# Improving Green Infrastructure to Enable Tourism and Development: Identifying and Assessing Sites for SUDS Retrofit in Blackpool, UK

**Neil Breton**
Rivers and Coastal
Atkins
United Kingdom

**Zorica Todorovic**
Water Operations
Atkins
United Kingdom

## ABSTRACT

Blackpool is highly urbanised city in the UK with limited Green Infrastructure. Its history as a tourist destination is threatened by poor water quality and an under-performing economy; it is the sixth most deprived local authority in England with a significant number of vulnerable people. A core policy in Blackpool Council's core strategy is the provision of Green Infrastructure although currently there are very few trees or green areas in the city centre. This paper discusses the methods used to assess the opportunities to infuse more Green Infrastructure throughout the town and provide additional benefit.

An assessment of Sustainable Drainage Systems (SUDS) retrofit opportunities across the 1,900km$^2$ Fylde Peninsula (including Blackpool) was undertaken using a geospatial tool. The benefits of the SUDS were to:

- increase the amount of Green Infrastructure in Blackpool city centre;
- provide amenity space by creating a potential for blue-green corridors across the town;
- improve coastal water quality by reducing spillages from overwhelmed combined sewer overflows (CSOs) at beaches currently failing EU Bathing Water standards;
- enable development through increasing drainage network capacity.

The paper will discuss the selected sites and corridors which will enable multiple benefits with the overall aim to improve the attractiveness of Blackpool as a tourist destination and place to live. It will also discuss prioritisation of opportunities for the project partners to consider as future targets for retrofitting of SUDS.

## 1. INTRODUCTION

Tourism is a key source of income to Blackpool and the surrounding area. An important consideration for Blackpool and neighbouring councils is the environmental quality of the town and associated beaches. A significant portion of visitors to Blackpool come to use the beaches and designated bathing waters found there.

The EU Bathing Water Directive (Directive 2006/7/EC and previously 76/160/EEC) and the Water Framework Directive (Directive 2000/60/EC) set out water pollution control policy and lay down new procedures for the identification of substances and development of control measures. The Directives are setting environmental quality and other standards for the substances which Member States should aim to achieve by 2015, to ensure a “good bathing quality status” and “good chemical surface water status”. Unfortunately Blackpool has a recent history of its bathing waters failing to meet the required water quality standards, with spills of sewage from combined sewer overflows (CSOs) being one of the key sources of these failures. Blackpool Council and the Environment Agency are aware of the negative impact that this could have on the tourist industry on which the town is so reliant, and therefore reducing surface water entering the combined sewer network is a key consideration for both organisations.

## 2. TOURISM IN BLACKPOOL

Blackpool has a history as a major tourist destination in the North West of England. It has 140,000 residents and 4,500 businesses with an annual Gross Value Added of £1.7 billion. The town remains one of the UK's most popular tourist destinations and is a classic seaside resort. In the last 30 years Blackpool has seen less tourist visitors, and a decrease in population as residents have left the town to look elsewhere for work. Tourism in Blackpool provides a significant source of employment in the area – 11,000 people are directly employed in the industry, equating to 20% of the total jobs in the Borough, and an estimated 25% of the total business.

Blackpool has an ambition to attract more business-related tourism and to capture higher levels of visitor expenditure by providing a higher quality and variety of tourism activities. Recent investment in the commercial and physical fabric of the town has resulted in the recent re-opening of the famous Blackpool Tower and renovation of the Winter Gardens, an improved seafront and public realm, and improved retail space. In addition the town is seeking to secure public investment in infrastructure and major attractions to help attract residents from the wider Fylde coast, including retired people and families who currently do not visit the town. Consequently improvement of local transport infrastructure to allow these targeted people to get to and from Blackpool is central to achieving this vision.

## 3. BATHING WATER QUALITY IN BLACKPOOL

The Fylde Peninsula (Figure 1), includes Blackpool and is home to one of the country’s most visited coastlines. The Peninsula does, however, suffer from a wide range of water management issues. Half the bathing waters in England and Wales that failed the Bathing Waters Directive in 2011 are on the Fylde Peninsula, however in the wetter 2012 bathing water season 32 bathing waters failed nationally, of which 3 were on the Fylde coast. The majority of drainage systems at the Peninsula are combined sewer systems and there are 11 combined sewer overflows (CSOs) that contribute to low bathing water quality. In recent years United Utilities have invested in construction of large attenuation tanks and pumping stations to alleviate problems of CSO spillages, however there remain 3 CSOs that are still contributing to low bathing water quality. The drainage systems are running at their capacity and surface water flooding is a real issue. Additionally, more pressure is added by the potential impacts of future climate change and the need for more development in Blackpool.

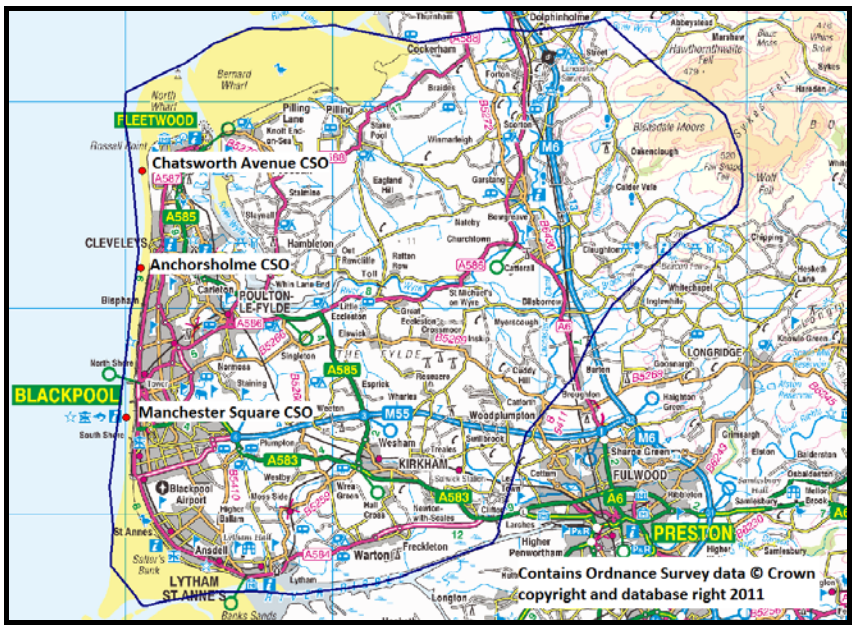


Figure 1: Fylde Peninsula study area

A significant contributor to the improved bathing water quality was the construction of twin 60,000m$^3$ storage tanks to intercept surface water, an investment of over £600 million by United Utilities. The tanks reduce immediate discharge and CSO spillages, instead passing the water for treatment at a Waste Water Treatment Works before being discharged to the bathing water. This led to the three bathing waters at Blackpool (North, Central and South) passing the Bathing Water Standards the first season after construction, and all beaches along the Fylde coast passing the following year. As identified by Myerscough and Digman (2008), the continual construction of additional storage is an unsustainable practice, and reduction of inflows offers a more holistic route to reducing the frequency of CSO spills. The revised Bathing Water Directive will pose even more stringent requirements and additional measures are needed to comply with the revised criteria.

## 4. AIMS

The Fylde Peninsula Water Management Group (comprising the Environment Agency, United Utilities, Blackpool Council, Wyre and Fylde Borough Councils, Lancashire County Council and Keep Britain Tidy) was created to provide a sustainable and integrated approach to managing coastal protection, water quality and surface water drainage. It led this study to assess the potential to retrofit the sustainable drainage systems (SUDS) in order to reduce the impacts of urban drainage flooding and pollution across the Fylde Peninsula and adapt to the inevitable consequences of climate change and need for future development in the area. Certain SUDS provide additional benefits by improving amenity value of the areas into which they are installed. SUDS such as green roofs, street planters and water gardens can improve the environment in which they are installed by improving the visual attractiveness of an area, whilst also increasing biodiversity and improving air quality.

Figure 2: Green roof, street calming measures and water garden examples

In order to achieve this, a screening methodology was developed to identify sites at which SUDS could be retrofitted to reduce runoff volumes passing into the combined sewer network. Previously mentioned SUDS were prioritised, although other SUDS were also considered. By reducing peak flows, the project aimed to contribute to reducing the annual number of spills from CSOs. Whilst other tools have used water quality indicators to identify potential SUDS sites (Mitchell, 2005), or for complex determination of combinations of SUDS options at a range of scales (Bach et al, 2012), the approach applied for this study enables significant opportunities for the retrofitting of SUDS for surface water flow reduction and Green Infrastructure improvement purposes.

## 5. EXISTING GREEN INFRASTRUCTURE

In Blackpool Council's Core Plan (2012), Green Infrastructure is defined as “the network of natural environmental components and green and blue spaces that lies within and between cities, towns and villages which provides multiple social, economic and environmental benefits”. Key existing Green Infrastructure that has been identified in the plan includes Blackpool Promenade, a key tourist destination. Policy CS6 seeks to:

- Protect and enhance the quality of existing Green Infrastructure;
- Create new accessible Green Infrastructure;
- Connect Green Infrastructure with the built environment and with other green space;
- Ensure all development incorporates new or enhances existing Green Infrastructure;
- Protects designated sites; and
- Preserve, restore and enhance local ecological networks.

Some isolated SUDS schemes have been undertaken in Blackpool. United Utilities have trialled the installation of water butts at residential properties in Fairhaven, an area prone to flooding from an undersized drainage system. Whilst the project was successful in installing the water butts, it was felt that the attenuation offered by the water butts was limited, and the project would need to be expanded to have a noticeable impact on the system. There is also an ongoing initiative to plant trees along 19 roads in Blackpool with a selection of species that will withstand the climate better than plants that have previously been used but which did not survive the harsh coastal environment.

## 6. METHODOLOGY

Application of the tool developed (Breton et al, 2013) identified a number of sites at which SUDS could be retrofitted. The tool focused on identifying opportunities for retrofitting SUDS to buildings and impermeable areas, following the recommendations of the CIRIA Guidance for Retrofitting to Manage Surface Water C713 (2012). As well as Green Infrastructure solutions such as street planters, green roofs, rain gardens and wetland areas, a full range of other SUDS was assessed including permeable paving and underground storage. As part of the assessment process, costs of installation of each solution at each site were also generated. A theoretical event of depth 50mm was used to identify event runoff volumes from sites.

The focus of the study was to use a GIS tool developed to rapidly screen potential areas for SUDS implementation and identify “quick win” opportunities for SUDS retrofit, which were identified by scoring various desirable attributes of potential large sources to be addressed, which will give immediate improvement. This enabled a quantified assessment of each opportunity to be undertaken, allowing a ranked list of opportunities to be generated. The quantified assessment was then reviewed to identify a shortlist of opportunities to be considered for implementation.

Opportunities to align with planned maintenance regimes on roads or car parks were investigated, with the shortlisted sites checked to identify locations where SUDS retrofit could be included as part of existing planned maintenance. Fylde Borough Town Hall, a supermarket car park, Pontins Holiday Centre and Blackpool Airport were identified as 4 key locations at which opportunities existed in the short term through existing planned maintenance. The impact that

these opportunities would have on CSO spill frequency is insignificant. In order to achieve the desired reduction in CSO spills, additional large scale retrofit schemes are required in Blackpool.

The comprehensive assessment of opportunities to retrofit SUDS across Blackpool concluded that in order to get a significant impact on reduction of CSO spillages, large areas need to be considered for SUDS retrofit across the town. This was in line with the overall strategy to green the city, increase the number of trees and create a number of green focal points across the city.

## 7. IDENTIFIED SITES

The GIS screening process provided a platform to analyse types of developments and open spaces across Blackpool and draw general conclusions about potential types of areas for SUDS retrofitting. These opportunities were grouped based on the ownership of the site and their land use, so that joint funding streams could be investigated, which would be rolled out for the sites from the same group. Impermeable areas often scored higher than buildings, partly due to larger areas, but also due to features such as their proximity to combined sewer systems.

### 7.1. Roads and streets

Roads and streets are major contributing areas to surface water runoff across the Peninsula which, together with large car parks, provide a major source of runoff whilst also giving many visitors their first impression of the area. Therefore retrofitting Green Infrastructure that includes SUDS for these areas would both improve the quality of the environment visitors pass through, as well as helping to improve bathing water quality by removing water from the combined sewer system. Historically, highway departments have been reluctant to implement SUDS, therefore joint cross-departmental effort is required to put together local policies and planning documents on types of SUDS solution which have consensus and have the highways departments' agreement and health and safety clearance. For example, promoting construction of narrowing street planters along the roads instead of other traffic calming measures (e.g. road humps) which would have multiple benefits. Section 8 outlines a Green Infrastructure project currently being pursued on Blackpool's transport network, whilst Figure 3 shows an area to the north of Blackpool where existing road traffic calming measures could be replaced with green infrastructure SUDS.


Figure 3: Areas of existing traffic calming measures (red) identified for potential SUDS retrofit

### 7.2. Retail and supermarket sites

Retail and supermarket sites scored highly in the assessment, as they have adjacent large car park and access road areas where SUDS could be retrofitted. A retail park location identified in the screening is shown in Figure 4. Special opportunities are provided by sites located on sand dunes, where the potential for surface water infiltration could be maximised to reduce not only the peak flows but also the volumes of surface water reaching the public sewers. The study identified a

number of retail parks across the study area, providing opportunities to reduce runoff into the combined system and improve bathing water quality. In addition, high level evaluation of cost benefits to the owners implementing SUDS provides a platform to approach retail park owners in the future to encourage SUDS retrofit on their sites. This will raise their environmental credentials by supporting local communities' effort in improving bathing water quality and greening the city and also provide financial benefits in reducing surface water disposal changes. This single combination of building and associated car park could remove 205m$^3$ of runoff from the combined system. When considered with the adjacent retail park stores and car parks, this figure rises to 396m$^3$ of runoff potentially removed.

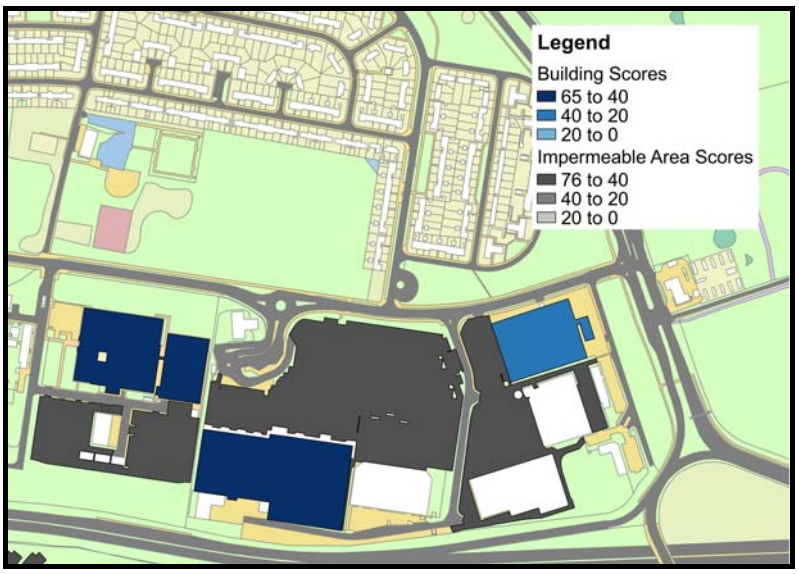


Figure 4: Supermarket and retail park location identified for SUDS retrofit

### 7.3. Large regeneration schemes.

Planning requirements for large regeneration schemes should include an assessment of SUDS implementation at early stages of planning, so that SUDS can be fully incorporated into the layout and not just be required at a later stage when the possibilities for implementation are limited. In this way the greening strategy will help future proof Blackpool. Local developer charges, such as the Community Infrastructure Levy (CIL) scheme in England should be evaluated to establish ways to fund SUDS on these sites. These opportunities would need to be brought to the attention of the planners and potential developers early in the process and included as part of the development brief in order to secure SUDS implementation on these sites. Figure 5 shows the location of a development site overlain on the outputs of the assessment where significant retrofit opportunities exist.

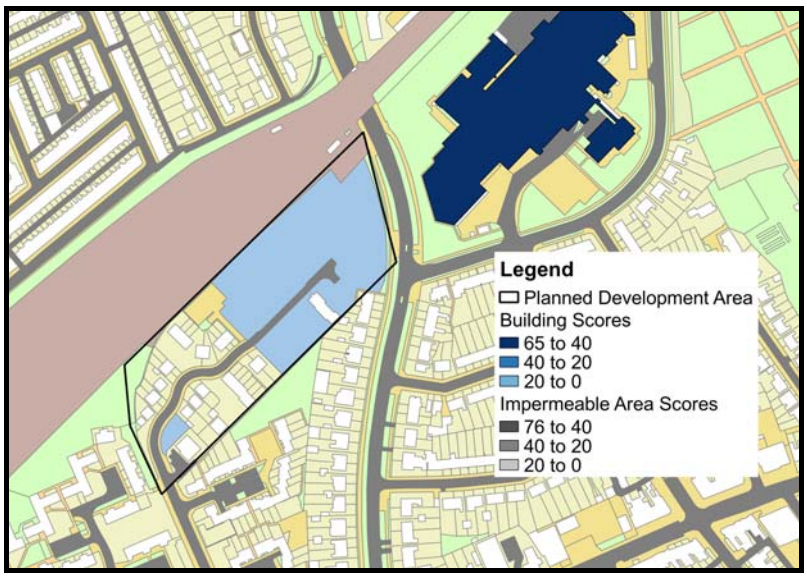


Figure 5: Development area identified for SUDS schemes

### 7.4. Large public, hospital and commercial buildings and adjacent large car park and access road areas.

A detailed list of these sites was produced to highlight locations that have a potential for SUDS retrofit. This list will be communicated to the land owners by the council, to assess the land owners' willingness to implement SUDS. To support that discussion, a high level evaluation of cost/benefits of SUDS has been produced. Victoria Hospital in Blackpool, shown in Figure 6, includes a number of individual large buildings, car parks and smaller surfaces which would all form suitable locations at which SUDS could be retrofitted to remove over 200m$^3$ of runoff during an event.

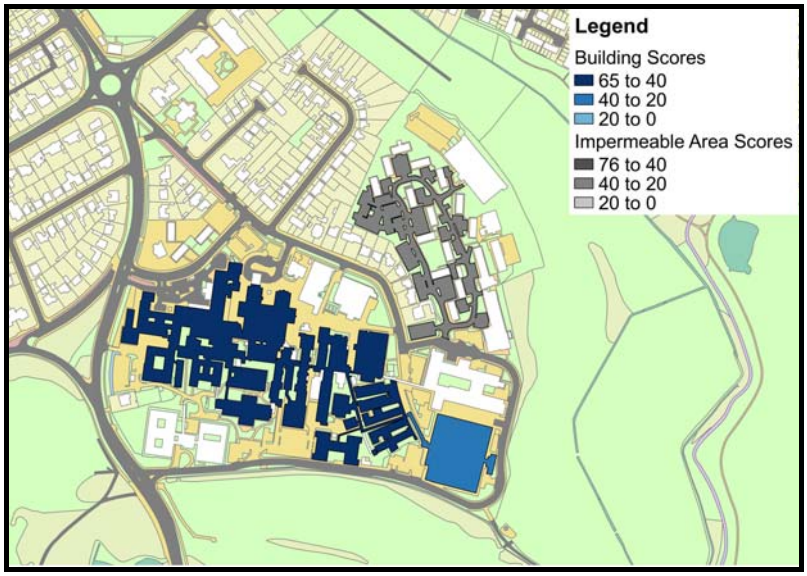


Figure 6: Victoria Hospital, Blackpool

### 7.5. Schools.

Schools provide large roof and surrounding hard standing areas. There is an opportunity to introduce through teaching the benefits of having SUDS components on-site. According to CIRIA Guidance on Surface Water Management in Schools (2006), "*this may help to emphasise aspects of the water cycle, and act as a teaching tool, in addition to providing an area of amenity and wildlife habitat. It may also reduce travel cost that would otherwise be incurred in visiting wildlife habitats and could providing a practical, visual aspect of the concept of environmental sustainability, which in turn promotes key concepts such as pupil consideration of: citizenship and*

*stewardship, the needs and rights of future generations, diversity, and quality of life"*. Joint funding which could include educational funds could be explored in order to provide funds for SUDS retrofit at these locations. Highfield Humanities College was one educational facility which scored highly in the assessment, and is shown in Figure 7. 83m$^3$ of runoff could be removed were effective SUDS installed at this location.

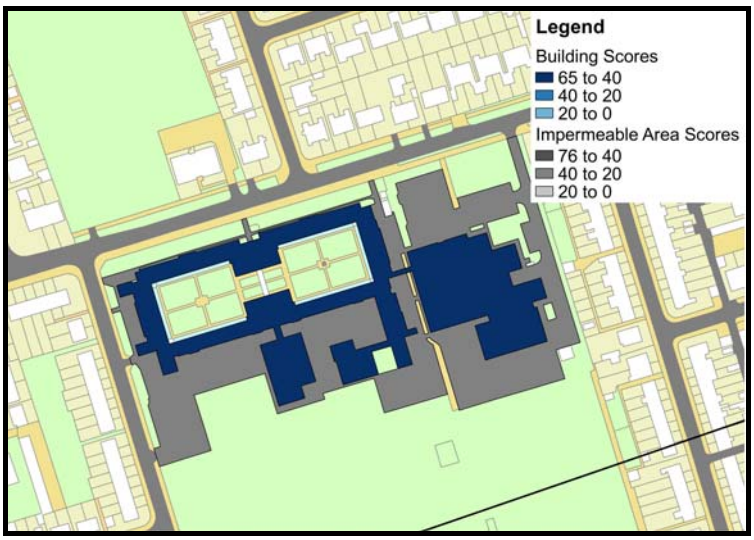


Figure 7: Educational facility retrofit opportunity – Highfields Humanities College

### 7.6. Large council estates.

Retrofitting on large residential areas has its serious challenges due to the individual ownership of the houses. SUDS retrofit on councils' owned estates provides fewer ownership issues, and therefore the capacity of council estates to accept retrofitted SUDS was investigated. Although a whole palette of SUDS types could be installed on these sites, depending on street layouts, water butts and disconnection planters prove to be most popular measures. A number of similar initiatives exist internationally (e.g. Toronto and Melbourne) and nationally (e.g. London and Hull). More importantly, Fylde Council has received approved funding from the Environment Agency and the water company (United Utilities) for a project installing water butts in a large residential area in Fairhaven as previously discussed. Figure 8 shows the location of a large council housing area at which there are significant opportunities to retrofit features such as rain gardens and water butts.


Figure 8: Council house area offering large scale retrofit opportunity

### 7.7. Blackpool Airport

Blackpool Airport has the largest single ownership hard standing area in the catchment with large green land adjacent to it (Figure 9). The airport owners are finalising their Masterplan and this provides a good opportunity to try to influence the implementation of SUDS on this site. This provides the opportunity to install Green Infrastructure at a visitor entry point as well as reduce surface water entering the combined sewer system. The potential for rainwater harvesting and reduction of water bills due to surface water redirection to ground or in open spaces would provide benefits to the owners. Over 1680m$^3$ of runoff could be removed from the combined drainage system were suitable types of SUDS for the airport to be applied to drain the runways and taxi areas alone, with another 800m$^3$ potentially removed if SUDS were applied to adjacent buildings.

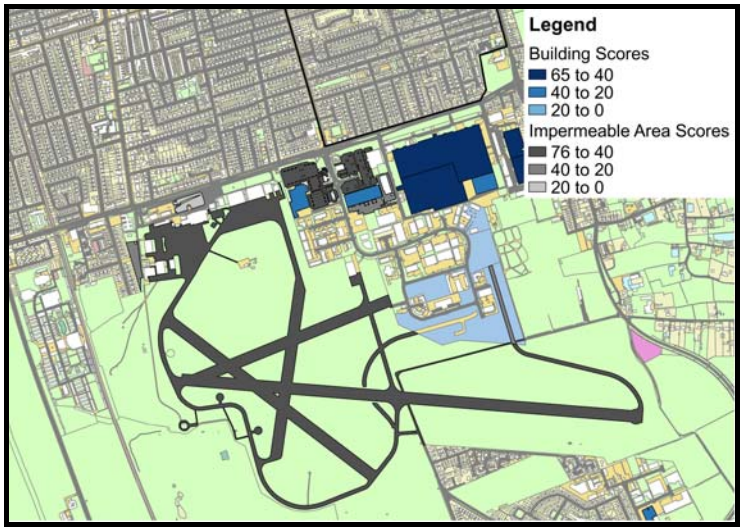


Figure 9: Blackpool Airport

## 8. GREEN INFRASTRUCTURE TO INCREASE TOURISM

In order to obtain funds for implementation of SUDS retrofit strategy, Blackpool council is currently applying for funding for a project entitled “Green Infrastructure Routes to Prosperity – sustainable access to town centre employment in Blackpool’s tourism driven economy”. The aim of the project is to provide Green Infrastructure routes to benefit local residents, visitors and inward investors, accessing capital funding from Local Growth Funding for the green corridors in line with Local Enterprise Partnership Strategic Economic Plan objectives. The ultimate objective is to “make a major contribution to Blackpool’s socio-economic regeneration process alongside yielding carbon reduction benefits”.

The primary routes identified for the project are along Dickson Road, Central Drive, Talbot Road and Park Road. The selected corridors include guest houses and hotels, together with tourism-focused retail sites. It is anticipated that these public realm improvements will provide a substantial return on the original investment. The council is seeking to implement Green Infrastructure principles, integrating planting into an intensely concreted urban environment that includes many obsolete buildings, to increase the “green” element of the area. The project has a particular cycling and walking focus, although all sustainable transport approaches are to be promoted. Once completed, it is envisaged that the project will:

- Extend improvements to the town centre into transport corridors
- Improve the environment across Blackpool resulting in improved physical and mental health
- Enhance and encourage sustainable access to the town centre via cycling and walking

- Provide a framework for community engagement including working with voluntary organisations
- Reduce peak-time congestion and accommodate traffic growth associated with future development
- Contribute to the control of carbon emissions
- Contribute to the regional and consequently national economy
- Improve road safety
- Improve children's general well being by encouraging exercise and play
- Increase bio-diversity and visual amenity
- Improve air quality

## 9. POLICY

As previously identified, Green Infrastructure is already included in Policy CS6 of Blackpool's Core Plan. However in order to implement more SUDS and make a real difference to both the amount of Green Infrastructure in Blackpool and frequency of CSO spillages, SUDS strategy should be fully integrated in all planning documents. SUDS would also help address the limited development potential in Blackpool caused by capacity problems in the sewers.

Blackpool suffers from a lack of green spaces, especially in and around the town centre and along the Promenade due to historic planning proposals and there are limited options as to what could be done. In order to create a viable strategy for future proofing SUDS retrofit in and around the town centre, it is essential that it is fully integrated with other spatial strategies, i.e. regeneration, green strategy, climate change, biodiversity or use of multipurpose open spaces. It is also critical to include highways department and get their engagement in SUDS implementation for revitalisation of street and road corridors across the town.

Finally, for all these planning strategies to be successful, wide engagement with the public is necessary as they will be the final users of these open spaces. Their acceptance and 'ownership' is critical for long term success of the schemes.

## 10. CONCLUSIONS

The SUDS GIS tool enabled rapid assessment of SUDS opportunities and different implementation scenarios across Blackpool. The paper demonstrates the benefits of undertaking regional scale studies to identify SUDS opportunities. Consideration of planned maintenance and infrastructure developments can identify opportunities to install SUDS, taking advantage of planned expenditure. The inclusion of SUDS as part of planned infrastructure amendments as proposed by the funding application is a pragmatic approach to reduce the interruption caused by SUDS retrofit, particularly on roads.

The study identified a number of quick win solutions at locations around Blackpool, as well as smaller opportunities offering a less significant impact. Some locations, such as roads and streets, and Blackpool Airport, provide dual impacts in as much as they can improve the amount of Green Infrastructure in Blackpool and therefore the amenity value and attractiveness of these spaces. Other solutions, such as those identified at supermarkets and schools, do not introduce Green Infrastructure in a way that is likely to directly benefit visitors through increased amenity and improved visual environment. These solutions will however help improve bathing water quality, and hence the desirability of Blackpool as a place to visit. A not insignificant additional benefit from retrofitted solutions at supermarkets and schools is the positive impact on residents, with a better living environment likely to attract more skilled workers and increased educational opportunities from installations at schools.

Large individual sites offer the opportunity to achieve incremental reductions in surface water runoff. They do not in themselves offer enough of a reduction in surface water runoff to meet

the required reduction in CSO spills and consequently must be considered with larger scale schemes to retrofit SUDS across wider areas.

Alternatively, areas can be strategically targeted to produce the most significant improvement in amenity and visual impact to tourists arriving at the destination, with suitable retrofit options at these locations chosen from the shortlist produced by a strategic study. Although the approach of selecting SUDS for their amenity and visual impact does not necessarily produce the largest reduction in surface water runoff or most efficient use of the Councils financial resources, the availability of external funding and improvement in the less easily quantified visual appeal of an area makes it no less valid an approach to identifying locations for retrofitting.

## 11. REFERENCES


Bach, P.M., McCarthy, D.T., Urich, C., Sitzenfrei, R., Kleidorfer, M., Rauch, W. and Deletic, A. (2012): DAnCE4Water's BPM: A planning algorithm for decentralised water management options, 9th International Conference on Urban Drainage Modelling

Blackpool Council, (2014), 1000 milestone in tree planting programme, http://www.blackpool.gov.uk/News/2014/April/1000-milestone-in-tree-planting-programme.aspx

Blackpool Council, (2012), Blackpool Local Plan Part 1: Core Strategy – Revised Preferred Option, Blackpool

Blackpool Council, (2011). Local Economy Baseline for Blackpool, Blackpool

Breton, N., Todorovic, Z. and Crayston, F. (2013). Screening tool for water quality improvements, flood risk management and urban regeneration through surface water flood reduction at a regional scale. Novatech 2013 proceedings

Construction Industry Research and Information Association (CIRIA), (2012). Retrofitting to Manage Surface Water (C713), London, 2012

Construction Industry Research and Information Association (CIRIA), (2006). Sustainable Water Management in Schools (W12) , London, 2006

Mitchell, G., (2005): Mapping hazard from urban non-point pollution: A screening model to support sustainable urban drainage planning, Journal of Environmental Management, 74(1): 1-9

Myerscough, P.E. and Digman, (2008): Combined Sewer Overflows – Do they have a Future? 11th International Conference on Urban Drainage, Edinburgh, Scotland, UK, 2008

Todorovic, Z. and Breton, N. (2014). A geographic information system screening tool to tackle diffuse pollution through the use of sustainable drainage systems, Water Science and Technology, 69.10, 2066-2073