FINANCING OPTIONS FOR GLASGOW'S GREEN DEAL

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Pengwern Associates

Executive Summary

This report explores important options available to Glasgow City Council (GCC) to finance its Green Deal. The Green Deal requires large scale capital mobilisation – various estimates suggest an investment need/opportunity of around £40bn over the next 8 years. There is strong evidence that this investment can bring long-lasting social, economic and environmental gains, as well as being essential for realising Glasgow's ambitions to reach net zero and enhance its climate resilience. However, mobilising the capital needed to realise these benefits, and efficiently allocating it to well-designed investment opportunities, represents a significant challenge, especially in the context of the funding constraints that the Council faces.

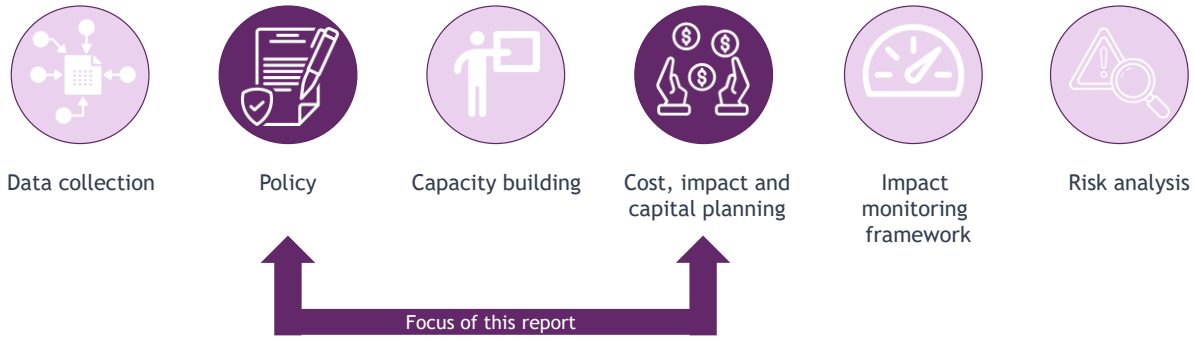
The report reviews each of the eight 'areas of focus' of the Green Deal. These are: maximising energy efficiency; increasing renewables; providing clean, safe and connected mobility; ensuring a competitive and circular industry; infrastructure and connectivity; conservation, restoration and valuation of nature; tackling residual emissions; and adaptation and resilience. For each focus area, it considers three issues:

- the current financing arrangements and models that are currently used to support investment;
- financing options that are available to GCC to increase capital flows towards relevant investment opportunities. In turn, it considers both those options that GCC can consider to raise new capital towards these opportunities and the options that GCC can consider to deploy that capital in strategic ways to deliver outcomes in that area, including through leveraging further private sector capital;
- the indirect actions that will improve the enabling environment so that others are more likely to invest in these opportunities.

This exploration represents an initial, high-level assessment providing a 'birds-eye view' across all aspects of the Green Deal. It is intended to complement, not replace, the need for individual projects to review and adopt their own business model, so as to optimises the use of public capital. As such, more detailed work for each of the eight areas of focus - exploring sources of finance, financial instruments and financing models – as well as looking at specific investment opportunities, will need to be undertaken in due course.

Such analysis is crucial for mobilising additional climate investment, but represents only some of the issues that will need to be considered within a comprehensive climate investment framework. The NetZeroCities programme, of which Glasgow is a member, identifies six pillars that need to be considered within a Climate Investment Framework: data collection; policy; capacity-building; cost, impact and capital planning; impact monitoring and risk analysis. As Figure 1 illustrates, this report primarily focuses on two of these six pillars: i) 'policy'; and ii) 'cost, impact and capital planning'. While these are critical, it will also be important to take forward actions relating to the other four pillars as well. For example, GCC is also developing its green budgeting framework which will track the amount of budgetary resources it allocates to the Green Deal. This activity directly supports data collection, while it will also support capacity building across the GCC and can provide insights to inform an impact monitoring framework.

Figure 1 This report's focus on financing models and policy primarily relate to 2 of the 6 pillars of the NetZeroCities programme's Climate Investment Framework



Note: Some of the actions identified in relation to policy and cost, impact and capital planning also have implications for the capacity building needs and opportunities for GCC.

Within this context, a series of options appear particularly attractive as they are identified as important in a number of different areas of focus. Seven options, in particular, stand out.

1. **Issue Community Municipal Investments (CMI).** They would be instruments issued and backed by the GCC that can be purchased by local residents, through a crowdfunding platform, with the capital hypothecated to funding climate/green investments. Previous experience suggests that they are effective ways of both accessing low cost capital and also increasing citizen engagement in local authority planning on climate change. In addition, some investors forgo returns and allow Local Authorities to use them to support further action. They can also build institutional knowledge within the GCC on (small-scale) capital market instruments, and the needs/expectations of investors in these instruments. There is also a growing ecosystem of stakeholders and service providers with experience in these instruments, including the Green Finance Institute (GFI), and existing crowdfunding platform providers with experience in Community Municipal Investments (e.g., Abundance Investment). As the CMIs would be backed by GCC as a whole, the funds raised from issuance could be used to help meet any GCC funding need related to the Green Deal, although the Council would face less risk if they were used to at least partly finance revenue generating activities. The product is likely to achieve greatest resonance with residents in relation to those activities that deliver appreciable local benefits and that can support socio-economic inclusion. This might include energy efficiency retrofits, small-scale renewable energy projects, local transport projects or nature and forestry projects
2. **Engage with the UK Infrastructure Bank to explore lending and advisory opportunities.** This newly created public institution intends to provide finance both directly to local authorities as well as to the private sector. It aims to differentiate itself from other financing sources by offering more competitive terms (local authority lending will be priced at gilts + 60 basis points); being willing to take more risk in recognition of its strategic policy objectives; and exhibiting flexibility in designing bespoke financing arrangements that reflect the specifics of transactions. It has a particular focus on supporting net zero ambitions and regional economic growth. Given

this, GCC should explore lending opportunities with the bank, especially in relation to energy efficiency, renewables, mobility, circular economy (waste) and infrastructure and connectivity. The UKIB is also developing an advisory function which will provide an important opportunity to access expertise needed for project development (see option seven below).

3. **Develop value capture methods that both incentivise emissions and resilience outcomes and generate additional financial resources.** The value capture method that would be relatively easiest to implement would involve requiring developers to make a per tonne of CO2 payment for the greenhouse gas (GHG) emissions associated with all new developments (potentially above a certain size threshold). This would both incentivise developers to explore low-carbon initiatives within new developments as well as generate additional resources that can be reinvested elsewhere in the City region to support low-carbon and/or climate resilience outcomes including in activities that are not revenue generating. Such a levy would need to be set at a rate which balances the revenue raising with impact on appetite for development, and the Council would need to confirm it has powers to implement this approach. Similar schemes are already operating effectively in Milton Keynes and parts of London, although some political resistance may nonetheless be expected. The Council could also consider whether value capture methods could help with the financing of the Clyde Metro.
4. **Develop one or more blended finance vehicle(s).** This/these vehicle(s) would combine both public and private sector resources in its/their capital structure, and provide capital, using a variety of different instruments (debt, equity, guarantees), to discrete projects that are able to generate some financial return but cannot finance themselves exclusively using private capital provided on fully commercial terms. These approaches can help de-risk private investment. Examples developed elsewhere in the country – such as the Mayor of London's Energy Efficiency Fund (MEEF) - suggest that these vehicles can be an attractive way of leveraging large quantities of private sector capital towards Green Deal relevant investments. For example, MEEF combined ~£50m of public resources with ~£450m of private resources. The close relationship between the risk/return profile of the projects financed by such vehicles and the risk/return profile of the fund itself may mean that it is more efficient to create more than one fund so as to efficiently segment investors with different risk appetites or investment mandates.
5. **Continued exploration of strategic partnerships with the private sector** This could build on GCC's existing use of such partnerships – for example with the Glasgow Recycling and Renewable Energy Centre (GRREC). These models can provide an important way of delivering large scale capital investments related to the Green Deal. These may be particularly important in relation to waste infrastructure and recycling as well as the public electric vehicle (EV) charging network in the Glasgow City Region. However, bespoke assessments of value for money will be required. In addition to these contract-based structures, GCC can also consider the use of lease and leaseback arrangements to support infrastructure upgrades, especially in relation to renewable energy. The Council can also explore some of more innovative partnership arrangements that other local authorities are using to pursue their climate strategies – such as the Joint Venture agreement Bristol City Council is pursuing in its City Leap project.
6. **Undertake 'Investor Collaboratives' to build a structured dialogue with, and involvement of, the private sector.** It is vital that GCC continues and strengthens its engagement with the private sector in relation to its Green Deal ambitions. This can include networking, education, and capacity building sessions with investors and businesses. They should cover both publicly sponsored investments for which the

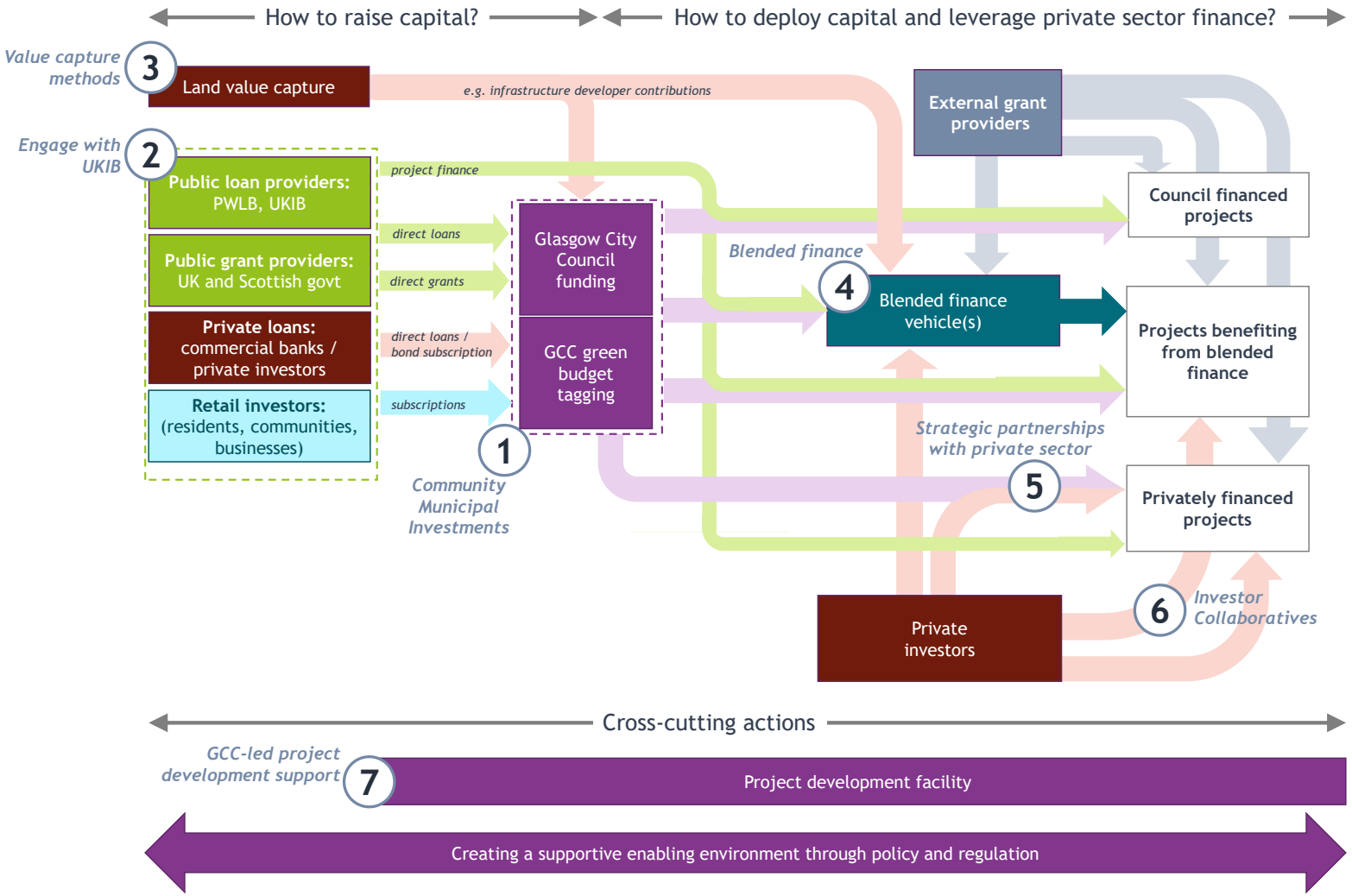
Council is seeking private partnerships as well as encouraging the private sector to orient its own investments and business models towards Green Deal consistent commercial opportunities. In relation to the former, the focus should be as transaction oriented as possible with the Council strengthening its capacity to handle early stage relationships with investors including, for example, the development of capital arrangements and signing Heads of Terms with specific parties. A strong dialogue between public and private sectors will help build trust and relationships, and also allow for private sector partners to make plans that will allow them to be responsive to the Council's requirements. Glasgow is a member of a number of platforms and initiatives, such as 3CI and the Horizon Europe mission on Climate Neutral and Smart Cities, that can be used to support this activity and that Glasgow should seek to maintain access to these and use them the greatest extent possible. However, ultimately, the Council should adopt an engagement model that goes beyond those provided by external platforms and is both enduring and more comprehensive than these (in particular, also including adaptation and resilience).

7. **Create a Citywide project development facility.** A critical challenge faced by many Councils is the transition from high-level statements of ambition to the development of a pipeline of investable projects that are technically sound and financially robust. In the short-term, this challenge can be overcome by exploiting the increasing number of external facilities that are intended to help Councils such as those that are or will be provided by the UK Infrastructure Bank, 3CI or the NetZeroCities platform. However, the most enduring solution will involve leveraging the expertise realised through participation in these initiatives to create sufficient permanent expertise within the Council, potentially through the establishment of a dedicated project development facility. This would ensure that the City is not solely reliant on these external providers, and provide the city with a guaranteed level of capacity .

Taken together, and in conjunction with the green budgeting analysis already under development, these options would help move towards a comprehensive set of options for financing Green Deal. As Figure 2 illustrates, they cover both ways to raise new capital as well as to deploy capital in creative ways; they combine approaches that will ensure that the Council's resources are financing activities where it offers best value, including to ensure that the Green Deal delivers on opportunities to reduce inequality and promote inclusion, while also leveraging the private sector where this is desirable. Some are more relevant and applicable for revenue generating activities, while others offer opportunities to move forward with investments that are not highly revenue generative. Finally they include options to increase the supply of capital with the suggested establishment of a project development facility to ensure there are sufficient projects available to make use of this capital.

The implementation of these recommendations is predicated on a number of assumptions. Some of the most important of these include that there will be sustained and deep political commitment to realising the Glasgow Green Deal with predictable resource flows to match. It will also require the cultivation of the appropriate skills within the Council and its wider partners (related to, for instance, technical design, financial analysis and procurement of low-carbon and climate resilient investments). It will further require a willingness to work with a wide array of different partners, including a significant role for the private sector.

Figure 2 **The identified options cover the ecosystem of actors and flows that can link capital or projects**



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Abbreviations

BEIS	(Department for) Business Energy and Industrial Strategy
CARES	Community and Renewable Energy Scheme
CCC	Committee on Climate Change
CCRA	Climate Change Risk Assessment
CfD	contract for differences
CMI	community municipal investment
DNO	distribution network operator
ECO	Energy Company Obligation
EIB	European Investment Bank
EPR	Extender Producer Responsibility
ESCO	energy service company
EV	electric vehicle
GCC	Glasgow City Council
GCR	Glasgow City Region
GRREC	Glasgow Recycling and Renewable Energy Centre
JV	joint venture
LAEP	Local Area Energy Plan
MEEF	Mayor of London's Energy Efficiency Fund
MW	mega-Watt
NBS	nature-based solution
NHS	National Health Service
NRF	Nature Restoration Fund
PES	payment for ecosystem services
PRN	Packaging Recovery Note
PWLB	Public Works Loan Board
SCCAP	Scottish Climate Change Adaptation Programme
SEPA	Scottish Environmental Protection Agency
SGA	Sustainable Growth Agreement
SGS	Smarter Grid Solutions
SNIB	Scottish National Infrastructure Bank
SPEN	ScottishPower Energy Networks
SPRUCE	Scottish Partnership for Regeneration in Urban Centres
SuDS	sustainable drainage system
TBID	Tourism Business Improvement District
TCFD	Taskforce on Climate-related Financial Disclosures
TIMO	Timberland Investment Management Organisation
TNFD	Taskforce on Nature-related Financial Disclosures
UK	United Kingdom
UKCIC	United Kingdom Climate Investment Commission
UKIB	United Kingdom Infrastructure Bank
UKRI	United Kingdom Research and Innovation

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1. Introduction

This report explores the options available to Glasgow City Council (GCC) to support the financing of Glasgow's Climate Plan and Green Deal and the Glasgow City Region's (GCR's) wider commitment to reach net zero and increase its climate resilience. As Box 1 explains, it is one of three outputs development by Pengwern Associates and partners to help support acceleration in the implementation of Glasgow's climate and just transition objectives.

Box 1 This report is one of three complementary reports reviewing the economics and financing options of the Green Deal to support its implementation

Pengwern Associates and partners have supported GCC in relation on three key issues to accelerate implementation of the Glasgow Green Deal:

- The first reviews the evidence of the economic costs and benefits of each of the Green Deal's areas of focus. It shows there is strong evidence that interventions and investments associated with each of the areas of focus can deliver significant benefits – often in the region of three or four times greater than their costs, and that, sometimes, benefits may be ten times higher than costs. It also shows that the interventions have the scope to support significant levels of employment. However, it also stresses that a series of implementation challenges – including rushed design and implementation, inadequate monitoring plans, and insufficient cooperation across bodies – can prevent the realisation of these benefits.
- The second, this report, considers the financing solutions GCC can pursue to support the implementation of the Green Deal. Looking across each of the eight areas of focus, it identifies 7 key options for raising and mobilising capital so as to unlock the benefits the Green Deal offers, despite the funding challenges faced by the Council.
- The third provides a practical recommendation for how GCC can implement green budgeting. This will allow the Council to monitor the extent to which its budgets are supporting the delivery of the Green Deal, providing valuable information to help monitor implementation and to make course corrections as necessary. It also considers the relevance of the Council making disclosures in line with those suggested by the Taskforce for Climate Related Financial Disclosures (TCFD).

There is an urgent need to explore and scale up successful financing models for low-carbon and climate-resilient investment in the region. The latest estimates of projected investment need for Glasgow are in the order of £40bn. This investment can yield substantial benefits – as explored in the complementary analysis discussed in Box 1 – and, as such, should be considered as an investment 'opportunity'. Nonetheless, the scale of capital mobilisation challenge is substantial and, especially given the funding constraints under which the Council operates. new approaches will need to be developed.

At a UK-wide level, the Committee on Climate Change's (CCC's) 6th Carbon Budget emphasises the important roles for both public and private sectors in financing the UK's climate-related investment. The CCC foresees that, especially in the light of expected fiscal

constraints, that the *'the required increase in investment can, and should, be delivered largely by the private sector'* (Committee on Climate Change, 2020). In this articulation, the CCC has an expansive definition of the private sector, including an important role for households through the properties and vehicles they purchase. At the same time, the CCC also notes a crucial role for the public sector. Part of this role is through the provision of an appropriate enabling environment for private sector investment (for example through favourable policy and regulation). However, it also envisages a short-term increase in publicly funded investments with three specific roles:

- to help buy down the upfront costs of some assets that are prohibitively expensive;
- to share costs in industries subject to international competition that may not be decarbonising as aggressively; and
- to attenuate risks that the private sector is not well-position to bear.

Although not explicitly stated by the CCC, there is also likely to be an important role for the public sector in ensuring that the transition takes places in a way that is socially just, sharing both the costs and benefits of the transition fairly. Furthermore, the CCC's analysis primarily focuses on the investment needed to reach net zero; investment needs related to adaptation and climate-resilience are expected to also require both private and public investment, although with a likely greater proportionate role for the public sector.

The situation in Glasgow is expected to largely mirror that seen nationally, although with important tailoring to adjust to the local context. There is likely to be an important role for the private sector, both businesses and households, especially in cases where there is or will be a clear economic upside from undertaking the investment. At the same time, Glasgow City Council also has an essential role to play. Indeed, across the UK, it has been estimated that 82% of investment needed for net zero is within the influence of local government(Department for Business Energy and Industrial Strategy, 2021b). Three specific roles that can be identified:

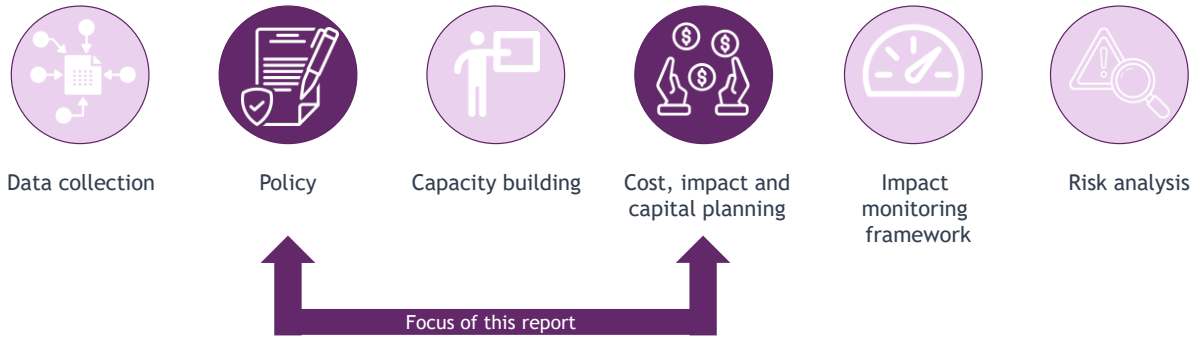
- Through direct local authority investment in the necessary technology and infrastructure. This is often the easiest way to ensure that the benefits from low-carbon and climate resilient investments are shared equitably. In turn, funding from this may come through both the conventional financing arrangements used by local authorities, as well as new financing arrangements such as the UK Infrastructure Bank. On occasion, grant funding to support these activities is or will be available from the Scottish and Westminster governments. Glasgow City Council has announced its intention to start 'green budget tagging' in order to facilitate increasing budgetary allocations towards this strategic priority.
- Through using its public funding to leverage private sector investment through grants, blended finance structures and/or strategic partnering with the private sector. In these arrangements, care must be taken to ensure social objectives are met, but there are plenty of examples both from Glasgow and further afield where this has been achieved. Again, dedicated financing streams might be tapped to provide the public resources needed for these structures.
- By using policy, regulation, influencing and convening power to steward private capital towards appropriate investment opportunities and ensuring that private sector driven solutions meet the needs of the poorest and most vulnerable.

This paper explores the financing options that might be explored across all eight 'areas of focus' of the Glasgow Green Deal. In each focus area, through sections 2-9, the report sets

out the current financing arrangements, some of the additional financing models that might be pursued and the other actions that the Council could consider to support financial flows. Section 10 then consolidates some of the key options that that the Council might consider across all areas of focus. This analysis represents an initial, high-level assessment providing a 'birds-eye view' across all aspects of the Green Deal. More detailed work, exploring financing models for each of the areas of focus, and looking at specific investment opportunities, will need to be undertaken in due course.

In addition, a comprehensive climate investment framework needs to address a range of issues beyond the scope of this report. For example, there are important issues relating to the skills that will need to be developed by GCC staff or the appropriate way for measuring the progress and impact of the Green Deal's implementation. Indeed, the NetZeroCities programme identifies six pillars that should be considered within a Climate Investment Framework: data collection; policy; capacity-building; cost, impact and capital planning; impact monitoring and risk analysis. As Figure 3 illustrates, this report primarily focuses on two of these six pillars: policy and cost, impact and capital planning.

Figure 3 This report's focus on financing models and policy primarily relate to 2 of the 6 pillars of the NetZeroCities programme's Climate Investment Framework



Note: Some of the actions identified in relation to policy and cost, impact and capital planning also have implications for the capacity building needs and opportunities for GCC.

2. Maximise energy efficiency

2.1. Current arrangements

Glasgow City Region's home energy retrofit programme aims to mobilise £10 billion of blended finance. Currently at feasibility stage, it estimates that there are 428,000 properties currently with Energy Performance Certificates in the range D-G (invest Glasgow, 2021). However, in determining these funding models two fundamental challenges need to be overcome

- While energy efficiency investments have the potential to deliver energy savings in excess of the upfront costs, to achieve the scale of change needed in the built environment is likely to require signficant public funding. For example, the UK Cities Climate Invesment Commission (UKCCIC) Analysis Report finds that *'In the built environment emissions can be reduced through a range of demand reduction and heat source changes, but the financial returns are very poor. Subsidies of around 80% are needed solely to cover financing costs, let alone create a financial incentive'*(Beechener et al., 2021) [1]

- A further key challenge in catalysing private finance for energy efficiency is the principal-agent problem – that the investor often is not necessarily the beneficiary. For example, landlords may be responsible for investing in building upgrades / retrofits, but do not benefit from the energy savings if they are renting out to tenants.

Given these barriers, most models seek to combine financing from households or businesses, with access to concessional public funding to help cover a portion of the upfront cost.

In relation to the financing by households/businesses, retail banks offer dedicated financing lines to support homeowners to invest in renewable energy and energy efficiency. For example discounted green mortgages are offered by e.g. Natwest, Nationwide, Barclays, Lloyds. To support this offering, banks are also issuing capital market instruments. For example Barclays October 2020 green bond issuance to refinance its UK mortgage portfolio 5-times over-subscribed and favourable yield of 1.70% (Barclays, 2020).

In relation to concessional funding, a number of sources are available. For example, Home Energy Scotland Loans offers owner occupiers cashback up to 40% for energy efficiency and 75% for renewable energy installation (Scottish Government, 2022c), while under Zero Waste Scotland, SMEs can apply for 75% cashback up to £10,000 towards renewable energy and a further 30% cashback grant up to £10,000 for energy efficiency measures (Scottish Government, 2022c). However, as discussed in previous Pengwern Associates reports, recent central government funding schemes have achieved mixed results in terms of effectiveness and value

[1] It should be noted that this statement partly refers to the electrification of heat, rather than improving residential energy efficiency. Activities to improve the energy efficiency of buildings tends to have more attractive financial returns than those related to heat electrification, although they are often pursued in concert.

for money. In England, the Green Homes Grant was abandoned in 2021 after just six months, reaching just 47,500 of the 600,000 homes more energy efficient, and of the 82,500 jobs it was expected to support only 5,600 had been realised. The reasons for this include a rushed design phase which constrained procurement options and reduced engagement with the installer market which made it hard for a many potential suppliers to mobilise to meet demand (National Audit Office, 2021).

There is also important corporate investment in residential energy efficiency, typically in response to legislative requirements.

- The UK Energy Company Obligation (ECO) required the big six energy retailers to help low income, fuel poor and vulnerable households reduce energy consumption, reducing bills and CO2 emissions. The latest round of the ECO was more costly than the previous schemes, at an average cost of £94 per tonne of carbon saved compared to £34 for previous schemes(National Audit Office, 2016).

- Social Housing developers in Glasgow are also investing in improving energy efficiency of the existing building stock. For example, Wheatley Group planning to invest £5m to £7m on improving energy efficiency of existing technologies in homes (Sustainable Glasgow, n.d.).

- More generally, social-housing developers have been using sustainable finance mechanisms to access affordable finance for housing projects. This includes sustainability-linked facilities, where the interest rate lowers if sustainability targets are met, and sustainability bonds, where the use of proceeds can only be allocated to projects that meet an agreed definition of sustainable (and/or affordable) housing, which can be measured and reported against. For example:

    - Peabody issued a £350 million Sustainability Bond in February 2022, following developing of its Sustainability Reporting Standards for Social Housing, with a further sustainability-linked revolving loan facility agreed with ABN-AMRO in May 2022, with the interest rate linked to improvements in the environmental performance of homes, the building of new homes and the increase ethnic diversity of its leadership team (Peabody, 2022);
    - Jigsaw Homes Group issued a debut £360 million Sustainability Bond in May 2022, to finance its aim to build 4,000 homes for social and affordable housing (Jigsaw, 2022);
    - L&Q completed a £300 million Sustainability-Linked Bond issuance in January 2021 for the housing sector, with targets to reduce operational carbon emissions, improve energy efficiency and deliver affordable homes (L&Q, 2022).

2.2. Future financing opportunities

The high upfront costs of energy efficiency investments has meant that blended finance vehicles, that combine public and private capital, and then offer loans towards energy efficiency projects at concessional rates, have been successfully deployed in a range of locations. For example:

- the Mayor of London's Energy Efficiency Fund (MEEF) is a £500m fund, mobilising €51 million from the European Regional Development Fund and with fund manager Amber

Infrastructure Group securing £456m from private investors including Lloyds Bank, National Westminster Bank, Santander UK, Sumitomo Mitsui Banking Corporation and Triodos Bank (Mayor of London, 2022). A minimum of 70% of the funds must be deployed to the public sector (e.g. Local Authorities, Health Trusts etc.) for renewable energy, energy efficiency, and vehicle electrification projects. For example, it has financed the implementation of Energy Performance Contracts with energy service companies to deliver energy savings for National Health Service (NHS) hospitals. See section 0 for more details.

- The New York City Energy Efficiency Corporation is an independent body, capitalised with grant finance from the Federal government, City funding, and philanthropies, as well as leveraged private sector finance from banks which provides financing support for decarbonisation projects (Green Finance Institute, 2022c).

It may be possible to contribute to the capitalisation of such a vehicle through charges made on developers. For example, the Milton Keynes Carbon Offset Fund is capitalised through payments from developers in the form of a carbon tax on new homes, which is then spent by the council on a range of energy efficiency and renewable energy initiatives (Hook, 2014). This approach has subsequently been adopted by other local authorities, such as Kensington and Chelsea (Royal Borough of Kensington and Chelsea, 2022). This both incentivises developers to reduce the carbon footprint of new homes, as this reduces their required contribution to the fund, and made funds available to effectively finance energy company obligations to retrofit domestic properties. Other sources of financing could include Community Municipal Investments (CMIs) issued to the local community or an anchor investment made by the UK Infrastructure Bank or Strathclyde Pension Fund.[2]

These fund arrangements could, in part, support private sector companies that are offering specialised finance-embedded delivery models. For example, ENGIE Zero offers a *'whole house retrofit solution'*, utilising savings generated alongside a combination of government incentives – including the ECO, Renewable Heat Incentive and payments made under Grid Balancing Agreements - to help finance the retrofit (Cooper, 2020). Similarly, new developers such as Citu are scaling up high-density, low-carbon development in the Leeds Climate Innovation District (Connected Places Catapult & Vivid Economics, 2021). Using the blended finance vehicle, or potentially through other funding arrangements, GCC could support development / rollout of private sector models such as these by providing grants to carry out pilots, or guarantees to reduce risk of customer default / non-payment.

An alternative model would involve the development of strategic partnerships with the private sector. The most common approach involves an energy service company (ESCO) being contracted to deliver either (or both) a kWh renewable energy target or energy use (and bill) reductions. The ESCO bears the cost of financing the retrofit, and provides a performance guarantee, with its returns generated through a share of the energy and maintenance costs savings and/or revenues from the sale of renewable power. The ESCO may also be able to avail itself of financing from low-cost sources of finance from blended finance vehicles or elsewhere. This is the model that has underpinned the development of Netherlands Energiesprong

[2] These models are discussed in more detail in latter sections of the report, especially sections **Error! Reference source not found.** and 10.3

initiative, which has driven 1,300 net zero energy retrofits and 500 new net zero houses being built, and has been trialled in Nottingham (Energiesprong, 2022).

GCC could also consider that would involve a more active role for the public sector. For example, GCC would directly procure and manage retrofits including for businesses, housing stock, social housing, and public sector buildings. While relatively common, this would need GCC to be able to finance retrofits at scale. Such finance could be accessed from a number of sources. For example, HSBC provided Isle of Man Government with a £155m credit facility (£30m term loan and £125m revolving credit facility) to support 150+ projects including energy efficient street lighting, energy efficient social housing projects and improvements to existing facilities in the island (Isle of Man Today, 2020). Local authorities can also use capital market instruments such as green, social, sustainability-linked bonds (as discussed further in section 3 below). For example, building on the momentum of labelled bonds to support sustainable housing projects described above, researchers from the Grantham Research Institute proposed a Transition Bond issued by the Northern Ireland Housing Executive as a way of accessing finance at scale to deliver defined (and measurable) social and sustainable housing objectives (Curran, 2022).

2.3. Other actions to support capital flows

Beyond its role as a financier / catalysing finance, Glasgow City Council can also continue to support the enabling environment for energy efficiency investment. This might include:

- Providing easily accessible information and advice to citizens, potentially including lists of approved / recommended energy service contractors, to ensure households and business know where to get reliable advice from e.g. energy companies offering energy savings schemes.
- Supporting skills development within the local construction industry so that the depth of capacity within the labour market needed to undertake the scale of retrofits can b achieved.
- Continuing to raise housing standards and exploring ways to use standards and regulations to leverage finance. For example, the Glasgow Standard (Glasgow Housing and Regeneration Services, 2019), which specifies design requirements for affordable housing, could support housing developers in issuing sustainability linked bonds as described above. Further, the housing standards for new build homes could be strengthened to require all new builds to be net zero, or where it is not possible to achieve 100% net zero to contribute to a carbon offset fund (as per the example from Milton Keynes above).
- Partnership with financing specialists and advisors to support them in launching financing mechanisms tailored to energy efficiency in new buildings and retrofits. For example, following the example of the Greater Manchester City Authority partnership with the Green Finance Institute which, in addition to supporting/using many of the financing models discussed in section 2.2 such as CMIs and the use of finance embedded delivery models, also envisages a campaign to boost the development of green mortgages and collaboration with institutional landlords to promote new tenancy agreements that incorporate energy efficiency (Green Finance Institute, 2022a).

3. Increase renewables deployment

3.1. Current arrangements

Utility scale investment in renewable energy generation is largely funded through private companies, backed by central government policy measures. Private investment into electricity generating assets make up the majority of finance for utility scale renewables. This has been supported by central government policy and financial incentives, especially the contract for difference (CfD) schemes. There is also some direct central government finance available to support for innovative technologies, such as the Department for Business Energy and Industrial Strategy (BEIS) Energy Innovation Portfolio which, following a competitive process, is providing grant finance to support the production and storage of hydrogen at Scottish Power's Whitelee windfarm near Glasgow (ScottishPower, 2021).

Institutional investors also invest, both directly and indirectly, in renewable assets. For example, The Strathclyde Pension Fund – the local government pension scheme for the Glasgow City Region – has so far directly committed over £500 million to renewable energy infrastructure investments (including specialist onshore and offshore wind funds, UK solar funds, and community power funds). It also allocated £1.7 billion in 2021 to a Climate Transition Index. This has been pursued in response to its strategy to 'incorporate the explicit objective of implementing an investment strategy that was consistent with achieving the goal of net zero emissions by 2050' (Strathclyde Pension Fund, 2022). Other institutional investors also invest in renewable power assets in the region. For example, GLIL Infrastructure[3] has been an investor in the 522 MW Clyde windfarm since 2016 (GLIL, 2020).

For smaller scale investment (behind the meter), renewable electricity and heating, finance is also largely from by households and businesses, but with a greater role for public grants. For example, the Home Energy Scotland Loans and Zero Waste Scotland cashback schemes, described in Section 2.1, also support renewables deployment. Similarly, the Community and Renewables Energy Scheme (CARES) also offers grants to encourage local and community ownership of RE projects across Scotland (Scottish Government, 2022c). There are various examples of community led renewable energy initiatives in Glasgow using these facilities. For example, Glasgow Community Energy has installed renewable energy generation in two schools in Glasgow with funding from CARES, and is exploring plans to install renewable energy on a range of further private/public buildings (Glasgow Community Energy, 2022) .

GCC has financed renewable energy deployment through strategic partnerships with the private sector and direct investments. An example of the partnership approach is the 3MW wind turbine at Castlemilk, where Glasgow City Council, SSE, and the Castlemilk and Carmunock Community Wind Park Trust have partnered to finance a £5m (3MW) wind turbine (Nicoll, 2013). The City is also exploring potential to scale up deployment of renewables on City-owned estate, and is implementing a plan, with secured European Union (EU) funding, for a roof mounted solar array with battery storage and electric vehicle chargers in Duke Street car park (Glasgow City Council, 2018).

[3] Established by Greater Manchester Pension Fund and London Pensions Fund Authority, with a number of other pension funds subsequently joining since GLIL was established in 2015

3.2. Future financing opportunities

Most investment in renewable energy will be at utility scale and carried out by the private sector; nonetheless GCC can continue to build a direct investment pipeline and support the development of business models to scale up private investment

Additional financing for renewables - for both the private sector and local authorities - is becoming available. The UK Investment Bank could also be an alternative source of finance, with its 2022 strategic plan anticipating that *clean energy will emerge as* [its] *largest sector, reflecting its importance to the UK's net zero and energy security ambitions'*. Hydrogen technology is also a priority for UK Infrastructure Bank (UKIB) investment, and could offer potential investment for utility scale projects in the Glasgow city-region (UK Infrastructure Bank, 2022). The Scottish National Investment Bank also underlines the Climate Emergency and transition to Net Zero as top priorities, and may offer investment in clean energy and sustainable housing projects for local communities (Scottish National Investment Bank, 2021b).

Renewable energy deployment for households and businesses is likely to continue to be predominantly financed primarily through private funding. To unlock this investment there could be policy support to help develop / pilot business models such as ESCOs and financed-embedded delivery models as described in section 2.2 above. Alongside explicit political support from the Council, the financial viability of these vehicles might be enhanced if they were able to access concessional support from a blended finance vehicle. These delivery models are likely to require bundling of renewable energy and energy efficiency activities as renewable power generation (revenue and/or cost savings) are likely to be needed to subsidise retrofit interventions with poorer returns, such as heat pumps.

The Council can also look to scale up its financing for local community energy schemes, building on the Castlemilk example described above. This activity could be supported by the issuance of CMIs, using crowdfunding platforms to bring in finance from retail investors (i.e. local citizens and businesses), see section **Error! Reference source not found.** for further discussion.

Other opportunities for the Council to directly engage in financing renewables projects may be constrained by restrictions on investing in 'for-profit' activities. Other local authorities have taken advantage of opportunities to partly or fully finance renewable power assets, through partnerships with the private sector. For example, Warrington Council's investment of over £62m in two solar farms and a battery storage unit to reduce the Council's energy bills. Warrington's implementing partner Gridserve bears the construction and operating risks, with the asset owned by Warrington and expecting an internal rate of return of 11% and 16% on each of the projects (Green Finance Institute, 2022c). In principle, similar opportunities could be available for GCC. However any impact on total cost of energy procurement and potential risk of increasing costs (e.g. through increases to local council tax) to Glasgow residents and businesses would be a crucial consideration

3.3. Other actions to support capital flows

There are a number of further actions that GCC to support financial flows in this area of focus, many of which also apply to the development of smart grids covered in section 6

These include (building on Stegman et al., 2021)**:**

- Continued and strengthened engagement with the investor community ('investor collaboratives') to explain the different investment opportunities foreseen in the local area, and the business models that are expected to support their development, alongside an assessment of how the market and policy framework might affect these opportunities. Where possible, these engagements should be as transaction focused as possible with the GCC strengthening its capacity to build relationships with specific investors through signing Heads of Terms agreements etc.
- Further building capacity within the local authority to support the development of a pipeline of projects, which could be aggregated in a database that is easy to share with stakeholders.
- Enhance the capacity within the local authority in order to ensure that effective appraisal of private sector proposals can be undertaken.
- Ensure that the Local Area Energy Plan continues to be updated with new policy, socio-economic and technological developments.
- Explore opportunities for collaboration with other local authorities, which could provide opportunities to exploit economies of scale.
- Engage with Scottish and Westminster governments to ensure that procurement frameworks meet the needs of the local authorities in relation to renewables and smart energy systems.
- Making available council land and property for micro-generation and/or providing support and advisory services to local groups developing renewables projects.

4. Providing clean, safe and connected mobility

4.1. Current arrangements

Mobility and clean transport interventions are split in terms of funding sources with public sources dominating some activities, and private finance others. Public transit and investments in active travel tend to be financed out partly or wholly from public sources, while the transition of private vehicles to cleaner energy sources is dependent on catalysing private finance.

4.1.1. Reducing congestion and promoting modal shift to public transport

The major planned investment in the coming decade is for the Clyde Metro, with finance expected to be sourced from national / regional government funds. The Glasgow Metro is currently at feasibility study stage (invest Glasgow, 2021), but is likely to need significant funding in the region of £11 billion to £16 billion (Paterson, 2022), and this could rise to £30 billion once all costs are factored in. This is expected to be financed publicly, although the relative financing contributions made by the Glasgow City Council and the Scottish government have yet to be determined.

4.1.2. Promoting active travel - cycling and walking

Active Travel interventions in Glasgow are also publicly financed. The details of implementation for the City's Active Travel Strategy (2022 – 2031) are under development (Glasgow City Council, 2022a), but key funders are expected to include Scottish Government and Transport Scotland. Sustrans is also noted as a funding source, although Sustrans is in turn funded largely through government grants, alongside donations. Much of the public funding needed to support active travel is revenue funding.

The private sector is involved primarily through sponsorship. For example, the NextBike cycle scheme is sponsored by energy provider Ovo in a three-year deal commencing in 2021.

4.1.3. Vehicle electrification

Vehicle electrification is largely driven by private investment by households or businesses. The UK Government has announced an end to sales of new petrol and diesel vans by 2030, and zero emissions at the tailpipe by 2035, with heavy goods vehicles (HGVs) to be zero emission by 2040 (HM Government, 2021b). Most of the investment in zero-emssion vehicles will need to be made by households and businesses, although there will likely be a greater toke for public funding for electric vehicle charging infastructure, as discussed in section 6.

To accelerate this change, public funding is available from UK and Scottish government. The UK government has previously provided grants to subsidise the purchase of new EVs, although it has recently been announced this will not longer be available for cars except in some cases such as electric taxis, vans, trucks, motorcycles and wheelchair accessible vehicles (HM Government, n.d.). Scottish businesses also benefit from incentives to purchase EVs. For example, no vehicle excise duty (purchases below £40,000), interest free loans (up to

£120,000) from Tranport Scotland, and tax breaks such as lower Benefit-In-Kind tax charges for company car drivers (Energy Savings Trust, 2022).

GCC is in the process of replacing its current fleet with around 1,400 hydrogen fuel cell and battery electric vehicles EVs, and scaling up the production of hydrogen fuels. This will likely need to be funded through conventional GCC resources e.g. funding from the Public Works Loan Board (PWLB) or equivalent. Scotland's *'Switched on Towns and Cities Fund'* has previously supported electrification of the Council's refuse collection vehicles (Glasgow City Council, 2019).

4.2. Future opportunities

4.2.1. Reducing congestion and promoting modal shift to public transport

Financing of large-scale infrastructure could consider strategic partnerships with the private sector, although this requires careful assessment of value for money. This could take the form of, for example, design-build-finance, design-build-finance-maintain, or design-build-finance-operate-maintain. Such approaches shift the need to raise upfront capital to a private sector financier, which has the responsibility to ensure either handover of the asset once it is built, or an ongoing requirement for maintenance and/or operation. Such contracts reduce or eliminate the need for public finance for the upfront capital costs. However, they have also proved controversial and have not always offered good value for money when applied to mass transit schemes (Mandri-Perrott, 2010). In the UK examples of such partnership approaches applied to mass transit projects include the expansion of the Docklands Light Railway, and Meridiam's financing, design, construction, operation and maintenance of the two new tramlines, and the operation and maintenance of the existing line, in Nottingham. Strategic partnerships with the private sector are discussed further in section 10.6.

There may also be an opportunity to use value capture methods (hypothecated taxation) to support finance. This effectively raises finance for infrastructure through a levy on the increase in value of assets (i.e. land) around the new infrastructure. There is a rich international precedent of using land-value-capture approaches to finance infrastructure, including mass transit systems. This approach, for instance, was used to support the financing of the Elizabeth Line in London (Buck, 2017). The role of businesses in supporting the financing of the infrastructure could be complemented by a role for residents through the use of CMIs.

The UK Investment Bank also provides loans for low-carbon public transport to local authorities. For example, in the West Midlands Combined Authority the first of the introduction of zero emissions buses and a new "sprint" bus route was financed through a £10m loan from UKIB. After clean energy, UKIB expects its activity to be "heavily weighted" towards transport (and digital), including financing local authorities to adopt zero-emission buses, to procure green rolling stock, and to finance mass transit systems (UK Infrastructure Bank, 2022). Glasgow's future investment plans cover all of these activities.

4.2.2. Promoting active travel – cycling and walking

It is likely that most of the finance for active travel will continue to come from public funding sources – but opportunities for sponsorship/advertising should continue to be

explored. In much the same way NextBike is sponsored by Ovo Energy in Glasgow, first Barclays and then Santander sponsored London's cycle hire scheme, while Santander also sponsors the NextBike fleet in Milton Keynes.

4.2.3. Vehicle electrification

Most investment in private vehicle electrification will be made by households and businseses, with potential for GCC to support innovative pilot schemes. For example, GCC could consider offering pilots / trials of electric vans and e-bikes. This has been done for example in Leeds, with £2 million funding from Highways England, and £900k investment from Leeds City Council via a government grant (Leeds City Council, 2019) . Other innovative pilot schemes have been developed with small grant support from the Connected Places Catapult, including pop-up electric charging and car share schemes, deployment of electric scooters etc.

There may be potential to bid into the Scottish Government's Hydrogen Funding (Scottish Government, 2021c). This could include accessing the £10 million 'Hydrogen Innovation Fund', or other funding sources such as the 'Energy Transition Fund', which for example has committed £15 million to support the development of the Aberdeen Hydrogen Hub to support rollout of a hydrogen transport fleet.

4.3. Other actions to support capital flows

There is likely to be value in strengthening the capacity within the Council to develop transport projects, and to embed these projects fully into the Council's wider Green Deal Plan. A previous review of local authority capacities to develop transport projects (across England) noted that, while some Councils had the necessary analytical and project delivery experience, there was significant variability across different authorities (National Infrastructure Commission, 2021). Similarly an Audit Scotland review of Scotland's key transport infrastructure projects found that business case development had not been sufficiently robust to fully demonstrate the viability, value for money and affordability of the projects (Auditor General for Scotland, 2013). While this was a reflection of project development at the national level, it demonstrates the challenges that can often exist in developing high-quality (low-carbon) transport infrastructure projects.

5. Ensuring competitive industry and a circular economy

5.1. Current arrangements

The current financing arrangements for assets and activities relating to the circular economy differ between those associated with waste management and wider circular economy initiatives. Both of these are explored below,

5.1.1. Waste management

Domestic waste collection, management and disposal is the responsibility of Glasgow City Council but with various arrangements for involving the private sector often used. For example, Glasgow Recycling and Renewable Energy Centre (GRREC) was constructed under a Design Build Finance and Operate, 25-year contract with Viridor whereby the asset is owned by the Council but was financed and operated by the private sector partner, who receives service payments from the Council (Glasgow City Council, n.d.). In discharging their responsibilities to manage domestic waste, Glasgow City Council and other local authorities can receive grant support from higher tiers of government, such as the Scottish government's Recycling Improvement Fund (Zero Waste Scotland, 2022b).

There is additional private sector involvement elsewhere in the sector. This includes the business-to-business arrangements relating to commercial and industrial waste. In addition, larger packaging producers have to show that a certain percentage of their products are recycled. This is achieved through purchasing Packaging Recovery Notes (PRNs) from accredited re-processors or exporters that prove they have met their obligation.

These arrangements will change significantly with the advent of the forthcoming Extended Producer Responsibility (EPR) scheme being rolled out across the UK as a whole. This will place the financial responsible for waste management of packaging materials on producers of that packaging who will, through a system administrator, pay local authorities for the full net disposal costs of providing efficient and effective systems for managing household packaging waste. The Scottish government has also announced that the costs of clearing littered packaging will be included in this assessment. Local authorities will then be able to use this additional funding stream to invest in new waste or recycling infrastructure. The PRN system will be retained for waste arising from businesses for the time being (Department for Environment Food and Rural Affairs, 2021).

5.1.2. Other circular economy businesses

The wider circular economy ecosystem is largely dominated by private sector companies, although they are often the beneficiaries of public sector support. Some of this public sector support is in the form of grants, for example Zero Waste Scotland already has a Circular Economy Investment Fund providing grant funding for SMEs and not-for-profit organisations (Zero Waste Scotland, 2022a), as well as a Circular Economy Accelerator (Zero Waste Scotland, 2019). GCC has launched the Step Up to Net Zero programme that uses a circularity assessment tool to help SMEs identify opportunities for enhanced practice, followed by an action plan and implementation support to help ensure change (Glasgow City Council, 2022b). Glasgow's

Circular Economy Route map identifies that that it will consider the development of a kick-starter fund to support the development of start-ups (Glasgow City Council, 2020). WRAP also provides grant funding for business-led initiatives that support private sector.

There are also some impact investors offering patient capital to private sector businesses. For example, the Future of Plastics Fund, established by Archipelago Eco Investors, is bringing together impact-focused investors to provide funding to investment opportunities looking to change the way plastic is produced and recycled. It intends to focus on solutions that can successfully deployed at scale with commercial and strategic partners in developed markets and emerging economies (Archipelago Eco Investors, 2021).

5.2. Future financing opportunities

5.2.1. Waste management

The additional funding associated with EPR should make it easier for Glasgow City Council to finance new waste management and recycling capacity - such as the planned new material recycling facility. A range of public investment sources are available to supply the necessary capital. For example, the UKIB has identified waste infrastructure as one of its five strategic priorities, with its Strategic Plan stating explicitly that (UK Infrastructure Bank, 2022):

'we heard achieving recycling targets required significant, sophisticated and long-term infrastructure investment, beyond what the current market could deliver. We are open to financing both local authority and private sector recycling and circular economy projects. We encourage local authorities and industry to engage our support for investable projects that fit national objectives and local ambitions.'

The Scottish National Infrastructure Bank (SNIB) has also identified recycling, waste and circular economy initiatives as a focus area, and will invest into projects and businesses on a commercial basis (Scottish National Investment Bank, 2021b).

As well as raising its own capital, there may be a role for the Council to support private sector operators in the waste and recycling sector address challenges in accessing capital. One of the greatest challenges that these private companies face is the volume risk around the amount of waste that will be received. To the extent that these challenges are not fully addressed by the UKIB, SNIB and other such organisations, a blended finance vehicle partly supported by public capital may be in a better position to absorb these risks, either by directly providing capital that helps absorb this volume risk or, potentially, by providing guarantees for the debt issued by specific projects.

5.2.2. Other circular economy businesses

Many private sector businesses operating in the circular economy face challenges in accessing finance. Their business models are unproven and unfamiliar to private capital providers making them reluctant to provide capital; this is particularly challenging when businesses need to incur significant fixed costs in order to achieve the economies of scale needed for commercial viability, for example to build networks that allow reuse and return models to be attractive to consumers. In this context, blended finance approaches may be

particularly attractive, with some of the instruments most frequently identified as being powerful including (Ellen MacArthur Foundation, 2020; Schröder & Raes, 2021) :

- loan guarantee schemes for banks lending to circular-economy focused companies
- patient equity and/or concessional debt co-investment in companies and projects focused on the circular economy

It may be possible for some or all of these instruments to be provided by a dedicated green economy blended finance investment fund. This idea is discussed in more detail in section 0 below.

It is important to note that the skills and investment approaches required for helping proven circular economies scale are quite different from those likely to be appropriate for start-up companies. The latter requires a much higher risk appetite with grants, equity or convertible equity as the key financial instruments. It also requires a much more 'hands-on' approach from the capital provider, acting as an incubator/accelerator. Acknowledging these different roles and, as necessary, develop separate approaches to support these different types of company will be important in maintaining clarity of focus.

5.3. Other actions to explore to support financing flows

As well as the direct support to financing solutions in the circular economy, there are a number of further actions Glasgow City Council can consider to support the growth of a circular economy:

- In relation to projects that it might sponsor, continue to grow and augment technical and financial advisory expertise to develop projects and bring them to financial close. This may be supported by, for example, the local authority advisory function being developed by the UK Infrastructure Bank
- Build on existing networks/initiatives with businesses and investors (investor collaboratives) to continue to build understanding of opportunities and barriers in the circular economy and increase investor awareness of specific transactions that the Council wishes to take forward. This will allow the Council to respond nimbly to new challenges, and realise new opportunities, as they become more apparent.
- GCC should maintain a constant focus on exploring how its own procurement practices can help build demand for circular economy goods and services.
- The Council can also look to build on its existing network with the business community, and its work on the Step Up to Net Zero programme, to encourage corporate best practices including the use of tools such as Circulytics that help companies understand the extent to which they are currently adopting circular practices and further actions they may take.
- The Council can look to encourage Scottish and UK legislators to adopt other changes that will support circularity, such as well-designed and justified tax advantages for circular businesses[4], or the enhanced integration of circularity into financial regulation

[4] For example, the Ex'Tax project has recently found that a rebalancing of taxes from labour towards resource use – through mechanisms such as a kilometre charge, increasing VAT, taxing CO_2 emissions and other emissions

so that the risks with conventional linear models are better understood by investors, including through changes to financial accounting regulations (Coalition Circular Accounting, 2022).

from industry, aviation, shipping and agriculture, and increasing excise duties on tobacco as well as measures that put a higher price on water, waste and the use of fossil fuels in chemical processes – could, across the EU, increase GDP by 1.6% and employment by 3.0% in 2025, compared to the business-as-usual scenario (Groothuis, 2022).

6. Infrastructure and connectivity

6.1. Current arrangements

The 'infrastructure and connectivity' area of focus covers a range of different assets, with different financing arrangements. The discussion below focuses on five specific areas: heat networks, smart grids, smart meters, electric charging stations and broadband.

6.1.1. Heat networks

Heat networks can be owed and financed by either the private or public sector. In either case, the business case underpinning the provision of finance is predicated on the sale of heat allowing for capital recovery of the asset. Financing arrangements may either use standard corporate finance, or project finance arrangements where the finance is provided solely on the robustness of the cashflows of the specific project, without recourse to the sponsor. In Scotland, there are fewer opportunities for local authorities to become involved in owning such assets – which might provide surplus the reinvest in other services – than for their English counterparts, due to legal restrictions that prevent Scottish local authorities from owning assets for commercial surplus.

There are often opportunities for additional public funding on a variety of terms:

- The Scottish government's £300m Heat Network Fund will provide public grants, loans and repayable assistance funding of up to 50% of the total eligible costs of relevant projects (Scottish Government, 2022a)
- Publicly provided debt and equity can be accessed from dedicated funds such as the Scottish Partnership for Regeneration in Urban Centres (SPRUCE), originally set up with European Regional Development Fund resources, and managed by Amber Infrastructure Group (Amber Infrastructure Group, 2022c). SPRUCE has a mandate towards investments in regeneration, property and sustainable energy aligned to Scottish Government policies. It has previously provided an £11m investment to the Guardbridge Energy Centre which combines a heat distribution network with a biomass plant (Amber Infrastructure Group, 2022b).
- In case of publicly owned projects, the Scottish government has also indicated that the Green Growth Accelerator programme – which provides outcome based payments to local authorities who deliver outcomes that require new infrastructure – could be extended to heat networks (Scottish Government, 2021b).

6.1.2. Smart grids

Most of the investment in smart grids is made by private sector companies. This consists both of regulated utilities – distribution network operator (DNOs) and transmission owners – as well as upstream technology providers.

- Distribution network operator (DNO) and transmission company investment in smart grids is incentivised and regulated by the Ofgem regulatory regime (Ofgem, 2020). The companies subject to this regulation are largely/exclusively privately-owned. For Glasgow, the relevant DNO is SP Energy Networks (SPEN) which has a near monopoly,

although there are also a range of Independent Distribution Network Operators (IDNOs) who can own, operate and maintain newer parts of the grid, connecting new housing and commercial developments to the legacy distribution network. IDNOs are also regulated by Ofgem. SPEN is also responsible for the transmission network in the area around Glasgow.

- Technology provision is undertaken through private companies. However, because of some of the challenges and market failures associated with the development of innovative new technologies that facilitate emission reductions, these companies may be supported by additional public capital. For example, the Scottish Loan Fund, which provides capital on commercial terms to Scottish businesses looking to grow but which have not been able to find capital from existing funders, has provided £2m mezzanine debt funding to Smarter Grid Solutions (SGS) (Butterfield, 2022). SGS provides active network management technology to electricity distribution companies. The UK government has also provided grants to support innovative, early stage pilots in a range of specific areas linked to smart grids (Department for Business Energy and Industrial Strategy, 2021a).

There are also a number of initiatives which typically combine smart grids with other decarbonisation technologies - across power, heat and transport - to support the development of 'smart local energy systems'. Most of these projects are at the demonstrator stage, benefiting from significant public grant contributions. For example:

- The Local Energy Oxfordshire project (Project Leo) is a £40m, smart grid trial with various renewable energy plug in projects (including electric vehicles and transport hubs, solar, heat networks, micro-grids, smart neighbourhoods, new housing developments). Of the £40m, £15m is provided through the Industrial Strategy Challenge fund (administered by UK Research and Innovation (UKRI)), with the remaining £25m contributed by project partners (including private sector operators such as EDF, etc.) (Local Energy Oxfordshire, 2022).
- ReFLEX Orkney is a £28.5m demonstrator project half-funded through the UKRI *'Industrial Strategy Challenge Fund'* and half-funded by private investment. It is focussed on decarbonising heating and transport and rolling out digital connections and implementing a flexible local energy system (ReFLEX Orkney, 2022).

6.1.3. Smart meters

The remaining roll-out of smart meters is mandated on private sector gas and electricity suppliers. Each supplier will have binding annual targets, with the aim of full roll out by 2025. They are being supported in this role by 'Smart Energy GB', a not-for-profit organisation established to lead the national consumer engagement campaign including explaining how smart meters can be used and the benefits they provide.

6.1.4. Electric charging stations

An important part of the electric charging station infrastructure is being provided by privately owned and financed companies. These companies provide charging stations where there is expected to be sufficient demand for electricity for the station's use that the sales of the electricity purchased will cover the cost of roll out.

Historically, in Glasgow and the rest of Scotland, this role has been complemented by a

network of publicly owned and financing electric charging stations. Specifically, under the 'ChargePlace Scotland' scheme, the Scottish government has provided 100% capital grants to local authorities who are then responsible for procuring, commissioning, operating and maintaining charge points, with ChargePlace Scotland providing back office functions. In many cases the electricity provided at these stations was free, although some now charge tariffs, although typically at a lower price than set at privately owned stations. In 2022, the Scottish government announced its intention to change this model (Transport Scotland, 2022), as discussed further below, due to concerns, expressed by organisations such as Scottish Futures Trust (Scottish Futures Trust, 2021), regarding its long term sustainability.

6.1.5. Broadband

Most of the broadband provision in the UK is financed, owned and operated independently of the public sector. Much is provided by large privately-owned mainstream providers such as BT and Virgin Media. However, there are also an array of 'altnet' providers providing broadband access using an array of technologies including fibre and wireless access. Most of these altnet providers are privately funded companies, although there is a diversity of ownership structures with some not for profit organisations and community groups. In Glasgow, the altnet company CityFibre intends to invest £150m in bringing full fibre to businesses and cities of Glasgow (Donnelly, 2021).

There are also some cases of public sector involvement, with the public sector either acting as a capital provider or as an aggregator of consumer demand.

- As a capital provider, some altnet companies have had their growth supported by blended finance vehicles such as National Digital Infrastructure Fund, an investment vehicle managed by Amber Infrastructure Group that has received public funding (Amber Infrastructure Group, 2022a).

- As a customer, the Scottish Government has supported this development of digital infrastructure through competitive tendering of contract to roll out infrastructure (R100 programme), complemented by a voucher scheme for those not covered by the technology delivered through this procurement(Digital Scotland, n.d.). The UK government also provides a voucher scheme for which Scottish households may be eligible (HM Government, 2022a).

The Scottish Government has also funded the 5G Centre located in Glasgow. This has been set up to accelerate the demand, deployment and adoption of 5G technologies in Scotland (The Scotland 5G Centre, 2019).

6.2. Future financing opportunities

6.2.1. Heat Networks

The financing support provided by the Heat Network Fund already represents a significant change in the landscape for funding for heat networks compared to the recent past. The design is intended to allow a 'new phase' in the delivery of heat network. The funding will be open to heat networks owned and financed by both public and private sectors.

To the extent that the construction and operation of heat networks require further support, then the infrastructure financing solutions already discussed elsewhere in this report could be valuable. Specifically, the development of a blended finance vehicle dedicated to Glasgow Green Deal investments could provide an additional source of capital for both public and private sectors wanting to develop heat networks. In addition, the UK Infrastructure Bank's Strategic Plan states (UK Infrastructure Bank, 2022): *'barriers to deploying heat networks include high upfront costs and uncertain demand. We will look to finance both local authority and private investment in urban heat networks'*.

6.2.2. Smart grids

Most of the investment in smart grids will likely continue to be financed by privately-owned regulated utilities, responding to the incentives and regulatory regime designed by Ofgem. There is unlikely to be a significant role for Glasgow City Council to play in bolstering these arrangements.

There may be value in exploring how Glasgow City Council could support technology providers and/or smaller scale smart grid schemes associated with specific facilities. In particular, a blended finance vehicle may make it easier for companies based in the Glasgow City Region developing technologies that drive the functionality of smart grids (both in Glasgow and further afield) to access finance. The same vehicle may also be able to provide capital support for small scale public or private sector smart systems that link specific facilities or integrate smart solutions across different energy vectors.

6.2.3. Smart meters

There is little need or opportunity for Glasgow City Council to support financing arrangements around smart meter deployment. This is already the responsibility of large, well capitalised energy supply companies.

6.2.4. Electric Vehicle (EV) charging infrastructure

GCC may wish to explore the use of strategic partnerships with the private sector to support the financing of the public charging network in the city region. Under this model, financing and operation of the public charging network would be undertaken by a private sector company/consortia, who would receive remuneration through a combination of revenue from electricity sales and, potentially, from ongoing payments from the Council. This model would allow at least some of the volume risk associated with use of the network to be passed to the private sector contractor and would provide an opportunity for new skills and expertise to manage and grow the network. This model is aligned to the Scottish government's vision for the financing of EV charging infrastructure (Transport Scotland, 2022). There could be scope to use the Electric Vehicle Infrastructure Fund to help develop and implement this model (Transport Scotland & Scottish Futures Trust, 2022). This is in addition to fully privately financed EV charging stations – such as, for example, those developed by Iduna in Greater Manchester – that GCC can help to publicise.

6.2.5. Digital broadband

The significant financing and policy support already supporting digital broadband technologies suggests that additional financing specifically linked to the delivery of

Glasgow's Green Deal may not be needed. There may be a specific opportunity for a blended finance vehicle to make it easier for companies that have a strong focus on rolling out new digital technologies that support emission reductions to access capital.

6.3. Other actions to explore to support financing flows

6.3.1. Heat networks

In addition to actions that direct supporting the financing of heat networks, there are at least two further areas where GCC action can support their development: project development activities and managing volume risk.

A number of initiatives indicate that, at the scale envisaged, the development of low-carbon heat networks creates a number of technical and planning challenges that need to be overcome before financing can be secured. For example:

- The Scottish government is in the process of developing a Heat Networks Support Unit that will co-ordinate support across the public and private sectors to support heat network development through the provision of options appraisals and feasibility, business cases, financial expertise, legal expertise, project management and procurement expertise(Scottish Government, 2022b).
- Likewise, the UKIB is developing a 'local authority advisory function' which it is noted will have a particular focus in the short term on heat networks(UK Infrastructure Bank, 2022).

In the short-run, GCC may wish to consider securing support from one or both of these initiatives to support its near-term heat network plans. However, in the longer-term, GCC may wish to consider using the experience gained from working with these initiatives 'in-house' by creating a dedicated Green Deal project preparation unit. This unit could across all of the Green Deal's area of focus where Council-sponsored infrastructure project development activities are envisaged, providing a 'centre of expertise' to expedite a pipeline of projects aligned with the speed and scale of the Council's ambitions. This is discussed further in section 10.8.

A second key area where GCC can support the development of heat networks is through reducing the volume risk that private-sector sponsors of networks would otherwise face. As noted by the UKIB this volume risk, in the context of the large capital investments that networks typically require, represents one of the biggest barriers to securing private sector financing of projects. There are a number of ways in which the GCC could look to reduce volume risk, in some cases, building on plans that it already has in place:

- Committing that its own assets will make use of heat networks to provide baseload demand
- Zoning to create 'Heat Priority Areas' where property developers have to enable connection to heat networks (or make such a connection easily available) and/or include heat network infrastructure
- Absorbing some of the volume risk directly through innovative contracting structures

In undertaking these activities, especially the first two, the Council will need to be aware about the possibility of (the perception of) conflicts of interest. It may need to design

arrangements, such as Chinese walls, so that its regulatory functions are not seen to be affected by the interests of the assets in which it has a financial interest.

6.3.2. Smart grids

While SPEN play the key role in financing and delivery smart networks, it will be essential for GCC to engage heavily with SPEN on network planning, through the Local Area Energy Planning (LAEP) process that the city has already developed. This is essential in helping to understand future electricity demand and to configure smart grid activity accordingly. As a recent Energy Catapult report stresses, it is vital that the development of a LAEP is not seen as a one-off plan but rather an ongoing process that needs to be managed, with associated governance arrangements and ability to access the relevant skills (Energy Systems Catapult, 2021).

The other complementary activities identified for GCC in relation to supporting renewables deployment will also be relevant for smart grids and smart energy systems. These are discussed in section 3.3 above.

6.3.3. Smart meters

There is unlikely to be a significant role for GCC in relation to the roll out of smart meters.

6.3.4. EV charging infrastructure

The considerations around GCC maintaining/enhancing collaboration with SPEN that apply to smart grids, equally also apply in relation to supporting the roll out of EV charging infrastructure. This can help ensure that there is enough distribution network capacity at the locations where the EV charging infrastructure is expected to grow the most. In addition, in order to support consumer uptake and satisfaction, GCC may consider working with proximate local authorities to support consistency in the system of tariffs on the public charging network, in cases where this can be justified by cost considerations as well.

7. Conservation, restoration and valuing of nature

7.1. Current arrangements

The Green Deal includes a priority for conservation, restoration and valuing of nature. This will help enhance natural capital and the ecosystem services they provide.

The public sector has traditionally played a key role in supporting and financing the protection, restoration and creation of natural capital (assets) – i.e., in financing conservation, green infrastructure and nature-based solutions. This includes investments that conserve, restore or create natural landscapes, such as floodplains, wetlands, and forests, and that ideally involve a *strategically managed* landscape to provide a set of desired benefits, such as carbon sequestration, flood control, or water filtration (Ozment et al., 2015). Globally, 86 percent of nature-based infrastructure are funded by public or philanthropic sources (United Nations Environment Programme, 2021).

In Scotland, for example, the Scottish Infrastructure Investment Plan 2021/22-2025/26 sets out a vision for future infrastructure projects underpinned by three themes: enabling net zero emissions and environmental sustainability; driving inclusive economic growth; and building resilient and sustainable places (Scottish Government, 2021a). The Plan acknowledges the need to 'invest in natural infrastructure and nature-based solutions to climate change, which also help to tackle biodiversity loss and create wider socioeconomic benefits.' It presents projects and programmes worth £26 billion including plans to increasing forest cover, reaching 18,000 hectares of new woodland in 2024-25 as part of a £283 million programme; and investing £20 million per year towards the Government 10-year £250 million commitment to restore 20,000 ha annually, and 250,000 ha by 2030.

A number of existing funds exist to fund such actions, but they are small-scale. The NatureScot Biodiversity Challenge Fund, has provided funding worth £4.4 million to 37 projects over two rounds of the fund. Examples of funded projects include work to restore natural river processes; efforts addressing invasive species; boosting the resilience of pollinators by connecting their habitats; and riparian tree-planting to ameliorate rising in-stream temperatures. The Biodiversity Challenge Fund has been further boosted by additional funds and a third round opened in December 2020 for transformational projects which improve habitats, safeguard species and tackle the causes of biodiversity loss. 12 successful projects were announced in May 2021. The £5 million Natural & Cultural Heritage Fund, led by Scottish Natural Heritage, supported projects that encourage visitors to experience more of the unique nature and culture of the Highlands & Islands, although this has now closed (NatureScot, 2022a).

This is further supported by the Scottish Government Nature Restoration Fund (NRF) (NatureScot, 2022b). Launched in July 2021, this specifically encourages applicants with projects that restore wildlife and habitats on land and sea and address both biodiversity loss and climate change. In its first year, the Fund allocated £5 million to 54 projects across Scotland alongside a direct allocation of £5m directly from Scottish Government to Local Authorities. The priority themes for the NRF are:

- Habitat and species restoration – management for enhancement and connectivity
- Freshwater restoration, including restoring natural flows in rural catchments
- Coastal and marine management to promote restoration and resilience
- Control of invasive non-native species impacting on nature

The NRF is split into two components: 1) a Competitive Fund split according to project size, primarily focused on providing grants to NGOs[5]; and 2) and the Edinburgh Process Fund, a semi-competitive fund for local authorities and their partners engaged in delivering local nature networks and other biodiversity projects locally. At COP26, the Scottish Government announced an expansion to the NRF, with at least £12.5 million being made available in 2022-23, part of a multi-year package of at least £55 million over the next five years.

The Scottish National Investment Bank also has an objective to invest to promote environmental wellbeing and biodiversity. The Bank, launched in November 2020 provides patient (long term) capital to businesses and projects to support the development of a fairer, more sustainable economy (and with missions around achieving a just transition to net zero by 2045 and for place-based finance). It is already investing in nature-based solutions (NBS), such as a new sustainable forestry fund focussed on woodland creation in Scotland (Scottish National Investment Bank, 2021a) and an investment to transform a disused quarry in the west of Edinburgh into multi-purpose country park and leisure facility which includes public access green space (Scottish National Investment Bank, 2022).

There are also initiatives for enhancing the capacity of landowners (public and private) and improving coordination. The Scottish Environmental Protection Agency (SEPA) have signed Sustainable Growth Agreements (SGAs) with individual or group of businesses, as well as some trade bodies, local authorities, Non-Governmental Organisations and others. SGAs are voluntary, non-legally binding, formal agreements that focus on practical action to deliver environmental outcomes. Through an SGA, SEPA help organisations collaborate with experts, innovators and stakeholders on different approaches that could improve environmental performance and create environmental, social and economic success (Scottish Environment Protection Agency, n.d.).

However, there is still a large funding gap, especially in relation to private finance. In Scotland, economic analysis commissioned by the Green Finance Institute in 2021 identified a £15 to £27 billion gap in financing nature-related outcomes (Green Finance Institute et al., 2021). Consistent with this, the financing UK nature recovery initiative (Young et al., 2022) identifies that the current approaches to regulation and public funding for the environment present significant barriers to environmental market development and identifies specific barriers to private investment in nature recovery including:

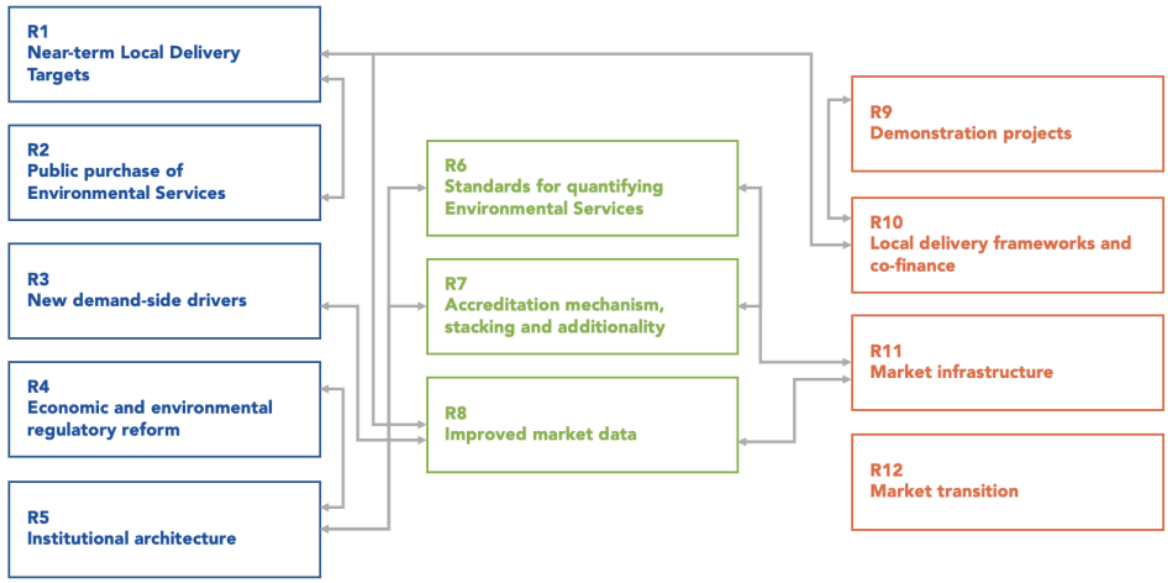
- Limited sources of revenue from nature to fund investment at the scale required.
- Lack of a coherent framework for ensuring market integrity.
- Mis-aligned economic and environmental regulation.

[5] Projects requesting a grant of £25,000 to £250,000 to be delivered over a maximum of 2 years, launched in January 2022 - 25% of the fund; and projects requesting a grant of over £250,000 that can be delivered over 3-5 years - 25% of the fund.

- Financial disincentives to investment.
- Limited expertise and capacity within supply chains for nature-based projects.

They highlight that these barriers mean that there is insufficient certainty for most investors to price and manage the risk of investing in nature over the long term, and thus risks outweigh returns. They identify recommendations to address these, highlighted below in Figure 4, split into market development, market governance and market operation.

Figure 4 Recommendations to enhance nature funding in the UK



Source: (Young et al., 2022)

Notes: Recommendations in blue relate to market development, those in green relate to market governance and those in brown relate to market operation.

To address the need for scale-up, the Scottish Conservation Finance Project has launched the £1 billion challenge, a route map to finance biodiversity, which includes a focus on leveraging private investors (Scottish Conservation Finance Project, 2020). This is led by the Scottish Wildlife Trust and the Scottish Environment Protection Agency (SEPA) and aims to generate new forms of investment in restoring Scotland's stocks of natural capital in ways that will deliver significant environmental, social and economic benefits, as well as returns for investors, by pioneering, developing and showcasing cutting-edge investment and funding models to fund natural infrastructure. This includes nine opportunities: a natural capital pioneer fund, a nature climate bond, invasive non-native species loans, a marine fund, vacant and derelict land fund, landscape enterprise networks, nature-based carbon payments, net positive for nature and blended finance. To deliver this a series of steps are set out, the first of which is to establish a Scottish Conservation Finance Fund to help accelerate private investment, facilitate innovation, promote good governance, support the development of common metrics and scale up knowledge exchange.

Voluntary and/or mandatory disclosures are also helping to promote private sector investment in nature. The UK Government supports (together will all G7 Finance Ministers) a new international initiative, the Taskforce on Nature-Related Financial Disclosures (TNFD),

which builds on the model developed by the TCFD. Similar to the TCFD, the TNFD aims to provide a framework for how organizations can address environmental risks and opportunities and to support a shift in global financial flows away from nature-negative outcomes and toward nature-positive outcomes. The new Task Force will recommend new disclosures for financial services firms and corporates (organisations) that capture nature-related risks, from 2023. The planned scope of disclosures will cover both nature risks and business opportunities. The idea is to help financial firms and organisations take steps to embed these risks and opportunities into their strategies, operations, and risk management processes. The Green Finance Institute hosts the TNFD Secretariat, supported by the United Nations Environment Program and United Nations Develop Program. The TNFD released the first version of its prototype risk management and opportunity disclosure framework in March 2022 and an update in June 2022 (Taskforce on Nature-related Financial Disclosures, 2022).

However, UK government plans to require companies to make sustainability disclosures have been postponed. In 2021 the Chancellor announced the introduction of new Sustainability Disclosure Requirements with the aim to bring together and enhance existing sustainability-related disclosure requirements under one integrated framework. It included requirements for companies, including in the financial services sector, to make sustainability disclosures; for asset managers and owners to disclose how they take sustainability into account; and for creators of investment products to report on the products' sustainability impact and relevant financial risks and opportunities, which will then form the basis of a new sustainable investment labelling regime (HM Government, 2021a). However, in May 2022, Ministers decided to postpone the adoption of such standards, though the Treasury said it 'remained committed to implementing sustainability disclosure requirement and will proceed with the necessary legislation in due course' (Cole, 2022).

7.2. Future financing opportunities

There is an emerging literature on new financial models for nature-based financing. This section discusses some of those that are most relevant for GCC. Models and schemes in relation to afforestation and reforestation, including the role of carbon credits, are discussed in the later section on residual emissions (section 8). In addition, several of the models below have been targeted at measures that also have adaptation and resilience co-benefits, and thus there are synergies with that section (section 9) as well.

In relation to the public financing of nature conservation and restoration, GCC could explore nature-based CMIs. An illustration of how this could work is described in the Road Map of the £1 Billion Challenge with a local authority such as GCC issuing the CMI via a crowdfunding platform, with investor returns partly supported by the cost savings and/or revenues generated by some of the interventions. Similar schemes have also been identified in relation to a range of focus areas for the Green Deal and are discussed further in section **Error! Reference source not found.** below.

A similar option would be to develop one or a series of Tourism Business Improvement Districts (TBIDs) and link these to the issuance of a CMI. Within a TBID, a series of investments to maintain and enhance natural capital for residents and visitors (as well as sustainable enterprise or community initiatives) would be financed through a CMI issuance. Investors would be repaid by TBID levies over the term of the TBID with any additional returns generated by investee projects recycled by the TBID.

GCC could explore opportunities for strategic partnerships with the private sector to finance nature-based solutions. Typically used for the delivery of "grey" infrastructure, there are examples internationally of successful partnerships for the delivery of nature-based solution, too. In the U.S. State of Maryland, for example, the Nature Conservancy, Walmart, and water technology company OptiRTC teamed up with the Maryland Department of Transportation to take existing stormwater treatment ponds and retrofit them to capture much more water pollution. In Pennsylvania, in 2017, the stormwater utility of Chester put together a $50 million partnership contract with a private company (Corvias). Stormwater projects are identified, planned, designed, and implemented by Corvias and will be paid back by Chester's stormwater utility. Thisinvolves 30 years of project maintenance (Opti, 2020).

One particular form of partnership that may be particularly attractive could be an (Environmental) Impact Bond. This use private funding from investors to cover the upfront capital cost of the investment. However, the investment is designed to achieve measurable outcomes specified by the commissioner. The investor is repaid only if these outcomes are achieved, otherwise investors typically will not receive all or any of their investment back. Environmental Impact Bonds are a particular category of impact bond used to mobilize private investment in green infrastructure and nature-based solutions. The issuer needs to define in advance conservation outcomes to be achieved, and establish probabilities of achieving the different levels of outcomes. The pay-out is then tied to the ecological performance of the projects financed by the bond. If the projects outperform the target, the investors will receive a premium on the base rate. If the targets are missed, the investors will accept a discount on the base rate, and in some cases could accept to lose some or all of the principal

GCC could also look to build a platform for Payment for Ecosystem Services (PES) schemes. These compensate individuals or communities for undertaking actions that increase the provision of environmental services, such as water purification, flood mitigation, or carbon sequestration. These could be created with a view to attracting a variety of suppliers (e.g. private but also public landowners) and buyers (including private companies, but also private individuals, non-government organisations, donors/charities, and government entities). GCC would need to consider the pros and cons of an input-based schemes - where providers are paid for adopting a particular land use (for example, converting cropland to grassland) or management practice (for example, limiting fertiliser usage) - compared to an output-based scheme, where payment is made based on the final outcomes. Critical to the success of these schemes will be finding ways for the intermediaries/platforms to reduce high transaction costs. As an example, the Wyre River Catchment Project is supporting natural flood management solutions by aggregating buyers and sellers through a neutral broker and a catchment-based platform, to set up a market for ecosystem services using a social enterprise model (The Rivers Trust, 2022).

The same concept behind PES schemes can also be used for financing models for sustainable urban drainage (SuDS) schemes. This has been trialled in Manchester, under the IGNITION project (The Ignition Project, n.d.). Sustainable drainage systems (SuDS) schemes help to reduce run off and hence the costs incurred by utilities in wastewater management as developments on land do not need to be connected to the sewer network. Under the Manchester scheme, developers are looking to finance these schemes by negotiating a low wastewater charge with the utility to offset the cost of SuDS development, although it is not a fully financially viable model, and still requires some public funds.

7.3. Other actions to explore to support financing flows

There are a number of further engagement and pre-financing activities that GCC will help to scale up financial flows into nature related projects.

- **Enhancing project development capacities**. The development of nature-based projects are challenging. There are often site-specific factors, and they require specialised expertise, thus they require time, resources and expertise to develop. There is an important role for support to help in project preparation (public, private and blended) to overcome these barriers, especially for new models.
- **Partnering with financial sector.** There would be advantages from GCC seeking to establish pilots and partnerships with the growing number of organisations looking to explore nature-based solutions, especially using blended finance. This could build off the Council's existing TreesAI initiative (see section 8.1 below), potentially evolving into the region becoming an innovation hub on this theme. This would also have strong synergies with the adaptation finance lab proposal discussed below (see section 9 below). This would require some coordinated development but the new TNFD framework provides a clear opportunity. Glasgow has a large number of large financial institutions, including banks and insurers, as well as institutional investors, including the Strathclyde Pension Fund, and there would be benefits in trying to approach and engage these organisations with a view to raising awareness and designing new financial mechanism and credit lines (especially local). In order to undertake this activity successfully, it may be necessary for the Council to strengthen its capacity to handling early stage commercial partnerships with specific investors, such as the capacity to develop and sign Heads of Terms agreements.
- **Policy engagement to support changes on biodiversity offsetting and nature based codes.** At present, there is no policy context in which to undertake biodiversity offsetting and it is not possible to undertake stacking - monetising multiple ecosystem services payments from a single parcel of land. Similarly, a number of codes are emerging for carbon sequestration using the natural environment building off the Woodland Carbon Code (discussed in section 8.1 below). These include plans to develop a Saltmarsh Code and a Soil Carbon code. These provide potential carbon revenue streams and would be beneficial for many of the potential financing models described above. This will involve engagement with the Scottish Government, but also seeking Scottish Government engagement with the Westminster government. This discussion could also consider how to make agricultural payment schemes (to replace the Common Agricultural Policy) more targeted to rewarding farmers for delivery of public goods and ecosystem services, and the use of payments to target conservation, restoration and creation of natural capital (as in the English Environmental Land Management scheme).

8. Tackling residual emissions

8.1. Current arrangements

A wide range of different parties, public and private, currently provide the finance for afforestation and reforestations activities:

- **Local authorities** such as GCC, as well as other public bodies such as Forestry and Land Use Scotland, can directly fund afforestation and reforestation activities using their existing budgets. These activities can both support climate mitigation goals as well as provide recreation and other services to residents and visitors.
- **Businesses and other organisations** with net zero and/or other corporate social responsibility commitments may support forestry activity. This will typically result in the creation of carbon credits – each credit corresponding to a tonne of CO_2 sequestered or reduced – and which organisations often claim as 'offsetting' other emissions for which they are responsible. The creation of high-quality credits is typically facilitated by standards such as the UK Woodland Carbon Code (Woodland Carbon Code, 2022) or Peatland Code (IUCN, 2022). There are a wide range of contractual arrangements that can link purchase of credits with the underlying finance provided for the forestry activities. Sometimes the organisation ultimately claiming the credit will also provide the finance for the afforestation/reforestation. On other occasions, knowledge that there is a commitment to purchase a credit will facilitate project development companies, and complementary financiers, to provide the upfront capital for the afforestation/reforestation activity.
- Sometimes existing **landowners** will choose to develop forests independently of any carbon credit transaction. This may be because of the shelter the forests provide for woods and crops, or to grow timber of because they wish to provide a habitat for wildlife. Scottish Forestry provides grants that can support this activity (Scottish Forestry, 2022).
- Finally, **investment vehicles** may look to grow forests as an investment strategy. They seek to generate a return from sustainable harvested timber and long-term capital appreciation from land. Such vehicles may complement returns from these activities by accessing government grants and/or selling carbon credits attributable to their activities.

8.2. Future financing opportunities

Through the Clyde Climate Forest, Glasgow has ambitious objectives for expanding forestry in the wider city region. This envisages the planting of 18 million trees in the urban and rural parts of the Glasgow City Region. This consists of three components (GCV Green Network, 2021):

- Urban trees: the plans envisage that the average tree canopy cover in urban Glasgow will increase from 16.6% to 20%;
- Connected native woodlands: the targeted planting of 101 native woodlands to reverse habitat fragmentation; and
- New forests: up to 1000 hectares per year of new forest and woodlands across the region

To support these activities, GCC has entered into a pilot with Dark Matter Labs on Trees As Infrastructure (TreesAI) which aims to provide an open source platform that will provide data and other services that will facilitate flows of private sector capital into forestry and related nature based activities.

A significant part of future investment will likely be financed publicly. To increase the capital that the Council has available for these activities, it could consider the issue of a CMI. As identified in relation to a number of areas of focus, this would involve the issuance of a regulated debt instrument, available for purchase by local residents, with the funding earmarked for particular climate-related activities in the region. It is plausible that potential investors would perceive the development of the region's forestry estate as an attractive use of such funding. While GCC would need to be conscious of assuming additional liabilities, the expectation is that the interest from local residents in supporting local climate-related activities such as the development of the Clyde Climate Forest, would result in this being a lower cost source of capital for the Council than lending from the Public Works Loan Board, or equivalent. This is discussed further in section **Error! Reference source not found.** below.

In addition, GCC could consider the creation of a Timberland Investment Management Organisation (TIMO) or equivalent forest fund. This would be a blended finance vehicle specifically targeting forestry-related investments. It would receive capital from investors with a variety of return expectations. This might include grants/donations from philanthropies, those implementing corporate social responsibility activities and public funding. However, it would also include capital from institutional and other investors seeking a return on their investments but who are keen to support forestry and other nature-based solutions. The manager of the TIMO would use this blended capital to deliver a set of place-based woodland creation and restoration (and ancillary) interventions that blended commercial and nature-based returns with revenue streams including carbon credits, sustainable timber, NFM payments and enterprise activities. The asset manager in this structure could perform many of the roles identified by the 'intermediary' in the TreesAI Platform.

A critical element in making forestry investments commercially sustainable is to continue to work on increasing the demand for sustainably harvested products (and services) that forests can provide i.e. for 'forest-positive' products. The most notable of these is sustainably harvested timber for use in construction, where the timber has the additional benefit of allowing substitution away from carbon intensive products such as cement and steel. However, many of the businesses that might demand forest positive products tend to be smaller 'fringe' companies who can struggle to access finance because their business models are different from more established companies (who, for example, use conventional construction materials). This suggests that a comprehensive approach to supporting the financing of Glasgow afforestation/reforestation activities would also include concessional financial support for SMEs whose business models rely on sourcing forest positive products, alongside potential grant funding for high-profile demonstration projects that use such products. Glasgow is already engaged in these activities through its participation in the EIT Climate-KIC Climate Smart Forest Economy Programme but such activity could be scaled-up over time. This funding might be provided as part of the activities of the TIMO discussed above.

A final area that the Council could consider would be some form of price guarantee scheme for certified carbon credits arising from forestry projects. There are a number of ways this might be structured including through a competitive bidding process for option contracts that

provided the right but not the obligation to sell credits at a particular price[6]. Alternatively, if a sufficiently transparent price for credits is available, then a contract for differences model (similar to that used to support renewable power generation) may be feasible whereby there is a commitment to 'top-up' the price of any credits sold below a threshold price. It may be more effective for GCC to engage the Scottish government to introduce such a scheme, rather than introduce it itself.

8.3. Other actions to explore to support financing flows

There are a wide range of other activities that GCC might consider in order to facilitate capital flows in a way that supports the sustainable development of forests within the region.

Given the unfamiliarity of many investors with the sustainable forest-economy value chain, it could be valuable to develop an 'Investor Collaborative' that aims to increase awareness and engagement among the local financial sector on these opportunities. Building on similar initiatives elsewhere (Convergence Blended Finance, 2022), but targeted exclusively at opportunities in the Glasgow City Region, the collaborative would involve developing a series of networking, education, and capacity building sessions for participating investors. Ideally these would be transaction oriented as possible. This could represent one collaborative or working group within a suite of similar initiatives aimed at increasing investor engagement in other parts of the Glasgow Green Deal (see section **Error! Reference source not found.** below).

While carbon credit transactions represent an important opportunity for leveraging finance towards afforestation and reforestation activities, their sustainable growth relies on a broad-based recognition of their value. A recent report (Robbie & Jokubauskaite, 2022) identifies a number of risks, contextualised within the Scottish economy, that could undermine their legitimacy of such transactions. These include the risk that the primary focus on carbon sequestration could lead to the development of monoculture forests that do not provide a wider portfolio of benefits and, indeed, undermine biodiversity; a failure to involve local communities in decision-making processes; and the possibility of an unequal distribution of the benefits from carbon market transactions. Glasgow City Council may wish to take direct action to address these challenges where it is in a position to do so – for instance providing support and advice to communities on how to work in partnership with a landowner and/or developer when carbon market transactions are being developed – and engage with the Scottish Government for regulatory reforms where this is more appropriate – for example, to investigate policies around community benefit packages.

There are also a number of ways in which GCC could support the demand for forest positive

[6] Under this approach project developers would bid in an auction for a contract which would provide them with the right, but not the obligation, to sell credits to public authorities at a pre-defined set price. The winners of that auction would then know that they had a floor price for selling those credits, making it easier to invest in the project that would deliver the emission reductions. Some of the budget that authorities would need to set aside to purchase credits would be offset by the proceeds from the auction. A similar scheme has been used internationally to support the delivery of methane reduction projects (World Bank, 2019).

products that can facilitate capital flows into a TIMO or equivalent structure. These include

- Reviewing its own procurement policies to drive demand for forest positive products, for example, in relation to the choice of materials in future construction projects
- To support skills training in the construction industry so that a greater proportion of the sector is aware of the opportunities and benefits from using forest positive products in new construction projects
- To engage with the Scottish Government for changes in national level building regulations that would support the use of alternative construction materials.

9. Adaptation and Resilience

9.1. Current arrangements

The Climate Change (Scotland) Act 2009 requires the preparation of strategic programmes for climate change adaptation after each round of UK's Climate Change Risk Assessment (CCRA). The second Scottish Climate Change Adaptation Programme (SCCAP2) (Scottish Government, 2019) outlines how Scotland is preparing for the impacts of climate change over the period 2019- 2024. Following the publication of UK Climate Change Risk Assessment 3 (HM Government, 2022b), a SCCAP3 will be developed for the five year period starting from 2025. This will draw on the recent Climate Change Committee progress report for Scotland (Committee on Climate Change, 2022).

At the regional level, the Green Deal sets out the priority for adaptation and resilience measures is to implement the Glasgow City Region Adaptation Strategy and Action Plan (Climate Ready Clyde, 2021a). This strategy presents the strategic direction for Glasgow City Region through to 2030, with 11 interventions supported by 42 sub-interventions, which range from incremental to transformational adaptation.

A resource mobilisation plan was developed for the GCR Adaptation Strategy (Climate Ready Clyde, 2021b), which identified sources of finance and financial instruments, and developed a set of possible new financing arrangements to scale up adaptation, aligned to the Strategy priorities. This did not estimate the total financing needs to deliver the 11 interventions. However, an initial assessment looked at the potential adaptation finance needs for the region by combining Local Authority level and National Health Service board spending and applying an adaptation cost mark-up. This indicates an adaptation financing gap of around £187 million/year. The Green Deal indicated potential adaptation and resilience financing needs of £1 billion in total by 2030.

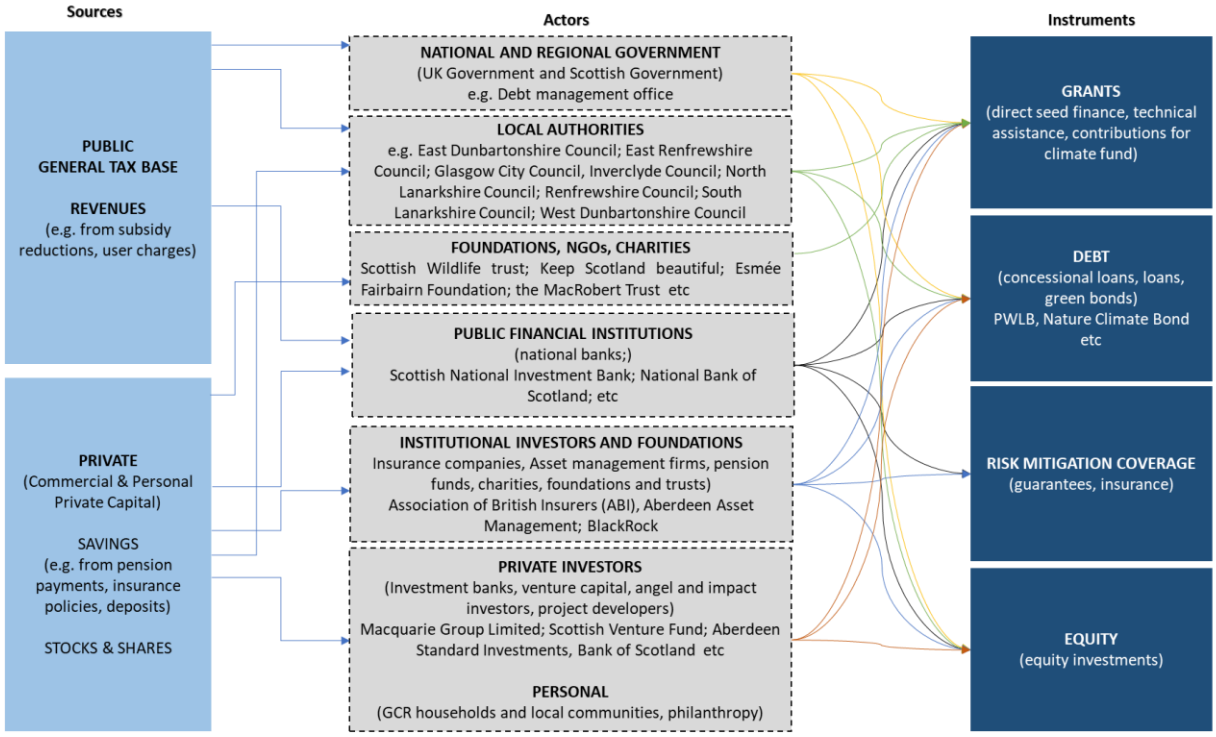
Most of the funding for adaptation is currently from the public sector. The Adaptation Scotland Programme Progress Report (Scottish Government, 2021d) shows that the current Adaptation Programme is almost entirely publicly funded. For example:

- The Infrastructure Investment Plan 2021/22 – 2025/26 published by the Scottish Government in February 2021 alongside a Capital Spending Review for 2021-22 to 2025-26 contains key investments on adaptation. This includes confirmation of an extra £150 million in flood risk management (to complement £42 million provided annually to Councils); £12 million in coastal change adaptation to support adaptation to sea level rise to protect £10 billion worth of assets; and £60 million to support climate adaptation and resilience measures for the road network (Scottish Government, 2021a).
- SEPA plays a key role in delivering many of the national policies set out in SCCAP2, in particular in relation to flood risk management. In 2020, SEPA launched two new flood warning schemes for Aberfoyle and the Outer Hebrides and Local Authorities are continuing to work in partnership and with SEPA to develop the 2022 -2027 Local Flood Risk Management Plans (Munro, 2020; Scottish Environment Protection Agency, 2020).

The dominance of public funding was also identified in the GCR resource mobilisation plan for the Adaptation Strategy. This mapped the sources of finance and instruments, as shown in Figure 5 below. This found that current flows are dominated by public finance currently from

local authorities, other public bodies and agencies, as well as national government, UK government and/or the European Union.

Figure 5 **Current adaptation flows in Scotland are dominated by the public sector**



Source: (Climate Ready Clyde, 2021b)

There are a number of barriers/constraints to financing adaptation. Recent work for the CCC[7] has identified the key barriers to financing adaptation. Many of these particularly affect potential private sector investors, and help explain why public finance has dominated adaptation activities to date.

- **Revenues**: Many adaptation measures do not create revenue streams (either positive revenues or cost savings), so finding revenue to repay finance or attract investors is challenging. This is driven partly by the nature of adaptation, e.g., its focus on public goods, in non-market or in public dominated sectors. It is also driven by the challenges in generating revenues from climate risk reduction, even in market sectors.
- **Timing**: Adaptation investments designed to prevent costs in the future, anticipatory adaptation, are harder to finance, due to the application of high discount rates. Adaptation projects often take time to develop, or to establish benefits streams.
- **Information gaps, uncertainty and risk appetite**: There are information gaps (information failures) around future climate risks, including uncertainty, and thus

[7] To be published summer 2022.

benefits of anticipatory adaptation. However, as importantly, there are also information gaps around the effectiveness and benefits for adaptation.

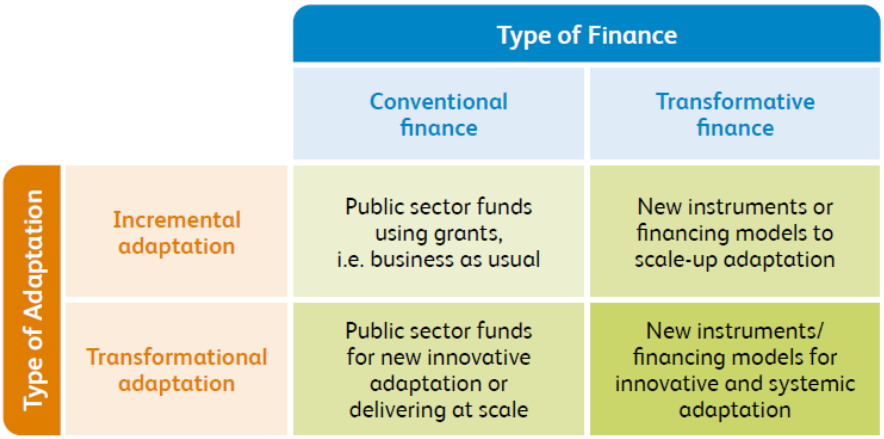
- **Project structuring, coordination, and preparation:** Adaptation projects tend to take more time and resources to develop, due to the site and context specific nature of adaptation, and the need to often involve many and/or diffuse stakeholders. This increases project financing costs, and disincentivises developers and financiers..
- **Regulation**: Investing in adaptation, especially in innovative areas, sometimes requires changes in regulatory frameworks or permissions. There can also be issues on the governance around mandated responsibilities for risks and the risk reduction.
- **Perception and willingness to pay:** Scaling up adaptation finance will involve persuading households and business to pay to reduce risks or realise savings with climate change. In many areas, society is currently used to government funding risk reduction. There may be barriers in persuading people to pay for services previously provided by the state, or people's willingness to pay may be too low to justify investment.

9.2. Future financing opportunities

The resource mobilisation plan for the GCR Adaptation Strategy concluded that to meet the interventions in GCR's Adaptation Strategy, public funds would need to be scaled up and used in more strategic ways, including to mobilise private investments. This would require the private, public and third sectors to design a process for mobilising public and private resources for innovation, developing a broader range of financing instruments and models, as well as developing long-term transformative financing solutions that are aligned to the different interests and requirements of the public and private sectors.

To support this, the resource mobilisation plan developed a typology of financing types. This recognised that resource mobilisation is needed to finance both incremental and transformational adaptation, using both conventional and transformative adaptation financing approaches. As Figure 6 shows, to deliver the 11 interventions in the Adaptation Strategy, finance in all four areas are needed. For example, there is a need for conventional public finance (left hand column) for core adaptation actions, and this type of funding can also help test innovative actions. However, new financing approaches (right hand column) will also be needed. The types of finance most suited to the eleven interventions in Glasgow City Region's Adaptation Strategy were mapped against this matrix. The analysis also reviewed the potential sources of finance for each of the interventions.

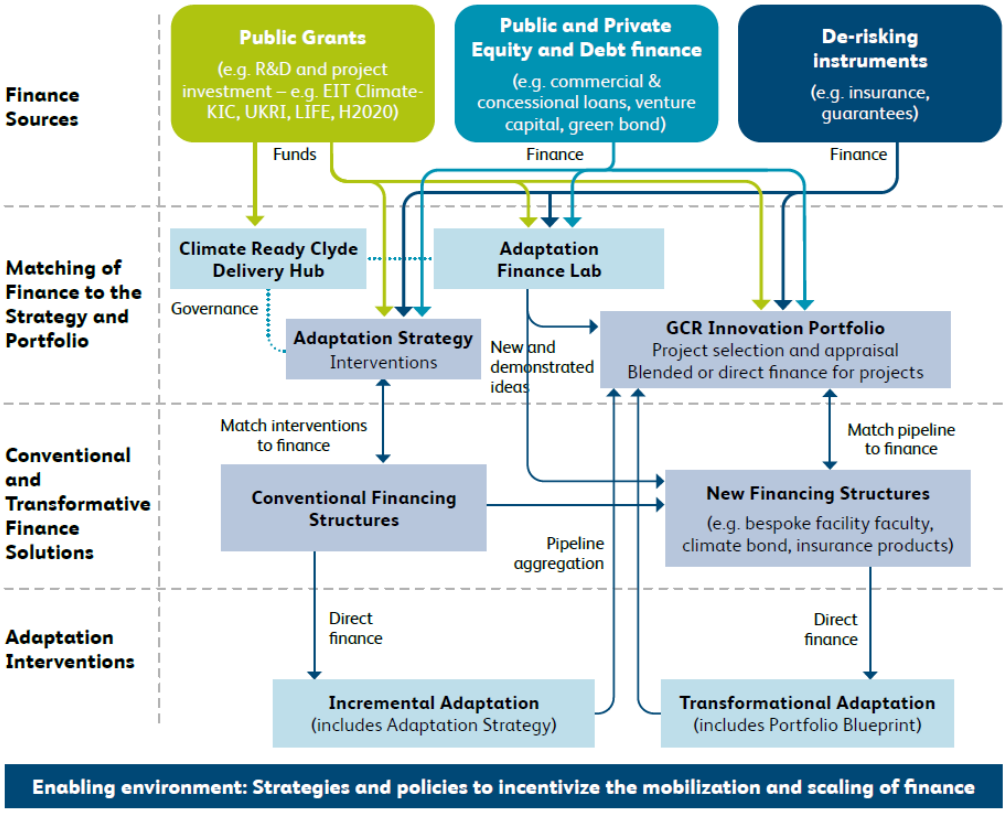
Figure 6 Adaptation investment will require conventinal and transformative finance for incremental and transformational adaptation



Source: (Climate Ready Clyde, 2021b)

The Resource Mobilisation Strategy also developed a high-level delivery structure (Figure 7**).** This sets out the sources of potential finance at the top, and then shows how to match the interventions in the Adaptation Strategy – including more innovative elements – to existing and new finance. To support delivery of transformative finance, appropriate financing mechanisms will need to be put in place, including more targeted use of public funds. This may involve reallocating government-based capital into adaptation solutions. However, this will only be effective if there is a supply of effective and desirable investment opportunities. This delivery structure would allow Glasgow City Region to cross-subsidise between new financing structures and traditional adaptation finance for the Strategy and the Innovation Portfolio, to help accelerate action.

Figure 7 The delivery structure for mobilising resources for the GCR adaptation strategy



Source: (Climate Ready Clyde, 2021b)

There are some - but now more limited - opportunities to tap into increasing public finance for adaptation. There will be a need for more public finance for adaptation, both to provide direct finance but also for solutions that blend private finance. This issue is also recognised by public financial institutions, and this provides some additional opportunities for concessionary finance (debt). The European Investment Bank (EIB) is scaling up its adaptation lending portfolio (in its role as the EU's climate bank), offering loans and framework loans for public sector organisations, and loans, equity and guarantees for private. However, from February 2020, projects in the UK are not eligible for EIB operations reserved for member states, and UK projects requesting loans or equity investments will be treated as 'entities located outside the Union' (Institute for Government, 2020). This significantly restricts access to these resources. The new UK Infrastructure Bank has a somewhat similar mandate but its new strategic plan provides only very minimal reference to adaptation and climate resilience (UK Infrastructure Bank, 2022).

There is also growing interest in resilience bonds. These can take different forms, but the most common are a standard debt instrument that invest in adaptation and resilience activities (note there are more complex resilience bonds that are forms of catastrophe bonds). There has been interest in whether local or regional authorities could issue resilience bonds, with repayments funded through revenue generation or from the local budget.

However to deliver the Adaptation Strategy, a more commercial focus is also needed,

where public funds are used to raise additional adaptation finance or to increase private sector investment in adaptation. The type of mechanism used will depend on the underlying opportunity. Where public funds are used directly, they could be strategically channelled towards, for example, early-stage innovation and, research and development as mentioned above. They can also be used to develop new blended finance solutions.

To explore this, the Adaptation Strategy resource mobilisation plan investigated seven new financial models:

- Green Infrastructure Blended Finance Vehicle (or Facility). This would be a vehicle to blend public and private sector finance. One option is to develop a dedicated vehicle, which could be capitalized with a mix of funds from Scottish Government and local authorities, private foundations and/or private investors. A combination of concessional loans and grant funding would be provided for the green components. Commercial finance could be provided from a partner bank for the grey components. Returns on provided could be delivered from the proceeds from sale of units, rent payments or cost savings. Blended finance vehicles are discussed further in section 10.5 below.
- Clyde Climate Forest Fund. This is discussed further in section 8 but could establish 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.
- Community Municipal Investments for adaptation. As discussed above, the approach connects a public authority, with private investors, through a private intermediary. While there can be issues with identifying adaptation projects that generate sufficient revenues for the CMI, this is mitigated by the fact that the CMI would be backed by the GCC rather than the cashflows of specific projects. In effect, this allows for the development a mixed portfolio where the revenue streams from more commercial mitigation actions, as well as the tax-raising powers of the Council, compensate for the lower revenue streams of adaptation actions.
- Adaptation infrastructure financing solutions for green and sustainable urban drainage systems solutions. As described in section 7.2, one financing model could involve exploiting the reduced costs from wastewater management utilities from developing SuDS on public sites, as the land area can be dis-connected from the sewer network, leading to a lower wastewater charge band and offsetting SuDs development costs. There are also examples of more direct financing solutions for adaptation infrastructure, for example through the use of household or business water charges to help fund additional infrastructure investment for adaptation. For example, in the Copenhagen Cloudburst Scheme, the main stormwater runoff infrastructure (underground storage, drainage system) is being financed through the collected water charges (from citizens) by publicly owned water utility companies.
- Climate Risk Reduction Public Private Partnerships. One specific approach for this could be to develop a climate risk management tool for SMEs to improve risk awareness, assessment, prevention and reduction. Public support could then be provided to help SMEs draw up a Company Adaptation Action Plan (CAAP). This type of partnership could be a powerful way to stimulate adaptation activity among SMEs in the city region. A similar approach was taken by Disaster Risk Reduction Insurance (DERRIS) project among Italian SMEs.

- Glasgow City Region Climate Adaptation Fund. There could be an opportunity for the GCR to develop a dedicated investment vehicle for the region, that would work across adaptation priorities. The vehicle could coordinate with bespoke financing instruments and vehicles, such as some of the other finance options mentioned. The purpose of the fund would be to act as a regional aggregator of opportunities and as a platform through which public sector funds would be channelled to lever in private sector investments. The vehicle could also be a means by which to establish sovereign guarantees and targeted insurance products for higher-risk adaptation interventions, including the transformational ones. It would focus on higher risk activities than the blended finance vehicle described above on account of being capitalised entirely from public funds. A similar proposal to set up a regional Environment Fund for Greater Manchester (GMEF) has been made by a partnership between Greater Manchester Combined Authority and Lancashire Wildlife Trust.
- Transfer of climate benefits to adaptation. This idea could take advantage of the economic opportunities from climate change in Glasgow City Region, notably from the reduced winter temperatures and associated reduced heating costs. There may be scope for these savings to be monetised to create revenue streams that could help capitalised either the blended finance vehicle or Adaptation Fund discussed above. This idea is untested, so would provide an opportunity for Glasgow to be a pioneer, although it might be challenging to operationalise.

Table 1 provides the assessment of the attractiveness of each of these new models included in the Adaptation Strategy suggesting that the CMI, innovation fund, blended finance facility and adaptation infrastructure options appeared the most attractive.

Table 1 Financing options identified in the GCR adaptation strategy

	Revenue stream potential	Portfolio opportunity	Existing examples	Scope for innovation	Blended finance	SCORE
Community Municipal Investments	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH
Glasgow City Region Climate Adaptation Innovation Fund	HIGH	MEDIUM	HIGH	HIGH	HIGH	HIGH
Green Infrastructure Blended Finance Lending Facility	HIGH	HIGH	MEDIUM	MEDIUM	HIGH	HIGH
Adaptation infrastructure including Green and Sustainable urban drainage systems solutions	MEDIUM	MEDIUM	HIGH	HIGH	HIGH	HIGH
Clyde Climate Forest Fund	MEDIUM	MEDIUM	MEDIUM	HIGH	HIGH	MEDIUM
Climate Risk Reduction Partnership	MEDIUM	HIGH	HIGH	HIGH	MEDIUM	MEDIUM

Revolving fund to transfer climate benefits to adaptation	MEDIUM	LOW	LOW	MEDIUM	MEDIUM	MEDIUM
Glasgow City Region Climate Adaptation Innovation Fund	HIGH	MEDIUM	HIGH	HIGH	HIGH	HIGH

Source: (Climate Ready Clyde, 2021b)

9.3. Other actions to explore to support financing flows

In addition to these financing approaches, these are at least two further actions that the GCC can consider .

- **Support for project development activity to develop a pipeline of bankable opportunities.** The development of adaptation projects, and the new solutions discussed above, take time and resources. There is an important role for support (technical assistance, grants, etc.) to help in project preparation (public, private and blended) to overcome these barriers, especially for new models which may involve business model development support, legal analysis and due diligence, etc. There are a range of ways to provide this support. The adaptation finance lab proposed by the resource plan (see above) would offer one route to deliver this support. It would also be useful for this pipeline development activity to consider the potential opportunities from climate change, and the potential adaptation economy for Glasgow, rather than just focus on addressing negative climate impacts.
- **Integrating resilience in net zero (and other areas of the Green Deal).** A key priority will be to ensure that adaptation (resilience) is integrated in the other Green Deal areas, for example, in retrofitting homes for energy efficiency, in climate proofing new green infrastructure, etc., To ensure this, all projects in the Green Deal should be subject to a climate risk assessment, and with appropriate adaptation interventions identified and included.

10. Key emerging opportunities

10.1. Introduction

The discussion in the previous sections highlights some specific opportunities across each of the eight areas of focus. It demonstrates that, while there are important differences between potential solutions in each of the focus areas, there are also some options for GCC to consider that are common to multiple focus areas, and therefore represent the most attractive early activities to prioritise.

Table 2 identifies some of the most of the common potential solutions identified across each of the areas of focus. These are structured into three sections:

- Options which relate to ways in which GCC may be able to *raise* more financial resources to support Glasgow's the Green Deal;
- Options that relate to how GCC may *deploy* its financial resources to support the Green Deal, including options that can leverage private sector finance
- Options that are not directly related to financing projects, but which can play an important role in facilitating an increasing flow of capital in the desired direction.

While all of the options in the table have the potential to be beneficial, there are a number of options which are salient across a wide number of focus areas:

- The potential for issuing Community Municipal Investments (CMIs) (raising capital)
- The opportunity to engage the UKIB in support of Glasgow's climate ambitions (raising capital)
- The development of one or more blended finance vehicles to leverage private sector investment (deploying capital and leveraging the private sector)
- Increased exploration of strategic partnerships with the private sector to support financing climate investment (deploying capital and leveraging the private sector)
- The development of explicit, structural dialogues with the private sector regarding Glasgow's net zero plans (enabling capital)
- The development of a project development facility (enabling capital)

Each of these six options, and their applicability to areas of focus in the Green Deal is discussed in more detail below.

To complement this analysis, Annex 1 provides a summary table of all of the options identified across each of the eight areas of focus.

Table 2 Common financing actions across the 8 areas of focus

	Energy efficiency	Renewables	Mobility	Circular economy	Infrastructure and connectivity	Nature	Residual emission	Resilience
Financing actions – raising capital								
Community Municipal Investments	✓	✓	✓			✓	✓	✓
Cultivate relationship with UKIB	✓	✓	✓	✓	✓			
Value capture models	✓	✓	✓	✓	✓		✓	✓
Financing actions – deploying capital and leveraging private sector finance								
Blended finance vehicles	✓	✓		✓	✓		✓	✓
Facilitate or sponsor specialised finance embedded delivery models	✓	✓						
Strategic partnerships with the private sector		✓	✓	✓	✓	✓		✓
Accelerators/ innovation support				✓	✓		✓	✓
Grants/ subsidies for residents or companies	✓	✓	✓-			✓		
Risk mitigation for investors	✓			✓	✓		✓	
Other enabling activities								

Investor collaboratives, including information provision and market making	✓	✓	✓	✓	✓	✓	✓	✓
Project development facility			✓	✓	✓	✓		✓
Standards setting	✓					✓		
Review procurement practices		✓		✓			✓	
Engagement policy/ regulatory change	✓			✓		✓	✓	
Enhance skills and training	✓						✓	

10.2. Community Municipal Investments

Community Municipal Investments provide an opportunity for local residents (and others) to invest in savings products that support Glasgow's Green Deal. They would be a regulated financial instrument issued and backed by local authorities that can be purchased by local residents, through a crowdfunding platform, with the capital hypothecated to funding climate/green investments. It is expected that the costs to the GCC from issuing these instruments would be equivalent or lower than borrowing from the Public Works Loan Board, or alternative especially as, on occasion, investors are willing to forego some of their returns. Repayments could be flexible, depending on the projects financed, with options including equal repayment, annuity or other bespoke terms. It would typically be expected that borrowing would be over any period between 1-40 years. While, in principle, the funds raised from CMIs could be used to help meet any GCC funding need related to the Green Deal, the product is likely to achieve greatest resonance with residents in relation to those activities that deliver appreciable local benefits. This might include energy efficiency retrofits, small-scale renewable energy projects, local transport projects, nature and forestry projects, as well as adaptation activities. There are already examples of this instrument that Glasgow can build from, as Box 2 shows.

Box 2 Existing Community Municipal Investments

The first two CMIs were issued by West Berkshire Council and Warrington Council in Summer 2020. Key details of each issuance include:

- **Warrington:** £1m target hit three days before close date, with 500 investors investing on average £1,921. The funds are helping the Council to develop two large ground-mounted solar farms and a 27MW battery storage facility, in partnership with Gridserve. The revenues from these projects will, in turn, be used to support other green projects in the community.
- **West Berkshire:** £1m target hit target 5 days before close day, attracting 640 investors. 22% of funding came from West Berkshire residents. The funds will be used for rooftop solar projects, improvements to cycle ways and flood defence projects across the community.

Each were structured at 5 years investments with a 1.2% annual return, with repayments made every 6 months. The 1.2% return represented a 50 basis point discount compared to the PWLB Certainty rate at the time. In addition, 1 in 6 investors in the West Berkshire case donated their first interest payment back to the Council.

Consumer survey research undertaken before and after the issuances suggest that they can begin to improve attitudes towards the council among local people.

Source: (Davis, 2021)

There are a range of peer-learning networks that can support GCC take forward this idea. The recently launched 3Ci Platform intends to support local authorities in issuing these instruments, potentially aggregating individual issuances to reduce the fixed costs that Councils may otherwise face. This is part of a broader set of activities that 3Ci will undertake to test and demonstrate financing frameworks (Cities Commission for Climate Investment, 2022). The Green Finance Institute also runs a related campaign (Green Finance Institute, 2022b).

10.3. Engaging the UK Infrastructure Bank (UKIB)

The UKIB represents an important new source of potential funding to support Glasgow's Green Deal. The institution intends to provide finance both directly to local authorities as well as to the private sector. It aims to differentiate itself from other financing sources by offering more competitive terms where needed (local authority lending will be priced at gilts + 60 basis points, which is lower than most conventional funding sources for local authorities); being willing to take more risk in recognition of the strategic policy objectives; and exhibiting flexibility in designing bespoke financing arrangements that reflect the needs of specific transactions.

The UKIB has identified 5 strategic priorities: clean energy, transport, digital, water and waste. Within these priorities some of the investment opportunities[8] it has identified that align most closely with the Glasgow Green Deal include financing (UK Infrastructure Bank, 2022):

- the deployment of retrofit, energy efficiency and heat technologies;
- the transition of mature renewable technologies to subsidy-free business models;
- the deployment of new technologies for renewable power generation;
- flexibility and storage technologies;
- electric vehicle charging infrastructure;
- local authorities switching to adopt zero emission buses;
- mass transit systems and infrastructure upgrades;
- gigabit capable broadband;
- nature-based solutions[9];
- heat offtake projects from waste facilities; and
- projects that increase the scale and sophistication of recycling infrastructure

The UKIB is already providing financing to local authorities to support their green objectives, as illustrated in Box 3

Box 3 UK Infrastructure Bank lending to local authorities

In March 2022, the UK Infrastructure Bank confirmed a £10m loan to the West Midlands Combined Authority to help finance the first phase of the 'Sprint Bus Route' in Birmingham. Making use of hydrogen buses, the project is part of an effort to make a zero-emissions corridor in the City. It will also enhance connectivity and is projected to support almost 4,000 jobs

Source: (UK Infrastructure Bank, 2022)

[8] The UKIB strategy document notes that these are not the only opportunities it will invest in, but they are likely to form a significant part of its portfolio.
[9] The strategy document notes that this is an option it will 'consider'.

10.4. Value capture models

Value capture models involve the public authority sharing in the some of the value created when developments are approved. There are two main value capture models that Glasgow might consider:

- for large scale green infrastructure, such as the Clyde Metro, which generate benefits for local businesses, formal or informal mechanisms to allow the Council to share in these benefits can be considered;
- for smaller developments, which may be less immediately aligned with the Glasgow Green Deal's objectives, new developments could face a fee pro rata to the emissions intensity of their development. Such a levy would need to be set at a rate which balances the revenue raising with impact on appetite for development, and the Council would need to confirm it has powers to implement this approach.

Both of these mechanisms have precedents that Glasgow can draw upon to develop their own plans. Boxes 4 and 5 illustrate

Box 4 The Crossrail project provide an example of how value capture models can generate resources for low-carbon infrastructure

The Elizabeth Line in London, delivered through the Crossrail project, made extensive use of value capture methods in order to support the financing of the project, including from businesses, developers and other stakeholders with an interest in the development of the project:

- In terms of the business community, Transport for London and the Greater London Authority held a number of meetings with businesses to test, and generate, support for the scheme. This made it more politically acceptable when the Mayor of London levied a £0.02 supplement on business rates properties of a rateable value over £55 000 per annum. This was a measure that required primary legislation and agreement from the Treasury that the proceeds could be hypothecated to the Crossrail project. A review of the funding arrangements for the project notes that: 'Key … was the strong government message that, without a significant contribution from London business, the project would not happen.'
- For developers, the conventional section 106 agreements were replaced by a community infrastructure levy for developments above and around station sites. This allowed the Mayor to impose an additional levy on commercial and residential development of between £20/m^2 and £50/m^2, set at the mayor's discretion and payable on completion of the development.

These, and other funding mechanisms, relating to Network Rail and Heathrow Airport, allowed Transport for London to issue around £3.5 billion of bonds with an initial tenor of 15 years.

Source: (Buck, 2017)

Box 5 The Milton Keynes Carbon Offset Fund shows how the value generated from smaller developments can be used to capture additional resources for green investments

The Carbon Offset Fund in Milton Keynes is linked closely with the local authority's planning policy, revised in 2005, which required all new housing and commercial developments over 1000m^2 to:

- incorporate an energy efficient design;
- include at least 10% renewables;
- demonstrate water conservation measures;
- make use of low-impact building measures;
- ensure waste reduction; and
- achieve carbon neutrality (measured by reference to the CO_2 emissions associated with energy use anticipated to be released in the first year of its use) .

Recognising the challenge in delivering carbon neutrality, as an alternative, the Council's scheme offered developers of paying £200/tCO_2. In 2019, the Council reported that the payments could reach €300,000 - €400,000 per year (£260,000 - £350,000 per year at the prevailing exchange rate in 2019).

These funds are hypothecated in the Carbon Offset Fund and must be used to deliver emission reductions with a cost per tonne lower than the fee amount (plus a margin). The initiatives that have been supported by the Fund include:

- free home insulation measures
- grants to upgrade boilers
- free energy efficient lightbulbs to households
- financial assistance for more ambitious energy refurbishment in social housing
- streetlighting upgrades
- rooftop PV installation on public buildings

The Council reports that the scheme has been a success. However, a 2019 review did note that the intended increase in the fee rate had not been possible to implement and that the Council was now finding it increasingly difficult to find low cost emission reductions.

Source: (Draper, 2019)

10.5. Development of one or more blended finance vehicle(s)

One option for large scale leveraging of private sector capital is through the development of one more blended finance vehicles. This would combine both public and private sector capital in the fund's capital structure, with the fund then providing capital, using a variety of different instruments, to discrete projects. These individual project transactions would offer further opportunities for leveraging private capital. The analysis in the earlier sections of this report suggested that there may be a particular benefit in this vehicle providing capital for

projects in relation to domestic energy efficiency, small-scale renewables, businesses in the circular economy, nature-based solutions and other afforestation and reforestation schemes, as well as resilience investments.

This type of structure may be an efficient way to leverage private capital for at least two key reasons:

- The establishment of a fund will make it easier to engage large scale institutional investors and other private finance providers whose minimum investment size is too high for some of the individual project transactions within the Glasgow Green Deal.
- The capital structure of the fund can be designed to absorb some of the risks that may otherwise deter private sector providers. In particular, the funds could adopt a 'waterfall structure' such that, in the event that project performance means that the overall returns of the fund are lower than expected, these losses are, in the first instance, absorbed by the public capital. In other words, the public capital take a subordinated position in the capital stack. These types of arrangements, although exposing the public capital provision to greater risk, can often allow a relatively small amount of public funding to leverage larger quantities of private capital.

There are a number of sources that GCC could consider to capitalise such a fund structure. As well as providing any conventional resources raised off its own balance sheet, it may also be able to access funding, over time, from the application of value capture models as discussed above. Smaller amounts of capital may be available from CMIs or from Glasgow's participation in the Horizon2020 NetZeroCities initiative. In addition, the Strathclyde Pension Fund could be approached to become a crucial 'cornerstone' institutional investor in any such fund, especially given its explicit objective of implementing an investment strategy that is consistent with achieving the goal of global net-zero emissions by 2050 (Strathclyde Pension Fund, 2022). This could send an important signal to other institutional investors regarding the fund's credibility.

In developing plans for this fund, it is important to stress the close relationship between the risk/return profile of the projects financed by the fund and the risk/return profile, in aggregate, of the fund itself. The more risky and/or less commercial the projects and activities financed by the fund, the greater will be the need for investors in the fund to accept higher risks or lower/concessional returns. This will likely imply a need for a greater share of public capital, and a larger proportion of this capital being invested in a subordinated position in the fund's capital structure. This may mean considering creating different vehicles for projects in sectors with different risk-return profiles – for example, separate funding vehicles in relation to forestry and nature-based solutions compared to renewables and energy efficiency - in order to efficiently segment different investors. This will also allow different vehicles to tap investors with different sectoral mandates, although it will increase transaction costs.

Examples of such funds already exist, as Box 6 demonstrates.

Box 6 The Mayor or London's Energy Efficiency Fund (MEEF) illustrates how a blended finance vehicle can operate

The MEEF is a £500m investment fund established by the Greater London Authority, and managed by Amber Infrastructure Group, with funding from the European Commission, which aims to help achieve London's ambition of being a net zero carbon city by 2030.

It secured £51.2m from the European Regional Development Fund which has leveraged £456m from private investors including Lloyds Bank, National Westminster Bank, Santander UK, Sumitomo Mitsui Banking Corporation and Triodos Bank.

It provides senior debt, mezzanine debt and equity to investments greater than £0.5m, with a target project size of £3m-£20m, focusing on energy efficiency, decentralised energy, small-scale renewables and low-carbon transport. This capital can be provided to projects in the local authority, NHS, education, charity, voluntary and small and medium-sized enterprise sectors. For example, MEEF provided a £15m loan to London Borough of Enfield to part finance the construction of a Water Heat Network that will supply over 10,000 new homes with low-carbon heat and hot water, as well as providing a £9.6m loan to Epsom & St Helier NHS Trust to improve the energy efficiency and develop a combined heat and power heat network at Epsom Hospital.

Sources: (Amber Infrastructure Group, n.d., 2019; Mayor of London, 2022)

10.6. Explore Strategic Partnerships with the Private Sector

There are a range of different models that can be considered under this heading. Three of the most relevant to local authorities, including GCC are (Local Government Association et al., 2022):

- Contractual partnerships
- Lease-leaseback arrangements
- Corporate joint-ventures (JVs)

Contractual partnerships are the most common partnership model. Under this model, a contract sets out the specific outcomes that a private sector partner should provide and the payment it will receive; with the private sector partner bearing some or all of the risk associated with the design, financing, construction and operation of the asset(s) needed to deliver these outcomes. There are a wide variety of different contracting structures which largely vary according to the risks allocated to the private sector party.

There are specific opportunities to use this model in a number of the Green Deal areas of focus. For example, this model has also been used to finance the construction of the Glasgow Recycling and Renewable Energy Centre (GRREC) and could well be suitable for further investments in relation to waste infrastructure and recycling. In addition, this model could be used to support the expansion of the public EV charging infrastructure network in the Glasgow City Region. There is also a rich set of experiences in using this type of model to finance energy efficiency retrofits within the public sector estate, using so-called 'Energy Performance Contracts' (EPCs) where the private sector partner guarantees the energy savings that will be secured.

A second partnership model that GCC may wish to consider are lease or lease-leaseback arrangements. Under these arrangements, buildings or other assets can be leased to a developer who undertakes an upgrade who and then leases the asset back to the Council, or otherwise monetises the upgrade. For example, under this arrangement, investors could take a long-term lease on an asset and install renewable power facilities. The Council could then purchase the power, which could be used to power local housing and council buildings. This may provide the Council with an opportunity to access power at prices lower than those available in the wholesale market at present. A lease and leaseback arrangement could also be used to finance the public EV charging network.

A final partnership model that many local authorities are turning to involves developing Joint Ventures. Under this model the Council would establish a corporate JV with a private sector partner to deliver one or a series of projects. However, rather than having to provide financial capital to the JV, the Council can use its land as the equity share in the JV. This type of model is being used in Bristol to advance its City Leap project, as explained in Box 7 below.

Box 7 Bristol's City Leap uses JV arrangements to support climate investments

Source: (Bristol City Council, 2018, 2022)

Bristol's City-Leap prospectus identified at least £875m of low-carbon infrastructure investment that would be required for the city to realise its vision of becoming a carbon neutral city by 2050. This included £300m of investment in heat networks and £300m in domestic energy efficiency. In launching its prospectus, it declared that *'Whilst the council may wish to, and reserves the right to, invest in some or all of these projects, it is likely that the large majority of the investment will be made by its partners'* and that the prospectus represented *'an opportunity for forward-looking organisations to establish a new, 21st Century public - private business model that delivers against the challenges of this century'*

In Spring 2022, the Council announced that it had selected Amereco Limited as its strategic partner to implement the City-Leap project, who will work in collaboration with Vattenfall Heat UK. Their investment will focus on solar photovoltaics, heat networks, heat pumps and energy efficiency measures at scale, with the expectation that the private sector partners will invest £424m over the first five years of the 20 year partnership, with this investment reducing 140,000 tCO2.

10.7. Investor collaboratives to engage with the private sector

GCC should continue to strengthen its dialogue with businesses and private capital providers regarding the Green Deal. Across all of the areas of focus, private sector companies will be critical for the delivery of the Green Deal. This may be through helping to provide the capital needed for publicly sponsored investments, as discussed in some of the options discussed above. There will also be an important role for private investors and companies responding to changing context to make their own investments in Green Deal related areas, responding to the changing policy context and changing customer attitudes. Even for projects

and activities that will be publicly financed, private sector companies will play a crucial role as contractors and delivery partners. A strong dialogue between public and private sectors will help build trust and relationships, and also allow for private sector partners to make plans that will allow them to be responsive to the Council's requirements. There are a number of areas where such dialogues are likely to be particularly important:

- In cases where the Council is looking for private sector partners to provide capital towards specific, discrete project opportunities that the Council has identified. In these cases, the focus of the dialogues need to be as transaction focused as possible and the Council may need to enhance its capacity to enter into early stage discussions with individual investors i.e. strengthen its capacity to develop Heads of Terms agreements with specific capital providers

- They are also likely to be particularly important in cases where delivery of the Green Deal requires potentially radical changes in business models, such as in the circular economy and in removing residual emissions (where there is a need to scale up businesses that demand sustainable timber, partly conventional construction materials.

Glasgow's engagement in the 3Ci provides an important platform to take forward this activity. One of 3CI's 5 actions are 'regional investor events – aimed at convening cities and local governments with investors to showcase opportunities, building mutual understanding and confidence'. Similarly, the City Council is exploring engagement with the Green Finance Institute around mobilising capital in the able to pay market to support housing retrofit. However, while this, and similar, initiatives provide a useful foundation, the scale of Glasgow's ambition suggests that it will need to adopt an engagement model that is both enduring and more comprehensive (also covering adaptation and climate resilience, for example).

10.8. Project development facility

A critical challenge focused by GCC, alongside many other local authorities, is the difficulties encountered in moving from high-level statements of ambition to the development of a pipeline of investable projects that are technically sound and financially robust. This pipeline development requires sufficient revenue spend to access, develop and maintain a team of technical experts. For example, it is estimated that the Bristol City Leap initiative discussed in Box 4 above took two years to develop, cost £7.5m, and drew on a team of 35 energy professionals within the Council's Energy Service (Bristol City Council, 2018; Rees, 2022).

There are a number of specific initiatives that GCC can draw upon to help strengthen its existing internal capacities. These include:

- The UK Infrastructure Bank, explicitly recognising the challenges facing local authorities in developing infrastructure projects, plans to develop a local authority advisory function. In the first phase this will consist of support through specific pilot projects but it then intends to scale this initiative by convening stakeholders to help identify solutions to common challenges.
- One of 3CI's five key areas of activity will be the creation of a development fund that will provide the necessary capital and skills to bring projects forward for investment.

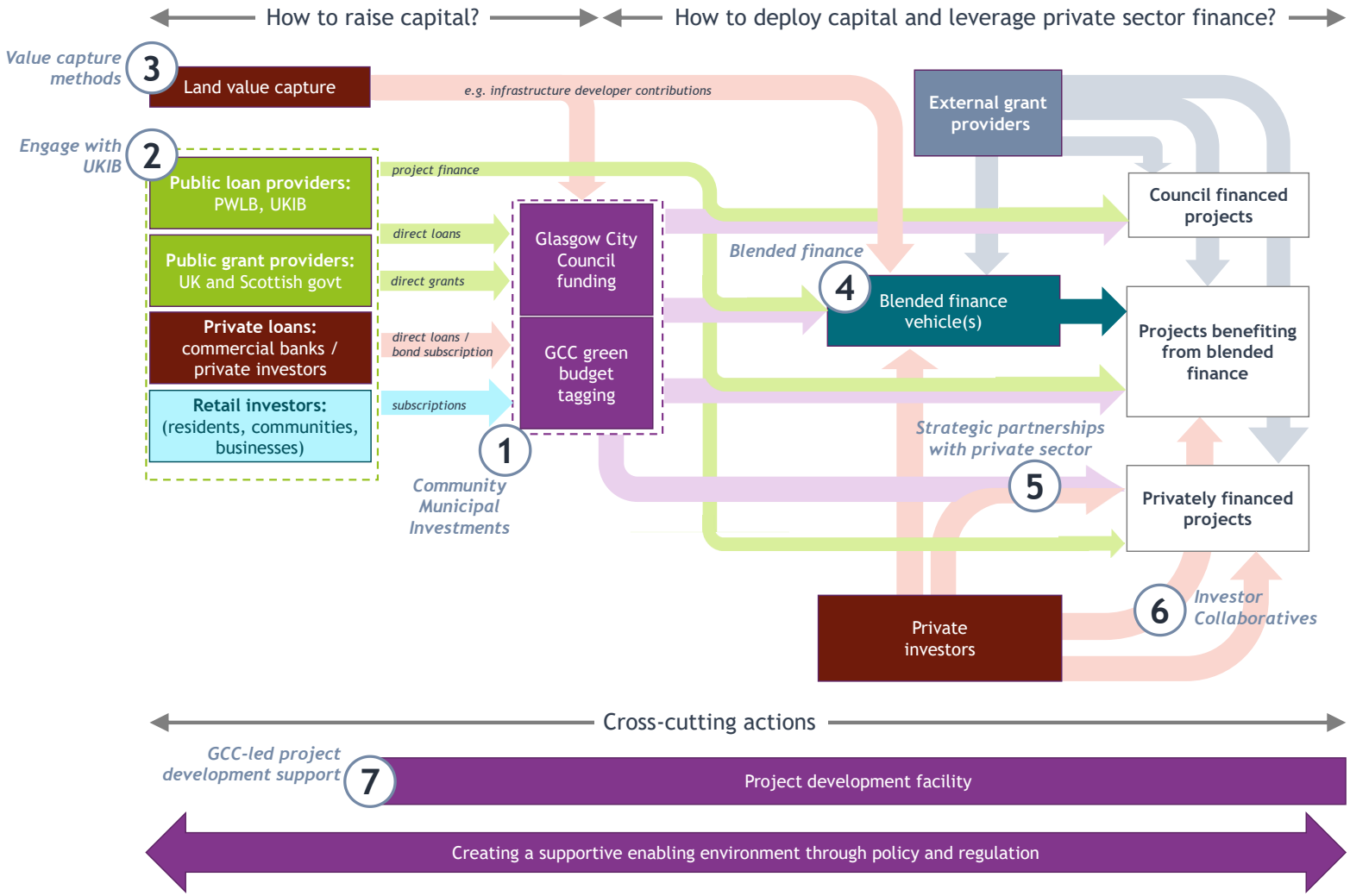
- Glasgow's participation in the NetZero Cities platform will provide it with opportunities to access support for investment planning.

The optimal response will involve leveraging the expertise realised through participation in these initiatives to create sufficient permanent expertise within the Council. This would be further supported if GCC had sufficient flexibility to make for-profit investments: recent analysis found that, in England, the local authorities that had maintained capacities in relation to energy planning and project development were those looking to use the revenue flows they anticipated from investing in this pipeline to support their financial autonomy (Kuzemko & Britton, 2020).

10.9. Summary

Pursuit of these options would move towards a comprehensive approach to financing the Green Deal, covering all of the key stages in the value chain that links capital providers to Green Deal activities, and the majority of the key stakeholders. Figure 8 illustrates. In particular the development of CMIs and engagement with the UKIB – labelled 1 and 2 in the figure - relate to ways in which GCC could raise more capital in relation to its Green Deal ambitions, providing it with resources that can be directly used to invest in areas demanding public finance across all eight areas of focus. In turn, the development of one or more blended finance vehicles and further exploration of strategic partnerships with the private sector – labelled 3 and 4 in the figure - represent important ways in which the Council may be able to use its (additional) financial resources to engage private capital providers to support the Green Deal. This will be further supported by structured engagement with the private sector – labelled 5 in the figure – which should lead to private capital providers financing projects without the need for GCC financial resources. Finally the development of a GCC project development facility is a critical 'demand side' intervention, ensuring that there are sufficient high-quality projects available that will support capital flows from all potential providers.

Figure 8 **The identified options cover the ecosystem of actors and flows that can link capital or projects**



Annex 1: Summary table

Table 3 Summary of opportunities across all areas of focus

Area of focus	Future financing opportunities	Other actions to support financing flows
Maximise energy efficiency	• Blended finance vehicle (partly capitalised through value capture methods, UK Infrastructure Bank (UKIB), Strathclyde Pension Fund, CMIs or others) • Supporting finance embedded delivery vehicles • Explore strategic partnerships with the private sector • Raising public sector capital i.e. green bonds	• Increasing information flows and advice to citizens • Supporting skills development in the local economy • Continuing to raise housing standards • Partnering with financing specialists to support them in launching relevant products
Increase renewables deployment	• Engage with UKIB • Support finance embedded delivery vehicles • Financial support to local community energy schemes, including using capital from CMIs • Explore possibility to directly finance renewable assets	• Investor collaboratives • Strengthen project development capacity (including appraisal of private sector schemes) • Maintain Local Area Energy Plan • Explore collaboration with other local authorities • Engage with wider policymakers for support fit for purpose procurement frameworks • Make spare Council land available and provide advice to community energy schemes
Provide clean, safe and connected mobility	• Explore strategic partnerships with the private sector • Exploit value-capture schemes • Engage with UKIB • Continue to explore sponsorship opportunities • Pilot e-mobility schemes • Explore opportunities from Scottish Government Hydrogen Funding	• Strengthen project development capacity

Ensure competitive industry and a circular economy	• Engage with UKIB • Blended finance vehicle (partly capitalised through value capture methods, UKIB, Strathclyde Pension Fund or others) • Accelerators/incubators for start-ups	• Strengthen project development capacity • Investor collaboratives • Explore opportunities to reform procurement practices • Support corporate best practices through promoting circularity assessment tools • Engage in dialogue for policy reform
Infrastructure and connectivity	• Exploit funding from Heat Network Fund • Blended finance vehicle (partly capitalised through value capture methods, UKIB, Strathclyde Pension Fund or others) • Explore strategic partnerships with the private sector • Promote private sector infrastructure developers	• Strengthen project development capacity • Use own demand, zoning or contracts to help reduce volume risks • Maintain Local Area Energy Plan
Conservation, restoration and valuation of nature	• Issue CMIs (including possible link to Tourism Business Improvement Districts) • Explore strategic partnerships with the private sector • Develop Payment for Ecosystem Services Scheme(s) • Explore innovative funding for sustainable urban drainage (exploiting avoided costs)	• Strengthen project development capacity • Investor collaboratives • Engage in dialogue for policy reform
Tackling residual emissions	• Issue CMIs • Explore creation of **Timberland Investment Management Organisation or equivalent forest fund** • (Continue to) provide support to companies demanding sustainable forest products • Explore price guarantees for forestry carbon credits	• Investor collaboratives • Engage in policy dialogue over regulatory reform • Explore opportunities to reform procurement practices • Supporting skills development in the local economy

Adaptation and resilience	• Blended finance vehicle (partly capitalised through value capture methods, UKIB, Strathclyde Pension Fund or others) • Issue CMIs • Explore innovative funding for sustainable urban drainage (exploiting avoided costs) • Explore strategic partnerships with the private sector • Set up public fund for adaptation • Explore scope for monetisation of climate benefits	• Strengthen project development capacity • Integrate resilience considerations into met-zero planning •

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About Us

Pengwern Associates is a UK-based consultancy specialising in the economics of climate change, the environment, international development and the linkages between them. Across these areas, it provides advice to support strategy development, decision-making and implementation, drawing on both quantitative and qualitative analysis.

Pengwern Associates was founded in 2018, as a lean and flexible consultancy to collaborate with others across the world to address some of today's most intractable environmental and social problems.

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