The benefits of distributed SuDS in London

In this briefing Simon Ainley, Arcadis presents some of the key outcomes of the London Strategic SuDS Pilot Study so far, and the implications they may have on future SuDS delivery in London and elsewhere.

Introduction

Arcadis is collaborating with the Greater London Authority (GLA), Thames Water (TW), the Environment Agency (EA), Transport for London (TfL) and several London Lead Local Flood Authorities (LLFAs) to understand the financial benefits of committing to long-term investment in retrofitting sustainable drainage in London. This briefing presents some of the key outcomes of the project so far, and the implications they may have on future SuDS delivery in London, including:

1. Understanding the underlying value of SuDS in London
2. Addressing the challenge in attributing benefit to individual SuDS features
3. Funding SuDS through Flood Defence Grant-in-Aid (FDGiA)
4. Turning strategy into action - from justification to delivery

Overview

In the future it is likely that the various bodies with responsibility for flood management and mitigation under the Flood and Water Management Act 2010 will need to take a more holistic and innovative approach to improving resilience. The progressive impacts of climate change and socio-economic challenges mean that focusing on current or short-term impacts will rapidly become less effective or desirable.

SuDS, as an approach to managing rainfall runoff and flood risk, can also deliver multiple benefits and create an opportunity for an incremental, scalable and adaptive strategy to manage the impacts that diverse and dense urban environments like London are facing. Distributing drainage infrastructure within local communities, public open space, and the streetscape will enhance London's resilience to the ever-worsening impacts of heavy rainfall and surface water flooding.

The resilience of infrastructure, i.e. ensuring it remains operational and fit for purpose under a range of future conditions, is the ultimate goal for critical engineering systems and infrastructure. However, this ideal situation is a shifting goal, and the journey toward it requires constant re-evaluation and justification of expenditure. Absolute resilience is ultimately unaffordable and unobtainable. SuDS should be utilised where they are most cost-beneficial and can provide demonstrable local improvements along the way.

The full value of SuDS to local communities and London as a whole will only start to be realised once features become more commonplace and integrated within residents' day-to-day use of their local places and spaces, i.e. where they live, work travel and play.

A proposal submitted to the Thames Regional Flood and Coastal Committee (TRFCC) in January 2017 by the London Drainage Engineering Group (LoDEG) members, led by the London Borough of Enfield, explored and evaluated the catchment-scale benefit of large-scale SuDS implementation. The proposal focused on flood risk management but also assessed the potential to deliver a range of supplementary local and regional socio-environmental benefits, required to justify long-term collaborative funding opportunities.

The Proposal was approved for funding by TRFCC in 2017 (match funded by Thames Water), which led to the commissioning of the London Strategic SuDS Pilot Study. The key components of the project are summarised in Figure 1, which shows how different data were collected and evaluated throughout the two-year project.

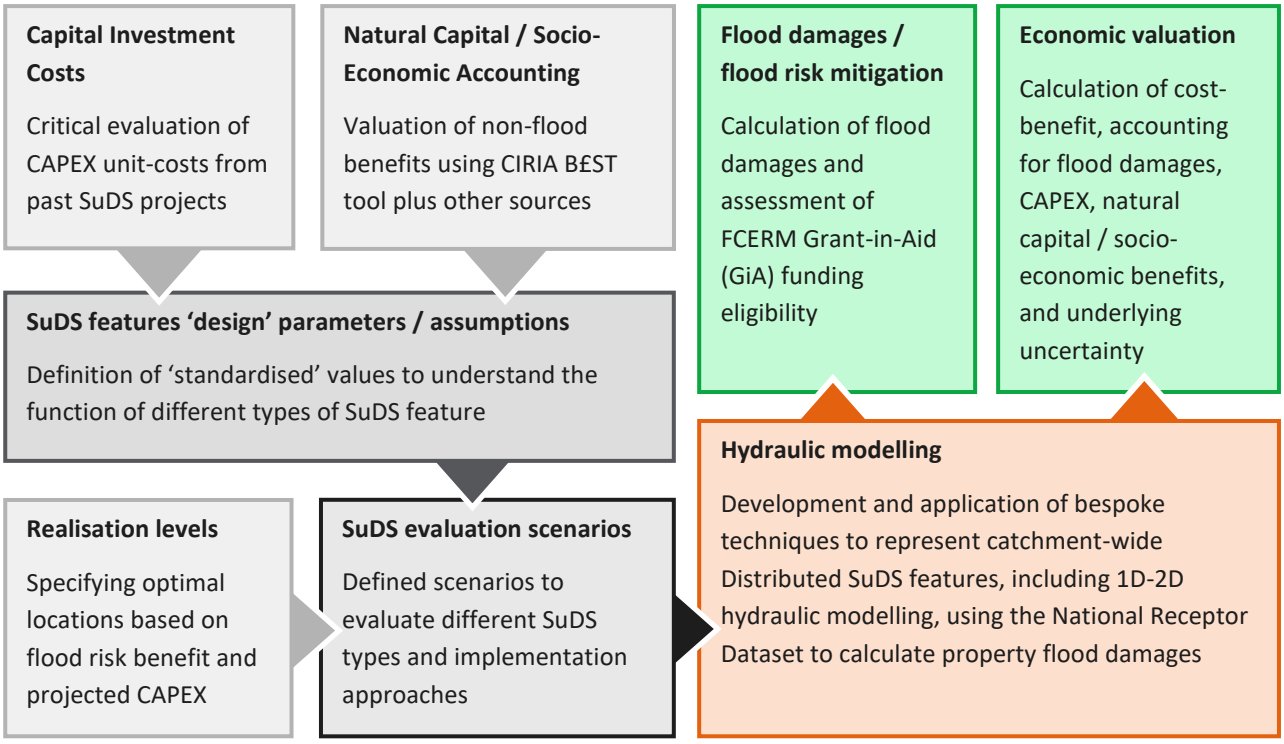


Figure 1 Key project components of the London Strategic SuDS Pilot Study

A range of conceptual SuDS evaluation scenarios were developed, including streetscape bioretention, living roofs, new street tree planting (inc. tree pit storage), and retrofitting existing street trees.

Underlying value of SuDS in London

A potential opportunity to invest up to £2bn in SuDS public infrastructure across three central London boroughs (Camden, Westminster and Southwark) was identified. This investment would reduce flood damage by nearly £1bn (See Figure 2) and could provide a further £2.3bn benefit in natural capital value at a benefit-cost ratio of around 1.5. The assessments assumed a 50-year design life and utilised the EA Multi-Coloured Handbook approach for calculating economic damages.

The large scale of reductions in flood damage illustrated represents the potential outcome should most opportunities be delivered through a long-term commitment (i.e. >= 25-years) to SuDS within the study area. While this may seem highly aspirational it does illustrate the 'bottom-line' value of a wholesale commitment to investing in SuDS based on their ability effectively self-fund through reducing flood damage benefits.

The socio-economic benefits (inc. physical & mental health, land values etc.) were determined to outstrip flooding and natural capital benefit, by up-to an order of magnitude for some scenarios evaluated. This demonstrates the underlying holistic value of SuDS to urban communities and that, while flood mitigation generates a significant case for investment, in many cases it will be a secondary factor.

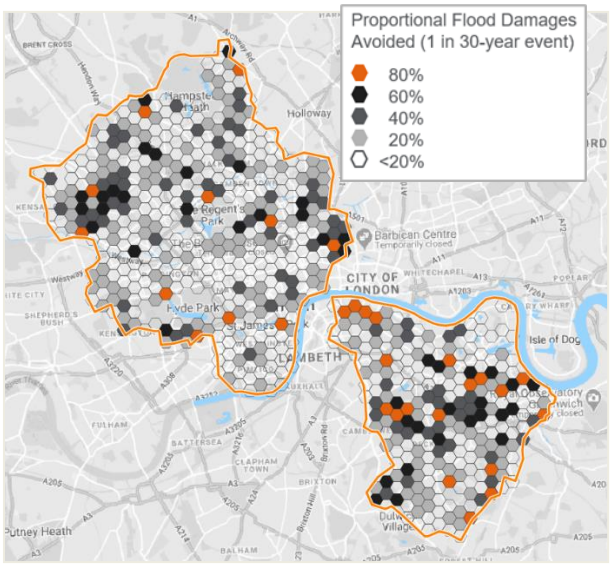


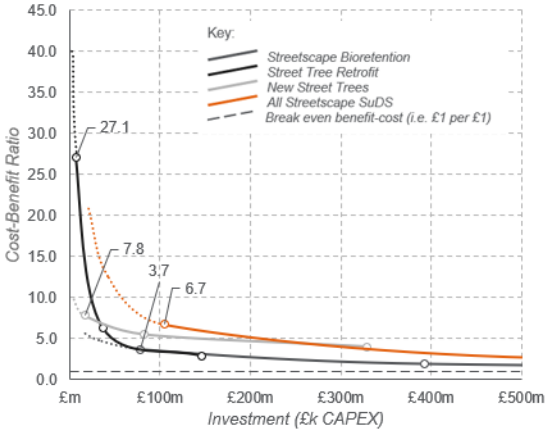
Figure 2 Flood damages avoided

Importance of selecting optimal locations based on the value to beneficiaries

A key outcome was to demonstrate the value of targeting optimal locations for SuDS investments based on flood damages avoided, as demonstrated in Figure 2.

Several approaches were tested, in order to understand the technical and logistical considerations needed to help LLFAs identify optimal 'sites'.

The results provided tangible evidence that optimising investments is not only practical but is likely to become essential for securing funding for SuDS. It was shown that benefit-cost ratios would rise steeply from around 1.5 to between 3 and 30 (depending on the SuDS feature types chosen), with clearly higher potential for flood damage reduction within the top 5% most optimal locations. Both these outcomes can be clearly seen in Figure 3.



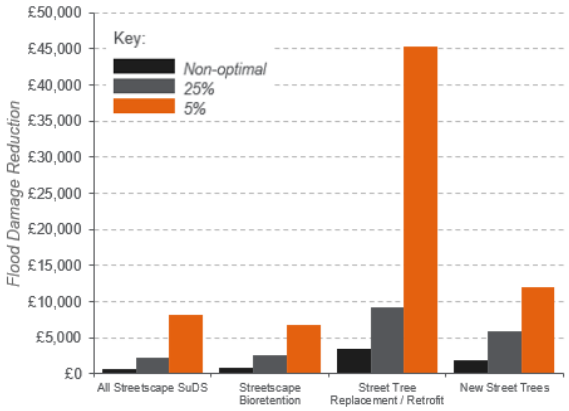


Figure 3 Cost-benefit and flood damage reduction benefits from optimisation

Challenge in attributing benefit to individual SuDS features

While this approach to selecting optimal locations for SuDS investment and demonstrating value at a catchment scale is pragmatic, it does rely on assessing clusters of SuDS features and their immediate local benefit. Moving the focus in from a catchment scale to a local or street scale, which is necessary to convert SuDS strategies into delivery programmes, requires an understanding of how much benefit an individual SuDS feature contributes to the overall catchment value. This takes into account neighbouring SuDS features that could be constructed at different times.

Furthermore, the benefit that each individual SuDS feature could provide is also a product of scale and the timeframe of investment across the whole catchment. The outcomes here show the ultimate benefit of a long-term commitment to SuDS investment, which could take many decades, indicating an independent valuation of each SuDS feature would be lower.

Theoretically, SuDS opportunities could be ranked based on their benefit, both individually and as part of a cluster of features, serving to reduce flooding both locally and more regionally. Alternative methods have been investigated, including simplifying the modelling to enable multi-objective optimisation or the use neural networks / machine learning. Further work is currently being undertaken to develop a higher resolution assessment method, utilising topography to relate SuDS features with neighbouring SuDS (uphill and downhill), and flood benefits.

Funding SuDS through Flood Defence Grant in Aid

The assessments of economic valuation provided evidence that targeted investments in SuDS can substantially improve the likelihood of securing full or part Flood Coastal Erosion Risk Management (FCERM) Flood Defence Grant in Aid (FDGiA) funding. In most cases however, under the current funding framework, engaging additional partners and investors will remain essential, requiring the effective demonstration of return-on-investment. The average partnership funding score for the top 5% most optimal locations equated to 28%.

Simplification and better alignment of the current (and future) FCERM FDGiA process could significantly improve SuDS investment prospects. A two-stage process is suggested, allowing for the strategic, economic and commercial case for funding to be proposed at a catchment-level with the financial and

management cases agreed on a site-by-site basis, as shown in Figure 4.

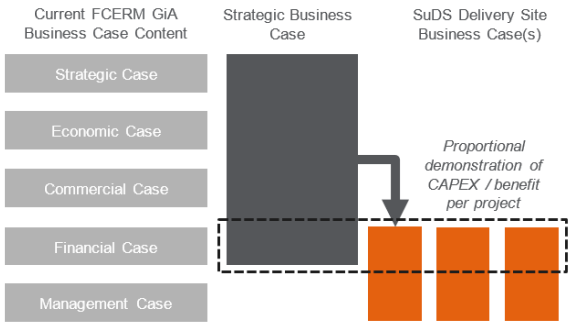


Figure 4 Suggested FCERM FDGiA process to better enable SuDS investment

To realise the benefits from what is effectively an 'essential' long-term financial commitment to SuDS, any revision to the current process would need to:

- Improve the efficiency of generating a business case
- Enable repeatability, consistency and transferability across catchments / LLFAs
- Generate resilience to regulatory / governmental policy changes.

Turning strategy into action - from justification to delivery

Measurable progress toward resilience is unlikely to be achieved if too much effort is concentrated in the strategy phase – "what can we do to be better prepared". Resilience can only start to be realised following the delivery of projects that prove the concept – "here's how we've reduced the risks". The transition from planning to delivery, where the approach proposed is considered novel or 'risky', can be very difficult to navigate, and in many cases can be severely inhibited by uncertainty around how it will function and perform. In relation to SuDS, the biggest resistance to this transition is typically a lack of clarity around costs, both construction and maintenance, and magnitude of the benefit that they can generate. Although both elements can be appraised post-construction the majority of funding opportunities require a prior 'proof', or evidence of benefits and an adequate return on investment, necessitating effective 'up-front' planning and evaluation.

This study aimed to provide a holistic, London-focused evidence-base to help relevant organisations effectively move through the transition from planning to action. The conclusions cover a wide range of key outcomes, including taking the following practical and achievable next steps:

- The LLFAs (plus TW and TfL) should identify and formulate SuDS strategies for the next 6-year programme of 2021 FCERM FDGiA funding
- London-wide guidance on obtaining funding for SuDS should be developed to provide a robust structure to support the LLFAs in realising their SuDS ambitions
- More effective stakeholder collaboration is needed to grow awareness and justify cross-department communication, specifically considering delivery timescales

The partnership workshops and ongoing collaboration have enabled the creation of a solid foundation for CAPEX estimation (OPEX was omitted for the assessment) and the calculation of natural capital value. The application of high-resolution and large-scale hydraulic modelling provided empirical evidence of flood risk mitigation value, forming the basis for demonstrating financial viability and return-on-investment for all potential beneficiaries.

The outcome of the project (to-date) has been to assist in securing £750k for SuDS retrofit projects in three London Boroughs. Potentially, and more significantly the project is providing the GLA with a practical evidence base to engage with, encourage and incentivise the EA and central government to grow their commitments to investing sustainable drainage. The ongoing goal is the development of financial and technical approaches / evidence as a catalyst for identifying opportunities for sustainable investment in blue-green infrastructure, across London and nationally.

Ultimately, the achieved aim of the study was to generate technical insight and objective evidence to demonstrate the true value of retrofit SuDS. The work has generated solid evidence to help catalyse future steps towards more robust and self-sustaining investments, to hopefully improve the quality of life for millions of London residents.

For further information please contact:
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Simon is a principal drainage engineer for Arcadis who specialises in the development of SuDS planning strategies, utilising innovative hydraulic modelling techniques and has multi-disciplinary experience. His technical capabilities and experience also cover hydraulic network modelling, drainage design, geospatial analytics, risk assessment, and benefit-cost analysis.

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