

BEST Case Study

Glasgow City Centre Surface Water Management Plan

Background

The Glasgow City Centre Surface Water Management Plan (SWMP) contains four key phases.

- Phase 1 – Site Appraisal
- Phase 2 – Catchment Assessment
- Phase 3 – Feasibility Study and Schematic Design
- Phase 4 – Economic Impact Assessment

The original case study was based on a restricted Economic Impact Assessment (EIA) carried out by MWH (now Stantec) for Glasgow City Council in 2013. The EIA included an assessment of the (capital and operational) costs, flood risk benefits and other, wider benefits from surface water management options, including SuDS. Glasgow City Centre was the location for the SWMP that contains a mix of residential, educational, commercial and retail uses. This version of the case study sets out an update to this work using the 2019 version of BEST. Values therefore differ from earlier versions of the case study due to inflation.

Approach

The proposed option assessed using BEST was to *'implement SuDS with other surface water management measures'*. It included several retrofit measures that could form part of the city's redevelopment plan, including green roofs, swales, permeable paving, a pond/wetland and exceedance management measures. The proposed option was compared to a baseline 'do nothing' case.

Results summary

The main results table from BEST is shown below. The option provides a total present value (PV) benefit of £70.7mn (before confidence) and £63.1mn (post confidence). The benefit cost ratio (post confidence) is 2.4 (range of 0.2 to 3.7).

Present Value Assessment Stage	Total PV Benefits	Total PV Costs	Net Present Value	Benefit Cost Ratio	Benefit distribution score
Present Value before confidence applied	£70,654,287	£26,833,659	£43,820,628	2.6	E
Present Value after confidence applied	£63,143,413	£26,833,659	£36,309,754	2.4	F
Present Value sensitivity - low	£6,528,874	£26,833,659	-£20,304,785	0.2	D
Present Value sensitivity - high	£99,832,417	£26,833,659	£72,998,758	3.7	E

The export report from the assessment is included below. This report includes the following outputs from B£ST.

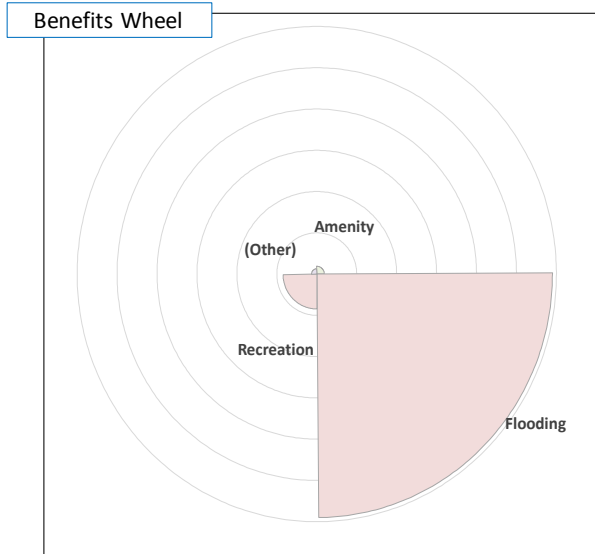
- Project details
- B£ST Results Dashboard
- Written evidence

B£ST Export Report

B£ST: Version: 4.1., February-2019, 12 Feb 2019, 10:16:20

Author	J McMullan
Date	01/02/2019
Project Name	Glasgow SWMP
Project Reference Number	41520543
Assessment version	1
Location name	Glasgow, Scotland
Summarise baseline option	Do nothing (no new interventions) - may adversely affect flood risk, amenity etc. due to expected urban/pop growth, climate change impacts etc.
Summarise proposed option	Implement SuDS or other surface water management measures
Baseline option Present Value Cost (if applicable)	£0
Proposed option Present Value Cost	£26,833,659
Scheme supporters	Local Authority, SEPA, Water and Sewerage Company
Scheme funders	Local Authority, Water and Sewerage Company
Discount rate to apply	3.5%

Results Dashboard

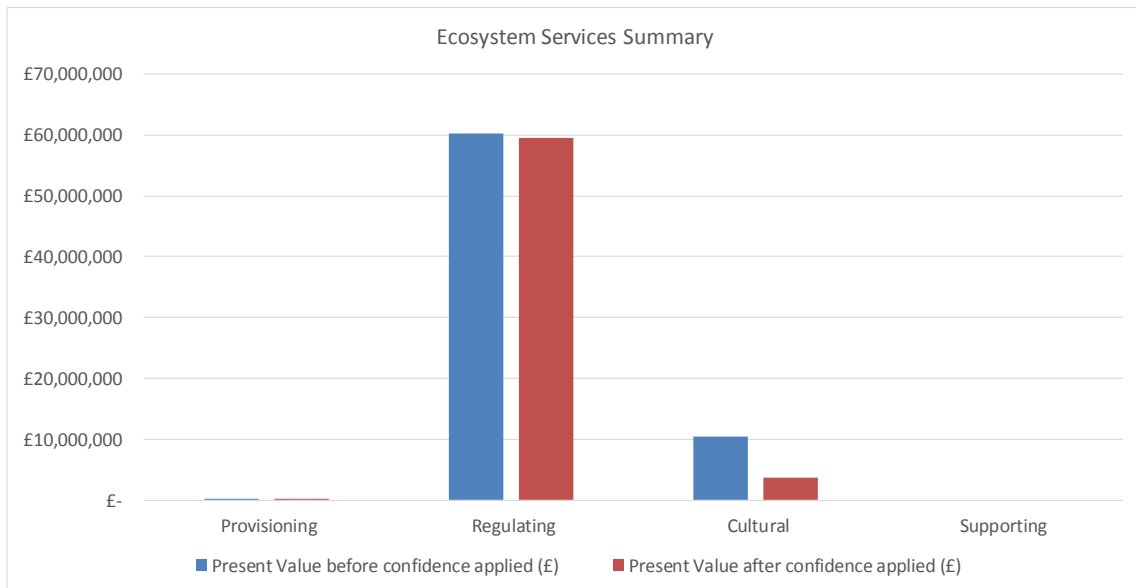


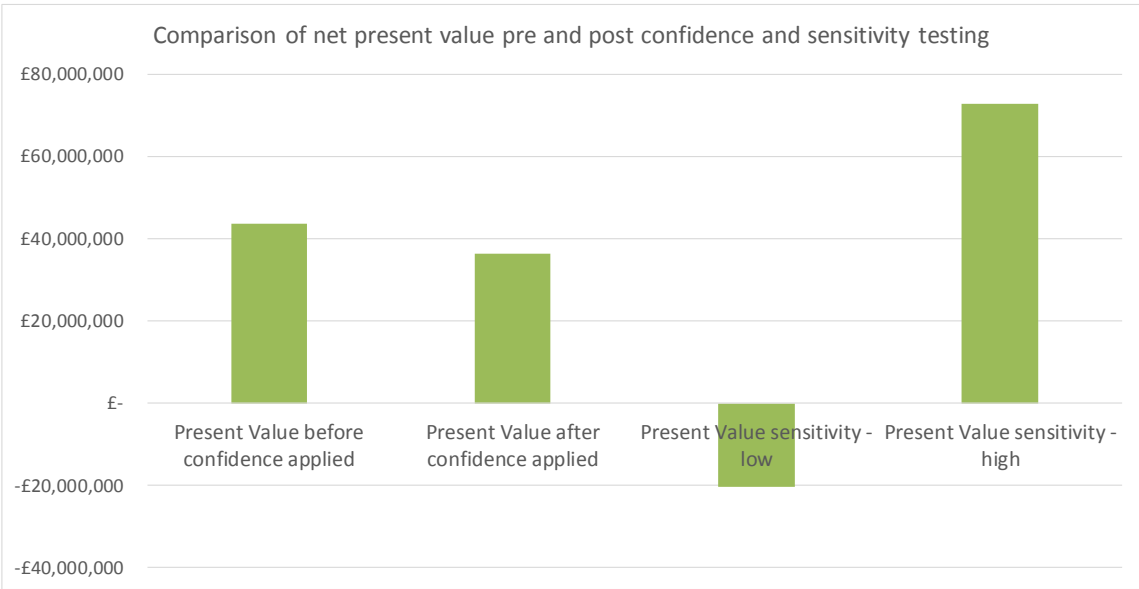
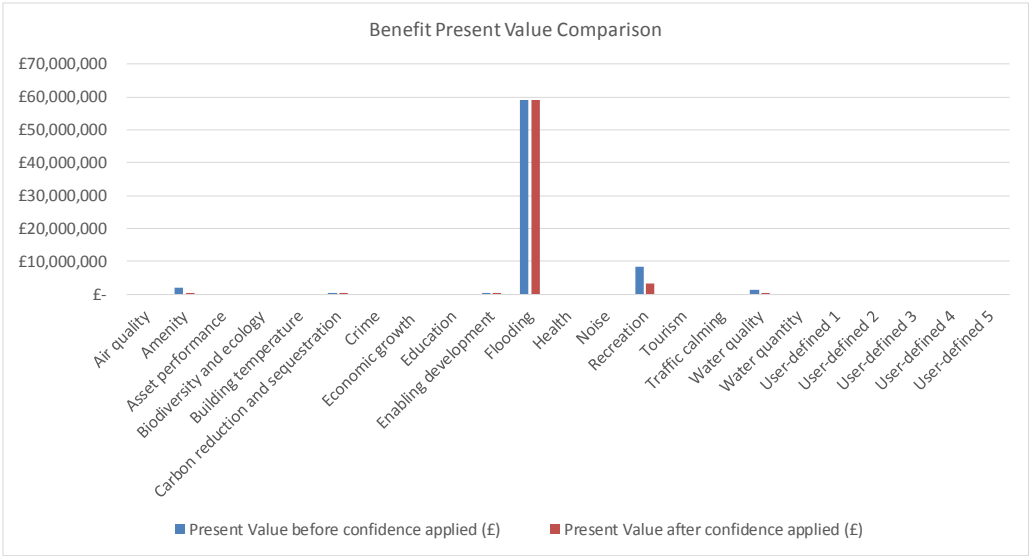
Select the number of benefits (1-10)

3

Select the present values results

Present Value before confidence applied





PV Assessment

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Benefit Category

Benefit category	Present Value before confidence applied (£)	Present Value after confidence applied (£)	Present Value sensitivity - low (£)	Present Value sensitivity - high (£)
Air quality	£0	£0	£0	£0
Amenity	£1,899,825	£474,956	£118,739	£2,968,477
Asset performance	£0	£0	£0	£0
Biodiversity and ecology	£0	£0	£0	£0
Building temperature	£0	£0	£0	£0
Carbon reduction and sequestration	£32,352	£16,176	£2,022	£50,549
Crime	£0	£0	£0	£0
Economic growth	£0	£0	£0	£0
Education	£0	£0	£0	£0
Enabling development	£34,610	£19,468	£2,163	£54,078

Benefit category	Present Value before confidence applied (£)	Present Value after confidence applied (£)	Present Value sensitivity - low (£)	Present Value sensitivity - high (£)
Flooding	£59,000,000	£59,000,000	£3,687,500	£92,187,500
Health	£0	£0	£0	£0
Noise	£0	£0	£0	£0
Recreation	£8,451,925	£3,169,472	£2,641,227	£2,641,227
Tourism	£0	£0	£0	£0
Traffic calming	£0	£0	£0	£0
Water quality	£1,235,575	£463,341	£77,223	£1,930,586
Water quantity	£0	£0	£0	£0
User-defined 1	£0	£0	£0	£0
User-defined 2	£0	£0	£0	£0
User-defined 3	£0	£0	£0	£0
User-defined 4	£0	£0	£0	£0
User-defined 5	£0	£0	£0	£0

EcoSystem Service

Ecosystem service	Present Value before confidence applied (£)	Present Value after confidence applied (£)	Present Value sensitivity - low (£)	Present Value sensitivity - high (£)
Provisioning	£34,610	£19,468	£2,163	£54,078
Regulating	£60,267,927	£59,479,516	£3,766,745	£94,168,635
Cultural	£10,351,750	£3,644,428	£2,759,966	£5,609,704
Supporting	£0	£0	£0	£0
TOTAL	£70,654,287	£63,143,413	£6,528,874	£99,832,417

Evidence Summary

Evidence from Am - Amenity page

- 1: Many of proposed measures will be visible and attractive, designed partly to improve appearance of areas.
- 2: There will be approx. 1000 homes overlooking newly constructed ponds

Evidence from CS - Carbon sequestration page

- 1: Some street greening (mainly plants) which have potential for sequestering carbon
- 2: There will be approx. 500 new trees planted as part of this scheme

Evidence from ED - Enabling development page

- 1: All SuDS measures likely to increase capacity in the network, which is already under capacity constraints.

Evidence from F - Flooding page

- 1: All SuDS measures likely to reduce flood risk
- 2: The annual average damage (AAD) calculation process was based on the "Multi Coloured Manual (MCM), The Benefits of Flood and Coastal Management: A Manual of Assessment Techniques (2010)" guidance and data.

Damages were calculated for a range of return period events using:

- damage rates from the MCM Appendices;
- property data (threshold levels, ground floor areas, building use) collected for the study area; and
- flood depths from model simulations.

The estimated annual damage was then derived by summing the damages factored by exceedance probability for all the return periods modelled.

This was a desk based assessment and no building surveys were undertaken. The key limitations of the assessment were:

- Basements were not assessed;
- Residential Sector Average property rates were used
- Threshold levels were approximated from external site photographs and online resources;
- Damages were calculated on the whole building footprint;
- Intangible costs were not calculated; and
- The analysis was based on a restricted set of rainfall events.

This was a high level assessment only and it is noted that damages are sensitive to the impact from a relatively small number of high value buildings

Evidence from R - Recreation page

- 1: Amount of green space will increase

Evidence from WQ - Water quality page

- 1: Some reduction in, or attenuation of, polluting flows entering watercourses with SuDS measures
- 2: 4.5km in total of watercourse expected to be improved: 0.5km St Enochs; 1km Merchant City & High St; 0.5km University & Cathedral; 0.5km City Centre; 0.5km Cowcaddens; 0.5km Sauchiehall; 1km Townhead

WQ likely to move from equivalent of poor to moderate (WFD categories), value for Solway Tweed taken as closest to Glasgow area

Conservative approach since SuDS alone may not be enough to improve WQ significantly