

# Glasgow City Region Climate Adaptation Strategy and Action Plan

## Annex 2: Selected Flagship Action Strategic Outline Cases

Funded and produced on behalf of the following organisations:



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## Resilient Regions: Clyde Rebuilt

Resilient Regions: Clyde Rebuilt is a project seeking to catalyse a transformational approach to addressing the impacts of climate change in Glasgow City Region. It is led by Climate Ready Clyde (CRC), a regional climate initiative made up of stakeholders from the City Region, with technical, cultural, economic and governance expertise from Sniffer which supports CRC. It also has cultural expertise and understanding of creative arts in sustainability from charity Creative Carbon Scotland, specialist climate change and economic expertise from research consultancy Paul Watkiss Associates and EIT Climate-KIC. The project is funded by Climate Ready Clyde's fifteen members and EIT Climate-KIC, Europe's leading climate innovation initiative. The project developed Glasgow City Region's Adaptation Strategy and a transformational adaptation portfolio blueprint.

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## EIT Climate-KIC's Deep Demonstrations

Unprecedented systemic crises threaten existing communities and future generations and will require urgent global action and collaboration. Regions are often responsible for (decentralised) resilience and adaptation planning and implementation, but they face multiple climate related shocks and stresses which affect their communities, landscapes and economies in different ways.

The need for climate adaptation and resilience strategies to address ongoing challenges, change the status-quo of 'reactive' climate measures and cope with more and increasing climate-related disasters, has given rise to the opportunity to focus on enabling and investing in climate resilience holistically.

EIT Climate-KIC's Deep Demonstrations accelerates learning about how to change the world in the context of urgency, diversity and radical uncertainty. They are inspirational examples of what's possible, have been designed to create a transformative impact and ultimately seek to achieve rapid systemic change, for the benefit of all citizens.

The *Forging Resilient Regions Deep Demonstration* works to accelerate the transition from climate-vulnerable to climate-resilient regions, where people, communities, and systems are able to withstand shocks and slow-onset stresses and transform into flourishing communities.

Contending that 'Business as usual' innovation is not delivering climate action fast enough, Deep Demonstrations use systems innovation to generate options and pathways for radical transformations. It starts with a demand-led approach, working with regional governments committed to fundamental transformation to a net-zero emissions, resilient future. It offers a fresh approach to innovation, combining research, entrepreneurship, education, policy, technology and sustainability, to maximise the potential for change in places and across value chains.

Deep Demonstrations involve an iterative, non-linear four-phase process of Intent, Frame, Portfolio and Intelligence.

# The Deep Demonstration iterative process

In Intent, we listen to understand local or sectoral challenges and current commitments with regard to resilience and decarbonisation. We collaboratively develop the regional transformation vision through deep listening activities, workshops and interviews with government bodies, businesses and communities. By bringing together as wide an array of stakeholders as possible, we learn about what creates the fastest pathways to change in regions.

In Frame, we map out the relevant systems (which we want to transform) to identify where and how innovation can play a role in catalysing change. The outcome is a Portfolio Blueprint, with a series of leverage points that can address barriers and opportunities through innovation.

In Portfolio, we build and manage a portfolio of connected innovations designed to address the leverage points identified in earlier stages.

In Intelligence, we generate actionable insights and intelligence to inform decision-makers, provide feedback loops and accelerate learning about how to achieve transformation at scale.

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# **PART 1**

# **Business Case Methods and Applications**

# Introduction

As part of the economics work stream of Clyde Rebuilt, the project team have considered possible business case models that could be used to support delivery of some areas of the Innovation Portfolio, which became Flagship Actions in the Adaptation Strategy and Action Plan.



Fig 1. Flagship Actions in Glasgow City Region's Climate Adaptation Strategy and Action Plan

The starting point for this work has been to review the business case methods in use in Government in the UK, as these are the appropriate starting point for regional and local government in Glasgow City Region. However, it is accepted that they may need further development or alternatives.

In the UK, business cases are prepared as part of economic analysis in Government appraisal and the development and delivery of projects. Government appraisal is based on the principles of welfare economics, that is, how the government can improve social welfare or wellbeing (HMT, 2018). It is therefore carried

out from the perspective of society, and includes the economic valuation of non-market areas, such as environmental or social benefits. Government economic appraisal also accepts a lower rate of return and takes a longer-term perspective, when considering costs and benefits of a policy or investment<sup>1</sup>. The economic appraisal usually assesses a policy, programme or project in terms of the benefits versus the costs (from a societal perspective), expressed as the Net Present Value (NPV) or the Benefit to Cost Ratio (BCR)<sup>2</sup>, and/or the Economic Internal rate of return (IRR)<sup>3</sup>.

In contrast, financial analysis and financial business cases are carried out from the perspective of the investor and consider the incremental cash flows (revenues and costs) generated to assess the ability of the project to generate cash flows, recover the financial costs and generate profits. Financial analysis only uses market prices – it excludes non-market aspects, such as environmental or social benefits – and includes relevant taxes and charges. The attractiveness of a project is usually expressed in terms of an Internal rate of return (IRR), or a payback period. Private investors usually require much higher returns than economic and public investments.

These differences are very important as it can mean that an adaptation has a positive economic return (from the perspective of society), but not a positive financial return and thus cannot attract private investors.

- 1 Economic analysis includes the valuation of all aspects of a project, including non-market areas, and it adjust values (excluding taxes/charges, using shadow prices, etc.).
- 2 Total discounted benefits minus total discounted costs. Sometimes presented as a benefit to cost ratios (NPV benefits divided by NPV costs). In economic analysis, this estimates the economic NPV (ENPV) and economic IRR (EIRR) while for financial analysis, the financial NPV (FNPV) and financial IRR (FIRR).
- 3 the rate at which the NPV is zero, which can be compared with the discount rate to assess if a project generates a sufficient return on investment to be viable.



# Public Economic Appraisal and Business Cases

The deliverable has reviewed the current five case business model used in UK public policy making.

## The HMT Five Case Model and the Programme/Project Business Case

The **Five Case Model** is the approach for developing business cases recommended by HM Treasury, the Welsh Government and the UK Office of Government Commerce. It has been widely used across central government departments and public sector organisations over the last 10 years. The Five Case Model provides a framework aimed at achieving at the best possible decision on public programme and project investments.

In 2018, the HM Treasury published a refresh of the Green Book (HMT, 2018), along with a “Guide to developing the project business case” and a “Guide to developing the programme business case”. These provide a practical “step by step” guide to the development of business cases, using the Five Case Model.

The Five Case Model is applicable to policies, strategies, programmes and projects and comprises of five key dimensions. These are five different aspects which are interconnected but distinct – the strategic, economic, financial, commercial and management aspects. The business case should enable Treasury and other stakeholders to ascertain that proposals:

- Are supported by a robust Case for Change – the Strategic Case;
- Optimise Value for Money – the Economic Case;
- Are commercially viable – the Commercial Case;
- Are financially affordable – the Financial Case; and,
- Can be delivered successfully – the Management Case.

The five cases are briefly explained below.

**The Strategic Case.** The purpose of the strategic dimension of the business case is to make the case for change and to demonstrate how it provides strategic fit. Key to making a compelling case for intervention is a clear understanding of the existing arrangements: the Business As Usual (BAU), business needs (related problems and opportunities), potential scope (the required organisational capabilities) and the potential benefits, risks, constraints and dependencies associated with the proposal.

**The Economic Case.** The purpose of the economic dimension of the business case is to identify the proposal that delivers best public value to society, including wider social and environmental effects. Demonstrating public value requires a wide range of realistic options to be appraised (the long-list), in terms of how well they meet the spending objectives and critical success factors for the scheme; and then a reduced number of possible options (the short-list) to be examined in further detail. The short-list must include the BAU, a realistic and achievable ‘do minimum’ that meets essential requirements, the preferred way forward (if this is

different) and any other options that have been carried forward. These options are subjected to cost benefit analysis (CBA), or cost effectiveness analysis (CEA) where more appropriate, to identify the option that offers best public value to society.

**The Commercial Case.** The purpose of the commercial dimension of the business case is to demonstrate that the preferred option will result in a viable procurement and a well-structured Deal between the public sector and its service providers. Demonstrating a viable procurement requires an understanding of the market place, knowledge of what is realistically achievable by the supply side and research into the procurement routes that will deliver best value to both parties. Putting in place a well-structured Deal requires a clear understanding of the services, outputs and milestones required to be achieved and of how the potential risks in the Design, Build, Funding and Operational (DBFO) phases of the scheme can best be allocated between the public and private sectors and reflected in the charging mechanism and contractual arrangements.

**The Financial Case.** The purpose of the financial dimension of the business case is to demonstrate the affordability and funding of the preferred option, including the support of stakeholders and customers, as required. Demonstrating the affordability and fundability of the preferred option requires a complete understanding of the capital, revenue and whole life costs of the scheme and of how the Deal will impact upon the balance sheet, income and expenditure and pricing arrangements (if any) of the organisation.

**The Management Case.** The purpose of the management dimension of the business case is to demonstrate that robust arrangements are in place for the delivery, monitoring and evaluation of the scheme, including feedback into the organisation's strategic planning cycle.

The Five Case Model can be used for the preparation of:

- Programme Business Cases (PBC).
- Project Business Cases in three stages: Strategic Outline Case (SOC), Outline Business Case (OBC), Full Business Case (FBC).
- Business Justification Cases (BJC). The Business Justification Case (BJC) is a 'lighter', single stage business case that is available for the support of smaller, less expensive spending proposals that are not novel or contentious and for which 'firm' prices are available from a pre-competed arrangement, including framework contracts negotiated in accordance with EU/WTO rules and regulations.
- Policies and Strategies.

A number of variables will determine the exact process for the Business Case development, and the template to be used, and whether a single or multiple stage approach is needed. In particular, these include:

- the value thresholds (see box below),
- the complexity and risk involved,
- whether the situation is novel or contentious,
- whether procurement is required and the scale of the procurement, and
- whether there are any dependencies, e.g. with business as usual matters or other projects?

### Five case templates<sup>4</sup>

**For Procurements and Projects** (enabling outputs, activities and infrastructure):

1. Single Stage Business Case – Low Value and Risk (£0 to £250k value of procurement).
2. Single Stage Business Case – Medium Value and Risk (£250k to £2 million value of procurement)
3. Three Stage Business Case (SOC, OBC, FBC) – High Value (Over £2 million value of procurement)

**For Overarching Programmes** (outcomes to be achieved through improved services comprised of enabling projects):

4. Programme Business Case using the Five Case Model<sup>5</sup>

For some of the small Interventions in the Adaptation Strategy, a single stage business case may be sufficient. However, for many of the larger Interventions, then the three-stage approach would be needed. The three key stages are<sup>6</sup>:

**Strategic Outline Case (SOC) – the scoping stage.** The purpose of the SOC is to confirm the strategic context of the proposal, to make a robust case for change, and to provide stakeholders with an early indication of the proposed way forward (but not yet the preferred option), having identified and undertaken SWOT analysis (Strengths Weaknesses Opportunities Threats) on a wide range of available options, together with indicative costs. This phase maps onto OGC Gateway 1 (Business Justification).

At this stage, this would include:

- The Strategic Case – completed in full but may be revised later;
- The Economic Case – completed to the long-list of alternative options stage, with a recommended way forward (£) and an initial recommended shortlist for further examination at OBC stage;
- The Commercial Case – addresses the fundamentals of any potential Procurement and Deal;
- The Financial Case – discusses the likely affordability of the proposed Scheme; and,
- The Management Case – outlines how the project will be set up and managed.

**Outline Business Case (OBC) – the detailed planning phase.** The purpose of the OBC is to revisit the SOC in more detail and to identify a preferred option which demonstrably optimises Value for Money. It also sets out the likely Deal; demonstrates its affordability; and details the supporting Procurement Strategy, together with management arrangements for the successful rollout of the Scheme. This phase maps onto OGC Gateway 2 (Procurement Strategy).

At this stage, this would include:

- The Strategic Case – revised;
- The Economic Case – completed according to the Green Book;
- The Commercial Case – outlines envisaged Deal structure/s and key contractual clauses and payment mechanisms;
- The Financial Case – contains a detailed analysis of affordability and any funding gaps; and
- The Management Case – develops in more detail how the scheme will be delivered with an outline of the proposed programme/project management plan.

<sup>4</sup> <https://www.gov.uk/government/publications/the-green-book-templates-and-support-material>

<sup>5</sup> See Better Business Case Five Case Model Programme Guidance: <https://gov.wales/guide-developing-programme-business-case>

<sup>6</sup> See “Assessing business cases ‘a short plain English guide’” at <https://www.gov.uk/government/publications/the-green-book-templates-and-support-material>

**Full Business Case (FBC) – detailed final phase.** This takes place within the procurement phase of the project, following detailed negotiations with potential service providers/suppliers prior to the formal signing of contracts and the procurement of goods and services. This is usually the stage at which final Treasury approval is required. The purpose of the FBC is to revisit the OBC and record the findings of the subsequent procurement activities; together with the recommendation for an affordable solution which continues to optimise value for money, and detailed arrangements for the successful delivery of required goods and implementation of services from the recommended supplier/s. This phase maps on OGC Gateway 3 (Investment Decision).

At this stage, this would include:

- the Strategic Case – revisited and revised if required;
- the Economic Case – the findings of the procurement included in the analysis and recorded;
- the Commercial Case – the recommended Deal written-up;
- the Financial Case – affordability and funding issues resolved;
- the Management Case – the detailed plans for delivery and arrangements for the realisation of benefits, management of risk; and post evaluation are recorded.

As part of ongoing efforts to improve business case development, DEFRA has recently updated supplementary guidance on accounting for the effects of climate change in business case development, providing a framework for ensuring the economic and financial impacts of climate change are accounted for (DEFRA, 2020). However, there is limited evidence of this being applied in practice at this point in time.

# PART 2 Early Business Case Development for Selected Portfolio Propositions

To support acceleration of adaptation delivery, this study has undertaken an indicative Strategic Outline Case (SOC) for four of the Flagship Actions in the Adaptation Strategy and Action Plan, these are:

1. A Heat Health Alert early warning system.
2. A City Region building retrofit programme.
3. The Clyde Climate Forest (urban canopy component).
4. The Adaptation Finance Lab.

In each case, we:

- Set out the strategic case.
- Outline the economic case, with a long list of options.
- Put down the possible markers for the commercial case.
- Discussed the likely affordability as part of the financial case.
- Considered how the project could be set up and managed.

# Business case 1: Heat Health Alert early warning system

There is an increasing risk of extreme heat in Glasgow City Region, and especially in the city of Glasgow itself and wider towns, due to the heat island effect. This business case focuses on an early intervention to address this, now and in the future, with a heat alert system. This would fall under Intervention 7 (early warning) of the Adaptation Strategy and is Flagship Action 5 in the Action Plan. Note the analysis here has focused on the early stages of such a multi-hazard climate warning alert system, particularly focusing on a heat health alert early warning system. These heat alert systems are commonly found across the world, and one such system (the heat-health watch system, HHWS) is in place for England and Wales as part of the heat-wave plan (PHE, 2020), but a similar system is not yet operating in Scotland. Over time, other hazards may also warrant being included but are not considered in scope here.

## Strategic Case

- While Glasgow City Region currently experiences heatwaves infrequently, this will change with climate change. The latest UK climate projections (UKCP18, Lowe et al., 2018), and analysis for Glasgow (Undorf et al, 2019) indicates heatwaves will occur once every two years by the 2050s.
- The main health risk of higher summer temperatures and heatwaves is associated with premature (excess) deaths. Several studies have quantified these impacts for Scotland (Hames and Vardoulakis, 2012; Hajat et al, 2014). These indicate that climate change could lead to a 520% increase in heat related deaths by the 2080s under a medium emissions scenario in Scotland. The Clyde Rebuilt project estimates that on average, an additional 60 heat-related deaths will occur every year by the 2050s (for a central warming scenario) in Glasgow City Region and almost double this (110 deaths each year) for a high warming scenario. Annual impacts increase significantly after 2050s.
- These premature fatalities have large economic costs. These are valued in economic appraisal by considering the effect of the impact on society's welfare, through three components: the resource costs i.e. medical treatment costs, the opportunity costs, in terms of lost productivity, and the dis-utility i.e. pain or suffering, concern and inconvenience to family and others. The current values used in UK government economic appraisal for a prevented fatality is approximately £2 million (2020 prices). However, there is some discussion of whether these values transfer to the heatwave context, and whether they should be adjusted down as heat predominantly affects those who are old and/or have existing health conditions. In this context, a sensitivity value can be used, based on the value of a life year lost (£60,000) and assuming one year of life on average is lost for heat-related deaths.
- In addition to these fatalities, extreme heat is linked with a range of other health impacts (morbidity) and these have also been quantified in studies for Scotland. This leads to a larger number of cases than mortality, but the valuation of each individual case is much lower. For the 2050s, this equates to an additional 5,800 hospital cases per year in Glasgow City Region from heat for a medium warming scenario (but again, almost double this for a high warming scenario). These can be valued using estimates based on hospital admissions (£700/case) and respiratory and cardio-vascular hospitalisation, based on human cost, lost productivity and medical care (£8500) (DEFRA, 2019).
- Using the central values (the average of mortality and morbidity valuation), the economic costs of climate change on heat and health in Glasgow City Region are estimated at an £87 million/year by the 2050s for a central scenario, with a range of £41 million to £166 million, for low and high warming scenarios.



- There is a strong economic case for public action to reduce these heat and health related impacts. There are a large number of possible options, but studies elsewhere internationally, and in England and Wales, have introduced early warning systems for heat-waves, often called heat health watch systems. These can be complemented by targeted actions within the national health service, and social care systems, to enhance the communication and to take action to reduce risks. A review of heat early warning schemes by Toloo et al. (2013) reports high effectiveness (reductions in heat wave related fatalities) – the average effectiveness was 40% (in reducing fatalities) but some systems delivered much higher benefits, as much as 80%.

## Economic Case

- There is a strong economic case for potential action in this area. A number of options are potentially available. These include:
- The commissioning of heat warning alerts (meteorological forecasting and dissemination through media), to be communicated in advance of heat-wave.
- The mobilisation of health services (professionals) to provide contact to the vulnerable in the event of a heat-wave and take precautions, including in the home and in care homes, and not just in hospitals.
- The combination of these together.
- It should be noted that other options exist for reducing the risks to health from heat, such as changes to buildings (e.g. passive ventilation), and the introduction of nature-based solutions. However, whilst helpful, these have much higher up-front costs and need to be coordinated / implemented as a package to be fully effective. As such, they have been excluded on the grounds that they do not offer value for money.
- Previous studies have assessed the costs and benefits of current heat alert systems, and their benefits as an adaptation option in dealing with future heat extremes. Hunt et al. (2016) conducted economic analysis of heatwave warning systems (HHWS) in Europe, focusing on London, Madrid and Prague. Their results demonstrate that in most cases the HHWS option can be justified in the current climate – it is therefore a “no/low regret” option. Their results also show that whilst costs increase slightly under climate change scenarios, benefits of HHWS are likely to increase also. For London, benefit-to-cost ratios go from 11 (under current climate) to 28 (hot climate scenario).
- An initial economic analysis has been made for the development of a HHWS for Glasgow City Region by Clyde Rebuilt. This estimates the costs of the early warning information, e.g. the actual meteorological forecasting and issuing of heat-alerts for Scotland, is relatively low (e.g. £200,000/year).
- However, there are additional resource costs for the NHS and social care services each time the HHWS is triggered, with rising costs according to the level of risk. The England HHWS has four tiers, associated with increasing risks:
  - **Level 1 – Awareness** — the minimum state of vigilance during the summer.
  - **Level 2 – Alert** — triggered as soon as the risk is 60% or above for threshold temperatures being reached on at least two consecutive days to have significant effects on health. This will normally occur 2 to 3 days before the event is expected.
  - **Level 3 – Heatwave** — triggered as soon as the Meteorological Office confirms threshold temperatures will be reached in one or more regions.
  - **Level 4 – Emergency** — reached when a heatwave is so severe and/or prolonged that its effects extend outside the health and social care system.

- The resource costs for each of these four levels has been estimated. This is based on the information in Watkiss et al., 2019b. on the level of action required by health professionals for each level, notably Advanced Nurse Practitioners, (ANPs) or equivalent. The total number, (full-time equivalents), of ANPs currently working in Greater Glasgow are reported to be 122, as of September 2018. The annual cost of employing an ANP is calculated from cost information identified from previous analysis (Hunt et al, 2016). Cost information includes: salary, on-costs, non-capital overheads, capital overheads. These are divided by 220 (annual working days) to give costs of £147/day (Glasgow City Region). The total HP costs for Glasgow are calculated for the four different warning levels.
- The annualised costs of the scheme over the next thirty years are estimated at £6 million. These can be compared to the annual benefits, presented earlier based on a reduction of 40% of fatalities, for a HHWS in GCR which is estimated at £35 million/year in 2050 (central values and scenarios). While not a full cost-benefit analysis, this initial analysis indicates the scheme would have a very high benefit to cost ratio.

## Commercial case

- The delivery of a HHWS system is made of two main components or activities: producing forecasts and alerts, and the design of a detailed plan laying out the roles and responsibilities of different parties (primarily health professionals) to respond to such alerts.
- Like for the Heatwave Plan for England, a HHWS for Scotland could be underpinned by a system of heatwave alerts developed with the Met Office. This would require procurement of the forecasting service from the Met office downscaled to a regional level, including for Glasgow City Region. Large economies of scale could occur if the service were procured for the whole of Scotland rather than for Glasgow City Region alone, with benefits being also proportionally greater for a national HHWS vis a vis a regional one.
- For England, the Met Office currently forecasts day-time and night-time maximum temperatures, which are monitored regionally. When certain heat thresholds are passed, a warning is issued and sent to relevant health professionals and people working in social care as well as displayed on the Met office website. This enables health professionals to take action to minimise the impact of the heat on people's health.
- For England and Wales, responsibility for preparing and publishing the Heatwave plan for England lies with Public Health England (PHE). PHE seeks to ensure that the heatwave plan is widely communicated using a variety of channels to ensure maximum publicity. Relevant government agencies also work together in partnership to provide the best possible information and advice. Mirroring this approach, Public Health Scotland could be appointed to deliver advice for the public and healthcare workers in Scotland, including in Glasgow City Region.
- No private financing is foreseen for the core activity, as the service provides a public good which requires different public agencies to work together in a coordinated way. However, there might be opportunities to promote the scheme, and build capacity, for certain highly vulnerable sectors (e.g. private care home provision) and this could involve commercial procurement.

## Financial case

- The financial affordability of the scheme is partly dependant on the level of climate change that emerges for the Region. The warmer the future climate of Glasgow City Region will be, the more frequently the scheme will need to be triggered, hence increasing the costs going forward. This will require careful planning and budgeting based on different scenarios. However, as highlighted above, the scheme has low running costs, especially in early years, and delivers very high benefit to cost ratios, and this is considered financially sustainable.
- The financial sustainability of the scheme is also intrinsically linked to a number of variables:
  - The accuracy of the forecasts and alerts provided;
  - The ability to communicate the alerts timely and effectively;
  - The ability of people to act upon the alerts received.
- The greater the accuracy of forecasts, and the timelier the communication of the alerts, the more likely the alert system will be efficient – with the right information cascading to the right people at the right time. The ability of people to act upon the alerts is also important in ensuring the benefits of a heat alert actually materialise. There is therefore likely to be higher value for money generated if a value chain approach can be taken, ensuring that all aspects from forecasts to use of information with appropriate action is considered.
- It is noted that a scheme that considered Glasgow City Region alone, would have higher costs than for a national HHWS scheme, possibly reducing its financial sustainability. There is therefore financial efficiencies possible from a scheme covering southern Scotland (east and west). A national scheme would be also cost-effective, though the levels of heat-wave risk for northern Scotland and the islands is considered very low.

## Management case

- This project requires a high degree of planning and coordination. At the central level, if the scheme has a national coverage, it could be managed directly by the Scottish Government's Health and Social Care Directorate and/or Public Health Scotland, which could procure the Met Office for the forecasting and alerting service, while defining roles and responsibilities for designing and delivering a Heatwave Plan.
- A regional scheme would possibly be more challenging to manage, due to the relatively lower capacity of the regional institutions, as well as the lack of a health authority for the Region.

# Business Case 2: Net Zero, Climate-Resilient Building Retrofit

This business case is focused on the Intervention to increase resilience in buildings (intervention 8), and Flagship Action 7, the net zero, climate resilient housing retrofit. From an adaptation perspective, this means addressing the multiple climate hazards facing the building stock in Glasgow City Region both now and in the future, with a particular focus on flood risks and extreme heat. However, in considering such an approach, it will be extremely important to develop these initiatives in synergy with net zero ambitions. The need for building retrofit has been put forward as a core proposition in Glasgow City Region's economic recovery plan, with a £5bn proposal for low carbon retrofit, as part of the Covid-19 recovery efforts. This business case is focused on extending this to provide a whole-system approach, integrating mitigation and adaptation elements.

## Strategic Case

- In 2019, the Scottish Government (Scottish Government, 2019) committed to a target of net-zero emissions of all greenhouse gases by 2045. The Scottish Government has also set out that it will adopt an ambitious new target to reduce emissions by 75% by 2030. Glasgow city has announced a goal to be the UK's first carbon neutral city by 2030 following a decision of the Council's City Administration Committee<sup>7</sup>.
- These commitments will have major implications for energy use in the homes, and especially winter heating, as 80% of homes are currently heated with gas (Scottish Energy Statistics, 2018). The Committee on Climate Change has developed techno-economic scenarios of how to achieve such Net Zero targets (CCC, 2019). This sets out that pathways are possible for addressing energy use and heating demand in the home, with energy efficiency, combined with zero carbon electricity, e.g. powering heat pumps, or from switching from natural gas to hydrogen for heating. These net zero options could be included in new build houses. However, even if this is undertaken, the majority of the building stock in Glasgow City Region is already in place, and current houses will dominate the built environment in 2050.
- Glasgow City Region has published an economic recovery plan in response to COVID-19 (Recover Rebuild Renew, GCR, 2020). This includes a proposition to retrofit the existing stock to meet local national net zero targets. The plan sets out that there are over 236,000 homes across GCR that would benefit from home insulation and improved energy efficiency, and these are often in the most deprived communities. The analysis estimates that it will cost approximately up to £25,000 per property to install energy efficient home insulation and to reduce carbon emissions by using clean energy technology. Overall, a ten-year £5 billion investment programme is proposed to upgrade the insulation for all properties in the city region that need it and to explore the use of innovative renewable technologies to deliver clean energy.
- However, there is also a future risk of increasing heat in Glasgow City Region, and especially in the city, due to the heat island effects. High temperatures and heat-waves lead to over-heating in homes, buildings, care homes and non-residential buildings, and are a major factor in the health-related impacts (see business case 1). While Glasgow City Region currently experiences heat-waves infrequently, this will change with climate change. The latest UK climate projections (UKCP18, Lowe et al, 2018), and analysis for Glasgow City Region (Undorf et al, 2019) indicates heat-waves will occur once every two years by the 2050s.

<sup>7</sup> <https://www.glasgow.gov.uk/article/25066/Council-Sets-Target-Of-Carbon-Neutral-Glasgow-by-2030>

- There is therefore a risk that energy efficiency measures could exacerbate the future problem of heat, if a synergistic mitigation-adaptation retrofit programme is not undertaken. This is a key focus of this business case. There are a range of options that can be included to make sure energy efficiency measures do not lead to over-heating, as well as a range of simple measures that can reduce over-heating more generally and can be retrofitted.
- At the same time, flooding risk is already significant in Glasgow City Region and is projected to increase. The annual cost of flooding in Glasgow City Region is currently estimated at around £70 million/year (on average annualised damages), split approximately evenly between the three sources: coastal, river and surface floods. Many of the higher risks are in the most deprived communities. An analysis of future climate change estimates these costs will rise significantly with climate change, and with both climate and socio-economic change included, they could increase by around £100 million/year by the 2050s, over current levels, with much higher impacts in a warmer scenario in the late century.
- In addition to public flood defences, it is possible to reduce flood related damages with household measures. These includes resilience measures that are undertaken inside a property to reduce damage caused by floodwaters, i.e. wet proofing, through internal design such as raising electrical sockets so that the building can quickly be returned to use. It also includes resistance measures, i.e. dry proofing, that aim to prevent floodwater from entering a building for example with flood barriers across doorways, raised floor levels. While both resilience and resistance measures are easier (and more cost-effective) to introduce in new houses, they can also be retrofitted to existing properties. There is therefore a potential to look at the flood retrofitting options, especially for deprived communities where flood risks are high.
- Integrating net zero and climate resilience measures together requires the necessary information, and the right capacity and training, and there is a role for government to ensure the integration of a whole system (integrated) approach. It may also require standards or procurement conditions to ensure this integrated approach is delivered.

## Economic Case

- The existing retrofit programme sets out (GCR, 2020) that it would cost £5 billion and would require a sustained 10 year investment. However, it would support over 75,000 jobs and generate £4.4 billion in Gross Value Added (GVA) across the City Region. In addition to the employment and economic benefits, widespread insulation across the City Region could remove 10.7 million tonnes of carbon emissions per annum. The economic benefits of these reductions can be costed using the Government shadow price of carbon (for use in economic appraisal), (BEIS, 2019) and would be large. Adding in a climate resilience component is likely to achieve further economic benefits and job creation, as well as driving skills into the new adaptation economy.
- There is some evidence on the economic costs of climate retrofit options in houses for reducing over-heating. DEFRA (2013) reports that costs are relatively moderate but can vary considerably. They report it is possible to reduce overheating by 80% at £3,000 for 3-bed semi-detached and by 97% at £10,000 cost, and these measures can provide energy efficiency and thus reductions in winter heating as well (10% and 30% respectively). A recent study commissioned by the Committee on Climate Change's Adaptation Sub Committee and carried out by Wood Plc (2019) has also identified low regret measures to combat over-heating for different types of dwellings, i.e. that seem to show high cost-effectiveness. It is noted that this is higher cost-effectiveness in targeting new houses, and this should also be considered as part of this option.

- However, some care should be taken in applying all measures (and cost-effectiveness estimates) to Glasgow City Region, because of the cooler climate. The focus is likely to be on measures that primarily provide heating savings, as these will dominate household benefits, but do not exacerbate over-heating (although preferably measures that reduce winter heating and reduce summer over-heating at low cost). More expensive measures that have a greater focus on over-heating risk reduction may not be justified.
- Similarly, resilience measures have been reviewed and there are options that are low regret (EA, 2015; Wood Plc, 2019), although measures are more expensive if retrofitted rather than installed in new builds (and so again, the consideration of these measures to new houses is important). Further, a ‘complete’ package of all resilience measures is expensive and might only be justified for very high-risk areas. Resistance measures tend to be more cost-effective and are likely to have higher household acceptability.
- A programme that was targeted at deprived households would also have strong distributional benefits, and this should be factored into future revisions of the economic case.
- Further work is recommended, but the set of options could consider:
  - Retrofitting measures to address over-heating as part of the net zero retrofit programme, with low and high packages of measures, and potentially a differentiated approach to target houses that are prone to over-heating and/or those in the areas of the city most affected by urban heat island effects.
  - The above retrofitting option, but with the addition of potential household resistance and/or resilience measures for flooding. Again, this might need to adopt a differentiated approach to target houses that are most at risk from flooding.
  - A complementary package to increase climate resilience in new build houses, to ensure resilience alongside emerging net-zero policies.

## Commercial case

- The commercial case for the resilience elements is likely to follow the same model as the main retrofit programme. The current proposal (GCR, 2020) is conditional on securing funding from Government to deliver the home energy retrofit plans. If this is secured, the plan is to establish a small technical team to develop the 10-year programme, create economies of scale, leverage funding from other sources, set consistent technical solutions for different stock types, and to liaise with the private sector, FE and skills providers, and to coordinate delivery across the City Region. Note there are likely to be higher costs and timeframes associated with this work, since to date this would be the UK’s first programme for net-zero, climate resilient housing at scale, and so there would be a range of methodological issues that would need to be resolved to deliver such a programme effectively.
- This might require the procurement of advisory services and cost modelling initially (technical assistance, from private providers), to understand the best approaches for resilience (as outlined in the options above). There would then need to be the procurement of delivery partners for the programme itself, in line with the modality of the overall programme.



## Financial case

- The initial investment will require public funding, especially for the technical team and the early development of solutions, capacity building etc. This would also apply to the climate resilience components, and initial studies, capacity, etc.
- For the retrofit programme itself, the scale of the programme (£5 billion) is large. There is the possibility to target public funds to deprived households, and this could be extended to the climate resilience measures, perhaps with a risk targeted approach to improve affordability. However, there are options for various type of household contributions. Households will benefit from energy efficiency measures introduced, as these measures will reduce winter heating bills. This might provide some revenues to allow a range of different financing options, e.g. direct subsidies or loans, or the use of energy service companies. Similarly, engagement with Home Energy Scotland or the Scottish National Investment Bank may allow the use of low interest loans to support the programme. This may also allow some revenues to buy-down or cross-subsidise the costs of the climate resilience measures. However, the delivery of low carbon energy may increase running costs, and thus offset these gains.
- One other option could be to explore factoring in the benefits of reduced heating demand due to climate change. This was explored elsewhere in the Clyde Rebuilt project, allowing the creation of a revolving fund to allow for reinvestment into the adaptation. Depending on the level of warming, this saving is estimated to result in savings of between £62m – £189m / year by the 2050s, depending on the warming scenario realised.

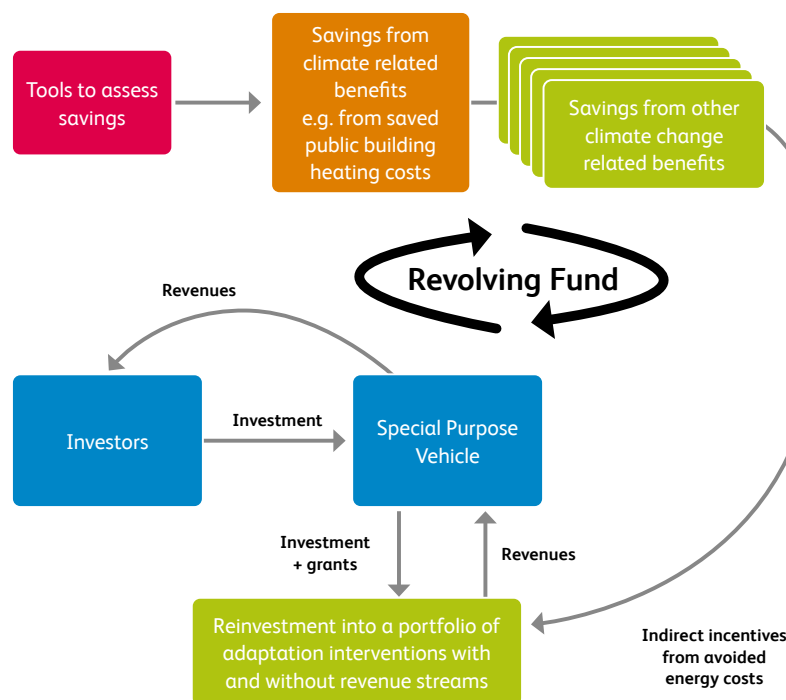


Figure 2: Revolving fund to transfer climate benefits to adaptation, Source: Clyde Rebuilt 2020

## Management case

The management case for the resilience elements is likely to follow the same model as the main retrofit programme.

# Business Case 3: Clyde Climate Forest (Canopy Component)

The Clyde Climate Forest is a new initiative that is being developed by the Glasgow and Clyde Valley Green Network Partnership, in partnership with the Woodland Trust and Glasgow City Region. It has three interlinked components:

- **Canopy** – to increase urban canopy cover across the Glasgow conurbation and through new tree planting, particularly in areas of deprivation and at risk from the heat and flood-related impacts of climate change.
- **Connectivity** – To plant new woodland, making connections in existing habitat networks to provide a potential migration route for woodland species from the headwaters of the River Clyde through to the Loch Lomond and Trossachs National Park.
- **Carbon** – to deliver carbon sequestration opportunities, notably on land owned by public bodies which could be the focus of carbon off-setting tree planting to help deliver net zero targets (but might also have a role in regional watersheds).

This initiative has multiple functions, including mitigation, and a range of ecosystem service benefits (see GI), but it also includes some adaptation elements. This initiative – and business case – is focused on the canopy component of the Clyde Climate Forest. This offers the potential for urban adaptation, and the business case includes the basic proposals but also a strengthened adaptation component.

## Strategic Case

- Nature-based solutions – also known as green infrastructure or ecosystem-based adaptation (EbA) – harnesses biodiversity and ecosystem services to increase resilience and reduce the vulnerability of human communities and natural systems to climate change. They also lead to important co-benefits, which include, among others, improved recreation and tourism opportunities, biodiversity conservation through enhanced habitat conditions, climate mitigation through increased carbon sequestration, conservation of traditional knowledge, livelihood and practices of local communities (Geneletti e Zardo, 2016). NBS are a priority for Scotland and are being advanced through a number of initiatives.
- These nature-based solutions are increasingly being adopted in urban management plans. For example, they were included in the Copenhagen Cloudburst management plan, to help with water management (and flood control). They are also used to help increase green space and reduce urban temperatures, as canopy cover within cities can help reduce temperatures (Tapper, 2019).
- The Clyde Climate Forest – and the component on increasing canopy cover – will assess the extent of canopy cover across the Glasgow conurbation and identify opportunities to increase this through new tree planting, particularly in areas of deprivation and at risk from the impacts of climate change.
- There are nearly 29,000 hectares of broadleaved woodland habitat in Glasgow City Region, occupying nearly 9% of the region. However, through urban development and agricultural land use, these woodlands are not well connected. This reduces their resilience potential, and it also reduces the co-

benefits they could provide, whether recreational or biodiversity benefits. The Clyde Climate Forest will assess the existing woodland habitat networks and identify where new woodland planting will make connections that provide a potential migration route for woodland species from the headwaters of the River Clyde through to the Loch Lomond and Trossachs National Park, as well as maximising the potential for recreational benefit.

- This is connected to the region's Forest and Woodland Strategy, which identifies the opportunity to create new plantation forests across Glasgow City Region, on marginal agricultural land in Glasgow's rural hinterland, on abandoned open cast coalmine sites, or on urban vacant and derelict land. The Clyde Climate Forest will identify where woodland creation will deliver good carbon sequestration opportunities, as well as potential resilience and wider co-benefits. Of particular interest will be land which is owned by public bodies which could be the focus of carbon off-setting tree planting to assist those public bodies to reach their net zero targets.
- There is a strong case for intervention to create the enabling environment for the Clyde Climate Forest, and the canopy component, given the wider public goods it will deliver.

## Economic Case

- The adaptation literature identifies that nature-based solutions generally have a good economic case, with positive benefit to cost ratios. This arises from their adaptation benefits (flood reduction or heat reduction), but also the wider economic benefits they generate of improved amenity and recreational value, health and mental well-being, social cohesion, air quality improvements and CO<sub>2</sub> sequestration. However, many of these benefits are non-market in nature.
- Urban trees provide urban cooling and surface water management for cloud-bursts, whilst also providing some carbon storage and wildlife habitat. They also provide potential recreational and amenity benefits. Compared to more traditional infrastructure-based approaches (e.g., concrete and engineered solutions), nature-based adaptation is typically a 'no regret' solution because they deliver benefits (e.g. recreational benefits and other social and environmental benefits) regardless of climate change.
- There are examples of nature-based solutions implemented by various municipalities around the world which have been proved to be cost-effective and generate large co-benefits. However, the costs and benefits of nature-based solutions are very site-specific, and hard to measure in monetary terms due to presence of non-market co-benefits. These options are most effective in reducing low levels of flooding (or modest reductions in heat), and have limits for large-scale major events, and thus may need to be complemented with other forms of adaptation, such as in grey-green portfolios. Such an approach was adopted in the City of Copenhagen (2012) Cloudburst Management scheme, and this combined approach reduced the costs compared to delivering resilience through grey infrastructure alone. Nature-based approaches often create recreation opportunities for locals and tourists and can therefore contribute to long-term gains in employment and income. Nauman et al. (2014) report that NBS along the River Elbe and its tributaries have a total economic benefit of €1.2 billion and a benefit to cost ratio of 3:1.
- There are a series of potential options associated with this action. Options could include different combinations of urban trees, woodland restoration and forest plantation to be decided on the basis of the socio-economic costs and benefits generated by each option, including the opportunity cost of land.

## Commercial case

- The Clyde Climate Forest is being developed by the GCV Green Network Partnership and Scottish Forestry. It is gaining support from the Woodland Trust, the Green Action Trust, TCV Scotland, Local Authorities, universities and housing associations amongst others.
- In general, there are three ways through which nature-based adaptation can be delivered: i) direct provision, ii) regulation, and iii) “facilitation” where the municipality can facilitate coordination with private and community actors, such as by establishing public-private partnerships for the provision of services and infrastructure.
- There is little financial incentive for the private sector to fund such green infrastructure alone, since these are public goods with positive externalities. Government direct provision is usually undertaken, but there are potential opportunities to enhance the commercial case and look at alternatives (See financial case below).
- Procurement could be done directly for the three components. Alternatively, each component (canopy, woodland, and forestry) could be procured separately. Procurement procedures will need to ensure value for money.

## Financial case

- The fact that many benefits are non-market in nature means that the financial case for NBS is lower than the economic case, which makes them less attractive from a private investment viewpoint. However, there are some options to encourage other investors, with payment for ecosystem services, or the use of challenge funds or cross-subsidies.
- Some pricing/funding methods could be designed which capture the positive externalities generated by nature-based solutions. For example, Copenhagen finances all water-related adaptation measures, including green infrastructure for water retention or natural drainage, using water charges and in cooperation with the water utility company. The municipality of Basel, Switzerland, has put 5 % of all customers' energy bills in the Basel canton into an Energy Saving Fund. It is used for energy-saving measures such as extending the area of green roofs, which also help to conserve biodiversity and adapt to climate change (EEA, 2017).
- Importantly, ongoing maintenance costs should be carefully considered and budgeted for, particularly for urban trees.
- The Clyde Rebuilt project has looked at possible financing mechanisms for the project, to help the financial case and financial sustainability. This could involve establishing a community forestry investment fund to capture the ecosystem service benefits of forestry and act as a funding mechanism to crowd in private investments. A similar approach is being explored in England for the Community Forest Fund. Such an approach could generate a predictable, secure and long-term funding stream to support the core forest-based activities for Local Authorities in GCR. Activities would include tree planting, bringing woodland into management, opening up woods for visitors, building and maintaining visitor facilities (e.g. footpaths, cycleways) and educational and community initiatives. Revenue streams could be generated primarily from forest products / charges for use of community forest areas by the local populations and tourists providing recreation, health and well-being benefits. Funds from the user charges could be used to develop and deliver verifiable pre-agreed activities for investors and communities – for example, planting and maintenance of woodlots.

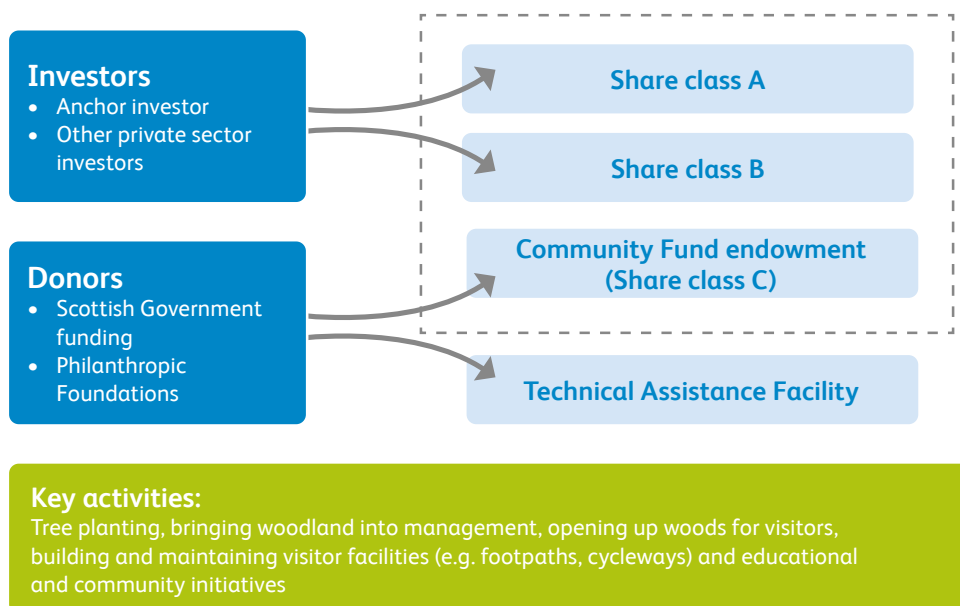


Figure 3: Clyde Community Forest Fund. Source, Clyde Rebuilt, 2020)

- Another approach could be to set up a Community Forestry Trust Fund into which any generated revenue streams would be channelled. The Trust Fund would then be used to maintain and expand the forestry-based activities. Potential revenue streams from carbon offsetting will also need to be assessed, based on whether local authorities and other public bodies want to use the carbon sequestration potential to offset local carbon emissions or raise finance for other activities.

## Management case

The project will be set up and managed by the GCV Green Network Partnership and Scottish Forestry. The proposed development of the financial case is linked to the adaptation finance lab, discussed in the business case below.

# Business Case 4: Adaptation Finance Lab

The Clyde Rebuilt Resource Mobilisation Plan investigated the potential for transformative finance to fund the various interventions in the Adaptation Strategy. This would require the scaling up of public adaptation finance, but also requires the development of new financial instruments, to crowd-in private sector finance. A series of possible new funding approaches was outlined. To bring this all together, the Resource Mobilisation Plan also recommended to set-up an [Adaptation Finance Lab](#) for Glasgow City Region. This early business case is focused on Flagship Action 12, of an Adaptation Finance Lab.

## Strategic Case

- The availability of finance is an obvious and important constraint to adaptation. Even the best adaptation plans will not be implemented if they lack the necessary financial resources. The availability of finance is therefore a key enabler for the delivery of the overall GCR Adaptation Strategy.
- The available finance for climate mitigation is increasing globally, and in Scotland, and is dominated by private sector flows (CPI, 2019). However, the financing of climate adaptation remains low, and has predominantly been funded by the public sector. This reflects a number of differences in the ease of financing of mitigation versus adaptation, most notably that it is harder to generate revenue streams for adaptation.
- As climate change impacts continue to accelerate in Glasgow City Region, there is likely to be a large gap that emerges between the adaptation finance needs and the available public finance. This means there will need to be additional sources to public finance, to deliver GCR's Adaptation Strategy, but securing this finance will be challenging.
- There is a need to unlock finance for GCR's Adaptation Strategy and Innovation Portfolio, and this is likely to require three strategies, in partnership with local, national and UK actors, and working across the entire development process from idea to implementation at scale.
- First, increasing the proportion of direct grants and creating the conditions for adaptation. There are some adaptation activities and investments that require (and justify) public intervention, notably because of market failures, or because they involve investments or changes where there is limited private sector interest. In these cases, public investment can support core adaptation, but there are also opportunities to use public funds to create the enabling environment for actions by the private sector and others.
- Second, encouraging public organisations operating in GCR to move a more commercial mindset. This involves thinking more long-term and at scale, for example using bonds and debt financing, and there are also opportunities to use public funds or assets to support public-private sector partnerships or unlock investment from the private sector for adaptation. These opportunities could be very significant and can help to address the adaptation finance gap.



- Finally, developing innovation for adaptation. There are many emerging opportunities for adaptation, and these can be developed through a cycle of innovation. This pilot and demonstrate new approaches with new actors. This can be developed through partnerships including local research institutions and national and European research funders, local, Scottish and UK government, and the private sector. This would also position GCR as an innovation hub for the emerging adaptation economy, i.e. for new adaptation goods services.
- The Resource Mobilisation Plan also outlines seven new potential financing approaches:
  - Green Infrastructure Blended Finance Lending Facility;
  - Clyde Climate Forest Fund;
  - Placemaking Crowdfunded Climate Bond;
  - Adaptation infrastructure including Green and Sustainable urban drainage systems solutions;
  - Climate Risk Reduction Public Private Partnership;
  - Glasgow City Region Climate Adaptation Fund;
  - Revolving Fund to Transfer Climate Benefits to Adaptation.
- To deliver the three strategic priorities, and these seven potential approaches, there is a need to develop climate finance and governance architectures. To take this forward, the Clyde Rebuilt Resource Mobilisation Plan recommended establishing an Adaptation Finance Lab for Glasgow City Region.
- The Adaptation Climate Finance Lab would have two roles. First, it would seek to identify and help coordinate governance across institutions. For example, to deploy the right vehicle – and right organisations – for delivering investments. In some cases, the existing GCR governance may be sufficient, whilst in others, separate legal entities such as special purpose vehicles may be required. It may also be possible to expand or evolve existing frameworks such as the Green Investment Portfolio used by Scottish Government. Second, it would create a platform to fund and encourage innovation in the Adaptation Strategy and to support its financing. The Lab would incubate and develop innovative ideas to demonstration and provide a common ‘marketplace’ for potential actors to collaborate in a structured and coordinated way.
- There is a strong economic and financial case for the establishment of the Lab. The nature of the investment required in adaptation – often with the characteristics of public goods and/or without commercial revenues – means that there is a need to create funding mechanisms able to combine both private and public resources. Creating the incentives for the private sector to invest when these are not clear or visible to private actors will be key to attracting capital.

## Economic Case

- The benefits of raising finance for adaptation are obvious. The economic case is therefore strong for investing time and resources to develop financing plans (including new financial instruments), because of the leveraging potential that this will generate. In effect, a small investment (cost) in this area will generate a large potential volume of finance flow, and this justifies the expenditure in this area.
- There are a number of potential options that are considered in the business case. These include:
  1. To take forward the planned new financing approaches/models in the Resource Mobilisation Plan in isolation, i.e. working on each individually.
  2. To establish the Adaptation Finance Lab as an over-arching framework, to co-ordinate the overall resource mobilisation plan and new financing approaches/models, i.e. to apply an integrated approach. The lab would also be open to wider organisations to apply for broader support, creating further benefit.
- The economic appraisal of these options is challenging, but has been investigated through the increased financial leveraging, as well as the improved efficiency of delivery, that will be generated by the Adaptation Finance Lab.
- For this Strategic Outline Case, we have considered the potential economic benefits of the Lab (option 2), over and above the individual delivery (option 1), using switching values. These look at the potential additional finance generated, or improved efficiency of finance delivery, that would be necessary to justify the investment in the adaptation finance lab.
- Initial estimates of the costs of the Lab indicate it might have a cost of £0.5 to £1 million, in terms of staff resourcing and activities, over the next five years. These activities would be aligned to raising the adaptation finance to help deliver the Adaptation Strategy objectives for 2030.
- While the future costs of delivering the Adaptation Strategy have not been estimated in detail, they are likely to be considerable. An initial analysis of adaptation finance needs was undertaken as part of the Clyde Rebuilt study, looking at the potential uplift that might be needed for adaptation on top of existing Local Authority budgets in Glasgow City Region, based on Local Authority level spending from the Scottish Local Government Finance Statistics (GFS, 2019) with estimates of average adaptation costs (Watkiss et al., 2019). The latter assumed a 2% uplift in budgets would be needed to deliver adaptation. This indicated a total adaptation gap (of capex and revenue) of £100 million/year by 2030.
- This means that to justify the Lab, it would only need to increase leveraging (new adaptation finance), but a small amount of this total (less than 1%) to be justified in cost-benefit terms.

## Commercial case

- The main activities of the Lab will be in the form of knowledge brokering, technical assistance and programme management. There are a number of possible options to deliver these services.
  - To recruit staff and run the Lab through an existing regional government authority or agency.
  - To work with a knowledge broker (e.g. Sniffer) to deliver the services on behalf of Glasgow City Region. This model is already used for the management and activities in Climate Ready Clyde.
  - To tender the services commercially.
- An initial review of these options has been undertaken below, using a set of initial criteria. These are based around the capacity to deliver the required services (including the ease of recruiting these in given the specialist skillset and knowledge required), the integration with government and the creation of capacity and institutional memory, and the likely price of delivering the services. Based on an initial analysis, the option of delivering through a knowledge broker scores highest.

Option	Capacity to deliver	Integration with Gov	Price	Overall score
Recruit	Low	High	Low – medium	3
Knowledge broker	High	Medium	Low – medium	1
Tender	High	Low	High	2

## Financial case

- This intervention will create a financial platform and a framework for multiple funding sources to meet and co-fund a regional plan for adaptation. Public resources will be needed to create the platform and to do the initial work on the development of new financing models and instruments. The focus will be to generate approaches that crowd-in private finance, and thus there is a strong financial case for this investment, through the leveraging potential and scale-up of finance. This is set out in the separate deliverable in Clyde Rebuilt, Deliverable 6, Resource Mobilisation Plan.
- For the Lab to work, public funds will need to be committed as seed funding to take selected ideas to demonstration. The affordability will depend on the ability to attract research and innovation funding, as well as potential co-funding from regional government.
- The Lab would have a role to generate new sources of finance to help this innovation, i.e. it would directly undertake resource mobilisation activities to try and attract finance (e.g. public sector proposals, linking into research and innovation projects, seeking third sector funding, etc.). This would mean the financial affordability is likely to be improved.
- A number of current proposals are being prepared to generate possible funding of the Lab. These include proposal submissions to the European Commission Horizon 2020 call on the new green deal (research and innovation funding) and the European Commission LIFE programme and call. If either of these are successful, this should provide the underpinning finance to take forward the Lab.

## Management case

- The governance for the Adaptation Finance Lab is proposed as being led by a multidisciplinary Steering Committee and will include board members from Climate Ready Clyde, as well as representatives from Scottish Government's Green Finance directorate. In addition, it is suggested that the Committee also includes private sector representatives (including SMEs), and communities. The Steering Committee would help decide/approve/guide ideas with the highest potential to innovate, scale and replicate across the region.
- The Adaptation Finance Lab itself would be the delivery agent for co-ordinating and developing new adaptation finance propositions. It would also act as a market place, to bring potential projects and funders together. A schematic is shown below.

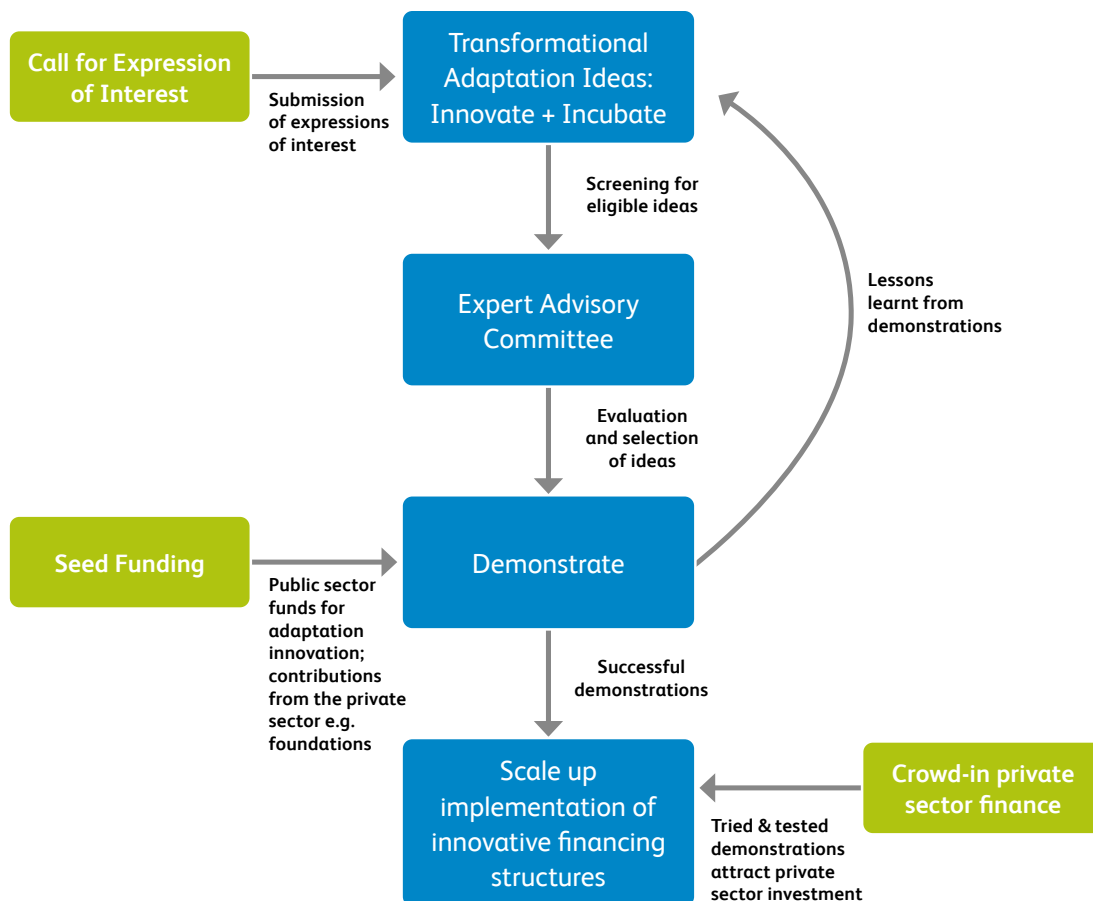


Figure 4: Adaptation Finance Lab for Glasgow City Region

# PART 3

# Next Steps

The sections above outline the Strategic Outline Case (SOC) – the scoping stage – for each of the four proposals. The next step will be to discuss these business cases with relevant actors and organisations in Glasgow City Region, and following feedback and changes, to progress to the Outline Business Case (OBC) – the detailed planning phase, as part of the development and delivery of the Flagship Actions. This will update and expand the business cases and detail the activities to progress them towards implementation.



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Climate**Ready**Clyde

Paul Watkiss Associates



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