Revisiting SuDS Economics

Exploring economic appraisals to identify flexible adaptation pathways

FACTSHEET

Project area: *SuDS economics, transition to Blue Green infrastructure*
Intended audience: *LLFA, EA, government, practitioners, developers, academia*

Summary

The slow transition to SuDS technologies in the UK is in part a result of an incomplete understanding of their economics. The existing evidence base around SuDS economics has not convinced decision-makers about their benefits (Melville-Shreeve et al, 2018). High-level issues include: (i) redefinition of economic appraisals to include wider costs and benefits, and (ii) simplification of the organisational route map to SuDS (from pre-planning through to maintenance). As a consequence, decision-making on drainage infrastructure is based on a narrow definition of economics and an "ease of implementation" attitude by only the key stakeholders (see Fig. 1). Understanding the need to prepare for an uncertain future, and the implications it has on drainage infrastructure economics, can lead to greater integration. *Adaptation pathways* use multi-criteria analysis which values multiple interventions and their role in a management train, as well as their multiple benefits. Thus, complex pathways with combinations of interventions can respond to system performance tipping points triggered in the future. The technique can support no-regret economic/technical decision-making under multiple possible futures by answering the question of "what is the most effective mix of blue-green and grey systems in any given location at any time".

Cost-Benefit Analysis

The standard technique of appraisals involves defining interventions, setting objectives, and creating and reviewing options by analysing their costs and flood benefits. Within this framework, cost-benefit analysis is recommended with supplementary techniques to be used for weighing up those wider benefits that remain unvalued, such as valuation methods for different categories of ecosystem services (DEFRA, 2007). The analysis quantifies in monetary terms as many of the costs and benefits of a SuDS proposal as feasible, including items for which the market does not provide a satisfactory measure of economic value. The defined objectives of the project are reflected in specifications and ultimately define what the potential costs and benefits are. In the case of SuDS, the primary objective is their function as part of drainage infrastructure while other coincidental benefits arise that can be co-assessed but are not always included in such calculations.

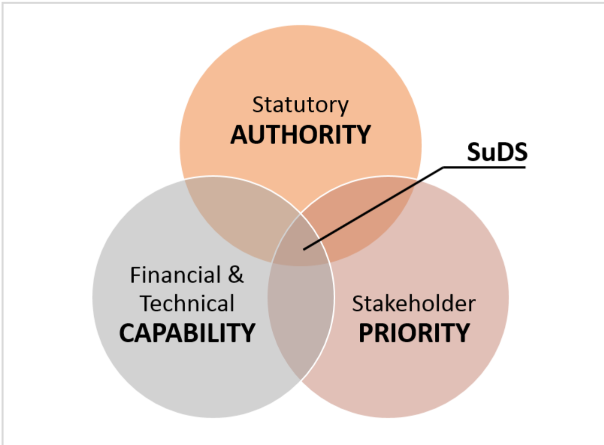


Fig. 1: The necessary conditions for successful transition to SuDS technology

What are the components of an economic appraisal of drainage infrastructure?

This depends on the definition of the problem's boundaries. Aside from damage reduction to properties and infrastructure, the ecological and societal functions of drainage infrastructure can also be monetised and captured. Valuation techniques for the monetisation of such benefits have been developed and included in tools such as BeST (CIRIA, 2015). Amenity and community value comprise additional indirect benefits. Costs include capital and maintenance/operational expenditure. Net present value estimation techniques are used to discount costs and benefits that accrue in the future.

Ongoing research

The methodology summarised overleaf is currently being applied to Sutton in South London and Ebbsfleet, in response to existing or future flood issues.

Problem boundaries in spatial and temporal scales

Even when a long planning horizon of drainage infrastructure is considered, whole-life costs are calculated for a single (most likely) performance scenario. Interventions, however, are not seen as part of a broader long-term integrated incremental adaptation strategy (Radhakrishnan et al., 2016; Manocha & Babovic, 2017). An adaptation pathways approach can become a valuable decision-making tool to support such an integrated strategy (Fig. 2). The approach allows the exploration of multiple scenarios under an uncertain future but also examines the evolution of the urban drainage system as a composition of multiple interventions that take place at different moments and locations.

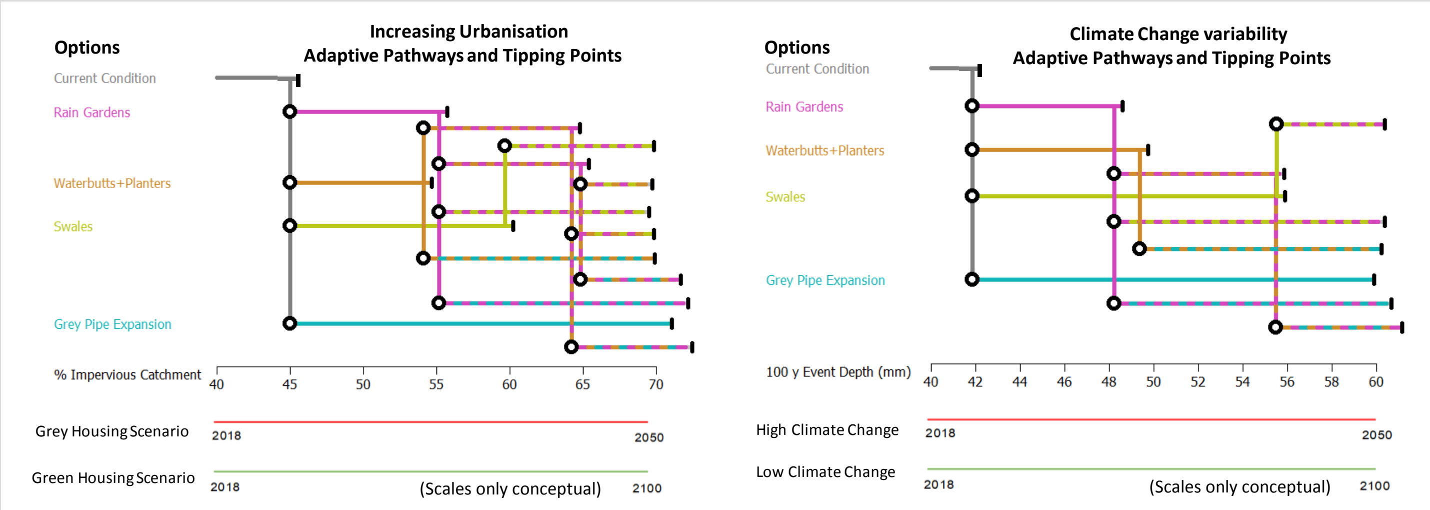
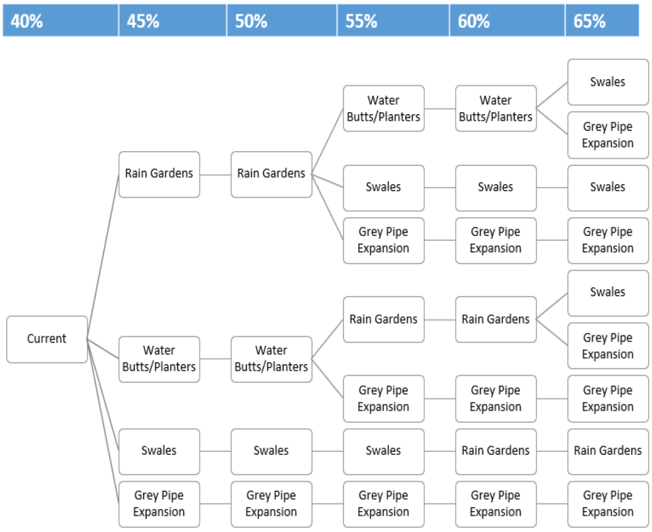


Fig. 2: An adaptation pathways diagram for an area expected to experience flooding problems in the near future: pathways responding to (a) urbanisation (note Green Building Policies which promote permeable areas will delay the timing of a tipping point compared to Grey Policies), and (b) climate change.



Pathways	Current Criteria	Additional Criteria		
	Standard CBA	Adaptiveness	Ease of Implementation	Multiple Benefits
1	Medium	High	High	High
2	Medium	Medium	Medium	High
3	High	High	Medium	High
4	Medium	Medium	High	Medium
5	Medium	Medium	Medium	High
6	Medium	High	Medium	Medium
7	Medium	Low	High	High
8	High	Medium	Medium	High
9	Medium	Low	High	None

Fig. 3: Adaptive pathways decision tree and multi-criteria pathway assessment as a response to urbanisation (see Fig. 2a).

Pipes deliver the highest target effect, followed by swales, rain gardens and planters. Planters and swales are delivered on the same area therefore they cannot be optimally co-developed.

Rain gardens are easiest to implement as they are developed on available space in private properties. They are also the most adaptive as they are scalable to the rate of development.

Whole-life costs can, therefore, be explored under a different set of future conditions and uncertainty. We use the technique to answer the following key question: ***What is the most effective mix of blue-green and grey systems in any given location at any time?***

Which gives rise to the following supplementary questions: (i) what is the desired performance threshold? (ii) How do different interventions combine one with the other? (iii) which interventions should be prioritised? (iv) What is the assessment approach? (v) When should they be implemented? (vi) How do we respond to climate change and urbanisation?

Comparing the appraisal of grey Infrastructure vs SuDS

Water companies and developers usually have confidence in grey Infrastructure as a more attractive economic option in. Even where costs are comparable, there is often a perceived uncertainty associated with performance, maintenance cost and long-term management of SuDS. Meanwhile, prevailing expertise in developing grey systems makes SuDS the less attractive option. Alternative procurement specifications where multiple benefits are valued can make SuDS the economically preferred option by increasing their benefit-cost ratio (Ossa-Moreno, 2017). Broader stakeholder partnerships have shown that this is possible in practice (e.g. “SuDS for Schools” project in North London; http://www.sudsforschools.wwt.org.uk), although harder to deliver from an organisational point of view, as illustrated in the recently published SuDs Route Maps (ICE & ACO, 2018).

The present specifications procedure is identified as a potential barrier to increasing take up of SuDS. The co-design of drainage infrastructure by multiple stakeholders, in multiple possible futures can support timely transition to Blue Green technologies. Developing the institutional capacity is therefore a major challenge to tackle in the future.

References: *1. Melville-Shreeve, P. et al. (2018). State of SuDS delivery in the United Kingdom. Water and Environment Journal, 32: 9–16; 2. DEFRA (2007). An introductory guide to valuing ecosystem services (No. PB12852); 3. CIRIA (2015). BEST: Benefits of SuDS tool; 4. Radhakrishnan et al. (2016). Flexibility in adaptation planning. Melbourne, Australia: Cooperative Research Centre for Water Sensitive Cities; 5. Manocha, N., Babovic, V. (2017), Development and valuation of adaptation pathways for storm water management infrastructure, 77, p.86-97, Environmental Science and Policy; 6. Ossa-Moreno J et al. (2017). Economic analysis of wider benefits to facilitate SuDS uptake in London, UK. 28 (2017) 411–419, Sustainable Cities and Society; 7. ICE & ACO (2018). SuDS Route Maps, Guide to effective surface water management.*

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