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Increasing flood resilience: residential and community runoff retention solutions

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Aim of the project

The project aim was to evaluate and compare the cost and effectiveness of residential and community property rainwater runoff source control solutions to increase flood resilience. Source control Sustainable Drainage Systems (SuDS) manage water at or near its source, in order to slow down or stop the water entering the drainage system. The project undertook a literature review, case study reviews and cost benefit analysis to consider the following key issues:

- i. What are the multiple benefits of source control SuDS and suitability for different urban land types?
- ii. What are the barriers to adopting these solutions at both residential and community property level?
- iii. What are the opportunities and recommendations for overcoming these barriers?

Background

In recent years there has been an increased awareness of the need to address surface water runoff in urban environments. This includes understanding where flood risks may arise, increase, or change in the future due to climate change and increased urban creep, the increased conversion of gardens and other vegetated areas which help to soak up rain. To support resilient surface water management in urban environments, the identification, efficacy, cost effectiveness and prioritisation of implementable flood risk management solutions is essential. This aligns with the Scottish Government's *Water-resilient places – surface water management and blue-green infrastructure: policy framework*, as well as several

elements of the *National Planning Framework 4 (NPF4)* and supports the development of the *Flood Resilience Strategy for Scotland*.

Key Findings

What are the benefits?

Well-designed, source control SuDS located within the land immediately surrounding a building (known as in-curtilage source control), can deliver multiple benefits to households and communities. Successful implementation can lead to solutions where flood risk reduction benefits become a part of the wider people-centred approach to planning and design of public spaces. For example, the biggest impact of implementing nature-based in-curtilage measures, such as raingardens or SuDS trees, in urban areas is in providing green spaces for residents and communities, particularly in areas where quality outdoor space is limited. Community-driven projects may open avenues that attract complimentary additional funding from other funding sources thus sharing the financial burden. Converting previously impermeable surfaces into permeable surfaces is also an effective approach to reducing the impact of urban creep and climate change. This allows rainwater to infiltrate into the ground as opposed to running off impermeable surfaces into the drainage system.

What are the barriers?

Currently, the use of in-curtilage source control is low, and there remain barriers to wide-scale use. These barriers can be categorised as:

Legislative – SuDS are required for new development, but source control is not mandatory. Most developments, instead, tend to include SuDS by which

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rainwater is managed centrally (rather than at the properties themselves), e.g. through the creation of ponds serving several properties where water can flow and be stored.

Regulatory – approval of SuDS design and regulation sits within planning policy and Scottish Water’s technical standards, but these do not include in-curtilage source control. Ensuring ongoing compliance of in-curtilage source control would rest with Local Authority Building Control. Local authorities are reluctant to promote in-curtilage source control as the resident may not properly maintain the system, creating a risk that the solution might fail and lead to localised flooding.

Financial – the cost to design, implement and maintain in-curtilage source control for the resident. In Scotland where for the vast majority of households, the water supply is not metered and is based on Council Tax bands, there is no financial gain to the resident to be made from retrofitting source control techniques to attenuate and store rainwater for reuse.

Social – awareness and acceptability of in-curtilage source control. Residents may not fully understand the environmental benefits of retrofitting source control. The space needed for, and the appearance of the measures may also contribute to reluctance to retrofit source control measures. For example, cheaper solutions such as standard rain barrels are typically plastic and may not be considered aesthetically appealing or desirable, particularly where space is limited.

Opportunities to overcome barriers and recommendations

People:

- Engage with consumers as early as possible when statutory authorities are improving surface water management through retrofit techniques. This will provide opportunities for consumers to co-design and inform the decisions for source control measures ensuring that consumers’ needs are met, and amenity benefit is maximised.
- Increase awareness around the impact of urban creep such as how putting down tarmac or concrete in their properties can increase flood risk. Residents can be encouraged to do their bit to mitigate climate change impact by introducing

source control techniques to compensate for the additional runoff from urban creep.

Place:

- Include source control at the design stage of projects, with additional focus on producing sustainable, well-designed places and homes which meet people’s needs to improve their overall quality of life.

Process:

- Develop collaboration amongst different stakeholders including statutory authorities, local communities, and individual consumers to coordinate approaches to identify and develop responses to surface water flooding and enhance the co-benefits of source control.
- Encourage legislative changes that require the use of in-curtilage source control for all new developments. For existing properties, source control could be encouraged through financial incentives, such as reducing the fixed water charge fee in council tax if source controls are implemented and maintained by the resident; or through household grants, in a manner similar to household energy efficiency grants.

Research Recommendations

- Further research to investigate the behaviour of specific SuDS measures and how they will perform under different climate scenarios, i.e. more intense and frequent rainfall in winter months. This is particularly important in understanding maintenance requirements to ensure efficacy.
- Further research on uplift values used by designers to account for the influence of urban creep and climate change. There has been limited research on uplift factors and if they are fit for purpose in the Scottish context.
- Improved availability of real cost data across the sector to enhance the cost benefit analysis process for In-curtilage source control. Uncertainty and lack of clarity relating to delivery and design costs is a key barrier to the implementation of SuDS with assumptions required when assessing benefit value of options at the early stages of projects.

Please see the main report for full details on the project findings and recommendations.