

**Overcoming Barriers to the
Adoption of Blue-Green
Infrastructure**

September 2023

Contents

Executive Summary.....	3
Glossary.....	5
1. Who we are.....	5
2. Policy Background.....	6
3. Methodology.....	7
4. Key Findings: barriers to BGI.....	9
5. Proposed solutions	14

Executive Summary

Background

Within Scotland, there is a growing recognition that more innovative, nature-based approaches to managing flood risk are needed in order to improve urban resilience and to adapt to the impacts of climate change. The Scottish Government has described its vision for the future of surface water management as follows:

“Scotland’s blue-green towns and cities are thriving water-resilient places designed to adapt to increased rainfall, river flooding and sea-level rise. They attract people, businesses and investors because they are great places to be and because they are resilient to climate change. They provide wide-ranging economic, social, environmental and well-being benefits to individuals, communities and the nation.”¹

Key Findings

Nature-based approaches represent a fundamental shift in thinking towards viewing rainwater not simply as a ‘risk’ to be managed, but as a vital resource that can deliver multifunctional, tangible benefits for consumers and for the environment.

In addition to their contribution to urban flood mitigation, blue-green spaces offer a host of other benefits to consumers and the wider environment. In 2017, it was estimated that the removal of air pollution by urban green-blue space in Great Britain equated to a total saving of £162.6 million in health costs, in the form of avoided deaths, avoided life years lost, fewer respiratory hospital admissions, and fewer cardiovascular hospital admissions.²

One study attempting to value the impact of Edinburgh’s parks and greenspaces found that every £1 invested in the city’s parks and greenspaces generated a £12 return in social, economic and environmental benefits.³ Despite the actual and potential value that they deliver, greenspaces across Scotland are under pressure from increasing and significant urbanisation. Although the amount of permeable land in Scotland lost to urbanisation is not easily quantifiable, one study found that the city of Edinburgh lost an average over 15 football pitches of vegetated land per year to urban creep, between 1990 and 2015.⁴

Understanding the drivers and inhibitors of Scotland’s blue-green vision is critical to support informed decision making and to avoid ‘locking-in’ unsustainable land use patterns for years to come. Consumer Scotland has conducted an evidence-gathering exercise to understand the types of barriers preventing a greater uptake and successful implementation of blue-green solutions. Our report draws on two primary sources: a desk-based review of evidence and a stakeholder workshop with organisations operating in the water sector.

The evidence we have gathered indicates that consumers are key to the successful delivery and long-term sustainability of blue-green infrastructure projects. They are the ultimate users of public blue-green spaces, and as such play an important role in supporting their maintenance. Consumers also have the power to deliver their own blue-green interventions at a household scale.

Not all consumers have equal access to the benefits of blue-green spaces. A greater proportion of adults living in the most deprived areas in Scotland (38%) report living further than a five-minute walk away from their nearest greenspace compared to adults living in all other areas (30%). Moreover, in 2021, while a little over half of adults (51%) visited their nearest area of green or blue space every day or several times a week, the frequency of visits was lower amongst disabled people or those who reported poorer general health.⁵ This wider context is important here and should help to inform the planning of blue and green infrastructure projects, so that fairer outcomes that benefit all consumers and help to reduce existing inequalities can be achieved, in line with the Scottish Government's broader aim of a just transition to net zero.

Recommendations

In order to deliver solutions that maximise benefits for consumers, our findings indicate that there is further scope to:

- **meaningfully engage** with consumers early on, and throughout, the journey of improving urban flood resilience by creating genuine opportunities for consumers to co-design and inform the decisions around blue-green infrastructure;
- **enhance consumers' understanding** of the role nature-based solutions play in causing and mitigating climate change, including by developing a shared language around the benefits of blue-green infrastructure and adopting a place-based approach to messaging which centres communities and their needs; and
- **incentivise and create opportunities** for consumers to take actions at a household or community level to mitigate the harms associated with rising rates of urban creep, particularly in instances where the local authority faces constraints in its delivery of blue-green projects.

Our findings also suggest that there is further scope for embedding nature-based solutions into planning decisions at all levels. Our key recommendations for how policymakers can help to realise this include:

- **strengthening existing legislative, policy and planning frameworks** and creating clear and outcomes-based targets for actors responsible for implementing blue-green solutions, which should set standards that take into account the quality of the space and meeting the needs of local residents;
- **increasing the availability of funding streams** for blue-green infrastructure projects, with an emphasis on funding for multi-partner projects that encourage collaboration amongst different stakeholders; and
- **supporting efforts to better measure and quantify the full range of environmental, health and community benefits** that blue-green infrastructure projects can deliver, above and beyond traditional approaches to flood risk management.

Glossary

The following terms are used in this report:

Blue-Green Infrastructure (BGI): a network of natural and semi-natural landscape elements within our urban and rural spaces that when connected, deliver ecological, economic and environmental benefits for communities and for nature. Examples of BGI include rain gardens, ponds, green roofs, and porous paving, which reduce flood risk by giving water a place to collect and be absorbed slowly and naturally.

Grey infrastructure: in the context of water services, grey infrastructure involves engineered infrastructure for water resources such as water and wastewater treatment plants, pipelines and reservoirs.

Just transition: refers to the principle that the costs and benefits of delivering net zero and transitioning to a green economy are shared equally. It is also about ensuring that the process of adapting to climate change is inclusive of communities and consumers, who should have the opportunity to help shape and design solutions.

National Planning Framework 4 (NPF4): Scotland's long-term plan that guides spatial development, sets out national planning policies, designates national developments and highlights regional spatial priorities. NPF4 was adopted by the Scottish Ministers on 13 February 2023 and replaces National Planning Framework 3 and Scottish Planning Policy.

Sustainable Urban Drainage Systems (SuDS): a key example of BGI involving a range of drainage solutions that aim to mimic nature by managing rainwater close to where it falls. SuDS reduce the quantity, and increase the quality, of surface water that drains into sewers from a development and can also help wildlife to thrive in urban areas.

Surface water: water which collects on the ground, from rainfall or snow melt, and doesn't immediately drain away. Surface water flooding describes flooding from high intensity rainfall, when sewers and other drainage systems exceed their capacity to absorb surface water.

Urban creep: the gradual conversion of permeable, vegetated areas such as gardens, into built-up surfaces, such as driveways and conservatories. Urban creep can increase flood risk because it reduces the amount of open land which can absorb rainwater, putting extra pressure on drains.

1. Who we are

- 1.1. Consumer Scotland is the statutory body for consumers in Scotland. Established by the Consumer Scotland Act 2020, we are accountable to the Scottish Parliament.
- 1.2. Consumer Scotland's purpose is to improve outcomes for current and future consumers and our strategic objectives are:
 - to enhance understanding and awareness of consumer issues by strengthening the evidence base

- to serve the needs and aspirations of current and future consumers by inspiring and influencing the public, private and third sectors
- to enable the active participation of consumers in a fairer economy by improving access to information and support

2. Policy Background

- 2.1. In Scotland, the management of surface water, including flooding, is a significant challenge in the face of increasing urbanisation and more extreme weather patterns, particularly rainfall events. The impacts of flooding are spread across different aspects of the urban ecosystem. Flooding leaves lasting negative social and wellbeing impacts on the people and communities impacted by floods⁶. Previous instances of flooding in the UK have also led to power cuts impacting services' delivery and recovery⁷; prevented water treatment and delivery services from operating successfully⁸; destroyed crops⁹; and disrupted natural habitats¹⁰.
- 2.2. The risk of surface water flooding in Scotland in future is heightened due to increasing urbanisation. The creation of more impermeable surfaces such as roads, pavements, and roofs, and the loss of green spaces to housing and development has increased the amount of rainwater that cannot be absorbed by the ground and instead runs off roofs, roads and pavements, and enters the drainage system.
- 2.3. Climate change is known to intensify the water cycle, fuelling more extreme rainfall events and further increasing the likelihood of flooding. Scotland's drainage systems, much of which date back to the Victorian era, are often overwhelmed by the increased intensity of rainfall and run-off. This occurs as the existing sewer network cannot cope with the influx of high volumes of surface water within a short time frame. During short and intense periods of rainfall, water either backs up in streets, causing flooding, or is discharged from the combined sewer overflows network, releasing the mix of rainwater and sewage into Scotland's rivers and waterways. Traditional grey infrastructure is not capable of fully meeting this challenge on its own.
- 2.4. In addition, Scottish Water's surface water policy discourages new surface water connections into their combined sewer system.¹¹ For new developments, this means that, apart from in exceptional circumstances, measures must be put in place to manage rainfall above ground instead of allowing it to be discharged into the combined sewer network. This further supports a shift in favour of innovative, sustainable solutions for surface water management, such as rainwater harvesting, drainage through the soil or drainage to a watercourse.
- 2.5. The Scottish Government is currently working with key water stakeholders, including Consumer Scotland, as part of a sector-wide policy development exercise. The policy development process is evaluating all water sector legislation applicable in Scotland, with a view to proposing new legislation that ensures the Scottish water sector is able to effectively respond to and adapt to climate change impacts. As the statutory consumer body for Scotland, Consumer Scotland, recognises the opportunities this process presents to create improved outcomes for consumers and communities. We are engaging in the process

through the provision of robust evidence and insight into the key opportunities and challenges for consumers, and on how consumers can be included and empowered on the journey to a more sustainable future.

2.6. To address the issue of surface water flooding in towns and cities, the Scottish Government has promoted the uptake of sustainable urban drainage systems (SuDS), and the promotion of Blue-Green Infrastructure (BGI).

2.7. Implementing BGI into a space can provide a wide range of benefits for consumers. These include:

- alleviating climate change impacts such as flooding, urban island heating, and pollution levels;
- improving water quality and biodiversity;
- wider social and wellbeing impacts that have been shown to be gained from greater access to such spaces.

2.8. The range and diversity of benefits that BGI can provide is recognised by the Scottish Government, which has begun to set out its approach to taking BGI forward. This includes the policy framework “Water-resilient places – surface water management and blue-green infrastructure: policy framework”¹², which makes a series of recommendations that will contribute to the review of BGI and develop a programme of work for delivery.¹³ Scotland’s NPF4 similarly sets out the need to protect and enhance BGI and encourages Local Development Plans to be informed by audits and strategies covering the multiple functions and benefits of BGI.¹⁴

2.9. While there is good evidence of the benefits of BGI, which has supported the development of policies, activities, guidance and toolkits around its implementation¹⁵, some of the barriers to implementing BGI are less well understood in the policy space. As such, to support the Scottish Government’s ambitions to implement effective BGI on a wider scale and to greater consumer benefit, Consumer Scotland undertook a review of existing research to better understand what types of barriers prevent the successful implementation of BGI in the policy and stakeholder landscape. This was followed by a workshop engaging relevant stakeholders to explore potential solutions to address the barriers to BGI.

3. Methodology

3.1. In December 2022, Consumer Scotland commissioned the research agency Ipsos Scotland to facilitate a workshop with stakeholders from across the water sector. The objective of the workshop was to work with industry stakeholders to consider how to address barriers to the take-up and implementation of Blue-Green Infrastructure (BGI) in Scotland. This included an exploration of how communities and consumers can be actively involved in, and engaged with, the processes to implement BGI.

3.2. The workshop followed on from a literature review exploring the range of barriers to successful implementation of BGI in the UK and Scotland. This literature review had been initiated by Citizens Advice Scotland (CAS) prior to the move of the consumer advocacy role

from CAS to Consumer Scotland. The review was subsequently completed by Consumer Scotland in May 2022.

The literature review

- 3.3. The literature review was carried out between January and May 2022. The review primarily considered UK-based sources of evidence. However, evidence which explicitly applied learning from other locations to implications for the UK were referenced where relevant.
- 3.4. The evidence base was limited to open access texts¹⁶ freely available at the time the review was taking place. A key word search of 'blue green infrastructure' against the terms 'barrier' and 'challenge' was used to explore relevant academic articles on open-source websites,¹⁷ with further evidence of this kind found by utilising web browser extensions¹⁸ to find additional open access articles. The search yielded 175 results. After application of the exclusion criteria, 37 articles remained.
- 3.5. The full literature review is available for reference on Consumer Scotland's website.

The workshop

- 3.6. Following the literature review, Consumer Scotland commissioned Ipsos to facilitate a stakeholder workshop to discuss the findings and to start building a consensus around possible solutions.
- 3.7. The workshop was held on 6 December 2022, and was attended by 13 stakeholders, representing the following organisations:
 - Aberdeen City Council
 - Consumer Scotland
 - Dundee City Council
 - The Green Action Trust
 - Hydro Nation Chair
 - The Independent Customer Group (Scottish Water)
 - Royal Botanic Garden Edinburgh
 - The Scottish Government
 - Scottish Water
 - The Scottish Environment Protection Agency (SEPA)
- 3.8. The workshop was structured around a discussion guide developed by Ipsos in collaboration with Consumer Scotland. The overarching question that the workshop sought to address, as presented to the stakeholders, was:

“Climate change necessitates the transition to more resilient surface water infrastructure. How should processes develop to ensure this is done in partnership with the communities impacted by this transition?”

3.9. The introduction was followed by a presentation by Consumer Scotland that set the context for BGI acting as a significant tool to mitigating surface water flooding and outlined the potential barriers (as identified in the literature review). Following the presentation, the stakeholders were split into small groups to reflect on one category of BGI barrier (physical, organisational, or knowledge and information) and note down their suggestions for possible solutions. Stakeholders were then asked to consider one of the categories in depth, and worked together to identify the most important solutions they felt should be taken forward, before presenting these back to the whole group.

4. Key Findings: barriers to BGI

4.1. Various challenges to the adoption of BGI were identified during the literature review and the workshop. These barriers can be categorised under three broad themes, which are explored further below:

- Physical – relating to both the availability and the quality of the space.
- Organisational – including stakeholder cross-working, funding and legislation, policy and planning frameworks.
- Knowledge and information – including community engagement and empowerment, sectoral language and terminology, the need to monitor performance and understand the benefits to encourage more uptake.

Physical barriers

Availability, quality and suitability of space

4.2. The lack of available land for BGI was referenced in much of the literature as a potential barrier and noted to be an important consideration when planning a BGI intervention. Land is a finite resource, and other policy imperatives such as housing, economic development and transport may be in competition over the same parcel of land, resulting in less available land set aside for BGI.

4.3. Physical limitations associated with a site may pose a problem and may take time and resources to resolve. This, in turn, may result in some of the full benefits of BGI being delayed. For example, it can take many years for trees – which can improve air quality and the water retention capacity of a site - to reach maturity.

4.4. During the workshop, stakeholders considered ground conditions to be a significant physical limitation, as this can make it physically very difficult or impossible to make the changes needed to install BGI. Stakeholders further observed that physical barriers can differ depending on whether BGI is part of a new development or is being retrofitted. While it can be easier to plan for BGI as part of a new development, there can also be reluctance from developers who are dissuaded either by the cost, complexity, or risk associated with BGI,

particularly when they are under financial pressure. One such risk arises in relation to insurance, as certain types of BGI can pose higher risks and raise questions around long-term maintenance (e.g. the development and maintenance of green roofs on housing).

- 4.5. Stakeholders noted a range of additional challenges associated with retrofitting BGI. One such challenge was the physical complexity of trying to fit BGI into an existing neighbourhood, which is more difficult than planning it as part of a new development. Establishing ownership over land and identifying those responsible for driving forward the project can also pose difficulties. As one stakeholder commented:

“When you are dealing with retrofit, you are trying to fit into an existing landform or streetscape, that opens up a range of different challenges...and there aren’t many levers to making that happen either. With new developments, the planning system can steer things to help [BGI happen]. But with an existing streetscape, there isn’t an obvious way in or organisation responsible. We are short of the policy levers to make retrofit happen.”

Organisational barriers

Stakeholder cross-working

- 4.6. The literature supports the current policy view that BGI development and implementation is still fragmented, despite the theory and principles being embedded with government initiatives at many levels. It is suggested that the underlying reason for this fragmentation is because organisations are naturally segmented into sectors, with different interests and priorities. Activities and actions are currently acknowledged to be largely ‘issue-driven’, with different organisations having different, distinct responsibilities for resolving specific issues¹⁹.
- 4.7. While responsible authorities generally understand and agree what solutions are required to address specific identified issues, a nationally consistent approach is lacking. Multiple organisations can struggle to achieve the various benefits or align priorities, resources, and finances into truly joined-up services, unless a cross-stakeholder outcome-based approach can be taken. As one workshop participant put it:

“There is common ground to be found between the organisations involved [in the planning and management of BGI]. How do we recognise synergies or recognise gaps in synergies? How do we bring people together and generate spaces for discussion between different, siloed, public bodies and other organisations where we can find commonality?”

Funding

- 4.8. Funding is a frequently cited barrier to BGI, often in relation to the limited economic resource of the responsible organisations, as well as a lack of information on the cost-effectiveness of BGI longer-term²⁰. Surface water management programs are typically enforced by public organisations that tend to select technologies to meet outcome criteria in the most cost-effective manner²¹.
- 4.9. Environmental benefits associated with BGI, such as reducing urban heat island effects²² or promoting recreational opportunities, have also been found to be drivers for adoption when

these benefits are quantifiable²³. However, not all wider benefits that BGI brings to society are easily quantifiable, whilst the associated costs usually are²⁴.

- 4.10. Uncertainties about financing mechanisms for BGI can hinder effective policy development²⁵. The impact of reduced funding available for planning functions has been noted as exacerbating this issue, as this limits flexibility and puts pressure on the resources available to local authorities to operationalise BGI.²⁶
- 4.11. In a multi-stakeholder environment, the issue of funding brings additional complexities, as BGI projects tend to have a range of different objectives, programme lines, agendas, and timescales to contend with. Consideration of how, in a collaborative setting, stakeholders prioritise, access, and share funding resources is important. Establishing a joint funding mechanism, for example, could support greater collaboration and streamline the way the project is run to the benefit of all parties involved.
- 4.12. Better financing for multi-benefit projects, i.e., funding that multiple partners can bid for together, was identified in the literature as a key enabler to unlock more innovation and uptake of BGI. This sentiment was echoed by stakeholders during the workshop, one of whom observed that:

“You can’t do BGI with the funding and resources currently available unless there is a joined-up approach. So [joining up] has practical benefits. You are not going to get the funding to do different aspects [of BGI] on an individual basis. You are only going to get it if you align and hit all the targets in one go.”

- 4.13. To enable this approach, finance that will pay for multi-partner projects needs to be made available, and funding applicants need to be able to assess the wider benefits of their projects to put robust cases together²⁷.

Legislation, regulation and policy

- 4.14. There is insufficient power within BGI regulations, policies and legislation to incentivise greater uptake of BGI activities among developers, planners, engineers and local authorities. BGI measures put in at the beginning of a design project are often ‘value engineered’ out of the project to bring down costs²⁸. Large scale reductions in public spending, and the related reduced resources, capacity and skills in public sector organisations, government agencies and local authorities²⁹ means that any issues that are not statutory requirements are not routinely taken forward in decision making³⁰.
- 4.15. Current legislation in England encourages, but does not mandate, the implementation of SuDS in new developments. Following a review of its legislative framework, however, England is expected to make SuDS mandatory to new developments from 2024.³¹ In Scotland, regulations mandate all surface water from new development to be treated by a SuDS before it is discharged into the water environment³². Research reviewing the process of increasing SuDS uptake in Scotland has nonetheless found that, while the country benefits from a comparatively strong legislative and regulatory regime that has driven the transition agenda from traditional drainage to SuDS, it has weak enforcement of regulatory requirements and inspection policies. Lack of enforcement acts

as a disincentive to developers to implement natural drainage systems, particularly when it comes to emerging techniques such as rain gardens and green roofs³³.

4.16. To encourage developers to go beyond the statutory requirements, a voluntary accreditation scheme, known as the *Building with Nature Standards Framework*, has been developed as the “UK’s first green infrastructure benchmark”. However, recent analysis across 19 Scottish local authorities looking at how their Local Development Plans integrate the principles established in the *Building with Nature Standards Framework* found that BGI-related policies were highly variable and that several of these were incomplete, inconsistent, or weak³⁴. This reinforces the wider literature’s conclusions that BGI is currently devalued and deprioritised in the planning process³⁵.

4.17. With regards to BGI, an analysis of local authorities’ Local Development Plans found that while most do recognise the multiple benefits of BGI, their effectiveness is likely hindered by the weak and ambiguous wording used. For example, the inclusion of the phrase “*new developments should seek to enhance biodiversity as part of the green network*”, taken from one Local Development Plan, is strong in its recognition of the biodiversity benefits BGI can bring. However, use of ‘*should seek to*’, weakens the intent and provides scope to scale back, or even abandon altogether at a later stage in the planning or delivery.

4.18. The concern over policy wording being too vague and open to interpretation was shared by participants in the workshop. As one stakeholder commented:

“There isn’t one organisation that has responsibility for driving all of this. The language used in policy is also too vague – with terms like ‘where possible’ or ‘if costs allow’. This means that BGI gets dropped if budgets are [limited].”

4.19. Stakeholders expressed a preference for a more ‘top down’ approach to integrating BGI into urban landscapes, with legislation and policy clearly stipulating the requirement for BGI to be included in building developments.

Knowledge and information barriers

Community awareness and engagement

4.20. Much of the relevant literature points to co-creating solutions as an important part of implementing effective BGI. Consideration of how and why local residents might engage with water infrastructure in a practical way is an important practice to adopt as part of the BGI process. One of the key benefits of BGI is the very fact that individual households and communities are able to play a part in their adoption and design.

4.21. Recent surveys have found that, despite some consumers acknowledging that blue-green and nature-based solutions should be a priority in Scotland’s response to climate change, most consumers do not yet see a role for themselves in supporting their delivery³⁶. Despite the overall trend of increasing awareness and concern about climate change in the population³⁷, it appears that consumers, in general, are not yet aware of, or have not yet engaged with, the different ways they might contribute to BGI and nature-based solutions as individuals or as communities.

4.22. Existing inequalities in access to greenspace are also an essential factor to consider when it comes to planning BGI interventions. In Scotland, a greater proportion of adults living in the most deprived areas (38%) report living further than a five-minute walk away from their nearest greenspace compared to adults living in all other areas (30%). The frequency of visits to local greenspaces is also lower amongst disabled people and those who report poorer general health. In 2021, adults who reported their health to be bad or very bad were less likely to visit their nearest green or blue space every day or several times a week (30%) than those who reported their general health to be good or very good (54%). The quality of local greenspace is also linked to the overall quality of the neighbourhood, as perceived by consumers. Satisfaction with one's nearest green or blue space is reportedly highest amongst those who already consider their neighbourhood as a very good place to live (86%) compared to those who rated their neighbourhood as very poor (45%).³⁸

4.23. If planning approaches to BGI fail to consider disparities in access to the benefits of greenspaces, they risk exacerbating existing health, social and economic inequalities. Matching BGI solutions with consumers' needs and aspirations for their neighbourhood is thus essential to ensuring that the positive outcomes of BGI interventions are fairly distributed across the population.

4.24. Meaningful consumer engagement can be approached through better communication of the potential benefits and value of BGI to consumers. The literature notes that these types of communications often focus on the amenity that BGI can provide, as this is a tangible benefit³⁹. However, the literature also notes that the concept of amenity is rarely unpacked: the theoretical amenity provided by a SuDS or BGI network is not always reflective of how the consumers or communities use or want to use the space in reality, which can result in misaligned targets and actions between consumers and developers. Stakeholders in the workshop similarly picked up on the fact that some methods used to engage consumers in BGI in the past have been superficial, without giving rise to genuine opportunities to co-design or at least inform the decisions around infrastructure:

"A lot of community engagement is tick box exercise. You get people to the village hall and you ask them what they think, and that's it – but that is not real community engagement, and not how you co-design with a community. In particular with retrofit, when you are changing what the community knows – you have to bring them in and retrofit with them."

Long-term sustainability

4.25. Debates around the longer-term sustainability of BGI centre principally around the uncertainty of maintenance costs needed to ensure projected benefits are delivered over installations' lifetimes.

4.26. Given that BGI is a relatively new innovation, there is uncertainty as to how these infrastructures will be used and maintained longer term. Meaningful consumer and community engagement is therefore particularly important to ensure longevity of a site, because the performance of BGI can be positively or negatively affected by the behaviours and attitudes of those that use and maintain them after their installation. While the benefits of BGI are widely reported, negative engagement with infrastructure can cancel these out

for consumers. This can arise particularly when consumers have not had adequate time to participate in, or do not sufficiently value, projects⁴⁰, or when there is a lack of community ownership.

- 4.27. The current evidence base regarding the long-term physical and social benefits of BGI for consumers is also not as extensive as stakeholders would like it to be⁴¹. This hinders effective analysis of projects and their potential for applicability elsewhere⁴². There is a need to monitor the performance of BGI and to collect real world data at a more granular level. Examples of this might include measuring the volume of rainwater displaced by BGI over a period of time, or the quantity and quality of water discharged from BGI features.

Vocabulary and terminology

- 4.28. In assessing the available literature on the topic of BGI, a wide variety of phrases and terms were used interchangeably to refer to BGI activities. This can hamper the effective development, delivery and/or assessment of BGI. If decision-makers are expected to work collaboratively, they must be able to 'speak the same language' to do so effectively.
- 4.29. Previous research has found that among consumers and communities, water sector terminology, including terms such as '*surface water management*' and '*blue-green infrastructure*' are not well understood and sometimes misinterpreted. The way this subject is communicated to consumers needs to be improved, to better meet them at their level of understanding. Enhancing familiarity and understanding of the phrases, through using simple and accessible language, should support increased engagement and buy-in from the consumer/community⁴³.
- 4.30. Participants in the workshop similarly pointed to a lack of consistent language and terminology as hindering the ability to communicate ideas and concepts effectively across different groups. In terms of messaging around BGI, it was also suggested that there was currently too much focus on flooding. Not all communities will feel they are at risk of or impacted by flooding, and therefore may not see BGI as relevant to them. It was felt that the approach to messaging therefore needed to be reframed and based around how BGI can benefit each individual community, promoting better places to live and work:

"Language is too complicated for communities, there's lots of different terminology. We shouldn't be explaining [BGI] as a big infrastructure project but as a series of smaller, natural interventions in their areas... and if we only focus on flooding, there will be people who won't feel they are able to relate to that, if they don't see that as being relevant to them."

5. Proposed solutions

- 5.1. In spite of the barriers identified through our research, BGI remains is a key component supporting Scotland's vision to build more water-resilient places, and to adapt to a changing climate in line with the principles of a just transition. With BGI, decision-makers have the unique opportunity to design infrastructure that delivers multiple environmental, health, and social benefits to consumers and communities, which can be embedded in the environment for years to come.

5.2. Scotland's vision for the future of surface water management shows promise, but the need for a fundamental shift in thinking remains. As the Scottish Government works with stakeholders to rethink existing water sector legislation, a key opportunity exists to embed 'BGI-first' thinking across decision-making at all levels.

5.3. The following proposals have been identified as possible ways forward for policymakers to address some of the barriers previously identified in this report:

- Developing an overarching strategy and a shared vision for BGI.
- Developing legislation and policy drivers that encourage BGI, backed by funding sources.
- Encouraging a joined-up approach to planning infrastructure and to engaging consumers and communities.
- Engaging with consumers and communities as partners from an early stage.
- Developing shared language and a collective narrative around the benefits to BGI.
- Finding a consistent approach to measuring the benefits of BGI.
- Finding ways to incentivise consumers and communities to invest in solutions that better manage surface water at a household and community level.

Developing an overarching strategy and a shared vision for BGI

5.4. As outlined above, the current approach to BGI in Scotland lacks an overarching strategy and suffers from a lack of clear and enforceable targets for actors responsible for implementing BGI to work towards. An important initial step, therefore, is the development of an overall strategy for BGI, supported by clear, outcomes-focused targets set out in relevant legislation.

5.5. This shared strategy is essential for developing a unified approach and vision for BGI, and countering the trend of having multiple, siloed organisations with different interests and responsibilities. A shared strategy for BGI would enable a common understanding of what the sector is trying to achieve, a common framework to work within, and clarity around individual roles.

5.6. As well as helping provide clarity around organisational roles and responsibilities, one of the potential benefits of having an overarching strategy is that it would help align resources and access funding.

Developing legislation and policy drivers that encourage BGI, backed by funding sources

5.7. Having effective legislation in place is an essential means of driving forward a shared vision for BGI.

“We need a two tracked-approach. Creating a shared vision that will drive forward legislation, and having legislation that will then empower the vision to become a reality.”

(Stakeholder comment)

- 5.8. As noted above, the strength of the language used in policy and planning documents can serve as a barrier to incentivising action where it is weak, and the opposite where it is strong. Any legislation or policy seeking to incentivise BGI should therefore aim to use ambitious, assertive language, with clearly defined and limited exceptions.
- 5.9. For the legislation to enable real impact, it should also be backed-up by funding, either through existing sources or by creating new funding specifically for BGI.

Encouraging a joined-up approach to planning infrastructure and to engaging communities

- 5.10. The literature points to an integrated and multi-stakeholder approach as a key feature in optimising BGI performance. Multi-institution collaboration can ensure there is the resource, capacity and buy-in required to support the coordination of projects with multiple drivers, stakeholders, and novel technologies.
- 5.11. One good practice example of how to achieve a coordinated approach between different stakeholder groups are Learning Action Alliances (LAAs)⁴⁴. LAAs provide a dedicated shared space to discuss benefits, barriers and uncertainties associated with BGI, typically outside the constraints of existing formal institutional settings. A LAA case study in Newcastle involved stakeholders from different interest groups coming together, including city council departments, environment, local interest groups, trusts and societies, water companies, academics, and major landowners, to discuss Newcastle’s ambition to become a blue-green, water resilient city. Groups like this can directly contribute to reducing barriers which emerge from some of the relational complexities that are inherent to the development of BGI⁴⁵.
- 5.12. Within Scotland, various – formal and less formal – examples of partnership approaches have been adopted across different urban areas, including the Metropolitan Glasgow Strategic Drainage Partnership⁴⁶ and the Edinburgh and Lothians Strategic Drainage Partnership⁴⁷, amongst others. A review of the current approaches to partnership working in relation to BGI and flood resilience planning in Scotland may help to identify ways to promote enhanced and more inclusive collaboration, while ensuring that good practices are captured and shared more widely.
- 5.13. A joined-up approach is also a crucial element in delivering effective consumer and community engagement and avoiding the duplication of efforts.

“This read-across and interconnection should translate into a joined-up approach to community engagement too. This should be done in a coordinated way, rather than having local authorities, Scottish Water, SEPA and others, all engaging communities on different issues in a different way. It is the equivalent of digging up a road once, rather than digging it up twenty times.”

(Stakeholder comment)

Engaging with consumers and communities as partners at an early stage

- 5.14. The research points towards consumer and community engagement as a consistent thread linked to the long-term sustainability of a BGI project. To be effective, consumer engagement must go beyond superficial measures, such as the mere provision of information, and give communities a genuine opportunity to co-design and inform the decisions around infrastructure. For BGI to be developed in a way that involves consumers, communities must be treated as partners in the process. This is especially true for retrofit projects, where changes are made to a space a community knows and uses.
- 5.15. Moreover, it is essential to involve consumers in BGI projects from an early stage. This way, the needs of the community and any concerns they may have can be understood and addressed at the design stage. Communities can be brought in through different methods, including consultations and site visits, as well as through awareness raising campaigns. Local stewardship has been proposed as one way of engaging with communities and supporting longer-term BGI maintenance⁴⁸. Stewardship might include encouraging positive behaviours like litter-picking and maintenance (clearing ponds or weeds), or facilitating creative use of the space, such as through organising walks or classes. Overall, a sense of community ownership or buy-in is important for BGI projects to be effective and resilient over a period of years, including in terms of maintaining strong intergenerational engagement.

Developing shared language and a collective narrative around the benefits to BGI

- 5.16. Current terminology and language used to describe BGI and its benefits is criticised for being inconsistent, overly technical, and not framed with communities in mind. Developing a shared language and a collective narrative that makes clear the benefits of BGI and the impacts on communities is an important step towards overcoming this barrier.
- 5.17. Given that different communities may understand issues in different ways, a place-based approach to messaging should be taken which centres communities and their needs. For example, for some communities minimising flood risk will be an important message, while for others this may not be seen as relevant, even though the principles of BGI are important nonetheless.
- 5.18. Evidence also shows that consumers are largely unaware of the link between water and climate change⁴⁹, and therefore the role water plays in climate adaptation and mitigation. Enhancing consumers' understanding of the role water plays in causing and mitigating climate change is an important preliminary step, in order to ensure consumers have the necessary information to be able to influence BGI development.

Finding a consistent approach to measuring the benefits of BGI

- 5.19. Multi-functionality and the provision of multiple co-benefits is fundamental to the growing appeal of BGI. However, as acknowledged in the literature, providing objective evidence of some of the wider benefits of BGI can be challenging. Establishing a way to quantify and assign a value to the full range of environmental, financial, and community

benefits of BGI projects is key to overcoming barriers associated with accessing space, funding, and achieving community buy-in, amongst others.

5.20. One technique proposed in the literature is the application of a systems thinking framework to assess BGI through the ecosystem services it provides across the multiple sectors it interacts with.⁵⁰ An ecosystem service is any benefit that ecosystems – defined as the community of interacting organisms and their physical environment - provide to people. Ecosystem services can take the form of:

- tangible goods (such as food, water and fuel)
- climate regulation (such as flood management and water filtration)
- impacts on people's health and wellbeing and supporting services (such as contributing to the water cycle, soil formation and biodiversity).⁵¹

5.21. The advantage of using a system thinking approach is that it provides a structured and coordinated approach to link the components of a system together. This enables decision makers to take a holistic view of the system and the multiple benefits that BGI provides, including offsetting negative impacts across multiple sectors. For instance, the role that BGI plays in urban heat mitigation, storm water and wastewater management can have a positive impact for multiple sectors either by reducing the operational costs (for example, reduction of the energy use for heating/cooling) or offsetting their negative impact on environment and health (for example, mitigating the impacts of urban creep and road runoff pollution). A systems thinking framework may be used to systematically map all the benefits of a BGI project as they are spread across different systems, and can be used to make the case for new investment in the project, particularly if cost-benefit comparisons with more traditional grey infrastructure approaches are made.

5.22. With BGI, there is an opportunity to redress some of the existing inequalities of access to high-quality green and blue spaces. Socio-economic and demographic inequalities in access to such spaces should help to drive planning approaches to BGI interventions so that the benefits of BGI spaces, including health benefits, are equally felt across the population.

Finding ways to incentivise consumers and communities to invest in solutions that better manage surface water

5.23. In instances where BGI has not been carried out by the local authority, or there are no plans to do so, communities and individuals can be encouraged to undertake local interventions to manage rainwater in their own homes, gardens or community areas. Household and community rainwater management solutions are particularly relevant as a means of tackling urban creep. Research on rates of urban creep across Edinburgh found that, between 1990 and 2015, Edinburgh lost an average 11.27ha/year of vegetated land to urban land cover (which is equivalent to losing over 15 football pitches of vegetated land per year). Urban creep is known to increase the risk of surface water flooding, but there is a need to better understand and quantify this risk, to enable better strategies to manage and mitigate it.⁵²

5.24. To help encourage actions to mitigate the harms associated with rising rates of urban creep, financial incentives could be offered at a household or community level toward localised rainwater management solutions. A degree of community awareness raising is also required, around what sorts of actions individuals can take, how they could go about doing them and what the benefits are. There is scope for imaginative thinking around effective ways to reach consumers at an appropriate time and place. For instance, consumers in the process of carrying out home renovations might benefit from information and advice around household rainwater harvesting solutions provided in DIY and garden stores. It cannot be assumed that businesses will take responsibility for championing these goods or services on their own, and as such there needs to be a deliberate effort to identify a network of possible ‘intervention’ points for encouraging blue-green solutions at a household level and to communicate roles and responsibilities with these actors. In tandem with this, it may be helpful to review existing planning legislation with a view to examining possible disincentives against individual homeowners taking action to manage surface water, such as installing a water butt as part of a house renovation or opting for a permeable driveway.

¹ Scottish Government (2021) Water-resilient places – surface water management and blue-green infrastructure: policy framework <https://www.gov.scot/publications/water-resilient-places-policy-framework-surface-water-management-blue-green-infrastructure/>

² Office of National Statistics (2019) UK Natural Capital: urban accounts <https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/uknaturalcapital/urbanaccounts#extent-of-urban-space-in-the-uk>

³ City of Edinburgh Council, Social Return on Investment <https://www.edinburgh.gov.uk/downloads/file/24775/the-value-of-the-council-s-parks>

⁴ Centre of Expertise for Waters (CREW) Report (2019) *Quantifying rates of urban creep in Scotland: results for Edinburgh between 1990, 2005 and 2015* https://www.crew.ac.uk/sites/www.crew.ac.uk/files/publication/CRW2016_16_Urban_Creep_Main_Report%20Blink.pdf

⁵ Scottish Household Survey (2021) *Telephone survey: key findings* <https://www.gov.scot/publications/scottish-household-survey-2021-telephone-survey-key-findings/pages/9/>

⁶ CREW (2020) *Impacts of Flooding in North-East Scotland* <https://www.crew.ac.uk/publication/impacts-flooding>

⁷ Royal Academy of Engineering (2016) *Living without electricity: one city's experience of coping with loss of power* <https://www.raeng.org.uk/publications/reports/living-without-electricity>

⁸ Farr (2021) *West-Lothian river flooded with raw sewage in heavy downpour sparking health fears* (9 July 2021) <https://www.edinburghlive.co.uk/news/edinburgh-news/west-lothian-river-flooded-raw-21006335>

⁹ Morris, Brewin (2014) *The impact of seasonal flooding on agriculture: the spring 2012 floods in Somerset, England*. *Journal of Flood Risk Management*, 7 (2) <https://onlinelibrary.wiley.com/doi/epdf/10.1111/jfr3.12041>

¹⁰ Vidal (2014) *Wildlife casualties of floods grow amid fears over ‘polluted’ wetlands* (23 February 2014) <https://www.theguardian.com/environment/2014/feb/23/wildlife-uk-floods-species-habitats-lost>

¹¹ Scottish Water, Surface Water Policy: <https://www.scottishwater.co.uk/Business-and-Developers/NEW-Connecting-to-Our-Network/Developing-housing-and-commercial-properties/Preparing/Surface-Water-Policy>

¹² Scottish Government (2021) Water-resilient places – surface water management and blue-green infrastructure: policy framework <https://www.gov.scot/publications/water-resilient-places-policy-framework-surface-water-management-blue-green-infrastructure/>

¹³ Scottish Government (2021) Water-resilient places – surface water management and blue-green infrastructure: policy framework <https://www.gov.scot/publications/water-resilient-places-policy-framework-surface-water-management-blue-green-infrastructure/>

¹⁴ Scottish Government (2023) National Planning Framework 4. Part 2 – National Planning Policy <https://www.gov.scot/publications/national-planning-framework-4/pages/3/>

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- ¹⁵ For example, in England, the Environment Agency has worked in partnership with CIRIA and others to update B£ST (Benefits Estimation Tool –valuing the benefits of blue-green infrastructure). The updated tool and accompanying updated guidance were published in February 2019. The tool, guidance and case studies are available on the Susdrain website <https://www.susdrain.org/resources/best.html>
- ¹⁶ Open access refers to research publications made available online, free of charge, and any other barriers to access.
- ¹⁷ The following research repositories were searched for open access papers: CORE <https://core.ac.uk/> MDPI <https://www.mdpi.com/> research gate <https://www.researchgate.net/>
- ¹⁸ <https://openaccessbutton.org/> and <https://unpaywall.org/>
- ¹⁹ Scottish Government (2021)
- ²⁰ Brown, Mijic (2019) *Integrating green and blue spaces into our cities: making it happen* <https://www.imperial.ac.uk/media/imperial-college/grantham-institute/public/publications/briefing-papers/Integrating-green-and-blue-spaces-into-our-cities---Making-it-happen-.pdf>; Flynn, Davidson (2016) *Adapting the social-ecological system framework for urban storm water management: the case of green infrastructure adoption* Ecology and Society 21(4) <http://dx.doi.org/10.5751/ES-08756-210419>; Collins, Cheshmehzangi, Chan, Lei (2020) *Identifying enablers and barriers to the implementation of the Green Infrastructure for urban flood management: A comparative analysis of the UK and China* Urban Forestry & Urban Greening 54 <https://doi.org/10.1016/j.ufug.2020.126770>
- ²¹ Flynn, Davidson (2016)
- ²² Urban Heat Island Effect is where metropolitan areas are significantly warmer than the surrounding rural areas due to increased human activities such as urbanisation and pollution
- ²³ Nowacek et al. (2003) Madden (2010) as cited in Flynn, Davidson (2016)
- ²⁴ Flynn, Davidson (2016)
- ²⁵ Scott, Holzinger, Sadler (2017) cited in Hislop, Scott, Corbett (2019) *What Does Good Green Infrastructure Planning Policy Look Like? Developing and Testing a Policy Assessment Tool Within Central Scotland UK* Planning Theory & Practice 20(5) <https://doi.org/10.1080/14649357.2019.1678667>
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- ²⁸ Brown, Mijic (2019)
- ²⁹ Committee on Climate Change (2017) *Progress in preparing for climate change* <https://www.theccc.org.uk/publication/2017-report-to-parliament-progress-in-preparing-for-climate-change/>
- ³⁰ Brown, Mijic (2019)
- ³¹ <https://www.gov.uk/government/news/new-approach-to-sustainable-drainage-set-to-reduce-flood-risk-and-clean-up-rivers>
- ³² <https://www.sepa.org.uk/media/219048/wat-rm-08-regulation-of-sustainable-urban-drainage-systems-suds.pdf>
- ³³ Duffy et Al (2013) Source control SuDS delivery on a global scale and in Scotland including approach by responsible organisations and professional groups <https://rke.abertay.ac.uk/en/publications/source-control-suds-delivery-on-a-global-scale-and-in-scotland-in>
- ³⁴ Hislop, Scott, Corbett (2019) *What Does Good Green Infrastructure Planning Policy Look Like? Developing and Testing a Policy Assessment Tool Within Central Scotland UK* Planning Theory & Practice 20(5) <https://doi.org/10.1080/14649357.2019.1678667>
- ³⁵ Hansen, Pauliet (2014) McWilliam et Al. (2015) Wilker et Al. (2016) cited in Hislop, Scott, Corbett (2019)
- ³⁶ Citizens Advice Scotland (2022) *Building Back Blue* <https://www.cas.org.uk/publications/building-back-blue>
- ³⁷ Smith (2021) ‘Concern for environment reaches record high in YouGov top issues tracker’ (9 November 2021) <https://yougov.co.uk/topics/politics/articles-reports/2021/11/09/concern-environment-reaches-record-high-yougov-top>
- ³⁸ Scottish Household Survey (2021) *Telephone survey: key findings* <https://www.gov.scot/publications/scottish-household-survey-2021-telephone-survey-key-findings/pages/9/>
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- ⁴⁰ Cotterill, Bracken (2020)
- ⁴¹ Ibid
- ⁴² Collins, Cheshmehzangi, Chan, Lei (2020)
- ⁴³ Citizens Advice Scotland (2022) *Building Back Blue* <https://www.cas.org.uk/publications/building-back-blue>

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- ⁴⁶ <https://www.glasgow.gov.uk/article/20020/Metropolitan-Glasgow-Strategy-Drainage-Partnership-MGSDP>
- ⁴⁷ City of Edinburgh Council (2021), *Vision for Water Management in the City of Edinburgh* <https://www.edinburgh.gov.uk/downloads/file/30101/vision-for-water-management-in-the-city-of-edinburgh>
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