



Water resilient cities: building resilience and saving money through better surface water management

A pilot with Greater Manchester Schools

Technical Report and Recommendations

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1. OVERVIEW

Business in the Community and the Water Taskforce sought to prove a concept; that non domestic customers, working with schools initially, could be incentivised to implement sustainable drainage systems (SuDS) through re-investing subsequent savings from surface water charges.

Across the pilot area, Greater Manchester, there are currently over 1,000 schools paying together over £4.3m in surface water charges to United Utilities per year. If they could all move down one charging band, this could save over £2m which could be reinvested to cover the costs of SuDS measures in the short-term and educational benefits in the medium term.

To test this concept, partners from the Water Taskforce (Arup, Costain, MWH and United Utilities) worked with stakeholders and schools across Greater Manchester, including AGMA, the Environment Agency, Manchester City Council, Red Rose Forest and the CLASP network. They produced information and resources for schools and both a site and programme-level model.

The information for schools included a Schools SuDS Audit Guide outlining the practical measures schools can take, case studies, and educational resources including a lesson plan and a video.

The modelling work produced two outputs.

- Firstly, a site-based ready-reckoner for schools and site managers to assess the opportunity for SuDS on their sites and identify whether a payback is possible from reduced surface water charges. This was informed by onsite auditing led by Red Rose Forest and involving members of the Taskforce.
- Secondly, a strategic model which extrapolated the findings of the school SuDS audits, and through analysis of charging data from United Utilities and the use of scenarios, developed options for a strategic programme of interventions.

The outcome of the work is that:

- There is a generally low level of understanding of the opportunities for SuDS to reduce costs and provide environmental and health benefits within schools and other non-domestic customers
- A good number of schools could achieve a reasonable payback (3-5 years) on the implementation of SuDS measures paid for through reductions in surface water charging.
- This will deliver not only cost savings to the schools, but also benefit organisations nationally and locally.
- Based upon our estimated average of £60 per m² of SuDS¹, a payback of 5 years and with a reasonable contribution from all benefitting organisations, this could be as many as a fifth of all Greater Manchester schools, rising to over 40% if a longer term 10-year perspective is adopted.
- At the other end, with no contributions and a 100% optimism bias on our cost per m² of SuDS (£120), then a sustainable model is only achievable over 10 years and would impact upon 13% of schools delivering £3m of investment.

All of these calculations are based upon assumptions explored in the reports, in particular on the cost per m² of SuDS (which has been based upon our site audits and desk-based research) and the number of schools where there are geotechnical constraints.

The conclusion is that the model is promising, but further investigation is required to prove the model and test the assumptions.

Full details of the information developed and analysis are contained in the individual reports, and full recommendations are provided at the end of this synthesis.

¹ This is based on the calculations made within this feasibility study

2. The PROJECT

The project delivered against the original objectives through the following:

Develop a model to test the potential to use existing surface water drainage charge mechanisms to incentivise increased implementation of Sustainable Urban Drainage Schemes (SuDS) as a means to improve flood resilience and improve water quality, using Manchester as a pilot location.	Two models were developed to assess the opportunity at both the site level and strategic programme level.
Explore the potential to create economic opportunities through implementing and maintaining SuDS, particularly in creating jobs for challenged groups.	The outline economic opportunities have been included in the area model, however evidence on the economic benefits of SuDS requires further investigation.
Model a school SuDS retrofit, to ascertain whether the model would be beneficial, from both a local authority and water company perspective.	Two schools were engaged through this project, Chorlton High and Burnage Academy in the City of Manchester. Through site audits and consultation with these schools we have trialled the model and tools created. Manchester City Council, the Greater Manchester Combined Authority, and United Utilities have been engaged throughout and have assisted with the direction and outcome of the project.
Use existing data to establish the potential outcomes if all schools in Manchester were included, to understand financial and operational viability as well as economic/social and environmental benefits at a catchment scale.	United Utilities data has been analysed to understand the opportunity for all schools in Greater Manchester, which provides the basis for the GM strategic model. The wider benefits have been included within the site based tool, allowing schools to undertake a qualitative assessment of the wider benefits. Little evidence is available to monetise these benefits for inclusion in the modelling, and is an area for further exploration.
Raise awareness of the challenges/opportunities within the business community, supporting action to consider using the model on their own assets/developments and promoting collaborative employee volunteering on the school pilot and with catchment partnerships.	Through the Water Taskforce, local partners and the CLASP Network, we have engaged both the public and private sector. Through our engagement of the pilot schools, we have also explored the potential for employee volunteering.

3. The OUTPUTS

Output	Audience	Location
SuDS Audit Guide	Schools – Management & Students	http://claspinfo.org/schools-suds-phase1
Case Study 1 – Burnage Academy	Schools & all United Utilities Business customers	http://claspinfo.org/schools-suds-phase1
Case Study 2 – Chorlton High School	Schools & all United Utilities Business customers	http://claspinfo.org/schools-suds-phase1
Lesson Plan for KS2 / 3	Schools	
Video for Schools KS2/3	Schools – students	https://www.youtube.com/watch?v=3uCk_O3yaL0
SuDS poster for Schools	Schools – students	http://www.ciria.org/Resources/Free_publications/WSUD_poster_final5.aspx

Blog – for Business	Businesses	http://www.bitc.org.uk/blog/post/surface-water-money-down-drain
Site Model – Ready-Reckoner	School site managers	http://claspinfo.org/schools-suds-phase1
Greater Manchester Programme Model	Local Authority contacts / wider stakeholders	http://claspinfo.org/schools-suds-phase1
Dissemination Event attended by 39 delegates	Local Authority contacts / wider stakeholders	

4. The FINDINGS

The key findings from the project are:

Lack of Awareness

There is a generally low level of understanding of the opportunities for SuDS to reduce costs and provide environmental and health benefits. It would be important going forward to continue to focus on information sharing and engagement with key stakeholders in local authorities and schools/academies.

Effectiveness of SuDS Measures

There is potential to reduce surface water charges through SuDS at school sites. The majority of measures identified within the Audit Template provide a direct reduction in hardstanding area, and would contribute directly to the calculation which the charges are based upon, as long as there is an alternative receptor to discharge the surface water to.

Costs of SuDS Measures

Through our assessment we have come to the conclusion that an average cost of £60 per m² of SuDS measures is achievable if there is an appropriate discharge alternative. However, there is considerable uncertainty, given that only two sites were subjected to a desk-based assessment only. This figure is critical to understanding the wider opportunity for a programme of engagement with schools. The table below summarises the four assessments derived from the two audits, based upon a cost at 100% optimism bias for each measure.

School	m ² of hard-standing changed	M ² of SuDS measures	Cost	Saving	Payback	Cost per m ² of SuDS measure
Chorlton High (Example 1)	5,800 m ²	177.5 m ²	£22,675	£15,696.32	1.5 years	£128.68
Chorlton High (Example 2)	6,742 m ²	922.5 m ²	£53,188	£15,696.32	3.5 years	£59.30
Burnage High (Example 3)	12,825 m ²	450 m ²	£19,733	£22,072	0.9 years	£43.85
Burnage High (Example 4)	4,270 m ²	3,490 m ²	£715,683	£15,696.32	45.6 years	£205.07

NB: Implementable SuDS solutions for Chorlton could not be found due to the fact that it was quickly identified that it discharged into a nearby brook, so additional measures were included (whose benefit in reducing surface water charges is uncertain at present) in order to provide a more accurate estimate of average costs for measures to inform the extrapolation to a Greater Manchester scale. This was not the case for Burnage Academy.

Overheads

There are potentially considerable management and development costs associated with successful delivery of a programme. This includes the technical assistance to assess the sites effectively, stakeholder engagement, and project delivery costs. These overheads are a considerable restriction on the scope of a project and typically would decrease the number of schools which could be engaged by around 15%. For example, at £60 m2 over 5 years' payback the number of schools decreases from 153 schools to 129 schools.

Additionally, these costs render any activity at £120 m2 (100% optimism bias) viable, only over 10 years.

Monetising In-direct benefits

The modelling has been unable to monetise the in-direct benefits due to a lack of agreed benchmarks currently. This could make a significant difference to any programme, and could increase the number of schools engaged by 25% based upon a contribution of 20% towards the total costs from organisations benefiting.

Payback

The timescale in which a programme may occur is critical to the scope and success of the project. A 10-year payback would engage approximately 400% more schools than a 3-year payback, and over 200% more than a 5-year payback. It is critical therefore that as long a term perspective is adopted to maximise the benefits and scope of the work.

Potential Impact at Programme Level

The project developed a number of scenarios which have differing impacts depending upon the finding above – payback, indirect contributions, overheads, and cost of measures. Each of these are explored in the Greater Manchester Model report. The table below seeks to summarise the sample of findings at £60m2 SuDS:

Payback in years	Indirect Contributions	Overheads Included	Number of Schools	Total Investment in SuDS
3	None	Yes (£50,000 pa)	None	None
3	None	None	110	£1.1m
5	None	Yes (£50,000 pa)	129	£1.5m
5	None	None	153	£2m
5	Yes (20%)	None	189	£3.2m
10	None	None	313	£8.4m
10	Yes (20%)	None	409	£12.8m

5. UNCERTAINTIES and CONSTRAINTS

Throughout the project there were some issues which require further clarification and testing to prove the model.

Calculation of Indirect Benefits

The model at present proposes that there may be calculable cash benefits for indirect beneficiaries, and estimates this as 20% for one of the models tested to analyse the impact at a programme level. However, the evidence base for these benefits requires further research and clarification with the organisations and agencies referenced – with regard to apportionment of benefits, cash savings and ability or willingness to provide funding. This was not possible within the timeframe of the original project.

Cost of SuDS Measures

We have researched potential standardised costs for SuDS measures, which informed the strategic model, however there is uncertainty over these costs and the model would benefit from further analysis. In order to minimise this uncertainty, we have allowed for an optimism bias of 100% in all calculations. (*GM Model Report 2016*)

Site Investigations

There is considerable variability in the onsite constraints for individual schools, especially with regard to structural integrity of buildings for green roofs and geotechnical information on soil structure, to assess whether SuDS measures would be effective. There could be significant costs to carry out these assessments. This has the potential to limit the number of schools where interventions would be successful, and allowance should be made going forward to assess this at site level, and factor into the model.

Highways Charges

The model does not include any savings from highways drainage charges due to the unlikelihood that any SuDS measures would satisfy the current criteria to enable a reduction - the highways charge only uses the hard-standing area as a proxy for the level of site use. United Utilities have adjusted their charging scheme between 2015/16 and 2016/17 to redistribute charges from highways drainage to surface water drainage, and if this trend was to continue then this could be advantageous to the model and increase the potential benefit of SuDS in schools. We have seen a change in charging between 2015/16 and 2016/17 to focus on the United Utilities drainage element, and if this was to continue then this could be advantageous to the model and increase potential impact in schools.

Data Limitations

The model utilises data on charging from United Utilities This does have limitations given that we were only able to utilise data which was derived from Local Authority accounts There will be additional school sites which are billed directly, but were not identified in the timescale of this project.

Management and Delivery Costs.

Based upon a fixed cost of £50,000 per annum over the lifetime of any scenario. This cost may vary depending upon the scale of risk of the final project, so it will be necessary to recalculate. However, for the purposes of this model, this cost is sufficient as a static cost. We have also assumed no additional costs for technical assistance, such as structural testing for green roofs or costs for geotechnical investigations which will need to be factored into any final delivery model.

Academisation.

The increase in Academisation of schools could have a significant impact on the project. There are potential benefits through increased independence of schools' budgets providing immediate impact, but equally the development of a programme of activity across schools would need to factor this in.

Additional Model Uncertainties.

The strategic model uses the following assumptions to deliver its scenarios.

Costs per m2 - It is assumed that the cost per m2 covers all development costs of SuDS measures, excluding project management and engagement costs. All maintenance costs over the payback period are also contained within this overall cost.

Inflation and Financing - The model does not take into account inflation or any charges relating to financing of the measures. Given the nature of the tool it was not deemed to be a significant cost, and may be balanced by reductions in charges.

Future changes in charges - We have assumed no changes to the charging rates across the selected payback period.

Insurance Costs - There have been indications that installing SuDS measures can save on buildings insurance by around 10% if the installation of SuDS measures reduces the risk from surface water flooding. We did not factor this into the modelling at this point, but it could be included once the benefits are confirmed.

Economic Benefits - An impact assessment of the investment into the Mersey Forest estimated that for every £1 invested in the Merseyside Objective One programme, £2.30 will be generated in increased GVA over the lifetime (50 years) of the investment (Regeneris, 2009:5).

6. LEARNING

This project has identified that there is potential to create a model that can make it easier to significantly increase the uptake of SuDS in the North West, using Surface Water Drainage Charges to help incentivise implementation. This could work for individual organisations, but would be most effective at a programme level (city/city region or collection of smaller conurbations). While the project focused on schools the process could work as well with businesses, local authorities, the NHS etc. and could lead to more holistic solutions at a landscape level. However, as this was a small feasibility study there are a number of areas that require further investigation to prove the full potential:

- 6.1 The project highlighted several challenges carrying out Audits and identifying SuDS opportunities at both an individual site level, and if this were to be rolled out at a programme level. The most fundamental of these was the need to understand the ground conditions at each site and across the proposed programme area, in this instance Greater Manchester.
- 6.2 It is difficult to account for attenuation in reducing surface water drainage charges. This means that for the model to work all interventions need to disconnect a site from the main drainage system. Exploring opportunities with United Utilities to account for the benefit attenuation measures provide at times of peak rainfall would be very helpful in scaling up implementation.
- 6.3 The capital costs can be significant, even if an intervention can pay back in 5 years or less. To make this work at scale will need innovative financing arrangements to enable the capital costs to be met and ideally enable those implementing schemes to benefit from savings straight away.
- 6.4 There would be multiple benefits to multiple stakeholders if SuDS are massively increased across our urban areas. Due to the timescales and size of the project we have struggled to quantify the value of those benefits for individual stakeholders. If we could develop a better understanding of what those are for different groups we may be able to develop a collaborative funding, implementation and maintenance model that makes it easier for all stakeholders to participate.
- 6.5 One of the main challenges for upscaling SuDS across UK PLC is that each water company operates a different model of surface water drainage charge, with only four currently operating area based charging and each of those differing significantly in the level of their charges. As pointed out by Local Authority stakeholders, the North West has the highest level of charges and requests to consider how they apply to schools are currently being considered by Defra. This project suggests that if we are going to be able to implement SuDS as a valuable solution for urban flood risk and reap the other benefits for air quality, amenity, etc. across the UK thought needs to be given as to how surface water drainage charging schemes could be more consistent and at a level that incentivises shared ownership of future flood risk challenges, rather than relying on water company/Environment Agency investments in large infrastructure projects.
- 6.6 There is significant interest in developing SuDS in schools, which means that a successful model would have considerable impact in Greater Manchester and beyond.

7. TAKING THE PROJECT FORWARD

As part of the project we have identified a number of steps that we believe would enable further refinement of the proposition and build the evidence base for action. Specifically, we would seek to:

- 7.1 Map the Greater Manchester schools against GIS data, local water courses and other local stakeholders who may want to develop a collaborative solution, to identify those that will be most able to effectively implement SuDS and move down a charging band. It is then recommended that the tools produced be trialled at a sample of identified schools.
- 7.2 There is significant interest in addressing this in other areas including Hull and Liverpool City Region. The programme level model could be replicated using schools and GIS data with other local authorities and the tools and model trialled on a sample of schools.
- 7.3 Work with BITC members in the finance industry (including insurance companies) to explore the potential for financing mechanisms and possible reductions in flood risk premiums to enable the programme to be rolled out more widely. If possible, develop a trial project.
- 7.4 Undertake discussions with United Utilities and wider water industry (via Water UK), regulators and government about current charging models and some of the shared issues, such as factoring in attenuation.
 - 7.4.1 United Utilities have expressed a willingness to discuss the wider value of SuDS which offer attenuation (taking into account that they currently offer a 50% discount on Green Roof areas) and consider whether there is an appropriate way to discount or amend charging based on this. Could this be applied more widely?
 - 7.4.2 Discussions with the wider water industry could also look at whether there can be greater consistency in charging, particularly with the deregulation of the Water Market in April 2017
- 7.5 Create a better understanding of the multiple benefits for multiple stakeholders and build a case for collaborative action at a programme level.
- 7.6 Explore the opportunities to use the model with different groups (business; other public sector estate such as Local Authorities and NHS; Universities, etc.) to increase the impact at programme level.
- 7.7 Develop a number of pilot schemes in different water company areas to explore the issues in more detail.
- 7.8 Investigate the potential for applying the model to other public sector real estate.
- 7.9 Further investigate the opportunities for links into the curriculum to maximise use of resources created, and create wider understanding and engagement with SuDS.

8. NEXT STEPS

This report summarises the first phase in what could be an exciting programme to increase the implementation of SuDS across the UK, providing effective flood risk mitigation by developing collaborative solutions to shared challenges. The additional benefits for water quality, air quality, biodiversity and making our cities better places to live and work could also be substantial. As Greater Manchester has been identified as the urban focus for the DEFRA Pioneers programme, there will be the opportunity to link the pilot as part of a wider environmental programme.

BITC believes that our ability to facilitate partnership working with strong business leadership could help accelerate progress and would welcome the opportunity to build on the momentum already achieved to take the project forward. If Defra agree that there is good potential BITC will be very happy to prepare a proposal for phase two.

Project partners

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