, increase our resilience to the impacts of climate change and improve biodiversity.<sup>5</sup> For example, the risk and impact of flooding is an ever-increasing concern, but through interventions such as planting street trees, using sustainable urban drainage systems (SUDS) and building rain gardens or

bioswales, nature can help us manage the impact. These nature-based solutions will also have benefits when the weather is the opposite extreme. During drought, SUDS, rain gardens and bioswales are a source of water and help keep urban areas green and cool, along with street trees that offer shade during high temperatures. Street trees offer multiple benefits to people while also providing habitat for wildlife within our towns and cities and storing carbon, with one study demonstrating that urban areas with trees in Central Europe are on average 8–12°C cooler than those with no green space.<sup>6</sup> Glasgow's urban forest intercepts 400 Olympic-size swimming pools of rainfall each year, reducing runoff and saving an estimated £1.1 million in sewerage costs.<sup>7</sup>

Air pollution is another ongoing issue in urban areas. Within Edinburgh the air quality fails to meet standards multiple times a year,<sup>8</sup> but the trees and woodlands in the city remove around 195 tonnes of airborne pollutants a year, saving an estimated £575,313.<sup>9</sup> In addition to street trees, there are other nature-based solutions that can help us deal with this pollution and improve the health and wellbeing of residents and visitors. Urban meadows, or wildflower areas, were shown to remove significant amounts of particulate matter from the air, but the level of removal depended on the types of plants present.<sup>10</sup> Having a diversity of planted wildflowers in our towns and cities can enhance biodiversity, increase pollination and reduce maintenance costs, all while cleaning the air and potentially reducing healthcare costs.

There are growing social issues of loneliness and poor wellbeing in urban areas, with overcrowded environments seen to increase loneliness by up to 38%.<sup>11</sup> The evidence suggests that urban green spaces can reduce the sense of social isolation and increase community interaction. Many towns and cities in Scotland have community growing initiatives, such as Maxwell Centre in Dundee,<sup>12</sup> Holm Grown in Inverness<sup>13</sup> and Edible Estates in Edinburgh.<sup>14</sup> All these projects are helping bring the community together to develop their own good-quality green spaces to enjoy, helping improve their mental and physical wellbeing.



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### Case study 1 – Glasgow Canal and North Gateway

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Glasgow City Council and Scottish Canals worked together to regenerate an urban area using nature-based solutions in Glasgow Canal and North Gateway project. Combined with smart technology which monitors rain fall and adjusts the canal accordingly, well designed sustainable urban drainage systems are used to mitigate the impact of flooding. The project has made space for people to enjoy the natural environment, increased biodiversity and helped deal with other impacts of climate change, while estimated to have saved £450 million when compared to grey infrastructure that achieves the same benefits.

*Figure 1 Glasgow Canal and North Gateway 2021 ©NatureScot*





## Case study 2 – Bosco Verticale, Milan

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Bosco Verticale in Milan, Italy is an innovative example of how to integrate nature-based solutions in a dense urban area. Two tall residential towers have been vertically planted with dense vegetation, improving the local biodiversity while cleaning the air, capturing carbon, cooling the buildings, and providing further social benefits and green jobs. This project is part of a wider green regeneration project.

*Figure 2 Bosco Verticale and surrounding area ©Dimitar Harizanov*





### Case study 3 – Green Corridor, Medellín

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The Green Corridor project in Medellín, Colombia has transformed the verges of 18 roads and 12 waterways with planting and regeneration. This change has made considerable impacts on urban temperature, reducing it by 2°C, making a noticeable difference to those living in the city. Derelict areas have been changed into community gardens and the city has trained and hired more gardeners to care for the green corridors, supplying sustainable green jobs. The cost benefit of this project amounts to \$136 million between 2020 and 2030.

*Figure 3 Green corridor and travel route in Medellín ©Joaquín Sarmiento*

These are just a handful of examples and case studies demonstrating the multiple benefits afforded by nature-based solutions in the urban environment. Not only are many of these

interventions more sustainable, with greater payoff in the long term and with the ability to improve citizens' lives, but they will also help us tackle the climate and biodiversity crises. With all the options for interventions and the many positive outcomes of nature-based solutions in towns and cities in Scotland, why are they not always the most popular choice?

## **Aim of this report**

This report aims to encourage discussion on the barriers to, and opportunities for, both on-the-ground and strategic practicalities of nature-based solutions in towns and cities in Scotland. Following a review of the available research and literature, the Scottish Wildlife Trust (hereafter referred to as the Trust) approached stakeholders previously involved in Edinburgh's Nature Network, with further people contacted following discussions. This consisted of stakeholders from the planning and development industries, city councils, community groups, government agencies, local government leadership forums and conservation charities. The questions posed by this report will, it is hoped, facilitate further input from stakeholders, from which a more detailed and well-supported series of policy requests can be taken to Scottish Government and shared more widely.

This project aims to delve further into the barriers and opportunities in a Scottish context, focusing on the use of nature-based solutions in an adaptive capacity and for wider social and biodiversity benefits. The Trust hopes that this will help improve understanding of the benefits of nature-based solutions in the urban environment and will encourage support for their wider rollout to help us deal with a range of societal problems.

For further information on urban nature-based solutions, and additional examples and case studies, visit the Scottish Wildlife Trust's website<sup>15</sup>.

## Existing evidence

### Barriers to urban nature-based solutions

Nature-based solutions are still a relatively new concept for many. This unfamiliarity is made worse due to the lack of a standard formal definition, which increases the risk that the term is misused.<sup>16</sup> Previous examples of urban change, such as low-carbon transitions,<sup>17</sup> suggests that the introduction of an innovative way forward can be difficult due to existing social and technical systems which are historically embedded and resistant to change.<sup>18</sup>

This was demonstrated by a report commissioned by the G20, showing that implementing nature-based solutions can be restricted by outdated guidelines, codes and standards, making it difficult for these interventions to be considered viable options and for their benefits to be fully recognised.<sup>19</sup> The G20 report puts forward that there is a perception held by some policymakers that nature is “too slow, too soft and not a real part of the solution”. The longer timescales involved for realisation of the additional benefits provided by nature-based solutions can mean their value is not fully appreciated by both policymakers and the public. The Clever Cities project<sup>20</sup> also identified this issue, and that it resulted in inadequate political and financial support for nature-based solutions. Insufficient collaborative governance<sup>21</sup> also exacerbates the problems of timescales and financing. Joint action will be needed to ensure successful projects and investment across government departments, as nature-based solutions will deliver multiple benefits for various municipal sectors, such as water quality, health and private investment.

Finance is also recognised as a barrier by the G20 report, regarding both the long-term investment needed for nature-based solutions to provide the greatest benefits, and the lack of vision when recognising the benefits. The United Nations Environment Programme (UNEP) reported that investments in nature-based solutions will have to triple by 2030 and increase four-fold by 2050 for us to avoid environmental collapse.<sup>22</sup> The report discussed further that current economic parameters are accelerating the depletion of natural resources and amplifying environmental degradation, creating an “uneven playing field”. To ensure that nature-based solutions receive the necessary funding from both public and private finance, UNEP noted that a common definition needs to be agreed to determine what constitutes a nature-based solution. This feeds into economic and financial value uncertainty which prevents investment. A review by Toxopeus and Polzin (2021) recognised two overarching barriers to financing urban nature-based solutions: (1) realising coordinated funding between public and private financiers, and (2) integration of the benefits of nature-based solutions into valuation and accounting methods.<sup>23</sup>

A study by Dorst and colleagues (2022)<sup>24</sup> identified the barriers to the wider rollout and scaling up of nature-based solutions in towns and cities in Europe and the underlying governance structural conditions that are causing the identified barriers. This study gave further credence to the issues of lacking collaborative governance, challenges in knowledge and understanding, insufficient and ineffective policy and inadequate public resources and engagement. There also needs to be greater political commitment to social inclusion. The lack of public awareness and support can be a significant barrier to upscaling nature-based solutions.<sup>25</sup>

Wide-scale rollout of nature-based solutions could also be impacted by the current system of land ownership and the business imperative to make the best financial decision rather than the



most sustainable, beneficial decision for the wider community and national climate and biodiversity goals.<sup>26</sup>

## Scaling Up of Urban Nature-based Solutions

### Knowledge and understanding

The existing research and on-the-ground examples provide a strong starting point for the mainstreaming and scaling up of urban nature-based solutions, but these have mostly been produced by academic institutions and NGOs and may not be fully accessible to those active on the ground. This disconnect has been experienced in planning previously and suggests that consideration is needed as to whether the resources available are in an accessible location and the language used is suitable.<sup>27</sup> The European Commission also recognised that a lack of networking and cooperation opportunities is a barrier to the growth of nature-based solution enterprises.<sup>28</sup>

One way of overcoming the negative perception and ongoing lack of investment is through improving education. It was discussed by the European Commission in a workshop entitled “Mobilising up-scaling of NBS for climate change throughout 2020 and beyond” that demand should be mobilised from the bottom up by enabling champions of nature-based solutions within urban areas to promote and advocate for their use.<sup>29</sup> NetworkNature<sup>30</sup> also recognised the need for greater nature education to restore the connection between people and biodiversity. Implementing nature-based solutions will require upskilling and learning opportunities,<sup>31</sup> but the lack of investment has prevented the demand from being met, suggesting there is a stalemate when investing in skills and education.

The Covid-19 pandemic has further increased the demand by the public for good-quality green space in the urban environment.<sup>32</sup> Broadening public participation in projects was identified by Armstrong (2020)<sup>33</sup> (as part of the Naturvation project<sup>34</sup>) as a key pathway to successfully mainstreaming nature-based solutions. This involves engagement with vulnerable and minority groups to ensure inclusivity and the greatest benefits for the local community. Without inclusion of the local community, urban regeneration projects run the risk of making the spaces more exclusionary and more difficult for people to use.<sup>35</sup> By their definition, nature-based solutions depend on the involvement of indigenous and local communities.

### Funding and investment

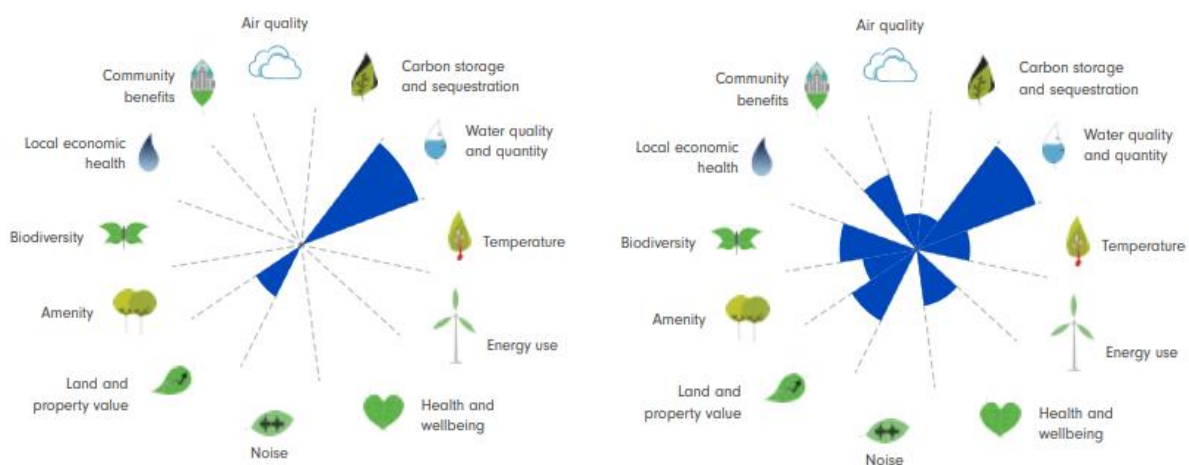
Initial investment needed for a successful urban nature-based solution project is still considered to be greater than traditional grey interventions. While this may be true in some instances, the long-term value for money of nature-based solutions is often far greater, and costs are recouped within a few years.<sup>36</sup> The average value per hectare of urban nature-based solutions per year was found to be twice the average GDP per capita in examples from the European Union.<sup>37</sup> Investment in green spaces can help attract development and businesses to an area and can help reduce economic inequalities.<sup>38</sup> However, despite these proven returns, the uptake of investment in nature-based solutions is still slow.

Nature-based solutions are reported to be 50% cheaper compared to hard engineering alternatives used to provide the same service.<sup>39</sup> The added benefits provided by nature-based



solutions also mean they can provide 28% of additional value, through improved health and wellbeing, job creation, and opportunities for leisure and tourism. Green spaces have also been shown to increase local business revenue: for example, The Land Trust demonstrated that £48,000 in annual revenue was generated by businesses using a specific green space in Manchester.<sup>40</sup>

The UK Green Building Council is working to increase the uptake and to promote the value of nature-based solutions in the built environment.<sup>41</sup> As part of this effort, it has demonstrated the multiple benefits offered by SUDs as nature-based solutions compared with grey infrastructure for drainage (Figure 4). Insurance companies are also promoting the use of green infrastructure to protect assets, such as through reducing flooding.<sup>42</sup>



*Figure 4 comparing the benefits provided by conventional and nature-based solutions for urban drainage. Taken from The Value of Urban Nature-based Solutions. UK Green Building Council, 2022, London, UK.*

## Governance

Improving the governance structure can help mitigate many barriers faced when implementing nature-based solutions in the urban environment. Egusquiza and colleagues (2019) proposed that nature-based solutions provide opportunities for innovative governance approaches that could improve understanding and financial uncertainty, increase community engagement and empowerment, and reduce siloed thinking.<sup>43</sup> To make the best decisions for land management in towns and cities, many different departments and players need to communicate, especially within local and city governments. Effective governance will require authorities to break out of existing structures and collaborate across departments on aspects such as budget delegation and planning strategies.<sup>44</sup> The Connecting Nature project worked to find ways to remove the siloed thinking of current governance systems<sup>45</sup> and has worked with city governments to build cross-departmental support and partnerships. While this will be a considerable shift from many current ways of work, implementing changes to facilitate nature-based solutions will open the door to other innovative changes, such as social improvements. Regulatory measures can also be used to increase the uptake of urban nature-based solutions, as has been seen in Copenhagen, where green roofs have been made mandatory for all new developments.<sup>46</sup>

Investment in nature is increasing in Scotland, with nature-based solutions being mentioned within Scottish policy as a key area to mitigate climate change, support nature recovery and create multiple other benefits for society. NatureScot is investing significant resources into improving understanding and promoting nature-based solutions in the urban environment.<sup>47</sup> This investment has made considerable progress in supporting meaningful and desirable interventions. Nevertheless, despite this positive rhetoric, the current action pales in comparison to the scale of the challenge. It is especially pressing that we make urgent changes to the way we prioritise urban land use. Increasing nature within our towns and cities can have significant positive impacts, and we want to ensure this is utilised in the best possible way.

## Stakeholder discussions

This section of the report builds on the barriers and opportunities for scaling up nature-based solutions by taking the discussion to stakeholders on the ground. Through this, we want to improve our understanding of what is stopping nature-based solutions from being used more widely. These discussions were undertaken in a casual, organic way with a few prompting questions where appropriate around themes of public perception, funding, governance, and wider understanding of nature-based solutions.

### Common themes

Stakeholders demonstrated the following common challenges and opportunities to implementing nature-based solutions in the urban environment:

#### Challenges

1. Accessing evidence on the reliability, benefits and costs associated with nature-based solutions compared to that of grey infrastructure is difficult. The time and pre-knowledge needed to source and use what is out there can be prohibitive.
2. Policy is unsupportive and difficult to navigate. For example, current tender and procurement processes do not support nature-based solution implementation in new developments. Nature is not prioritised and is still considered a “nice to have” asset, rather than offering a sustainable solution to problems faced.
3. More investment is needed in skills and understanding of what constitutes a nature-based solution and the many environmental and societal problems that can be addressed with urban nature-based solutions. There is a perception of nature-based solutions being a costly, difficult intervention, and they are still considered risky.
4. There needs to be better governance protocol so that there is more supportive project management, and responsibility is understood. Greater support should be provided to communities leading on projects, or once a project has been left in their stewardship. Strong governance structure and legacy support are essential for a project to be successful and to continue to provide benefits.
5. There can be insufficient communication and cross-collaboration between different levels of city management and departments and among other actors in the same environment. More needs to be done to encourage collaboration between local government, city planners, developers/contractors and community groups. Implementing nature-based solutions in the busy urban environment comes with conflicts of interest and will impact a lot of people.

## Opportunities

1. Private-sector funding is becoming more accessible, but greater support and promotion is needed. There are still concerns about unpredictable financial returns.
2. There is a growing public awareness and appreciation of natural green spaces in the urban environment, but some further engagement is needed, especially with vulnerable and minority groups.
3. Improving the green space within the urban environment leads to people spending more time in an area, which can have the positive knock-on effect of increased use of local businesses and services. Public green spaces provide unique opportunities for local businesses and community groups to increase their reach and income.
4. Opportunities exist for new skill development and improved understanding of the potential for nature-based solutions within professional disciplines such as architecture, city planning and development.
5. Developers are beginning to understand the benefits, and support is building for nature-based solutions to be a standard intervention in the urban environment. Insurers are encouraging developers to use natural flood mitigation.
6. Nature Networks offer a way to integrate nature alongside existing infrastructure and other needs in the urban environment. Nature-based solutions are a key intervention to ensure needs are met while space for biodiversity is provided.

## Possible ways forward – questions

Considering the common themes discussed by stakeholders and in existing evidence, the Trust is keen to discuss the following questions with wider stakeholders to better understand how to overcome the challenges and take advantage of the opportunities. We are interested in hearing your thoughts on the questions below and whether you have experienced any other challenges or opportunities that have not been covered.

1. There is still a negative perception of nature-based solutions: for example, the timescales for the realisation of the benefits can prevent their use and adequate resourcing. **What can be done to encourage the use of nature-based solutions over traditional grey interventions?**
2. Financing nature-based solutions is still considered risky, despite the obvious benefits. **How can more investment be encouraged in the nature-based solutions space?**
3. Barriers are experienced when communication between groups and departments is ineffective. **How can we ensure meaningful communication between all stakeholders, including within local government, and make sure nature is prioritised wherever possible?**
4. There is a lot of evidence and case studies out there, but it might not be accessible to some. **What can be done to improve access and understanding of existing resources, and how can the gaps in these resources be filled?**
5. Nature-based solutions are not always considered a viable option in urban planning and developments. **What can be done to improve the engagement across private and public actors and to support planners, developers and those working in construction so that they can be advocates for the use of nature in urban planning?**



6. Nature-based solutions must represent and benefit the whole community. **How can projects reach more people and make sure that there is full consideration of local priorities?**
7. A robust governance and legacy plan are key to a successful project. **How can we ensure that projects are well managed, and communities can continue to champion, support and make the most of nature-based solutions after development?**

## Conclusion

Initial discussions and investigation of the literature suggests that there are some defined areas for change which would make nature-based solutions more mainstream in the urban environment and beyond. However, the changes needed may require considerable thought and time to implement. The key areas that emerged were:

1. **Evidence** and case studies are key to supporting the use of nature-based solutions, but it needs to be more easily accessible.
2. **Education** about the benefits and practicalities of nature-based solutions in an urban environment should be included in professional qualifications such as architecture, civil engineering and planning.
3. **Communication** about nature-based solutions needs to be encouraged as early as possible in the design process of an urban development with all relevant stakeholders. Communication needs to happen between different sectors and departments to ensure a coordinated and streamlined approach.
4. **Investment** in nature-based solutions from both public and private sources is growing, but the scale and speed at which this is happening is not sufficient to support necessary mainstreaming of nature-based solutions in our towns and cities. Greater incentive and support are needed to increase private investment.
5. **Engagement** with people from all local demographics is needed if a project is to have the greatest positive impact and provide the most benefits, particularly for vulnerable and minority groups.
6. **Governance** should be clear from the beginning to ensure a project is well supported. High-level regulations need to be reviewed to remove barriers. Projects also need a legacy plan once the initial development of a project is complete, and communities should feel empowered to take responsibility.

Transformational change is needed to shift the status quo to a point where nature-based solutions are a viable, prioritised intervention in our towns and cities. Nature-based solutions offer a wealth of options to help encourage biodiversity in the urban environment, make it more resilient to climate change and generally make towns and cities healthier, more pleasant places for people and wildlife to thrive. The current rhetoric, while broadly positive, has few practical support mechanisms to ensure that nature is given priority when making urban land-management decisions. Nature needs to be given equal weight so that we can better harness the multiple services it provides, to make ourselves and nature more resilient to climate change.

If you would like to respond to any or all of the questions above, or you have any further comments, please email [naturebasedsolutions@scottishwildlifetrust.org.uk](mailto:naturebasedsolutions@scottishwildlifetrust.org.uk). We are very keen to hear your thoughts.

Your responses will be used to further inform our policy and advocacy efforts, and a second report will be produced to incorporate the additional insights and to lay out recommendations which will be shared more widely.

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