



STRATEGIC INFRASTRUCTURE PLAN - ENERGY TRANSITION

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1. Vision

The vision for the Strategic Infrastructure Plan - Energy Transition (SIP) is to outline infrastructure projects which will contribute to the city's energy transition from fossil based to net carbon zero public sector; net carbon zero city and ultimately a climate positive city over the next few decades.

The end goal in this transition sequence is for Aberdeen to become a climate positive city: one where any greenhouse gas emissions relating to the city are exceeded by the quantity of emissions saved. This is to be achieved through the export of zero carbon energy and related solutions into UK and international markets.

This vision is a natural extension of the vision of the first Strategic Infrastructure Plan which has successfully been delivered.

To achieve this vision, the Council, with all its key players working together, will need to activate enabling levers and policies ranging from investment to research and development, and will require the support of government. It is a vision which is based on existing strengths, renewed focus and a strength of leadership which will see the city and region contribute to decarbonisation, mitigate climate change and contribute to the local, national and international economy.

2. Strengths and Challenges

The University of Strathclyde Fraser of Allander Institute Scottish Cities Outlook Report published in 2019, states:

Aberdeen for example is well placed - not just in Scotland but in the UK - to support the transition to a low carbon future.

There is good reason for this statement. Building on the successful delivery of its first Strategic Infrastructure Plan, the Council has a track record which demonstrates a willingness and capability to invest in and deliver energy transition. This is backed up by strong economic growth. The Scottish Cities Outlook indicates that between 1998 - 2017, the city and region grew in terms of GVA per head at a rate which was 85% greater than the Scottish average.

This track record includes flagship assets in the areas of offshore renewable energy regeneration, hydrogen production, gas and hydrogen distribution, hydrogen fuel cells and carbon capture. Projects such as the European Offshore Windfarm Demonstration Project, Hydrogen Aberdeen, a Waste to Energy Plant and the approval of an Energy Transition Zone, reinforce this track record. Moreover, Aberdeen is the only UK member and current president of the World Energy Cities Partnership, which provides an international network for the UK to collaborate with cities including Stavanger, Norway; Perth, Australia; Houston, USA; and Halifax, Canada.

It is well placed globally as an energy capital to make use of existing skills, a production based supply chain and an ecosystem including Oil and Gas UK, two universities and an Oil and Gas Technology Centre to not just deliver a net carbon city but to go one step further, to become a climate positive city, as defined in the vision section.

There are challenges. The energy sector is not immune to macro level volatility. More than ever, there is a need to protect the sector, as far as possible, and the energy transition projects which are outlined in this Strategic Infrastructure Plan show a way forward.

Whilst the existing workforce, skills and global supply chain provide competitive advantage, investment in re-skilling and relevant infrastructure which connects Aberdeen and the region to the rest of the UK and beyond will be vitally important. It will require the support of government which in turn must be able to have confidence that the main players in the city and region are working together to optimise the opportunities that are available.

In recent years, the city has seen a net outflow of working age people annually, offset only by the city's ability to attract an international workforce. There is an increased need to connect with local communities to provide training and employment opportunities - that is why projects such as the Tertiary Skills Academy are so important to the local, regional and national economy.

Aberdeen by comparison with other cities in the UK, is in a strong position. The Council through the delivery of its first Strategic Infrastructure Plan, the raising of finance by way of the bond and its current level of investment within the city has demonstrated it is ready with the appropriate support to take the next steps to become a climate positive city.



3. Evidence

This Strategic Infrastructure Plan - Energy Transition (SIP) outlines projects that will support the city and region transition to a Net Zero Carbon Public Sector; Net Zero Carbon City and ultimately, a Climate Positive City.

As part of the annual credit rating exercise undertaken by Moody's for the Council, the issue of climate change risk has been raised. Supporting that annual rating exercise is an annual 'state of the Aberdeen economy' report that assesses how the city and region is performing in relation to the Regional Economic Strategy (2015). Its November 2019 report highlighted not only the challenge that climate change represents, but also the economic opportunity that this presents for Aberdeen. It recommended that the city develop a plan for a net zero carbon city transition that distinguished Aberdeen from other cities, reflecting its track record in offshore energy exploration and production.

The Council has undertaken significant work to better understand the impact of climate change for Aberdeen. The evidence base which underpins the Aberdeen Adapts report highlights the impact of climate change on:

- Sea level
- Temperature
- Buildings and Heritage
- Transport and infrastructure
- Water and energy
- Species, habitats and landscape
- Soil
- Trees and woodlands
- Watercourses and coastline
- Communities
- Health and wellbeing
- Economy
- Food

The report outlines the challenges and opportunities, summarises the policies and actions to adaptation and identifies ways to strengthen resilience. What is clear is that concerted action needs to take place to mitigate the worst of the impacts of climate change for Aberdeen.

Of equal concern is the impact of transport, buildings and waste as significant contributors to CO² emissions on the city and region. The main sources of Scottish greenhouse gases in 2017 for cities were Transport, Residential, Energy Supply and Development according to a Scottish Cities Alliance data pack.

The Council's Powering Aberdeen Emissions Update for the period 2005 - 2014 shows an emissions trend of a reduction of 18% for the city of Aberdeen. This is in line with the existing target of reaching its 2020 and 2030 targets of 31% and 50% respectively. Over this period, the biggest reduction was seen in Waste.

The Council is contributing to the picture as set out in the Sustainable Scotland Network report 2018/19, which shows a reduction in CO² emissions between 2015/16 to 2018/19 of 20%. According to UK Local Authorities and Regional CO² emissions national statistics, 2005 -2017, the Council's CO² emissions, within its scope of influence, has fallen from 1828 to 1157 kt CO², with the biggest reduction being in the Industrial and Commercial sectors.



The reduction in emissions demonstrate that a range of activities and projects which are set out in Aberdeen Adapts, Powering Aberdeen, the Local Development Plan, North East Flood Risk Management Plan and Green Space Network strategies and policies are contributing. However, the challenge is on for Aberdeen. Cities such as Bristol, Aarhus, Glasgow, Edinburgh, Melbourne, The Hague and Copenhagen are all aiming to be net carbon zero by 2030. Other cities such as San Francisco, Canberra and Minneapolis have 100% renewable energy targets by 2030.

Turning to international studies as a reference point for Aberdeen is also helpful in understanding the key areas which need addressed in the infrastructure plan to take the city down the path of decarbonisation to achieve net zero carbon and become a climate positive city beyond.

The Coalition for Urban Transitions, in its 2019 report Climate Emergency Urban Opportunities, cited the work of the Stockholm Environment Institute to demonstrate that at a national and international level an abatement approach which tackled buildings, materials, transport and waste could significantly reduce emissions. Of these, the emission reductions for commercial and residential buildings was greatest followed by transport, materials and waste management. The greatest contributor to the reduction in emissions was the decarbonisation of electricity, by using renewable technologies such as solar, wind and biomass.

The Stockholm Environment Institute in its work for the report, which was launched at the Climate Action Summit, Sustainable Development Goals Summit, New York, also noted that urban abatement potential for cities with populations of less than 750,000 was significant and it is likely that these cities lack the financial and technical resources of larger cities. The population of the Council area is just under 230,000 people.

The findings of the Institute are in line with a McKinsey report, Energy Insights, published in 2019. Of particular interest in the report is that the cost of renewables will come down further to the point where it is cost competitive with the fuel cost of conventional generations - particularly important for Aberdeen in building on its track record of delivering hydrogen based projects - that battery costs will fall which is relevant to EV cars as well as Council and non-Council EV trucks and vehicles and that demand for oil and coal will start to decline. The report also points out that with the right level of investment, hydrogen may be the answer to abate difficult carbon emitting sector.

The evidence provides a number of pointers for Aberdeen in progressing the new SIP that reflects green investment projects. Buildings, transport, waste and materials are all sectors that need to be addressed by the plan - a city wide energy transition approach to Council and non-Council housing, transport, waste and materials with a focus on decarbonisation of energy with associated key performance indicators.

The SIP will need to continue to address at a local authority level its approach to fleet replacement, transport, heating sources, boiler replacement programme, new builds, building materials, energy sources for its electricity to achieve a Net Carbon Zero Public Sector as well as influencing in areas of policy and legislation and working together with One North East, the Universities, Oil and Gas UK, NESCOL, oil and gas companies, corporates and others to achieve a Net Carbon Zero City, and ultimately a Climate Positive City.

However, given the evidence, it is clear that the existing policy and fiscal levers at a city level are not enough to support the scale of change and accompanying investment in energy transition. There are also further, wider implications for Aberdeen of not delivering meaningful change at the city level: at risk are Aberdeen's ability to retain and attract new people to live and work in the city, and the disproportionate economic contribution that the city makes at the UK and Scottish levels. The attractiveness of Aberdeen as an economic driver also relies on its green credentials. The support of central government is critical to Aberdeen if it is to realise its green ambitions.

The University of Strathclyde, Fraser of Allander Institute report, *Scottish Cities Outlook, 2019* shows that Aberdeen performs well in traditional economic measures such as productivity and GVA against its Scottish counterparts. Although this Scottish and UK context is relevant, the international reports also highlight the importance of Aberdeen in the global context,

competing as it does with other oil and gas cities such as Stavanger, Norway, Esbjerg, Denmark and Perth, Australia. The strength of the existing oil and gas supply chain provides an opportunity to leverage skills and experience into renewables. Moreover, the city and region is well placed on the global stage to consider the investment required from central government to be an exporter of hydrogen, securing its position as the global leader in energy.

It is this competitive advantage which allows Aberdeen to aim to be a climate positive city and in turn clearly differentiates it from other cities.

This plan focuses on the physical infrastructure projects that could contribute to a net zero carbon Aberdeen and lead its way to becoming a climate positive city. The C40 Cities Climate Leadership Group is a great resource for cities, and their 2019 Cities100 report lists a large number of projects which cities are taking forward across the world.



Appendix 1 - International Projects lists eleven selected international projects that may be relevant to Aberdeen, from cities which demonstrate what can be done with leadership, investment and support from government, the private sector and other public sector institutions. These eleven international projects have informed new projects which supplement the Council's existing projects, all of which are set out in Section 6 and Appendix 2 - Strategic Infrastructure Projects.

The next stage for the Council is to understand the up to date baseline position of CO² emissions for the city and the environmental benefits of each of the projects through the development of Outline Business Cases. This could be overseen by a Specialist Technical Advisory Council such as a Transition Delivery Unit supported by a City Leadership Board.

The infrastructure projects are set out under the categories Net Carbon Zero - Public Sector, Net Carbon Zero - City and Climate Positive City. They are also strategically related by a sense of place, sustainability, economy and inclusion and international factors are all critical to Aberdeen's competitiveness on the Scottish, UK and particularly the global stages:



Place

- Electric vehicle and car clubs
- Active travel superhighways
- Hydrogen for heat initiative
- Central District Heating for Council housing and buildings and non Council housing and buildings
- Retrofitting of existing housing stock
- New build of 2000 houses to gold standard
- Pedestrianisation of city centre



Sustainability

- Hydrogen production and storage hub
- Zero Emissions Corridor, hydrogen bus fleet and bus corridors with informatics
- Electric charging points
- Replacement of vehicles with hydrogen vehicles
- Low carbon concrete
- Net Zero Carbon Declaration
- Offshore Wind Production and Hub
- City wide forest credit programme for carbon offset
- Green Social Space to prevent flooding
- Sustainable Drainage System
- Energy from waste plant



Economy and Inclusion

- Unlocking Grid Supply Points
- ESCO - supply of electricity to residents from renewable and low carbon sources, providing energy efficiency tools and information, linked to other energy supply projects
- Teca - expansion of energy centre
- Hydrogen, production and storage hub, transport
- Offshore Wind Production and Manufacture Hub
- Ship to Shore Electrification Hub
- Economic Energy Zone for energy transition
- Energy Transition Skills Academy



International

- Global centre for hydrogen production for export
- University led Centre for Energy Transition and Energy Transition Institute
- Export of data to global centres
- Ship to Shore Electrification Hub
- Carbon capture use and storage dependent on carbon storage from St Fergus projects

4. Defined Strategic Infrastructure Goals - Energy Transition

The setting of defined goals is essential if investment is to be prioritised in the areas which will support the delivery of this vision for the infrastructure plan. The setting of goals and associated criteria provides a framework to deal with conflicts between competing priorities.

The evidence at a local and international level and, in particular, the framework from COP40 Cities Climate Leadership Group, Cities100 Report, forms the basis for a set of defined strategic infrastructure goals and criteria against which future infrastructure projects can be prioritised. These goals are clean energy supply; adaptable infrastructure; sustainable mobility; building energy efficiency; and sustainable waste management.

Strategic Infrastructure Goals	Critical Success Factors
Clean energy supply for the city, UK and, particularly, globally	<ul style="list-style-type: none"> • ACC aims to use 100% green energy supply • Integrated microgrid and carbon storage • Decarbonise electricity using - solar, wind, wave, hydrogen • Drive economic growth through supply of hydrogen nationally and internationally • Employability in low carbon sectors based in Aberdeen • Support citizens to use renewable energy sources which is affordable
Aberdeen's infrastructure is adaptable to changes in climate	<ul style="list-style-type: none"> • Embed climate resilience and mitigation into all policies • Use technology and data to model future scenarios • More green and open space to connect the city, greater use of walkways, cycle paths to connect the city
Sustainable mobility	<ul style="list-style-type: none"> • Improved use of electric vehicles and infrastructure • Extend alternative fuel use (Hydrogen) for transport • Full pedestrianisation of urban streets • Connected transport for ease of access to employability in low carbon sectors
Building Energy Efficiency	<ul style="list-style-type: none"> • Adoption of green building policy for local authority and non Council building, residential, non residential • Energy efficiency codes, policy and targets for residential, non residential • Materials standards for new builds
Sustainable Waste Management	<ul style="list-style-type: none"> • Increased levels of recycled waste

5. Enablers and Policy Levers

The goals and criteria will only be achieved if the appropriate enablers and policy levers are in place to support the them.

Enablers:

Connectivity and Data

Aberdeen is well placed to build on both full fibre broadband network and the roll out of 5G in the city, as the Council has a track record of working with companies to deliver this capability. 5G, particularly, provides a significant opportunity for the city in the context of infrastructure, with faster uploads and downloads, connected devices and lower latency.

The Council, O2 and Wireless Infrastructure Group are working together to install a small cell network providing 5G services and it is clear from the activity elsewhere in the UK, that 5G offers an opportunity for the universities and the Council to work together on a range of projects, which may attract UK and university funding. These projects could be directly linked to a number of the projects set out in section 6 of the report, with 5G enabling AI, Internet of Things and data management. Whilst the sharing of data raises a number of practical issues, the necessary underpinning of the projects by strong data analytics for hydrogen capture and storage, decarbonisation of materials and renewables provides a powerful reason for a cross sector approach to managing city wide data.

Finance and Funding

The Council will need to target the funding and financing of energy transition in a way which leverages existing funds as well as the more traditional PWLB.

In its recent draft budget, the Scottish Government announced a range of funds which will support the Council's ambition, including the Future Transport Fund, Low Carbon Transport Loan Fund and Hydrogen Heat Demonstrator Fund. The upcoming Scottish National Investment Bank could also be a source of funds for regional projects and for non local authority projects. The Shared Prosperity Fund

and Industrial Strategy Challenge Fund can supplement these funds at a UK level.

Moreover, the scale of investment and economic and social case for energy transition provides a strong rationale for the next iteration of the city deal policy, with a focus on energy transition, supported by both UK and Scottish Governments. The Aberdeen City Region Deal was negotiated on the basis of intervention that was immediately needed in response to a fluctuating oil price, and focuses on innovation and technology by industry. The response to climate change indicates that a more place based focus should be on any future wave of government funding. Research and development funding for the universities could be a key element of any deal which would support an energy transition ecosystem with international ambitions.

The Council has a track record in securing alternative means of financing. Research of other cities suggests that there is a range of financial mechanisms, including the role of the North East Pension Fund, which the Council could explore, some in partnership with other public sector institutions, corporates, other pension funds and financial institutions. Examples include:

- **Philadelphia** - has committed to powering 100% of municipal operations with renewable power, entering in to a power purchase agreement with a renewable developer;
- **Paris** - has set up an investment fund, the Paris Green Fund, to finance small and medium sized companies commercialise their solutions in a variety of sectors;
- **New York** - has divested its pension funds from fossil fuels to increase investments in climate change projects as well as supporting financial markets in establishing decarbonisation markets.

Financial institutions increasingly understand the need to work together to find green financial solutions to climate change issues. One example of financial institutions working together is the Green Finance Institute's Coalition for the Energy Efficiency of Buildings, which is bringing together a range of private and public sector organisations, which could include Aberdeen, to deliver demonstration green financial products and solutions for COP 26 in Glasgow.

Supply Chain and Skills

A great strength of the city and region is the supply chain which currently exists for the oil and gas sector. This sets Aberdeen apart from many other UK cities and positions it strongly amongst a small number of cities globally, which are considered oil and gas cities. Skills in relation to oil and gas technology should be transitioned, with the right support, into green and blue hydrogen production; marine and subsea equipment; management, design, health and safety consultancy and installation, maintenance and operations. Building on its recent track record of investment in hydrogen in the city, there is an opportunity for institutions, corporates and small and medium sized enterprises to work together to support the transition to a hydrogen-based economy which supports the city's aim to be climate positive.

Research and Development

Aberdeen is building a research and development ecosystem to support energy transition. The University of Aberdeen's new Centre for Energy Transition will provide research and support to industry on clean energy and renewables and will be an important factor in supporting the city to achieve net zero carbon. Its work with companies involved in decarbonisation will support the supply chain which will contribute to the delivery of the energy transition projects.

There is a key role for the Centre to support the city in identifying the greenhouse gas baseline, investment required, and impact of infrastructure projects on key performance indicators to achieve climate positive city.

The Centre's work will be complemented by Robert Gordon University's Energy Transition Institute, and the Oil and Gas Technology Centre, all of which are providing a strong connection between academia and industry.



Policy Levers:

Economy and Inclusive Growth

The transition of Aberdeen's economy from one that is predominately dependent on oil and gas to one where oil and gas sit alongside renewables is a key driver for the energy transition strategic infrastructure plan. This transition will occur within the oil and gas sector itself, as these businesses seek to become net zero carbon companies, within the wider energy sector and across the wider economy.

The broader economic and social inclusiveness aspects of the SIP are multi-fold, ranging from re-skilling and up skilling to sustaining and delivering new jobs in low carbon sectors to the social and health benefits derived from an inclusive approach to those projects which will deliver net carbon zero. The two are not mutually exclusive in the sense that key inclusion indicators arising from decarbonisation such as access to transport, health outcomes, better housing can all benefit from the approach. Two inter-related projects of strategic economic importance are:

- The creation of a special economic zone with a focus on offshore renewables and sub-sea engineering - that maximises the investment in the Aberdeen Harbour South Expansion, and supporting infrastructure through the City Region Deal to support Aberdeen as a global centre of excellence in energy transition in technology, manufacturing, operations and support; and
- Tertiary skills academy - energy transition pathways - to support employers and the local workforce to re-skill or up-skill to support jobs in low carbon sectors, in collaboration with Universities and NESCOL

Procurement

The Council's approach to public procurement has a role to play in ensuring that contractors meet sustainability specifications relating to a whole range of goods and services, in construction, food, waste disposal, vehicle use and so on. Procurement of renewable purchase power agreements for the Council will also support a number of the projects and support could also be given to local energy companies, corporates and others to do likewise. This will require a shift in focus by all departments within the Council supported by procurement, with the added advantage of it being on a regional level - Aberdeen City, Aberdeenshire, Moray and the Highland Council areas.

Looking elsewhere and at a strategic level, Energy Service Bristol, an Energy Services Company (ESCO), has issued a prospectus to the market to seek expressions of interest to deliver its City Leap, Bristol's path to net zero carbon by 2030. It is now in a formal tender process for strategic partners to set up a joint venture and to attract investment of £1bn. This may be something that is looked at, as a way forward, by the city and region.

Planning

A supportive approach to infrastructure energy transition at a national and local planning authority level will be an important lever in delivering national and local net zero carbon targets. The Infrastructure Commission for Scotland noted in its Key Findings Report that National Planning Framework 4 which is in progress would need to develop an Infrastructure First approach, embedding net zero carbon.

At a local level, planning authorities can also shape infrastructure energy transition through Local Development Plans, master planning and the use of supplementary guidance. The recently approved Council Local Development Plan includes a specific Energy Transition Zone policy and an allocation of sites that could deliver a globally recognised energy transition cluster that maximises the marine competitiveness of the new Aberdeen Harbour South expansion.

Other cities also view planning as means to support their path to net zero carbon. Bristol in its City Leap Prospectus sets out that from a planning perspective, new developments in heat priority areas should connect to heat networks from day one and where these are not available should be ready to connect to networks from day one when they come on stream.

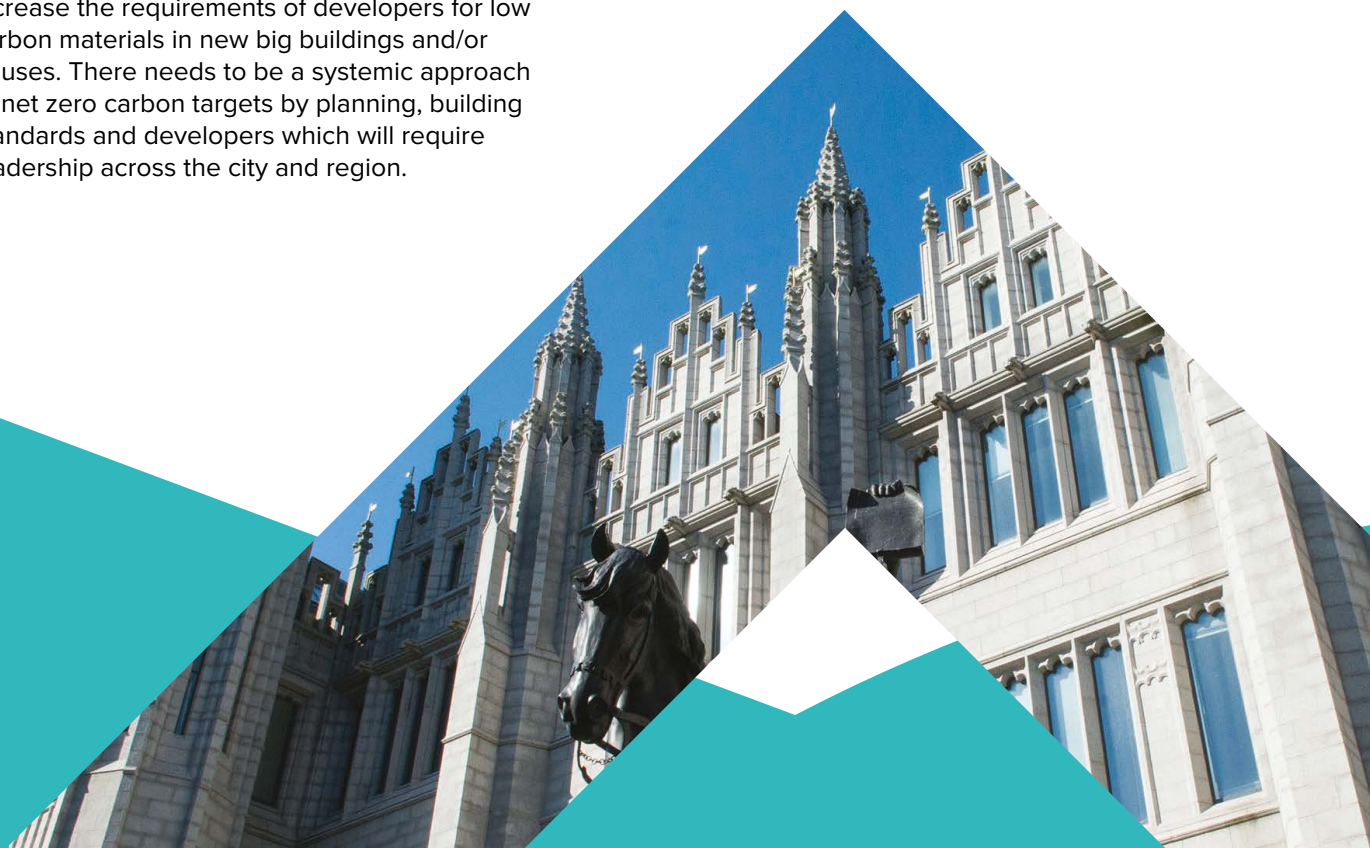
Supplementary guidance and associated building standards are also an opportunity to increase the requirements of developers for low carbon materials in new big buildings and/or houses. There needs to be a systemic approach to net zero carbon targets by planning, building standards and developers which will require leadership across the city and region.

Local Taxation

There is a desire on the part of cities, raised by the Scottish Cities Alliance work Empowering City Government, to have more power over local decision making and taxes to support economic growth, inclusion and energy transition. Many cities across the world use taxation to change the way citizens use their infrastructure.

In Denmark and Copenhagen, high taxes are applied to cars, fuels and new car purchases making it less attractive for citizens to use cars. In Copenhagen this is supported by significant investment in cycling infrastructure to deliver high cycle usage. In the Netherlands, citizens receive a credit in their payslips for cycling to and from work.

These are examples of how tax is being used at a national and city level and whilst perhaps not instantly transferrable, their use demonstrates that a better balance and application of tax levers at the national and city level, combined with appropriate levels of investment, can support changes to behaviour.



6. Identifying High Priority Projects

The defined strategic infrastructure goals set out in Section 4 provide the Council with the framework to identify existing and new projects which build on the successful delivery of the first Strategic Infrastructure Plan. By supplementing the Council's existing projects with new projects benchmarked according to the strategic goals, a list of projects can be identified which will contribute to the Council's aim to become a Net Carbon Zero City and ultimately a Climate Positive City. These are:

Pathway To Climate Positive City	Strategic Infrastructure Project	Strategic Infrastructure Goal
Net Carbon Zero - Public Sector	Central District Heating System - extension of existing DHS to Council housing stock and buildings	Clean Energy Supply
	Retrofitting of existing housing stock; installation of heat pumps; phase out of gas boilers; heating system replacement	Building Energy Efficiency
	Replacement of Council vehicles with hydrogen and electric vehicles	Sustainable Mobility
Net Carbon Zero - City	Central District Heating System - extension to non-Council housing and buildings across the city.	Clean Energy Supply
	Establishment of hydrogen production, storage and distribution hub in ETZ for city	Clean Energy Supply
	Heat for Hydrogen Initiative - houses	Clean Energy Supply
	Zero emissions corridor, 100% hydrogen powered bus fleet and bus corridors with accompanying informatics	Sustainable mobility
	Electric charging points, linked to renewable energy source and car clubs	Sustainable mobility
	Active Travel Superhighways - extension of cycle routes and walkways across the city	Sustainable mobility
	ESCO – supplying 100% renewable energy and providing advice about energy use	Clean Energy Supply
	TECA – investment in energy centre to expand heat network across TECA development site	Clean Energy Supply
	Sign up to Net Zero Carbon Buildings declaration for new build homes and non-domestic properties	Building Energy Efficiency
	City Centre Regeneration – traffic management measures and network improvements leading to pedestrianisation	Sustainable mobility
	Energy from Waste Plant	Sustainable Waste Management
	Low carbon concrete and other materials for new build construction	Building Energy Efficiency
	New build of 2000 houses to gold standard	Building Energy Efficiency
	Aberdeen City Wide Forest Credit Programme	Adaptable to climate change
	Green social spaces to guard against flooding	Adaptable to climate change
Sustainable Drainage System	Adaptable to climate change	

Climate Positive City	Establishment of hydrogen production, storage and distribution, UK transport (rail, road, maritime) and export (Energy Transition Zone)	Clean Energy Supply
	Offshore Wind Production and Manufacture Hub	Clean Energy Supply
	Carbon capture use and storage dependent on carbon storage from St Fergus projects	Clean Energy Supply
	Shore to Ship Electrification Hub	Clean Energy Supply
	Unblocking Grid Supply points to connect new generation to grid network	Clean Energy Supply

For details of each project see Appendix 2.

Supporting projects:

Two important supporting projects are:

- The creation of a special economic zone with a focus on offshore renewables and sub-sea engineering - that maximises the investment in the Aberdeen Harbour South Expansion, and supporting infrastructure through the City Region Deal to support Aberdeen as a global centre of excellence in energy transition in technology, manufacturing, operations and support; and
- Tertiary skills academy - energy transition pathways - to support employers and the local workforce to re-skill or up-skill to support jobs in low carbon sectors, in collaboration with Universities and NESCOL



7. Prioritisation of Projects

The projects which have been identified have already been benchmarked against the Strategic Infrastructure Goals. To refine these further, a further prioritization has been undertaken to understand the extent to which projects are contributing to the delivery of a climate positive city, ranging from full to partial contribution. This is based on the following set of criteria:

- Path to a Climate Positive City
- City and region competitive advantage
- Attracts co-funding and investment
- Existing Council programme (could be expanded)

Strategic Infrastructure Project - Energy Transition	Path To A Climate Positive City	City And Regional Competitive Advantage	Attracts Co Funding And Investment	Existing Council Programme
NET CARBON ZERO - PUBLIC SECTOR				
Central District Heating system - extension of DHS to council housing stock and buildings	●	◐	◐	●
Retrofitting of existing housing stock; installation of heat pumps; phase out of gas boilers; heating system replacement	●	◐	◑	●
Replacement of council vehicles with hydrogen and electric vehicles	●	◐	◐	●

Strategic Infrastructure Project - Energy Transition	Path To A Climate Positive City	City And Regional Competitive Advantage	Attracts Co-Funding And Investment	Exsiting Council Programme
NET CARBON ZERO - CITY				
Central District Heating System – extension of DHS to non council housing and buildings across the city	●	◐	◐	◑
Establishment of hydrogen production, storage and distribution hub in ETZ for city	●	●	●	
Heat for Hydrogen Initiative – houses	●	●	●	●
Zero Emissions Corridor, 100% hydrogen powered bus fleet and bus corridors with accompanying informatics	●	◐	●	◐
Electric charging points, linked to renewable energy source and car clubs	◐	◐	◐	◐
Active Travel Superhighways – extension of cycle routes and walkways across the city	◐	◐	◐	●
ESCO – supplying 100% renewable energy and providing advice about energy use	●	◐	●	
TECA – investment in energy centre to expand heat network across TECA development site	●	●	●	●
Sign up to Net Zero Carbon buildings declaration for new build homes and non-domestic properties	●	◐		
City Centre Regeneration – traffic management measures and network improvements leading to pedestrianisation	◐	◐		●
Energy from Waste Plant	●	◐		●
Low carbon concrete and other materials for new build construction	●	●		
New build of 2000 houses to gold standard	◐	◐	◐	●
Aberdeen city wide forest credit programme	◐	◐	◐	◐
Green social spaces to guard against flooding	◐	◐	◐	
Sustainable Drainage System	◐	◐	◐	◐

Strategic infrastructure project - energy transition	Path to a climate positive city	City and region competitive advantage	Attracts co-funding and investment	Existing council programme
CLIMATE POSITIVE CITY				
Establishment of hydrogen production, storage and distribution, UK transport (rail, road, maritime) and export (Energy Transition Zone)	●	●	●	◐
Offshore Wind Production and Manufacture Hub	●	●	●	
Carbon capture use and storage dependent on carbon storage from St Fergus projects	●	●	●	
Shore to Ship Electrification Hub	●	●	●	
Unblocking Grid Supply points to connect new generation to grid network	●	●	●	

In summary, the projects which will drive the city to a positive climate city with its associated benefits for the region are the ones that are based around the cluster of hydrogen-based, global focused climate city projects, which with significant central government support will deliver for the Scottish and UK economies. To be successful the city will also have to take decisions on public sector and citywide projects to push the city towards a net zero carbon position, create the initial demand for the climate city projects and support the transition of supply chain and skills for future benefit of the city.

The next stage for the Council is to understand the up to date baseline position of CO2 emissions for the city and the environmental benefits of each of the projects through the development of Outline Business Cases, overseen by a Specialist Technical Advisory Council.

Appendix 1 - International Projects

Stockholm: Beloved City Collaboration

A collaboration between the city council and three different businesses to solve sustainability freight issues leading to the replacement of six diesel run trucks with one electric vehicle. The result to 2019 has been a reduction in CO² emissions of 74% from this project.

Guangzhou: Citywide bus electrification

In 2018, Guangzhou's entire fleet of buses were converted to run solely on electricity. The project also included the installation of 4,000 charging points. This project required significant financial support from central government. The project is expected to deliver 249,000 tonnes of CO₂ emissions annually.

Aarhus: City halves emissions

The city is delivering a plan to become carbon neutral by 2030 and has halved its emissions by 50% in the last five years to 2019. Using a collaborative approach the city has a Climate Action Plan and Strategic Energy Planning Programme which sets out the steps to carbon neutrality and a future run on 100% renewable energy in all sectors.

Halden: Sustainability mobility meets the sharing economy

In February 2019 Halden Municipality shifted its mobility policies resulting in the leasing of 20 electric vehicles and bicycles for its employees which complements a diverse mix of electric vehicles available for its residents to lease. The aim is to reduce CO² emissions by 14,000 tonnes across Norwegian municipalities.

Copenhagen: Cycle Superhighways

2012 marked the start of an ambitious 33 year project which is a collaboration between municipalities to create 746 kilometres of cycle paths across 45 interconnected routes. It is expected that 6 million additional cycle journeys will take place every year by 2045.

San Francisco: Green Energy Programme

As part of the CleanPowerSF programme, the City and County of San Francisco is providing residents and businesses with an option to purchase electricity from renewable and low carbon sources. The aim is to achieve 100% decrease in electricity emissions by 2030.

Barcelona: Fueling a renewable transition while empowering citizens generation

Barcelona Energia is the first public sector distributor in Spain which has been created with the goal of promoting local and renewable energy. 16,500 tonnes of CO₂ emissions have estimated to have been saved as a result of Barcelona Energia supplying renewable energy since 2018

London: Net zero builds put London ahead of the pack

In 2018, 19 C40 cities signed up to the Net Zero Carbon Buildings Declaration committing to all new buildings operating at net zero carbon by 2030. London was ahead of other cities and has mandated zero carbon homes since 2016 as well as establishing carbon offset funds where this a difficulty in carrying out the policy. London's net zero policy is estimated to reduce CO² emissions by more than 25 million tonnes compared to if it has stayed with national standards.

Honolulu: utilizing captured carbon from concrete

The city government is encouraging the use of low of carbon concrete that has undergone CO² mineralisation, utilizing and storing captured carbon from local industrial emitters. This is helping scale new carbon capture technology and reduce freshwater consumption. 15,000 tonnes of CO² could be abated each year is Honolulu standardized CO² mineralised concrete across city infrastructure procurement.

Austin: City Forest Credit Programme

The City of Austin has developed a City Forest Carbon Credits Programme to not only offset municipal carbon emissions but also to protect against flooding and drought. 1,302 saplings are being planted to boost climate resilience.

Boston: Green, social spaces guard against coastal flooding

The city has developed the Resilient Boston Harbor Plan connecting 75km of coastline with its citizens and creating 765,000 m² of new and regenerated open space to protect the city from storm surges and rising seas.



Appendix 2 - Strategic Infrastructure Projects

NET CARBON ZERO - PUBLIC SECTOR

Name of Project	Strategic Infrastructure Goal	Nature of Collaboration	Investment
Central District Heating – extension of CDH to existing Council housing stock and public buildings.	Clean Energy Supply.	ACC, AH&P, Corporates; other public sector buildings; Central Government.	Investment in infrastructure.
Environment Benefit	Social Benefit	Health Benefit	Economic Benefit
Reduce CO ² emissions.	Inclusive, mitigate fuel poverty, heating costs reduced.	Homes are habitable improving health outcomes; reduction in fossil fuels.	Support economic case for hydrogen storage and supply; create local jobs.

Name of Project	Strategic Infrastructure Goal	Nature of Collaboration	Investment
Retrofitting of existing housing stock; installation of heat pumps; phase out of gas boilers; heating systems replacement.	Building Energy Efficiency.	ACC, central government.	Investment in infrastructure – heat pumps; extension of CDH.
Environment Benefit	Social Benefit	Health Benefit	Economic Benefit
Reduce CO ² emissions.	Inclusive, mitigate fuel poverty, heating costs reduced.	Homes are habitable improving health outcomes; reduction in fossil fuels.	Reduced whole life costs.

Name of Project	Strategic Infrastructure Goal	Nature of Collaboration	Investment
Replacement of Council vehicles with hydrogen and electric vehicles.	Sustainable Mobility.	ACC, Corporates, Central Government, Scottish Enterprise, Haulage companies.	For cars, HGVs, vans, investment over 12 years.
Environment Benefit	Social Benefit	Health Benefit	Economic Benefit
Reduce CO ² emissions and NO _x emissions	Support sustainable transport.	Reduction in exposure to particulate matter and will improve air quality.	Wholelife costs may be cheaper than conventional vehicles; support economic case for hydrogen storage and supply.

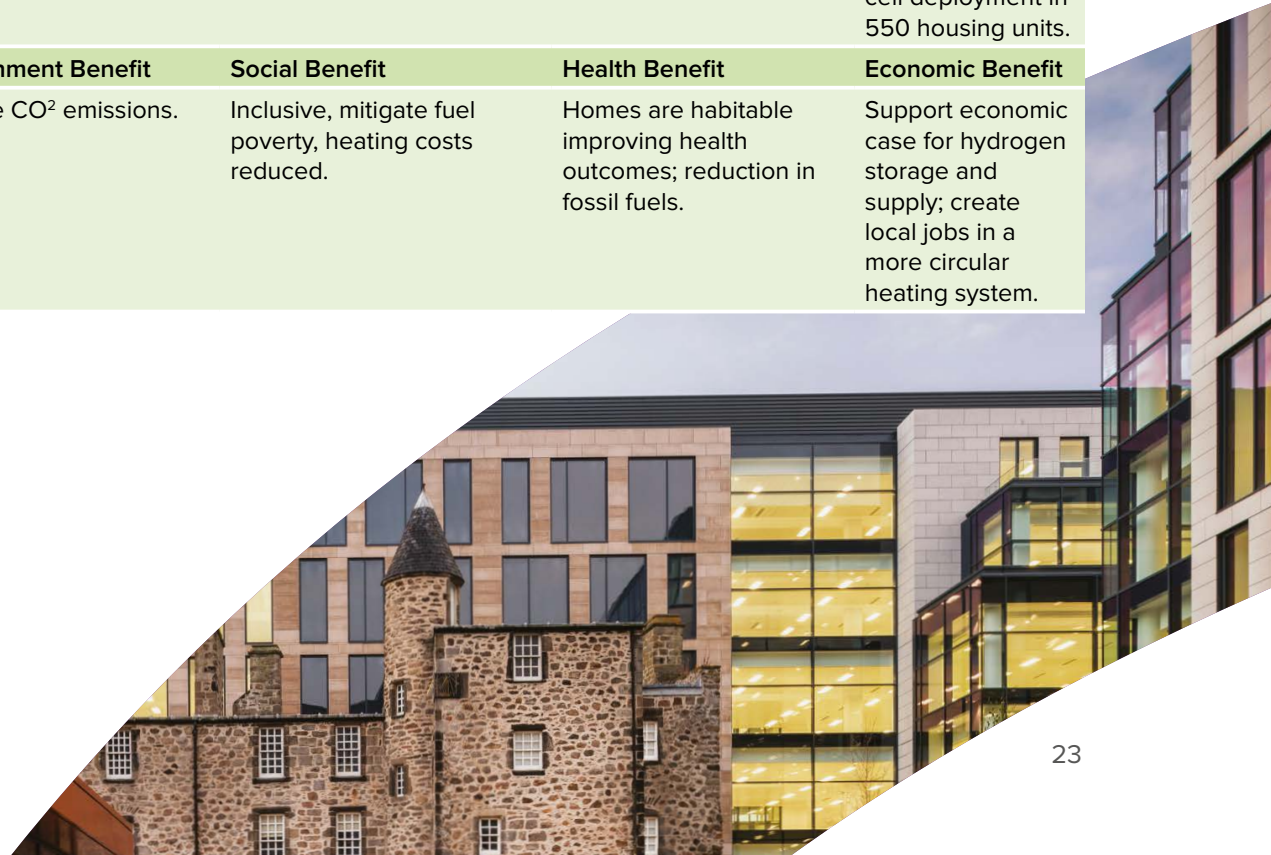


NET CARBON ZERO - CITY

Name of Project	Strategic Infrastructure Goal	Nature of Collaboration	Investment
Central District Heating – extension of CDH to non-Council housing stock and non-public building across the city.	Clean Energy Supply.	ACC, AH&P, Corporates; other public sector buildings; Central Government.	Investment in infrastructure.
Environment Benefit	Social Benefit	Health Benefit	Economic Benefit
Reduce CO ² emissions.	Inclusive, mitigate fuel poverty, heating costs reduced.	Homes are habitable improving health outcomes; reduction in fossil fuels.	Support economic case for hydrogen storage and supply; create local jobs in a more circular heating system.

References in Appendix 1: Stockholm: Beloved City Collaboration – Central Heating System from excess heat from data parks; Aarhus: City halves emissions – a carbon neutral city by 2030

Name of Project	Strategic Infrastructure Goal	Nature of Collaboration	Investment
A hydrogen for heat initiative – new houses.	Clean Energy Supply.	ACC, corporates; other public sector buildings; Central Government.	Investment with an international supplier to invest in hydrogen fuel cell deployment in 550 housing units.
Environment Benefit	Social Benefit	Health Benefit	Economic Benefit
Reduce CO ² emissions.	Inclusive, mitigate fuel poverty, heating costs reduced.	Homes are habitable improving health outcomes; reduction in fossil fuels.	Support economic case for hydrogen storage and supply; create local jobs in a more circular heating system.



NET CARBON ZERO - CITY

Name of Project	Strategic Infrastructure Goal	Nature of Collaboration	Investment
Establishment of hydrogen production, storage and distribution hub in ETZ for city (Phase 1), UK transport (rail, road, maritime) (Phase 2) and export globally (Phase 3).	Clean Energy Supply.	Central government; Scottish Enterprise; Corporates.	Initial investment to support development of infrastructure. Further significant investment required as project develops through the phases.
Environment Benefit	Social Benefit	Health Benefit	Economic Benefit
Reduce CO ² emissions and NOx emissions.	Support sustainable economic and inclusive approach to economy.	Reduction in exposure to particulate matter and will improve air quality.	Global energy cluster; benefit local supply chain, creation of jobs and new skills in low carbon sector, drive renewable economy.

Name of Project	Strategic Infrastructure Goal	Nature of Collaboration	Investment
Zero emissions corridor, 100% hydrogen powered bus fleet and bus corridors with accompanying informatics.	Sustainable Mobility.	First Bus; Cityfibre;5G providers; Central government	Investment in partnership with UK vehicle manufacturers and regional bus operators in vehicles and infrastructure for a fleet replacement programme. Reduction in price point for bus company to be on a par with diesel.
Environment Benefit	Social Benefit	Health Benefit	Economic Benefit
Reduce CO ² emissions and NOx emissions.	Support sustainable, inclusive transport policy.	Reduction in exposure to particulate matter and will improve air quality.	Benefit local supply chain, support economic case for hydrogen storage.

Reference: Stockholm: Beloved City Collaboration – Beloved Cities Project; Guangzhou: Citywide bus electrification – Electrification of buses

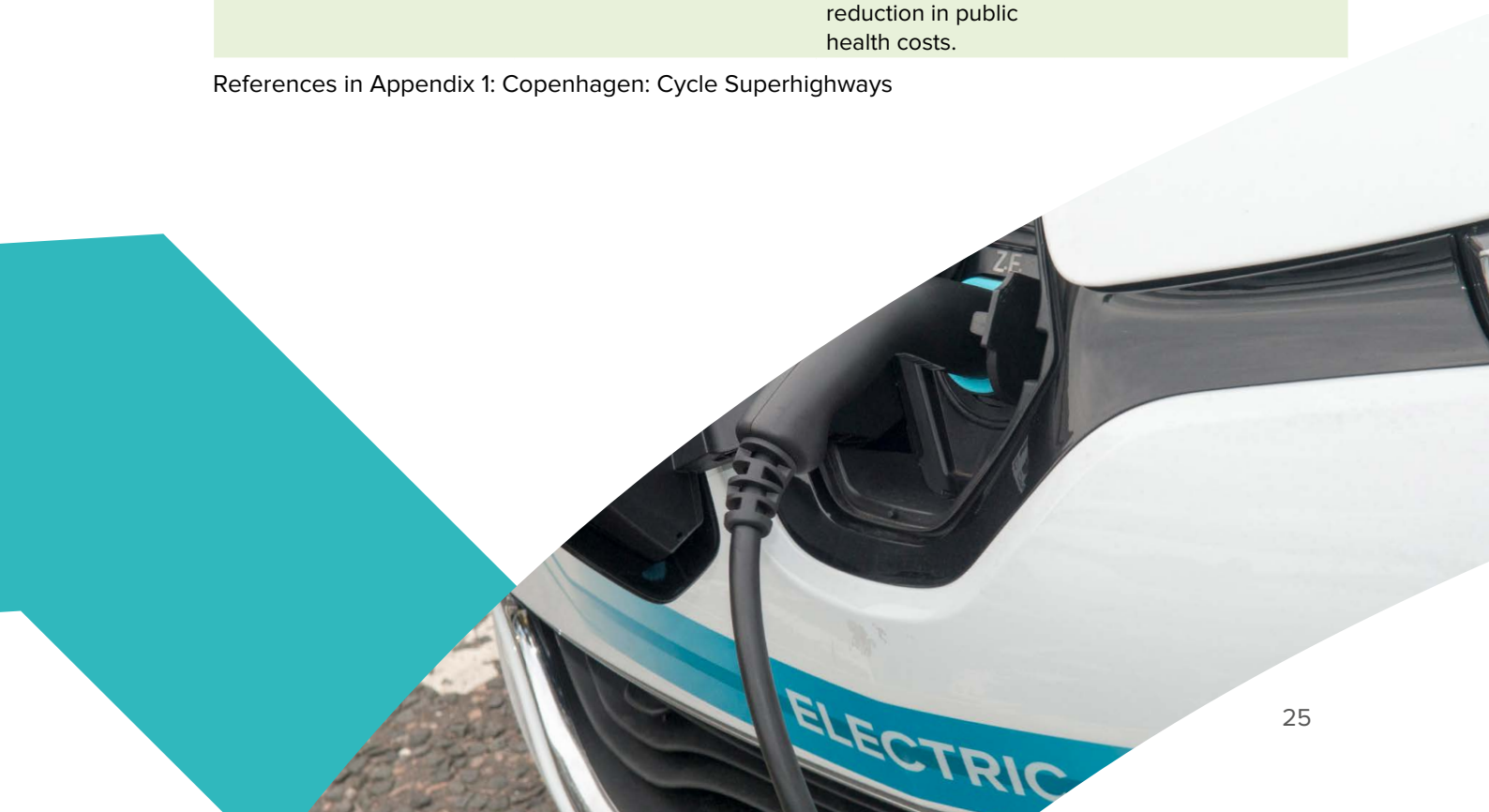
NET CARBON ZERO - CITY

Name of Project	Strategic Infrastructure Goal	Nature of Collaboration	Investment
Establishment of electric charging points, linked to renewable energy source and car clubs.	Sustainable Mobility.	ACC, SSE, central government.	Investment in charging points across the city.
Environment Benefit	Social Benefit	Health Benefit	Economic Benefit
Reduction in CO ² emissions.	Sharing of transport; inclusive access for communities.	Reduction in fossil fuels will improve air quality and support healthier outcomes.	Improved access to jobs, further education for all communities; local jobs in low carbon sector.

References in Appendix 1: Aarhus: City halves emissions – carbon neutral by 2030; Halden: Sustainability mobility meets the sharing economy – sustainable transport

Name of Project	Strategic Infrastructure Goal	Nature of Collaboration	Investment
Active travel superhighways.	Sustainable Mobility.	ACC, Aberdeenshire Councils, NESTRANS.	Extend Kilometres of walkways and cycle paths across Council areas.
Environment Benefit	Social Benefit	Health Benefit	Economic Benefit
Annual reduction in CO ² and NOx emissions.	Fewer car journeys, time spent in traffic.	Increase in cycle journeys and footfall will lead to increased health benefits and reduction in public health costs.	Reduced congestion leading to increased economic benefits.

References in Appendix 1: Copenhagen: Cycle Superhighways



NET CARBON ZERO - CITY

Name of Project	Strategic Infrastructure Goal	Nature of Collaboration	Investment
New ESCO providing information and advice to Aberdeen residents with the opportunity to purchase electricity from renewable and low carbon sources, more control over prices, any profits reinvested.	Clean Energy Supply.	ACC, AH&P; SSE; Community Groups.	Establishment of a new ESCO, "AberdeenCleanPower", organisation – scope, investment value and ROI to be identified.
Environment Benefit	Social Benefit	Health Benefit	Economic Benefit
Reduction in CO ² emissions.	Tackle social inequalities in accessing energy efficiency.	Energy primarily sourced from green energy sources reducing requirement for fossil fuels.	Creation of local jobs and reinvestment of any profits.

References in Appendix 1: San Francisco: Green Energy Programme; Barcelona: Fueling a renewable transition while empowering citizens generation

Name of Project	Strategic Infrastructure Goal	Nature of Collaboration	Investment
TECA – investment in energy centre and expansion of heat network.	Clean Energy Supply.	ACC, Operators, central government, Aberdeen Airport.	Investment in energy centre to support expansion of heat network to adjacent commercial properties, Aberdeen Airport and other large heat users.
Environment Benefit	Social Benefit	Health Benefit	Economic Benefit
Reduction in CO ² emissions.	Reduced heating costs and local jobs.	Reduction in fossil fuels will support healthier outcomes.	Creation of locally based jobs; revenue stream reinvested.



NET CARBON ZERO - CITY

Name of Project	Strategic Infrastructure Goal	Nature of Collaboration	Investment
Sign up to Net Zero Carbon Buildings Declaration – mandate zero-carbon new build homes and non-domestic properties – by reducing energy demand, use renewables, or pay into a locally managed carbon offset fund; more stringent monitoring and data management.	Building Energy Efficiency.	UK wide local authorities; Developers.	Investment in low carbon materials, renewables, carbon offset fund.
Environment Benefit	Social Benefit	Health Benefit	Economic Benefit
Reduction in CO ² emissions.	Carbon offset funds invest in projects in schools, social housing.	Reduction in greenhouse gases.	Savings in energy bills; significant carbon offset fund.

Reference in Appendix 1: London: Net zero builds put London ahead of the pack

NET CARBON ZERO - CITY

Name of Project	Strategic Infrastructure Goal	Nature of Collaboration	Investment
City Centre Regeneration – Traffic management measures and network improvements leading to pedestrianisation and cycling opportunities accompanied by a 20% reduction in traffic demand.	Sustainable Mobility.	ACC, City Centre stakeholders	Significant levels of investment in infrastructure.
Environment Benefit	Social Benefit	Health Benefit	Economic Benefit
Annual reduction in CO ² and NOx emissions; contribution towards Low Emission Zone.	Fewer car journeys, time spent in traffic.	Increase in cycle journeys will lead to increased health benefits and reduction in public health costs.	Reduced congestion leading to increased economic benefits.

Name of Project	Strategic Infrastructure Goal	Nature of Collaboration	Investment
Energy from Waste Plant will take non-recyclable waste from three councils, burn it cleanly to EU emissions standards and energy will be used to power district heating system.	Sustainable Waste Management.	ACC, Aberdeenshire Council, Moray Council.	Investment in Energy Waste Plant from three Councils.
Environment Benefit	Social Benefit	Health Benefit	Economic Benefit
Reduction in CO ² emissions.	Address fuel poverty issues for many households.	Better air quality.	Creation of new jobs.



NET CARBON ZERO - CITY

Name of Project	Strategic Infrastructure Goal	Nature of Collaboration	Investment
Low carbon concrete and other materials (utilising captured carbon).	Building Energy Efficiency.	ACC, construction companies, government	Investment in conversion to low carbon concrete – investment value and ROI to be identified.
Environment Benefit	Social Benefit	Health Benefit	Economic Benefit
Reduce CO ² emissions.	Local employment opportunities in green infrastructure.	Reduction in CO ² will positively impact on climate change with knock effects on health.	Local production of low carbon concrete will support the local economy.

Reference in Appendix 1: Honolulu: utilizing captured carbon from concrete – Low Carbon Concrete

Name of Project	Strategic Infrastructure Goal	Nature of Collaboration	Investment
New build of 2000 houses to gold standard – low carbon materials; energy efficiency.	Building Energy Efficiency.	ACC, developers, local supply chain; central government; corporates; University.	Investment in new build to requisite standard.
Environment Benefit	Social Benefit	Health Benefit	Economic Benefit
Reduce CO ² emissions.	Fit for purpose homes – equitable and inclusive.	Homes are of highest standard resulting in health outcomes.	Wholelife costs may be cheaper than conventional build; support local supply chain.



NET CARBON ZERO - CITY

Name of Project	Strategic Infrastructure Goal	Nature of Collaboration	Investment
Aberdeen City Wide Forest Credit Programme – planting of trees across the city on public land.	Adaptable to climate change.	ACC, Corporates – especially oil and gas to support community groups, schools, SG agencies, third sector.	Investment in trees across the city and along the shore line based on carbon pricing.
Environment Benefit	Social Benefit	Health Benefit	Economic Benefit
City wide tree planting to improve air quality, manage excess water and will offset carbon, supporting Aberdeen’s path to net zero carbon.	Work with local schools, citizens through community groups to put in place tree planting schemes.	Reduction in fossil fuels, improved health and well-being to support healthier outcomes.	Establish ecosystem credits for improvements in flooding, stormwater damage.

Reference in Appendix 1: Austin: City Forest Credit Programme – urban reforestation programme

Name of Project	Strategic Infrastructure Goal	Nature of Collaboration	Investment
Green social spaces to guard against flooding.	Adaptable to climate change.	ACC, Aberdeen Harbour, Central Government.	Investment in elevated open spaces along the shoreline, value to be identified.
Environment Benefit	Social Benefit	Health Benefit	Economic Benefit
Greater capacity to retain stormwater; increased bio diversity.	More open, accessible green space for residents.	Improved air quality, more green space for citizens.	To prevent long term flooding damage to the city.

Reference in Appendix 1: Boston: Green, social spaces guard against coastal flooding



NET CARBON ZERO - CITY

Name of Project	Strategic Infrastructure Goal	Nature of Collaboration	Investment
Sustainable Drainage System	Adaptable to climate change.	ACC, Scottish Water	Investment in natural flood management, moving away from hard infrastructure.
Environment Benefit	Social Benefit	Health Benefit	Economic Benefit
Greater capacity to retain stormwater; increased bio diversity.	More open, accessible green space for residents.	Improved air quality, more green space for citizens.	To prevent long term flooding damage to the city.



CLIMATE POSITIVE CITY

Name of Project	Strategic Infrastructure Goal	Nature of Collaboration	Investment
Establishment of hydrogen production, storage and distribution hub in ETZ for city (Phase 1), UK transport (rail, road, maritime) (Phase 2) and export globally (Phase 3).	Clean Energy Supply.	Central government; Scottish Enterprise; Corporates.	Initial investment to support development of infrastructure. Further significant investment required as project develops through the phases.
Environment Benefit	Social Benefit	Health Benefit	Economic Benefit
Reduce CO ² emissions and NOx emissions.	Support sustainable economic and inclusive approach to economy.	Reduction in exposure to particulate matter and will improve air quality.	Global energy cluster; benefit local supply chain, creation of jobs and new skills in low carbon sector, drive renewable economy.

Name of Project	Strategic Infrastructure Goal	Nature of Collaboration	Investment
Offshore Wind Production and Manufacture Hub	Clean Energy Supply	ACC, Corporates, Funders.	Investment in design, development and construction.
Environment Benefit	Social Benefit	Health Benefit	Economic Benefit
Reduction in CO ² levels.	New jobs in low carbon sector.	Supports shift to clean energy with corresponding health benefits	Making use of blue economy to create new jobs, innovative funding, support international supply chain.



CLIMATE POSITIVE CITY

Name of Project	Strategic Infrastructure Goal	Nature of Collaboration	Investment
Establishment of Carbon Capture Use and Storage and hydrogen, where applicable – dependent on carbon storage from St Fergus projects.	Clean Energy Supply.	Central government; corporates.	Significant – requiring central government support.
Environment Benefit	Social Benefit	Health Benefit	Economic Benefit
Reduce CO ² emissions and NO _x emissions	Support sustainable economic and inclusive approach to economy.	Reduction in exposure to particulate matter and will improve air quality.	Global energy cluster; benefit local supply chain, creation of jobs and new skills in low carbon sector, drive renewable economy.

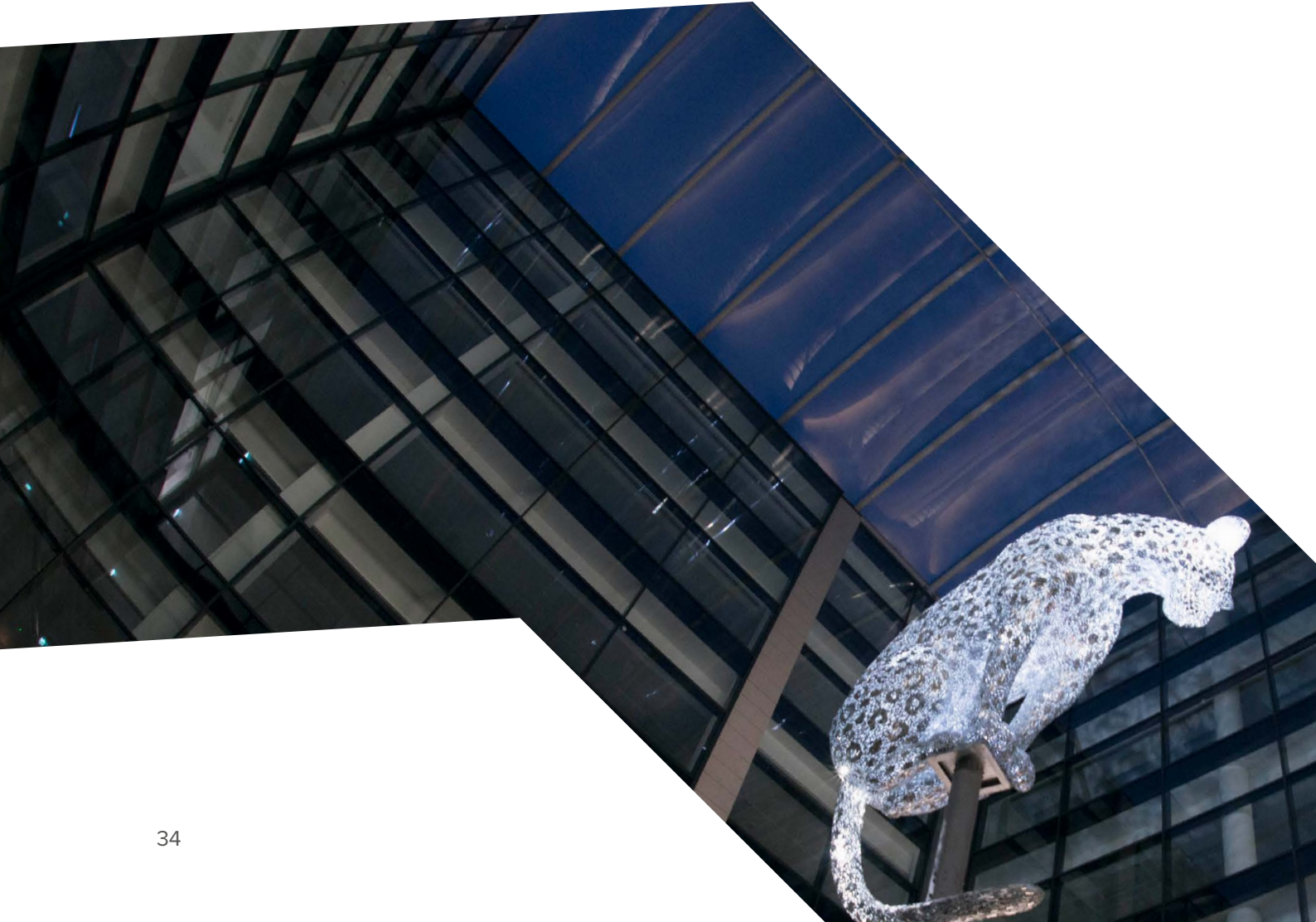
Name of Project	Strategic Infrastructure Goal	Nature of Collaboration	Investment
Shore to Ship Electrification	Clean Energy Supply.	ACC, SSE, central government.	Investment in infrastructure to be identified.
Environment Benefit	Social Benefit	Health Benefit	Economic Benefit
Greater use of renewable energy reduction in CO ² emissions.	N/A	Reduction in pollutants.	Diversification of maritime sector to hybrid powered shipping



CLIMATE POSITIVE CITY

Name of Project	Strategic Infrastructure Goal	Nature of Collaboration	Investment
Unblocking Grid Supply Points – a number of grid supply points are blocked or are in danger of being blocked in East area – challenges in connecting new generation to the grid network.	Clean Energy Supply.	ACC, SSE, central government.	Investment to be identified.
Environment Benefit	Social Benefit	Health Benefit	Economic Benefit
Greater use of renewable energy reduction in CO ² emissions.	Reduction in fossil fuel energy.	Reduction in pollutants.	National network fit for renewable purpose.

Reference: Regen Report – Distribution Generation and Demand Technology Growth to 2032



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