

Urban river corridors and sustainable living agendas



Developing sustainable urban riversides: an integrated assessment

Introduction

Rivers and their corridors are at the heart of many cities. These potentially attractive and ecologically interesting urban spaces are now prime targets for redevelopment, offering the opportunity to create mixed use, high-density and high-quality environments. If carefully designed, with a focus on the river, these urban areas can provide multiple social, environmental and economic benefits to society. But this means balancing different, and often conflicting, interests and visions.

The Ursula project team has developed an integrative approach to sustainable urban riverside design and development, using a case study site in Sheffield, UK.

Four designs for a study site have been assessed by practitioners against a range of sustainability criteria. The results are being used to develop a knowledge based model to balance the various interests, and to develop design guidance.

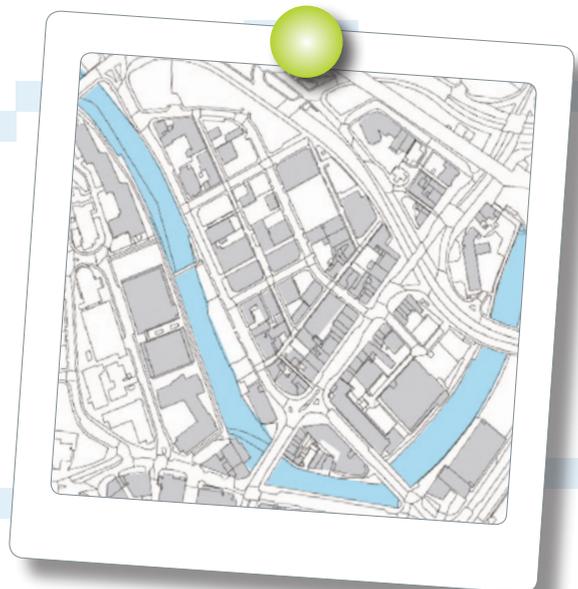
Methodology

The study site is an 11.3 ha urban area adjacent to the River Don in Sheffield, UK. The site lies on the northern edge of the city centre and was once the most important gateway to the city, but has degenerated in recent years. The area is at risk of flooding and was subject to serious inundation during the floods of Summer 2007.

Guided by a stakeholder workshop, key interventions were identified: integrated urban water management, using the river as a microclimate modifier, enhancing public access, and river restoration through modifying an existing weir. Three alternative scenarios were developed to incorporate alternative versions of these interventions.

The scenarios were designed and visualised using a variety of different media, including maps, photomontages, 3D video walkthroughs, and interactive 3D visualisations.

An evaluation of the designs was undertaken using a broad range of sustainability indicators, compared to the baseline (2009) situation. Findings from the evaluation are being used to identify potential design improvements.



The three scenarios

The first scenario (Council), comprised re-development proposals put forward by Sheffield City Council in their Wicker Riverside Action Plan (Sheffield City Council 2007¹) along with flood channel clearance works proposed by the Environment Agency to reduce flood risk in the area.

The other two scenarios (Street and Flood Channel) are hypothetical research scenarios designed by the URSULA project team. These latter scenarios were designed to be highly contrasting, drawing out different possible elements of riverside redevelopment.

Key features of the three scenarios and the current situation are compared in Table 1 and a photomontage of each scenario is shown opposite. An 'information pack' was produced containing background information about the site, objectives of the scenarios, and numerous maps, plans and visuals providing detailed information concerning the proposals².

Sheffield City Council (2007) *Wicker Riverside Action Plan*. Sheffield City Council, Sheffield.

Pattacini, L., Moore, S. L., Burton, M., Davison, B., Hathway, E. A., Henneberry, J., Hornby, S., Kumar, V., Nunns, P., Ramadan, M., Rouquette, J.R., Shaw, E., Stovin, V. R., Warren, P., Wu, L. & Lerner, D. *Wicker Riverside: Sustainable development options considered by URSULA*. URSULA Project Report no 9, University of Sheffield, Sheffield.

Table 1. Key features of the site as it is now and under three re-development scenarios

	As is (2009)	Sheffield City Council/ Environment Agency	URSULA 'Street'	URSULA 'Flood Channel'
General layout	Grid pattern of streets. A new Inner Relief Road has broken the grid and divides the site.	New buildings replace existing and vacant spaces. New public green space by river.	Built form organised around hard landscaped urban squares and streets planted extensively with trees.	Built form structured around an open space (flood channel), allowing water to periodically invade the urban environment.
Typology	Traditional block and street structure.	Conservation of existing block and street structure.	Slight modification of street/block structure to multiply access to the river	Destruction of street and block structure to make space for water.
Relationship with the river	No direct access to river but some riverside paths overlooking river. Few possibilities for leisure activities in relation to the water.	Terraced pocket park along large stretch of waterfront, providing closer interaction and direct access to the river.	Amenity space created on riverside with direct access to water. Urban squares at higher level provide spaces for outdoor terraces.	No direct access to the river but some public green space next to river.
Flood risk	Site currently at high risk of flooding and flooded extensively in summer 2007.	Managed by constructing walls, dredging and widening river channel, and removing bankside trees.	Managed by constructing a linear low wall along the waterfront, complemented by deployable barriers.	Flood channel designed to carry water from a 1 in 5 year flood event. In addition: walls, deployable barriers and buildings to be flood resilient.
River management	Weir creates obstacle for fish and canoeing. Self seeded trees occur on sediment banks along edge of river.	Fish/canoe ramp built into existing weir. Trees and sediment banks along the river have been removed.	A rock ramp is constructed on the existing weir. Trees and sediment banks along river have been retained.	Weir removed entirely. This will lower water levels, providing increased habitat for riverine biodiversity.
Buildings and uses	Small industrial units and mixed uses, but also many underused and vacant sites.	Standard high density buildings, dominated by offices.	A diversity of built forms and functions. Building height decreases towards the river to improve microclimate.	Innovative buildings following latest technologies in sustainability including energy efficiency and built to be resilient to flooding.
Open spaces and vegetation	Hard landscaped away from the river, with no public green space.	Mixture of hard and soft landscape.	Mainly hard urban landscape.	Mainly soft landscape and water.
Integrated Urban Water Management	Traditional drainage through pipes to sewers.	Traditional drainage through pipes to sewers with some green roofs.	Rain water absorbed through green roofs, tree pits, and permeable paving.	Capturing rain water in ponds and the new flood channel.



As is



Council



Streets



Flood channel



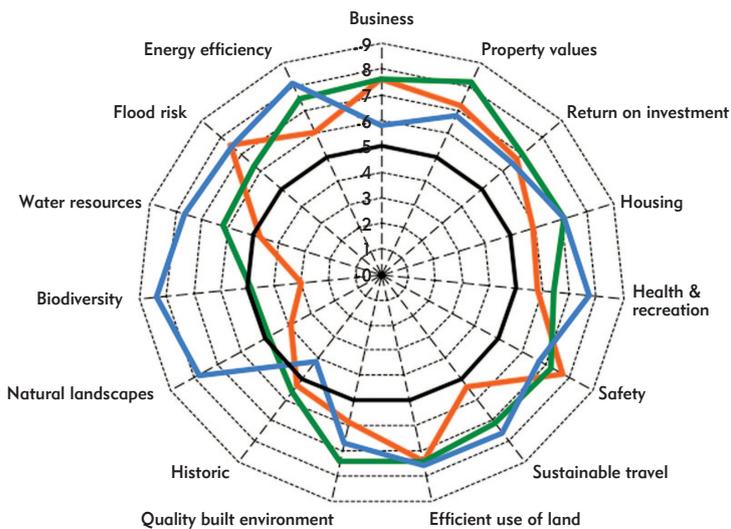
Assessment

A wide range of practitioners scored the four scenarios for selected sustainability indicators, based on their area of expertise. The current situation was scored on a 9-point scale, with 1 being very poor, 5 being average, and 9 being very good.

The other scenarios were then scored in comparison to the current situation, also on a 9-point scale, with 1 representing a substantial detriment, 5 being equal to the baseline score, and 9 indicating a substantial improvement.

Finally, the experts took part in a mind mapping exercise to identify which elements of the designs were important in determining each sustainability objective.

Preliminary findings



Council Scores range from 1 (substantial detriment) to 9 (substantial improvement), with a score of 5 (bold line) indicating that the scenario is neutral compared to the current situation.

Streets

Flood channel

The current site scored below average for 14 of the 15 indicators. It scored particularly badly for all economic indicators, safety & security, flood risk, and energy & climate change.

The Council scenario scored particularly poorly for natural landscapes and biodiversity, where it was judged to be moderately detrimental compared to the current situation. Both Council and Streets scenarios scored highly for the economic indicators.

In contrast, the Flood Channel scenario scored much lower for economic indicators, historic environment and cultural heritage, but scored very highly for most environmental indicators. It was the highest scoring scenario for 7 of the 15 indicators.

Sustainability criteria assessed:

- Supporting business, growth and investment
- Uplifting property values
- Achieving return on investment
- Decent housing available to everyone
- Health & wellbeing ,leisure and recreation opportunities
- Safety and security for people and property
- Minimising travel needs/ promoting sustainable travel
- Good use of previously developed sites and buildings
- A quality built environment
- Historic environment & cultural heritage protected
- Quality natural landscapes maintained, enhanced
- Wildlife sites and biodiversity conserved and enhanced
- Water resources protected and enhanced
- Minimal risk to human life and property from flooding
- Efficient use of energy, resilience to climate change

Next steps

The integrated assessment is being used to develop a Bayesian Network model to balance the various interests, to develop design guidance and produce recommendations for designing sustainable urban riversides.

Key messages

The integrated assessment demonstrated that alternative designs for the same area can achieve very different results in terms of sustainability.

It showed that people are able to score complex plans against broad indicators quickly, so presenting radically different outline plans can generate useful feedback on the positive and negative aspects of design options. By addressing these issues at the early design stages, modifications to improve sustainability can be made well before major financial commitments have been made.

The appraisal also highlights that sustainability can be increased substantially by careful consideration of sustainability in these early stages. For example, by orientating buildings to maximise natural cooling, and integrating features such as stepped building height and integrated urban water management elements into building and site design, it is possible to considerably enhance not only energy efficiency, resilience to climate change, and water resources, but also potentially improve social and economic factors and the overall quality of the built environment.

Evaluation of designs in terms of sustainability criteria (whether this is by formal Sustainability Appraisal or other methods) needs to be an integral part of the design process, rather than an add-on assessment of detailed design options if sustainability is to be maximised.

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