SOCIAL INNOVATION FOR DELIVERING BLUE AND GREEN INFRASTRUCTURE

Review of beneficiary Business Cases

For the Interreg North Sea Region BEGIN project

This review considers how the beneficiaries in the BEGIN project have developed appropriate and tailored business cases, or similar justification for using Blue and Green Infrastructure (BGI) in their projects. BGI can, in conjunction with social innovation, deliver and enhance urban areas and well-being. This Briefing Note complements, and should be read alongside, other outputs from the BEGIN programme, including the BEGIN Brief for developing a compelling business case[1] and the review of the place of social innovation in the projects[2].

BACKGROUND TO BEGIN

The Interreg North Sea Region project BEGIN[3] (2017-2021) aims to deliver BGI through Social Innovation. The project is a unique partnership in which ten municipal areas, referred to as cities and six research institutes across the region collaborate to develop BGI solutions and exchange experiences.

Social innovation is the development and implementation of new ideas (products, services and models) to meet social needs and create new social relationships or collaborations[4].

The ten cities are developing and implementing innovative BGI approaches of varying scale and function with a focus on improving social outcomes. The BEGIN project helps cities identify, plan, value and deliver multiple benefits from BGI. Likewise, BEGIN supports cities to engage with stakeholders, including citizens, in a creative process that could significantly enhance the liveability of their neighbourhoods.

[1] Horton, B., Ashley, R., Shaffer, P., Walker, L., van Herk, S. (2021) Social Innovations for Delivering Blue and Green Infrastructure: Developing a Compelling Business Case.
[2] Willems J. (2020). Delivering Blue-Green infrastructure through social innovation – Evidence from the pilots in the 10 BEGIN cities.
[3] https://northsearegion.eu/begin
[4] EC (2013) Guide to Social Innovation. Brussels: European Commission (Directorate-General for Regional Policy).

WHAT IS A BGI BUSINESS CASE?

A business case essentially provides the justification for a project or programme. It can demonstrate the value[5] or usefulness of BGI to funding organisations and to other beneficiaries, including local communities and wider society, i.e. the 'audience'. Business cases should be well-structured and clear, setting out the rationale for the intervention. They should include:

- Where we are now - the baseline
- Where we want to get to - the desired outcome
- An assessment of the impacts, both good and bad of different ways of achieving the desired outcome.
- Relevant supporting evidence presenting the case in a clear and compelling way
- Monitoring and evaluation
- Feedback on outcomes

The business case is more than just a financial or economic justification and should be developed and designed with the target audience in mind; primarily those with a role in, or impacted by, the decision-making process. For BEGIN, this could be politicians, policy makers, policy officers, engineers, planners, developers, BGI specialists, local authorities, funders, auditors and citizens.

There are many different types of business case defined in BEGIN (Figure 1) and the most appropriate depended on the purpose, content and organisations involved in each project. Multiple types of business case may have been necessary for each project and the lead organisation has been responsible for their formulation. This has included engagement with and involvement of the widest range of partners, stakeholders and audiences, both early in, and throughout the project formulation and delivery process. Each of the BEGIN business cases has integrated several purposes, most commonly to address climate change impacts whilst also delivering better urban spaces.

Figure 1 The types of business case

There have been notable differences between the types of business case in BEGIN. For example, the UK based projects had a focus on value for money utilising cost-benefit assessments, whereas the

[5] In economic terms, value implies an understanding of the balance between costs and benefits. As such, BGI enhances value where the economic, social and environmental benefits outweigh the costs. Of course, a business case should consider who the costs and benefits accrue to.

Flanders projects did not need to demonstrate economic or financial value as such, as these were developed in conformity with strategic plans for their cities.

The Developing a Compelling Business Case briefing for BEGIN, set out four recommendations, that have been adapted as shown in Table 1. Detailed recommendations for each step are provided in the Briefing[6].

Table 1: BEGIN Developing a Compelling Business Case briefing - recommendations

Recommendation	The Challenge
1. Define vision, objectives and expected outcomes	A compelling case supports a shared understanding of, and vision for, what should be achieved.
2. Identify and assess all relevant impacts	Comprehensively identify who or what is impacted and how
3. Develop an evidence based BGI business case	Fully justify the proposed interventions
4. Communicate clearly	Ensure appropriate communication with relevant stakeholders

This Briefing Note draws on the projects' own reviews of their cases and how the business plans developed to support these complied with or differed from the original Briefing Note for business case development in BEGIN recommendations as given in Figure 1 and Table 1.

REVIEW OF BUSINESS CASES FOR BGI and BEGIN

Many business cases for BGI arise from diverse project objectives. For example, BEGIN's Bergen and Bradford projects that improve transport and promote active mobility have also brought numerous opportunities for 'mainstreaming' BGI as part of new or modified infrastructure. In each case a unique set of business plans has been required.

Each of the cases reviewed here has a fact sheet in the Appendix (Table A1) summarising the project and reviewing the business case in terms of the Developing a Compelling Business Case briefing above. Table 2 below highlights the key characteristics of the business cases using the typology in Figure 1 above. Table 2 also shows the objectives of and primary driver for the scheme, the types of benefits that were assessed, the main outcomes from the business case and the extent to which future scenarios have been explored.

Here, the overall lessons from the business cases in BEGIN are drawn, in order to better inform future business case development for BGI projects. Information is also drawn from the BEGIN City to City Learning Programme 2021[7] meeting summary for Building the Business Case for BGI[8].

LESSONS

The business cases, and the schemes on which they are based, are diverse, reflecting different geographical scales, different objectives, the extent to which they assess and value benefits and the

[6] Horton, B., Ashley, R., Shaffer, P., Walker, L., van Herk, S. (2021) Social Innovations for Delivering Blue and Green Infrastructure: Developing a Compelling Business Case

[7] https://northsearegion.eu/begin/city-2-city-learning-programme/

[8] This was an online event hosted by The London Borough of Enfield, Kent County Council, Antwerp City, CIRIA, The University of Sheffield. The summary report was produced by Amber De La Haye, Sofia Aivalioti, Sebastiaan Van Herk, Pere Giralt (all of Bax & Company).

audience to which they are tailored. This is entirely appropriate and to be expected since (as shown in Figure 1) there are different types of business case appropriate to different contexts.

The majority of BEGIN business cases are (at least partly) strategic in nature, designed to demonstrate the role of BGI within wider city planning and urban placemaking. Some business cases go beyond this (e.g. to help raise funding or support), and include an economic, financial or commercial justification for the scheme.

Indeed, all the BEGIN beneficiary cities have effectively produced multiple business cases. This reflects the range of objectives that the cities are seeking to deliver and the need to address different audiences. This means that varying types and amounts of evidence and information are appropriate to different business cases. In general, strategic cases highlight the overall vision for the city, and the desire to deliver improvements in social, environmental and economic outcomes for residents and visitors. In most cases, this is complemented by an economic or financial business case that articulates the costs and benefits of the scheme in more detail.

There are fewer examples of management-based business cases, suggesting that the evidence for delivery, maintenance, monitoring and evaluation of schemes is not generally of paramount importance, at least in the early (design and assessment) stages.

All business cases recognise the extent and importance of multiple benefits provided by BGI in urban areas. The primary benefits include flood risk reduction, enhanced amenity, public health and managing climate change.

There is limited evidence of consideration of different future scenarios within business cases. Most extend the 'business as usual' 'BAU' situation or factor in population growth and demographic change, whilst a few also consider the role of BGI in helping to adapt to climate change.

RECOMMENDATIONS

Our top recommendations emerging from this analysis are as follows.

1. Clear and well-structured business cases for BGI in urban areas should be used to help provide justification for schemes and the investment required to deliver these. However, there is no one-size-fits-all and each business case should be tailored to the audience and context of the proposed scheme.
2. Business cases should reflect the range of potential benefits associated with BGI in urban areas. They should use appropriate evidence and tools (e.g. Benefits Estimation Tool (B£ST) & The Economics of Ecosystems and Biodiversity (TEEB)), in particular to help assess and value benefits.
3. As well as capital investment, business cases need to consider ongoing maintenance requirements.
4. To garner support, business cases should utilise and embed social innovation techniques from the outset. In particular, they should seek and demonstrate active engagement as well as communication, and should utilise partnership approaches to maximise support (including financial) and realisation of benefits.
5. Business cases should explicitly consider the potential for different futures, and the need for and role of BGI under a range of plausible future scenarios.

Table 2: Summary of Business Case typologies for BEGIN pilot cases

Pilot case	Scheme objectives in order of priority	Primary driver for scheme	Benefits assessed in order of expected relative significance	Main outcomes from the business case	Type of Business Case (Figure 1) Primary and secondary		Consideration of futures
Aberdeen	1. Safe pedestrian/cycle route 2. Manage flood risk with changing climate	Flood risk reduction	a. Flood risk reduction locally and downstream b. Numbers of users of route and nature areas	Scheme provides expected benefits at acceptable cost	Economic	Financial	Within the local climate action plan
Antwerp	1. Flanders: Raise the dikes for flood protection 2. Flanders: Improve nature-based areas in inter-tidal zone 3. City: Bring more opportunities for BGI into urban area and fit with waterplan	Driver for State of Flanders was flood risk reduction Driver for City was improving City with BGI	No quantification of BG related benefits, other than increased BG areas and public usage/access. Expected quantification of groundwater improvements and resilience, together with heat buffering. Flanders - quantification of flood risk reduction.	Scheme provides expected outcomes, cost considerations secondary	Strategic	Management	Within the local climate action plan
Bergen	1. Transform a former industrial area into a liveable & multifunctional neighbourhood 2. Fulfill Bergen's strategic goals for climate and urban development.	Create multifunctional area as part of goals for climate and City development	a. Amenity, b. health and c. flood risk reduction d. tourism and e. water quantity	Whilst business case not crucial, used as a means of communication with decision makers	Economic	Strategic	BAU plus national defined uplifts

Bradford	1. Enhance health and welfare of citizens 2. Improve transport links and corridor 3. Utilise infrastructure opportunities to improve environment and access by citizens	Major highway realignment scheme used as an opportunity for environmental improvements	a. Health b. Amenity c. Business Value Added d. Offsetting traffic impacts e. Flood risk reduction f. Recreation	Adding BGI to highway scheme increases BCR by as much as 2.6:1. Significant multiple benefits accrue.	Economic	Strategic	BAU plus national defined uplifts
Dordrecht - City Park	1. Comply with City transformation vision into climate adaptive city 2. Promote social cohesion and public health by increased access from existing and additional housing 3. Increase biodiversity and enhance water quality	Ensure City is liveable and climate adaptive in the face of additional development of 10.000 houses	a. Amenity value b. Public health improvements c. Resilience to climate change, including water quality d. Enhanced ecosystems	Economic case significant with a minimum return of 3:1 on investments	Economic	Strategic	Changes in population numbers and distribution
Enfield	1. Flood risk reduction locally and downstream 2. Water quality protection and improvement 3. Understand potential for multiple benefits from use of BGI	Flood risk/damage reduction	a. Flood damage reduction b. Traffic calming c. Health d. Amenity e. Air quality f. Carbon sequestration	Optimisation process can identify most cost-beneficial type and disposition of BGI measures	Economic	Management	Business as usual (BAU) plus national defined uplifts and consideration of how BGI measures will change over time

Ghent	1. Climate Robust City ambition 2. Create continuous, comfortable and safe walking and cycling routes across the city.	Climate resilient City	a. Benefits from new and enhanced safe, attractive and useful BGI spaces across and within the city.	Use of BGI is an essential contributor to climate robustness and wider value to the city.	Strategic	Management	Planning understands post-Covid City changes and use of green and other areas. Axes also assume that cars in city centre will be reduced.
Goteborg	1. Create new neighbourhood with city park, re-channelisation and access routes 2. Reduce flood risk in the area	Citizen demands for recreation of former industrial area	a. Amenity b. Education c. Flood risk reduction	Benefits outweigh costs and are worth investing in.	Strategic	Economic	BAU plus several variations on optional changes to development
Hamburg	1. Flood damage reduction 2. Water quality improvements 3. Demonstrate the benefits from using BGI	Flood damage and receiving water quality	a. Flood risk reduced b. Water quality improved	Costs for BGI less and performance better than traditional.	Economic	Commercial	BAU
Kent	1. Flood risk reduction 2. Demonstrate the wider benefits from using BGI	Flood damage and disruption	a. Flood risk reduction b. Amenity c. Health	Use of BGI brings multiple benefits at significant BCR.	Financial	Economic (unofficially)	BAU

Appendix

Table A1.1 – A1.10 Summary of the BEGIN pilot cases (KPI – Key Performance Indicator; BAU - Business As Usual planning and design; BCR – Benefits Cost Ratio; B£ST – Benefits of BGI assessment tool; CC – Climate Change; TEEB – Dutch tool similar to B£ST)

Table A1.1 ABERDEEN CITY COUNCIL – Maidencraig Flood Management Wetland Scheme

Objectives	Funders & expected KPIs	Baseline	Options	Impacts	Quantification & key evidence	Main assumptions	Results	Communication and social innovation	Consideration of future states
Construct safe route to school as part of housing development; Improve understanding of SuDS and work with community to define and understand flood risk. Reduce the risk of flood damage. Maximise 3rd party funding. Environmental improvements.	BEGIN project/ Developer Contributions/Sustrans. Adapting to climate change. KPIs: Number of properties being removed from flood risk; Numbers of users of safe route and wetland	Current flood risk-based on Integrated Catchment Model; national flood maps; historical flooding incidents; Identified land & improvement opportunities Denburn classified as Poor ecological status.	Four: Do nothing & 3 similar options with variations on interven-tions with a range of SuDS/BGI; wetlands flood plain	Extant flood risk data. Working Group & public consultation Surveys (topo., existing utility services, ecological).	Integrated catchment modelling, land opportunities mapping, Economic assessment using national manual, Water quality monitoring, ecological assessment. Historical recorded flooding incidents; Business case and opportunities maps.	most cost-beneficial scheme will attract greatest interested party funding	Build Flood Protection Basin and safe route to school now, and Improve Path Network	Used evidence from Business case - B£ST tool; Community engagement/ public consultation before final design; leaflets & site signs, Media releases. Engagement with 'Friends of Denburn', Raise flood awareness/ nearby schools, with learning activities on site, Engagement with a housing builder onsite	BAU + CC adaptation plan (Responding to the impacts of climate change)

Table A1.2 ANTWERP – Scheldeboorden Linkeroever (component schemes: a. Sint-Anneke-Plage; b. Gloriantlaan)

Objectives	Funders & expected KPIs	Baseline	Options	Impacts	Quantification & key evidence	Main assumptions	Results	Communication and social innovation	Consideration of future states
Flanders: Uplifting the dikes for flood protection; Create more tidal nature; City: Redesign of the public domain with an important role for green and blue spaces and solutions.	Dike raising: Flanders, also paid for extra depaving in scheme (b). Navigable waterways maintenance by De Vlaamse Waterweg. Majority of the BGI funded by City. City KPI is the fit with city-wide water plan - dealing with ground water stress (levels and saltwater intrusion) and heat. Flanders - flood risk reduction and more nature in tidal zone.	What would happen without the measures. Area analysis by theme, based on existing master plans and thematic visions for the area.	BAU/ depave to maximum extent; numerous opportunities city-wide Trying to move to green as BAU.	identified via a Citylab design sprint with BEGIN money - which provided opportunity for greening ideas	Consultants used. Waterplan; flood maps; Heat maps; Drought study, impact on groundwater and city greenspace. May check the outcome of the final designs for alleviating drought using TEEB. (This is not needed for funders or planning). Area opportunity map; user stories; Isometric map for images. City has a bespoke tool for heat stress.	Opportunity for Waterplan; Green plan vision; Structure plan. Visions for BGI used city-wide to formulate ambitions in city development or public space projects. New projects also originated from this vision.	Project (b) underway. Overall project learning from this and (a), and no need for a costed business plan.	Numerous workshops; BGI 'building blocks' catalogue; vision map, project map. Citylab design sprint with local businesses, communities, waterway co. & NGOs. Local area waterplans with communities. Common vision for maintenance of nature; experimental within the department and across departments to make BGI BAU.	Covid has not changed forward looks. Biggest impact has been in removing barriers to adopting BGI. 2030 climate adaptation plan, plus strategic plan to 2050.

Table A 1.3 Bergen Mindemyren

Objectives	Funders & expected KPIs	Baseline	Options	Impacts	Quantification & key evidence	Main assumptions	Results	Communication and social innovation	Consideration of future states
Transform a former industrial area into a liveable & multi-functional neighbour-hood. Fulfill Bergen's strategic goals for climate and urban development.	50% Norwegian State, City and developers KPIs - 15,000 jobs, 7,500 new residents. Decreased risk for flooding. Numerous multiple benefits.	Without BGI. BAU Increasing risk for flooding. Initially a deep channel but this would not provide the extra benefits – BEGIN exposed the possible.	BAU. Open channel and BGI as part of the public infrastructure.	B£ST used Amenity, health and flood risk reduction most valuable. Also tourism and water quantity benefits are substantial.	Database from national insurance firms, reports on effects of extreme floods in Norwegian urban areas, national statistics on traffic safety, health, noise and air pollution.	Goals, strategies & masterplans for development give framework and premises for the project.	BGI including an open channel, forms the central axis of the area, also includes the light-rail, connecti vity.	Monetary valuation was not directly a part of the decision-making process. But a valuable tool when communicating the benefits to politicians, inhabitants and private developers. Numerous individual groups and open citizen meetings; construction company open meetings. Including non-residents. Long-term interagency/ interdisciplinary work; training of stakeholders. Municipal stormwater management plan first of its kind in Norway. Art installation to focus citizens' interest.	BAU but scenarios used by key Institutions such as Norwegian Water for resources etc. planning using National criteria.

Table A1.4 Bradford – Canal Road Corridor – naturalising Bradford Beck

Objectives	Funders & expected KPIs	Baseline	Options	Impacts	Quantification & key evidence	Main assumptions	Results	Communication and social innovation	Consideration of future states
Major highway realignment scheme. Opportunity to to integrate BGI into this large infrastructure project as part of economic strategy for entire City Main priority is for health and wellbeing of citizens. Hence environmental improvements	West Yorkshire combined authority transport fund 50%, municipality, Environment Agency, EU and various National funding schemes. Deculverting now decoupled due to timing delays. With shortfall loan from Municipality. Additional funding from post-Covid recovery funds. KPIs Multiple benefits, including to flood mitigation (from 1 in 5 to 1 in 50 years) & impact on traffic on a key main highway, also habitats and human health.	Baseline was traditional highway scheme with BGI. Evidence from existing study reports etc. plus consultation with Community groups and other Agencies.	Variations on the amount and use of BGI, considering the multiple benefits. Project delivery in phases.	Benefits for economic land use impacts assessed using B£ST. Challenge impacts to be improved: Heavily modified watercourse; Contaminated land; Land Ownership; Topography; Underground Services. Existing flood risk, habitats.	Catchment based analysis, desktop studies and surveys. B£ST valuation. strongly positive cost-benefit case heavily related to the flood risk reduction for highway and also the health and wellbeing value that fits with policy goals. B£ST showed substantial BCR benefits increased for BGI, deculverting on top of highway scheme.	highway scheme can be enhanced by exploiting BGI opportunities	BGI options have greatest benefits and best cost benefit ratios, up to 2.6: 1.	Strong cross-departmental partnerships. Reports outlining & quantifying outputs: flood mitigation, habitat creation, amenity use, fish passage etc. enhanced transport capacity. Outlining how makes existing green space more accessible, attractive and useful. Informed cross-departmental working. Engaging with existing community groups to gain evidence to inform project (prior to new dwellers moving into area).	BAU, no evidence of significant changes to city centre residents other than some offices converted to apartments (mainly for students).

Table A1.5 Dordrecht – City Park

Objectives	Funders & expected KPIs	Baseline	Options	Impacts	Quantification & key evidence	Main assumptions	Results	Communication and social innovation	Consideration of future states
Part of Spatial vision for city transformation; climate adaptation; promote biodiversity; & public health by stimulating access. Housing development adjacent to park. Water quality improvements via better water circulation and more open water.	City Council, water board, province. Private funding needed, potentially from developers and carbon compensation funds. Add value to existing green space (biodiversity). Improve connectivity of green spaces and access points. Improved water quality. Every city inhabitant visits the park every week.	Current situation - includes three existing parks (and their usage) and four sport parks.	Originally a larger plan but too costly and downsized to Green corridor only, with active and climate buffer axis	Increase of property values, improved health and improved biodiversity, improved water quality, reduced flood risk	National Institute for Public Health and the Environment (RIVM), using (TEEB) Green benefits planner showed positive, benefits, with Increased house prices exceeding other benefits. Stress testing for climate change impacts. Water system with long term data. Limited evidence about pedestrian/cycle movements more for car traffic.	BGI will add value to existing (mono functional) green areas and attract new residents. Will increase resilience to climate change as a City	Increased property values €130M Health impacts €44M. CBR of 3:1 up to 20:1	Citizen engagement, semi-continuous. Recurrent festivals around water and flooding. Benefits valuation included in national report. Professional publications. Citizen engagement in two design ateliers.	BAU and future population growth and distribution of population (Green corridor, with and without large scale infrastructural measures)

Table A1.6 Enfield - Broomfield Park Wetland & Natural Flood Management Programme / Woodland Creation, part of London Strategic BGI Pilot

Objectives	Funders & expected KPIs	Baseline	Options	Impacts	Quantification & key evidence	Main assumptions	Results	Communication and social innovation	Consideration of future states
Flood risk reduction using BGI as part of natural flood management; water quality protection via buffering; test and evaluate effectiveness of BGI as part of London-wide strategy for multiple benefits.	Rivers Trust / Coca Cola Foundation, Thames Water, Environment Agency, Transport for London, Greater London Authority, Greater London Authority, Forestry Commission, Enfield Municipality. KPIs – reduced flood damage costs; Formalisation of a process for BGIretrofits; Encapsulation of community engagement & co-design within that process, plus value for money	Existing flood extent and damage; current water quality of water bodies	A range of options comprising a combination of BGI measures, implement-ation including un-optimised and optimised. Range of types and extent of new wetlands and woodlands.	Reduction in flood damage costs locally and downstream. Other benefits from by B£ST, including traffic calming, health improvements and amenity, air quality and carbon sequestration as minor financial benefit	Modelling and optimisation showed the most effective locations for various BGI, including wider environmental and socio-economic benefits improves the business case Integrating BGI into other public realm projects can reduce costs and realise additional funding.	Maintenance costs neutral by engaging local community. Optimal hydraulic design capacity of features (75% of volume during a 1 in 5-year rainfall event) accommodates highway runoff Assumptions made about size of wetlands and maturity of woodland over time. Scale of the surrounding rewilding site which is usually uncertain.	Distributed BGI can be highly effective at reducing both property-level flood risk and general surface water flooding. As well as improving water quality.	Public consultation prior to projects locally. Used to gather knowledge of other issues and informed design. BGI spaces delivered to accomm-odate wider use patterns in the spaces.	BAU with national uplifts. Full scale and potential of wider schemes considered for future which could bring about much wider benefits. Perception of the new spaces constructed and how users of the spaces have interpreted them.

Table A 1.7 Ghent - Vision on Green climate axis

Objectives	Funders & expected KPIs	Baseline	Options	Impacts	Quantification & key evidence	Main assumptions	Results	Communication and social innovation	Consideration of future states
Design and realise a climate robust city, utilising development opportunities to create eight climate axes running through and across the City. Continuous, comfortable and safe walking and cycling route. Six spatial targets with cooperation between different city services; bring policy documents together in one vision with political validation. BGI will also help alleviate flooding.	EU/BEGIN funding design, municipality the construction. Other sources available when more details, including private, national, but latter only for capital investments, not staffing. KPIs - climate robust city, increase biodiversity, stimulate modal shift; combine in integrated project and address other city challenges like growth of number of students, need of affordable housing.	General City vision in masterplan per City Region: The development vision for each of these. identified actions to realise these where some actions are now projects.	Numerous as vision covers the entire City. Options depend on neighbourhoods and local engagement.	Contribution to City climate action plan. Based on different policy documents. include less/no car circulation and less/no parking lots in the green climate axes. Reduced buildable area – offset by allowing higher buildings. Private development mandated to provide 20sq.m greenspace for one living unit for above 10 units. Especially along the green climate axis.	Modelling, including, biological valuation, heat mapping, drought and flood risk assessment. Economic value not assessed, but may be using TEEB tool.	BGI will provide multiple benefits. Mandating private developments will force use of BGI. Exploiting synergies between stakeholders will help deliver. 'Easy' pilot projects will show and help monitor the benefits;	Projects underway in stages (large scale and locally engaged). No need to demonstrate cost-benefits as schemes fit with overall City strategy.	Branding: Communicate about projects/ parts of the system that are realised will bring acceptance of BGI. Different stories presented to different interest groups, including different city services to create 'ownership': City Architect, Service for Mobility, Service for Climate, Greenery Service, Service for urban planning, Service for roads and waterways, Service for social innovation.	City Climate Plan considers futures. Reductions in cars in City centre included in plans

Table A1.8 Goteborg - Frihamnen Jubilee Park

Objectives	Funders & expected KPIs	Baseline	Options	Impacts	Quantification & key evidence	Main assumptions	Results	Communication and social innovation	Consideration of future states
Transforming former industrial area into an urban neighbourhood with a new city park. With management of facilities such as an open water swimming area, sauna, sailing school, summer camp, roller derby rink and urban planting plots. Kvillebäcken river will be channelled through Frihamnen to form a 'green corridor', and comprise new access bridges linking to Östra Hamngatan and Avenyn.	Municipality. KPIs: effectiveness of new workplaces, socially mixed housing and public transport/walk and cycle routes. The cost-benefit of reducing flood risk.	The existing area is highly affected by flooding. But development is planned in response to City needs. Considered doing nothing with the area, because of the high costs linked to protecting it from flooding, removing hazardous substances from the soil and managing the difficult geotechnical conditions.	Transform the area with and without the fulfilment of Gothenburg citizens' wishes. Or only use a some of the ideas. Also different topographic plans where the ground level is raised/lowered in various ways.	Less focus on green and social areas and more focus on simply protecting the development area without risking the area being flooded.	Modelling for flood and other impacts. Cost-Benefits analysis.	The masterplan for the city including new district Älvstaden provides the framework. Frihamnen is the result of the Gothenburg citizens' wishes for green areas and to get closer to the river. Expressed as part of the city's 400th anniversary and the construction of Älvstaden (new district within the city). Stormwater and flooding prevention measures are set within TTÖP (thematic representation of the city's flooding masterplan). A new sewer system is to be planned in the area.	Modelled flood mapping and the cloudburst measures are available to everyone on one of our websites.	Citizens engagement, a joint story and transparency. Outdoor classrooms present the suggested scheme for BGI-solution of the entire area. Building pilot site together with Gothenburgians, providing an outdoor classroom for water issues and programming it with pedagogical content for the pupils of Gothenburg. Reaching 602 pupils in 2021.	Future climate change predictions and which time horizon that the area should be adapted for without the need for greater flood protection measures.

Table A1.9 Hamburg - Falkengraben & Hohe Straße

Objectives	Funders & expected KPIs	Baseline	Options	Impacts	Quantification & key evidence	Main assumptions	Results	Communication and social innovation	Consideration of future states
Flood Protection and water quality amelioration at a local scale. Highlight potential of multifunctional land use.	Municipality KPIs: reduced flood damage; improved water quality and biodiversity	The lessons from the Falkengraben project (still in progress) provided the means to better 'sell' the Hohe Straße scheme using filter drains.	Traditional piped drainage compared with BGI.	BGI has better performance for both flood control and water treatment.	Flood & groundwater modelling, Cost analysis based on unit cost per kg filtered.	BGI will deliver multiple benefits	BGI cheaper and better performance (10yr RP at €2.7m compared with 2yr RP at €4.4m)	The main challenge was to engage the District Authority and municipality departments to facilitate the use of BGI and achieve multiple benefits. Necessitated a 'common' language based on landscape architects' perspectives. Changes in personnel also assisted with open mindedness.	BAU and possibly reducing the land occupied by highways.

Table A1.10 Kent - Bell Road, Sittingbourne & George Park, Margate;

Objectives	Funders & expected KPIs	Baseline	Options	Impacts	Quantification & key evidence	Main assumptions	Results	Communication and social innovation	Consideration of future states
Flood risk reduction (also unofficially demonstrate the other benefits from using BGI).	Municipality	Existing drainage system (ensure functionality)	Combination of BGI measures and flow pathway management	Flood risk reduced to acceptable level	Flood modelling. B£ST assessment of benefits.	Some local increased access and use of area, including local community maintenance.	Schemes reduced local flood risk and also downstream overloading of Water Company sewers. Numerous multiple benefits with BCR from 3 – 10:1.	Only minor engagement with local communities. Internal attempts to engage departments of limited success and no success with other stakeholders, including sewerage company.	BAU using national CC uplifts