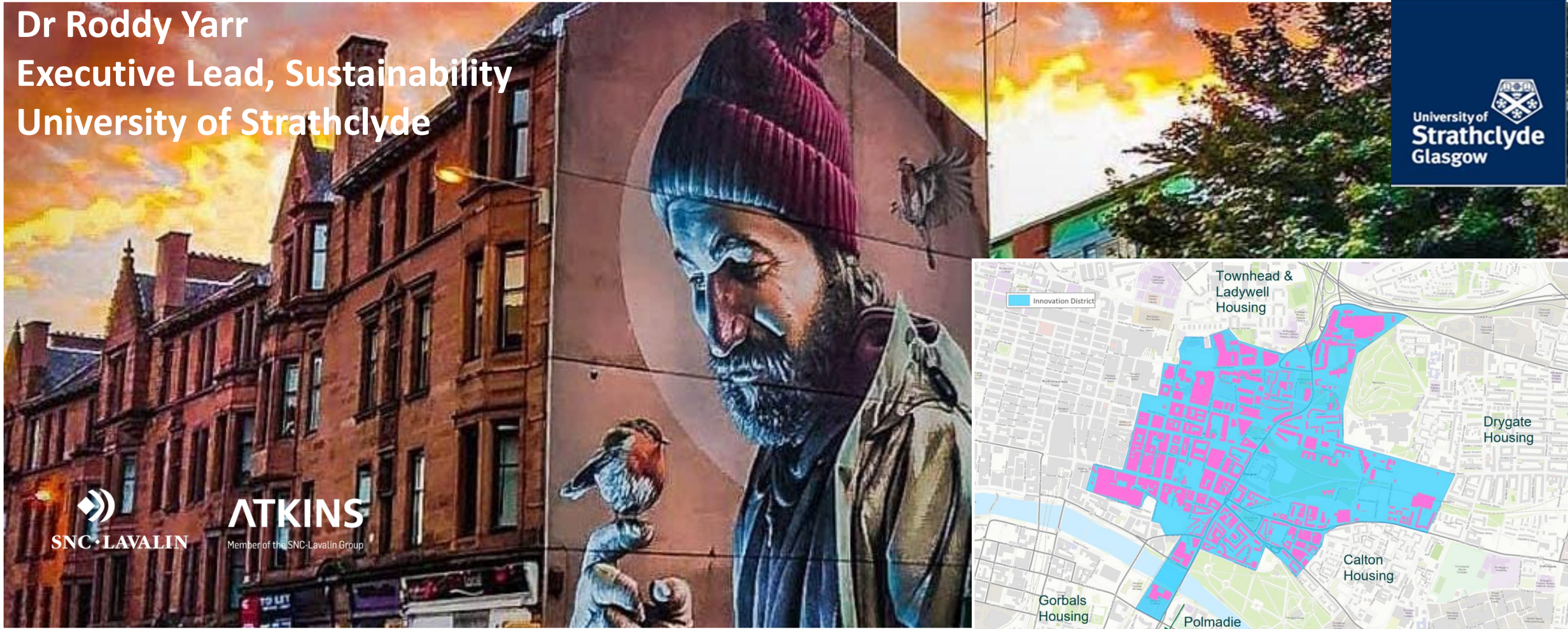


Dr Roddy Yarr
Executive Lead, Sustainability
University of Strathclyde



Using a Whole Systems Approach to Deliver 'At Scale' Climate Action Projects – Climate Neutral Districts

2nd May 2023



Strategic Context

- UK and Scottish climate targets are mandatory (Climate Change (Scotland) Act 2009 and revisions)
- Climate Emergency declared in Summer 2019 by UK and Scottish Government
- Energy crisis has recently doubled University utility bills to add to the cost of operations
- University estate requires significant investment in order to meet decarbonisation and climate targets on top of existing capital and revenue investment plans (backlog buildings maintenance)
- New or revised funding models needed to enable a transition
- Markets want to deploy capital which is more 'patient'
- Expectation of action from stakeholders



- Scottish Government has set target of **Net Zero emissions by 2045** (5 years ahead of RUK)
 - Large organisations are legally bound to meet certain targets – this includes Universities
 - Public Sector is expected to lead
 - Where emissions are unavoidable we are expected to have an offset strategy, incl. carbon sinks
 - Even with maximum use of renewables some emissions inevitable
- Additional Intermediate targets are set in **Scotland's Climate Change Action Plan**:
 - This is updated every 5 years and adjusted to help ensure the 2045 target is achieved
 - For example: 'On track to achieve **75% reduction in Greenhouse Gas Emissions compared to baseline by 2030**

UK Economic Focus is on a Clean Growth Strategy

- *“To achieve the clean growth we want, the UK will need to nurture low carbon technologies, processes and systems that are as cheap as possible.*
- *It is only through innovation that we will see new technologies developed and the cost of clean technologies come down.”*

(BEIS, now called Department for Energy Security and Net-Zero)

- ...“Such pilot schemes would allow robust integrated systems analysis to be undertaken through monitoring and testing of innovative combinations of technologies, business models, and user behaviour, and provide a basis for learning by doing. “

(Royal Academy of Engineering)



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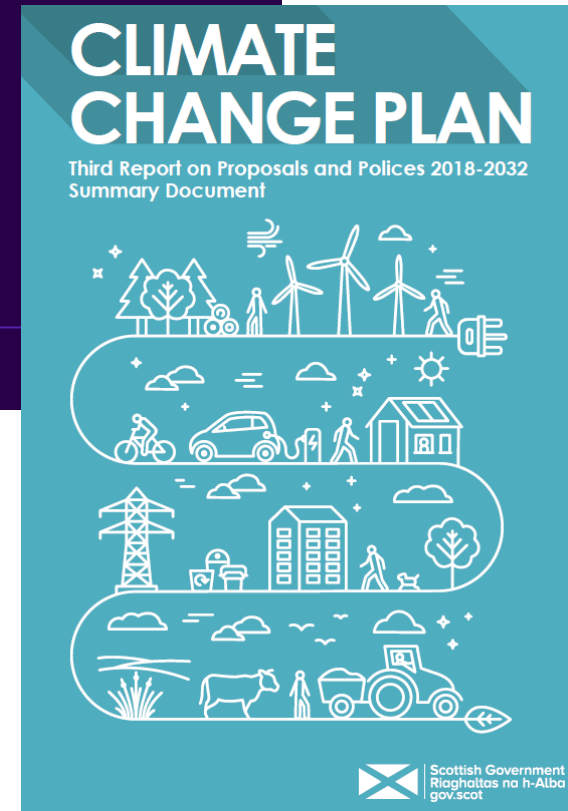
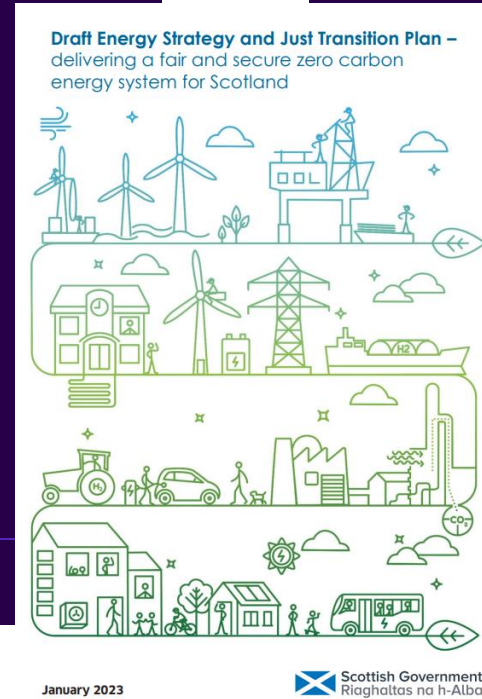
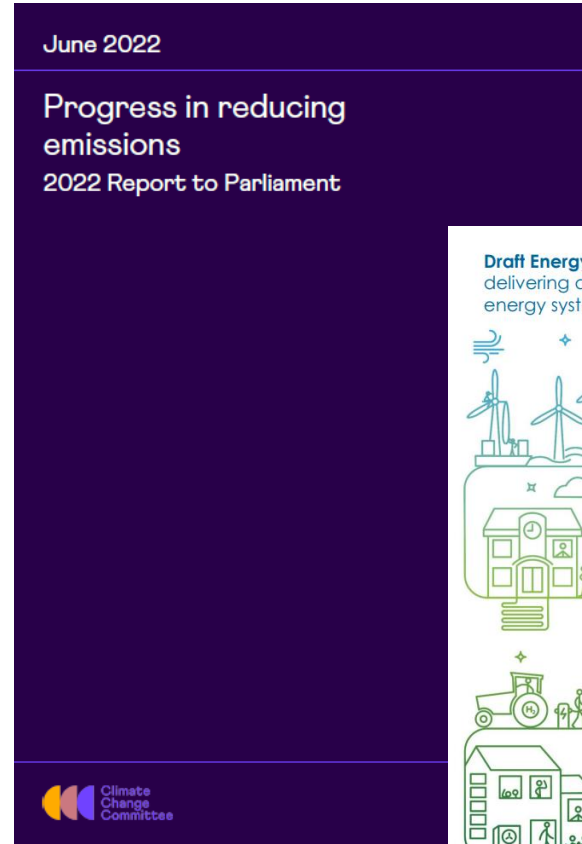
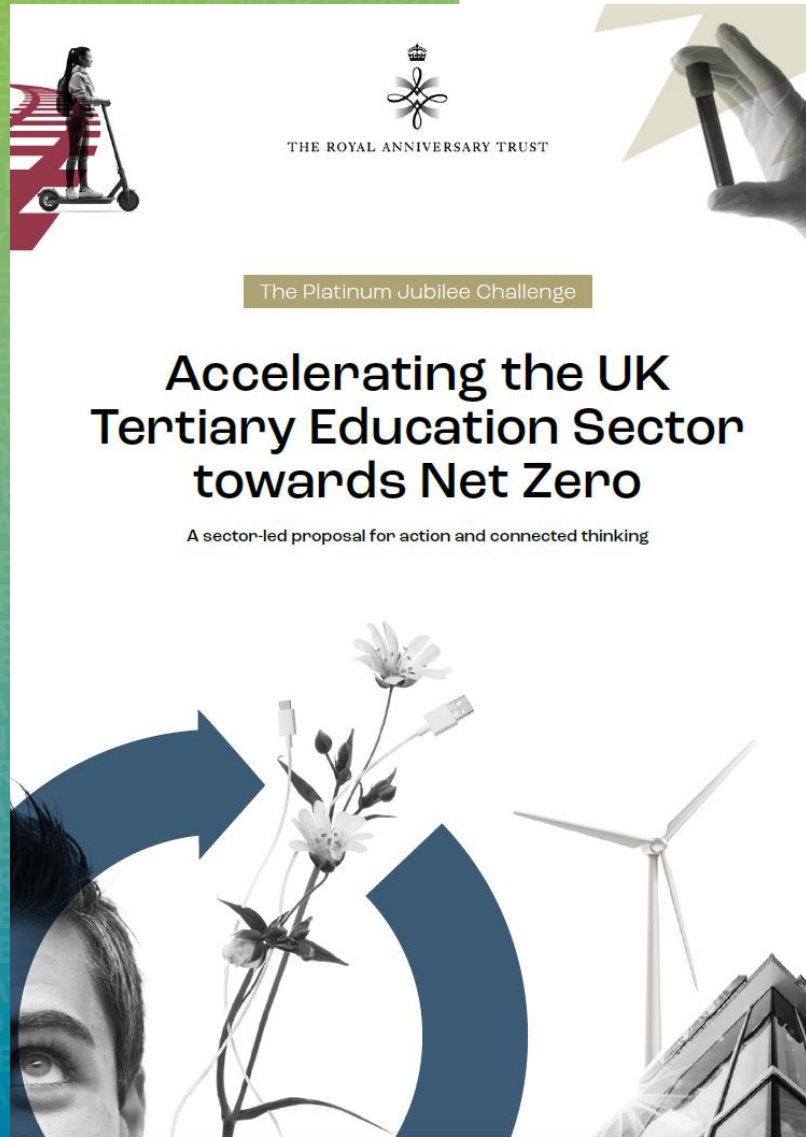
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Climate Change (Scotland) Act 2009

- What it includes.....
 - Greenhouse Gas reduction via a Just Transition
 - [Adaptation to climate change](#)
 - Supporting [decarbonisation in the public sector](#)
 - Engaging with [business and industry on decarbonisation](#)
 - Engaging the public and encouraging people to move towards [low carbon living](#)
 - [Supporting communities](#) to tackle climate change
 - Leading [international action on climate change](#)
 - Supporting developing countries to tackle climate change through the [Climate Justice Fund](#)
 - Jointly administering the [UK Emissions Trading Scheme \(UK ETS\)](#) alongside the UK Government, Welsh Government and Northern Ireland Executive. Read [more information](#)
 - Keeping track of how efficiently nitrogen is being used through a national-scale [Scottish Nitrogen Balance Sheet](#)
 - Delivering a [just transition](#), by working with communities, business, industry and the people of Scotland to plan for our net zero future

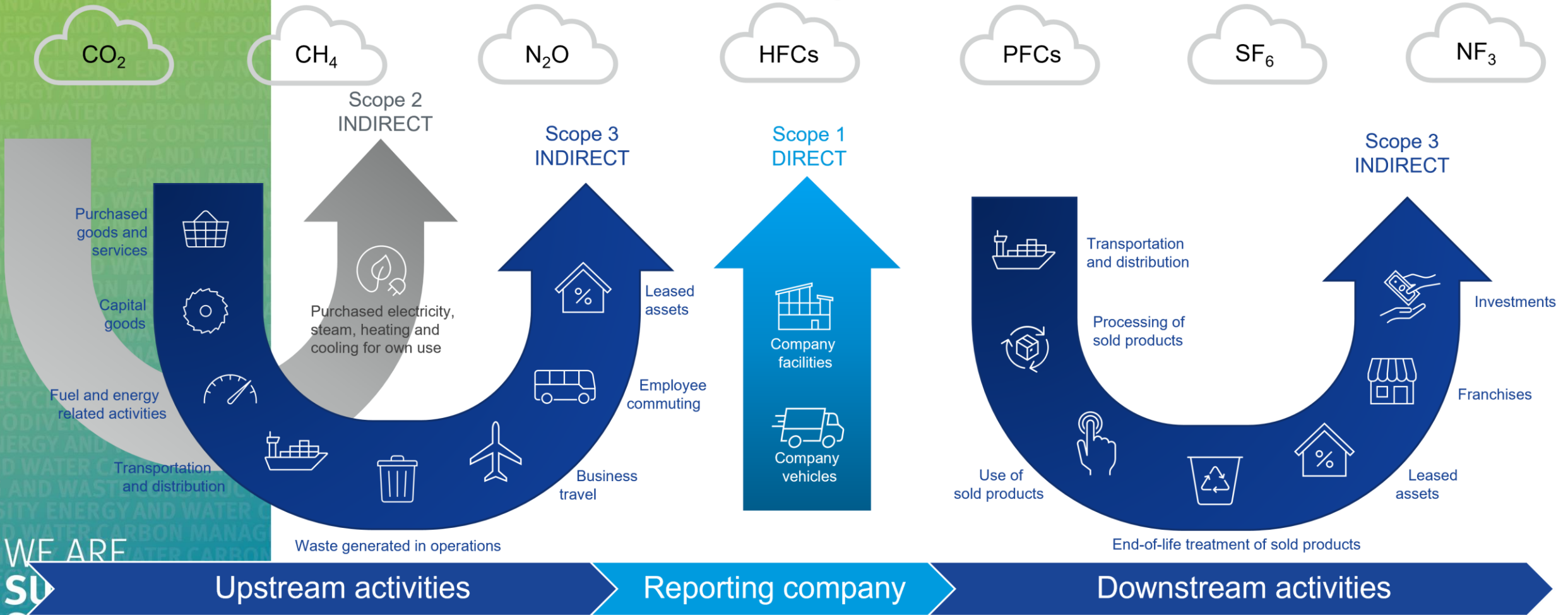
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Policies Evolving and Guidance Networks Developing



- UK and Scottish climate targets applicable
- Sector wide HE and FE collaborative approach emerging
- Mandatory emissions reporting across all areas of sustainability

Understanding Greenhouse Gas Emissions 'Scopes'



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How do we measure performance?


- All Public Sector Organisations must report emissions, and how we will move towards Net Zero
- This is calculated via:
 - Scope 1 = direct emissions (burning of fuels and greenhouse gases emissions/leaks)
 - Scope 2 = indirect emissions arising from the generation of purchased energy (gas & electricity and use of company vehicles)
 - Scope 3 = all other emissions caused by our activity which covers staff and students
- This is achieved by reducing all emissions as much as possible, and implementing methods to absorb greenhouse gases from the atmosphere.



Examples

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A global hub for entrepreneurship, innovation and collaboration. Anchored by the University of Strathclyde and centred on Glasgow's thriving Merchant City.

The District is home to innovative companies and organisations, who locate here to nurture and accelerate inclusive growth, improve productivity and develop world-class talent, research and technology within a vibrant 'live, work, play and innovate' environment.

1A Technology and Innovation Centre
23,900 sq m of mixed research and innovation space & conference/meeting facilities, University of Strathclyde.

1B Inovo
5,000 sq m of innovation space, University of Strathclyde.

1C TIC West
£50m - 10,000 sq m of innovation space with planning consent.

1D TIC East
£100m - 20,000 sq m of mixed research and innovation space.

2 Tontine - Business Accelerator
3,000 sq m of scale-up space, plus conference facilities, Glasgow City Council.

3 The Garment Factory
4,456 sq m of innovation/creative space, Castleforge Partners.

4 Candleriggs Square
Mixed use development, including hotels, offices, residential flats, retail and restaurants, Glasgow City Council.

5 Merchant Point
Private developer in for pre-application discussions for 301 "Build to Rent" apartments.

6 George Street /Martha Street
2,228 sq m, 54 apartments 375 beds, Chris Stewart Group

7 The Met Tower
9,290 sq m of offices, planning submitted, private ownership.

8 Meat Market
8A 250 residential units. 18,013 sqm of mixed hotel, office and industrial space.
8B Planning within City Deal Strategic plan, Glasgow City Council

9 Collegelands
9A 90,000 sq ft offices, let: 588 + 243 student beds, 1,170 space multi storey car park and a MOXY Hotel.
9B Development opportunities for offices and student residential. Private Developer.

10 Get Living High St
Planning permission granted.
New public square, 99 student studios, 700 new homes and approximately 3,365 sq m of leisure, food and drink and commercial business.

Our partners



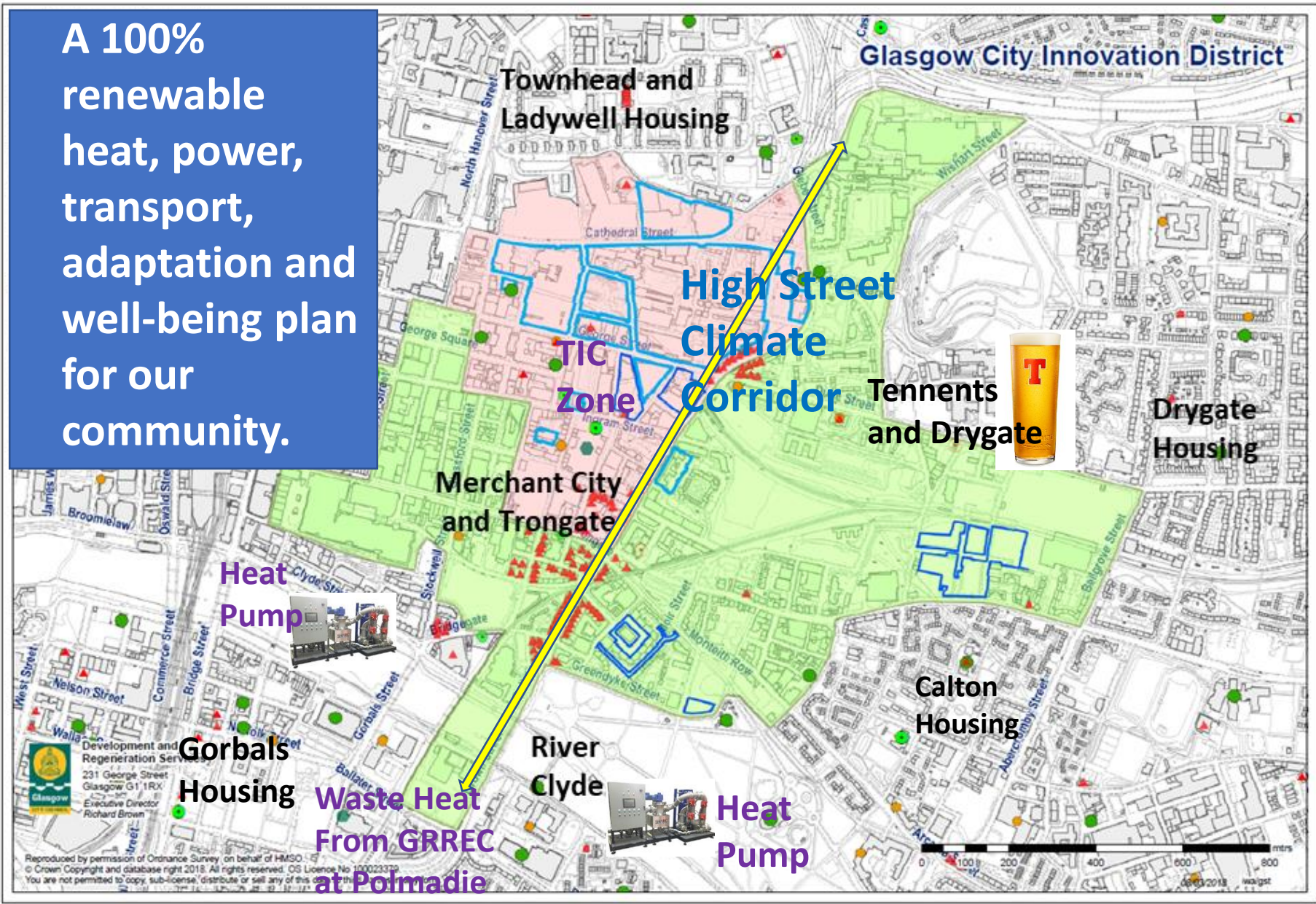
Entrepreneurial Scotland...

Correct as of June 2020

- THE DISTRICT
- UNIVERSITY OF STRATHCLYDE
- Completed developments
- Development sites

What is A Climate Neutral District?

A 100% renewable heat, power, transport, adaptation and well-being plan for our community.



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And What is Climate Neutral?

1. CO₂ Fossil fuel emissions

CO₂ emissions shall be prioritised – heat from the Clyde, sewerage, industrial, ground source, deep mine heat, transport, active travel, LEZ

2. CO₂ Removal (using green infrastructure, tree planting)

CO₂ removal should be implemented via mechanisms such as green infrastructure, tree planting, green space

3. Non-CO₂ emissions, focusing on CH₄ and N₂O

Mitigation of the non-CO₂ emissions shall be factored into project lifetime carbon emissions where relevant.

4. Climate risk assessment and adaptation measures

Aligning carbon neutral measures with the impacts of climate change to ensure resilience of city communities, health and well being.



Whole Systems Approach - two definitions for climate

The whole system approach includes all contributing physical and natural resources, people, data, policy, commercials and funding, health and well being, skills and behavioural elements and their interdependencies in responding to climate change.



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A 100% renewable heat, power, transport, adaptation and well-being plan for our community.

People with good ideas



Use natural resources and collective drive



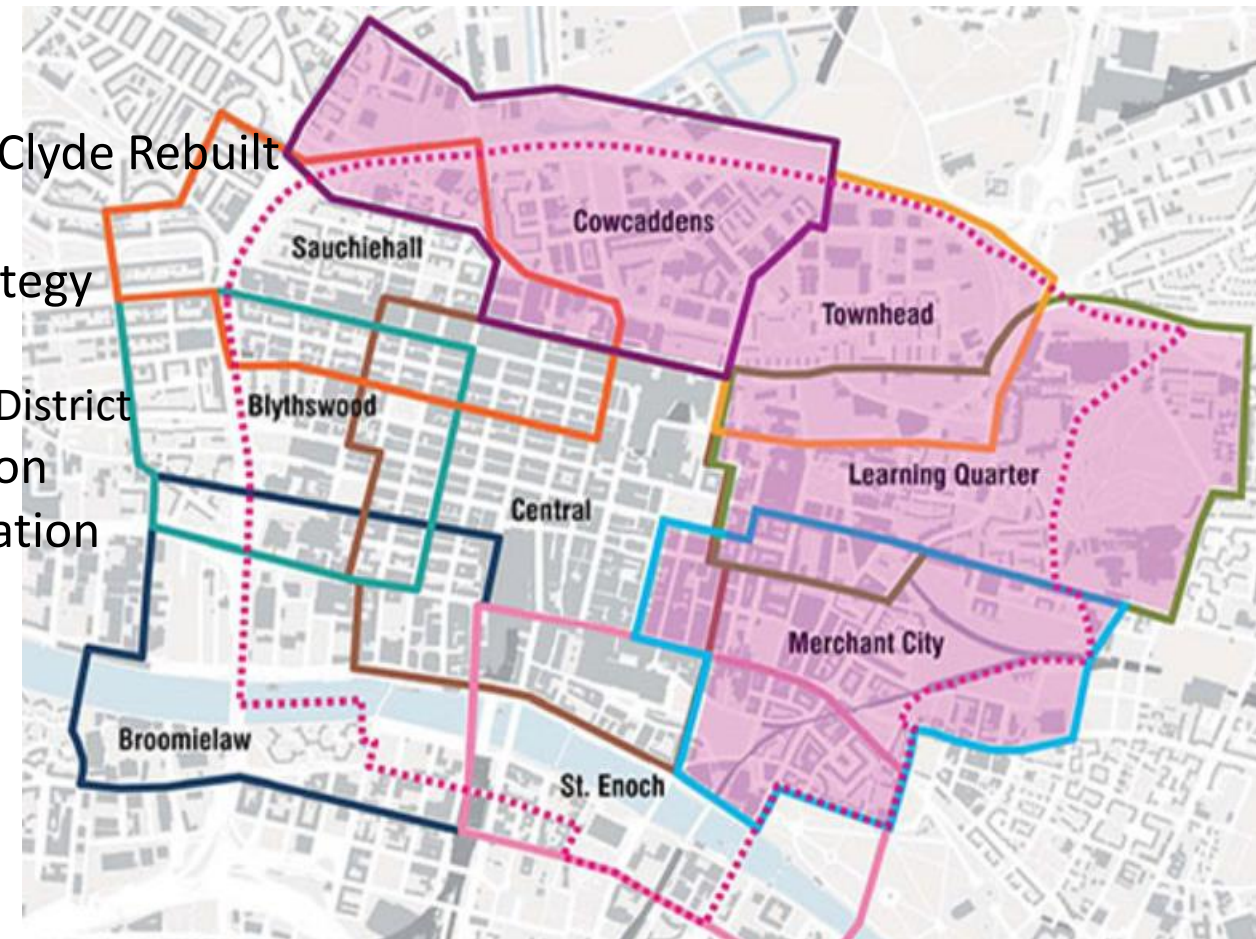
Climate action and social inclusion

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City Linkages in Glasgow – planning infrastructure to tackle net zero

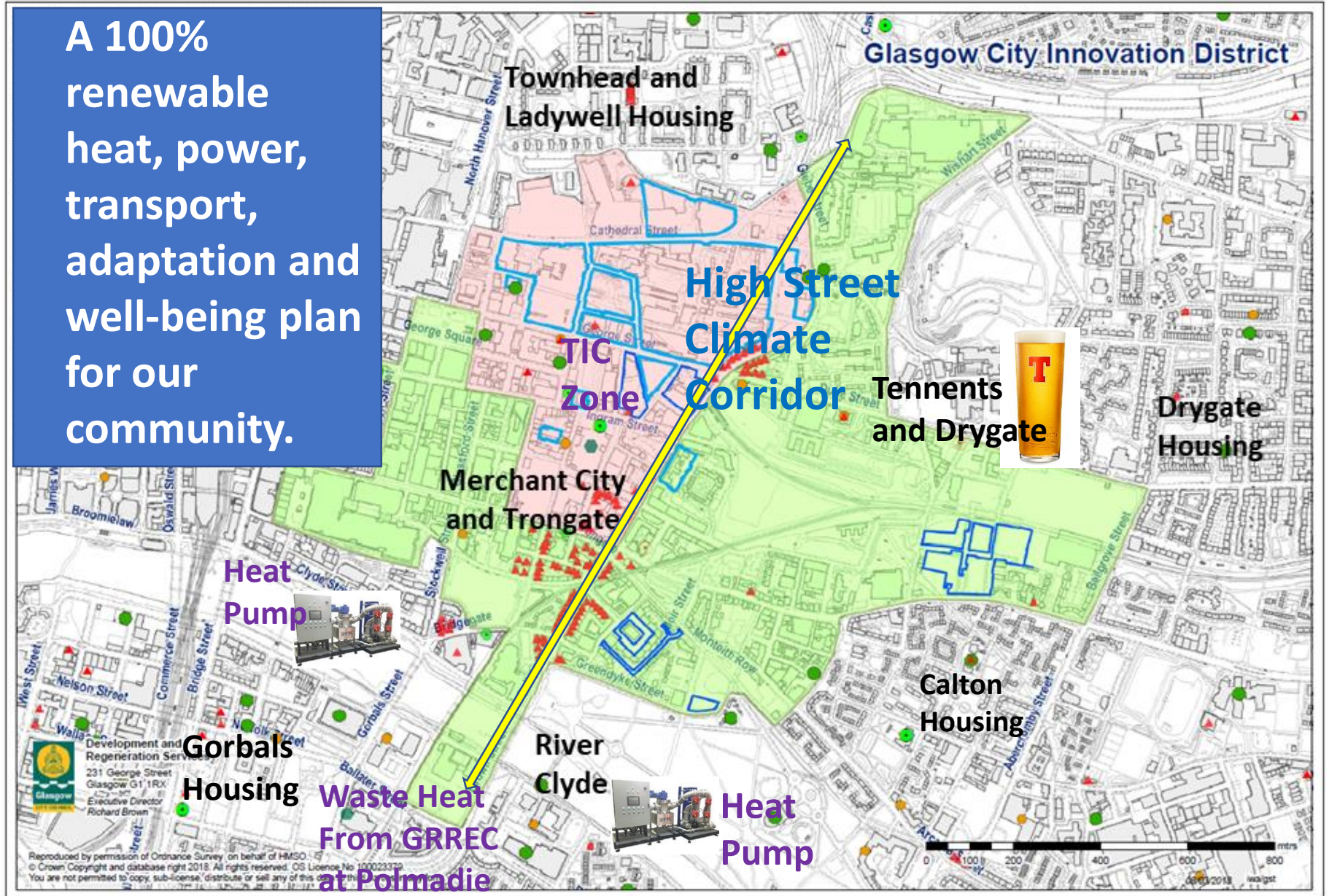
- City wide developments
- Local Heat and Energy Efficiency Strategy (LHEES)
- DRFs
- City Deal ‘Avenues’ project
- City Centre Strategy 2035
- Clyde Waterfront, Clyde Mission, Clyde Rebuilt
- High Street regeneration
- City and Regional Adaptation Strategy
- Clyde Gateway regeneration
 - Green Regeneration Innovation District
- City Transport Strategy consultation
- Connecting Communities consultation
- Connectivity Commission Report
- Park Power – greenspace energy
- Hot Scot – minewater heat
- Waste heat from sewage
- Municipal Drainage Strategy



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The Climate Neutral Innovation District

A 100% renewable heat, power, transport, adaptation and well-being plan for our community.

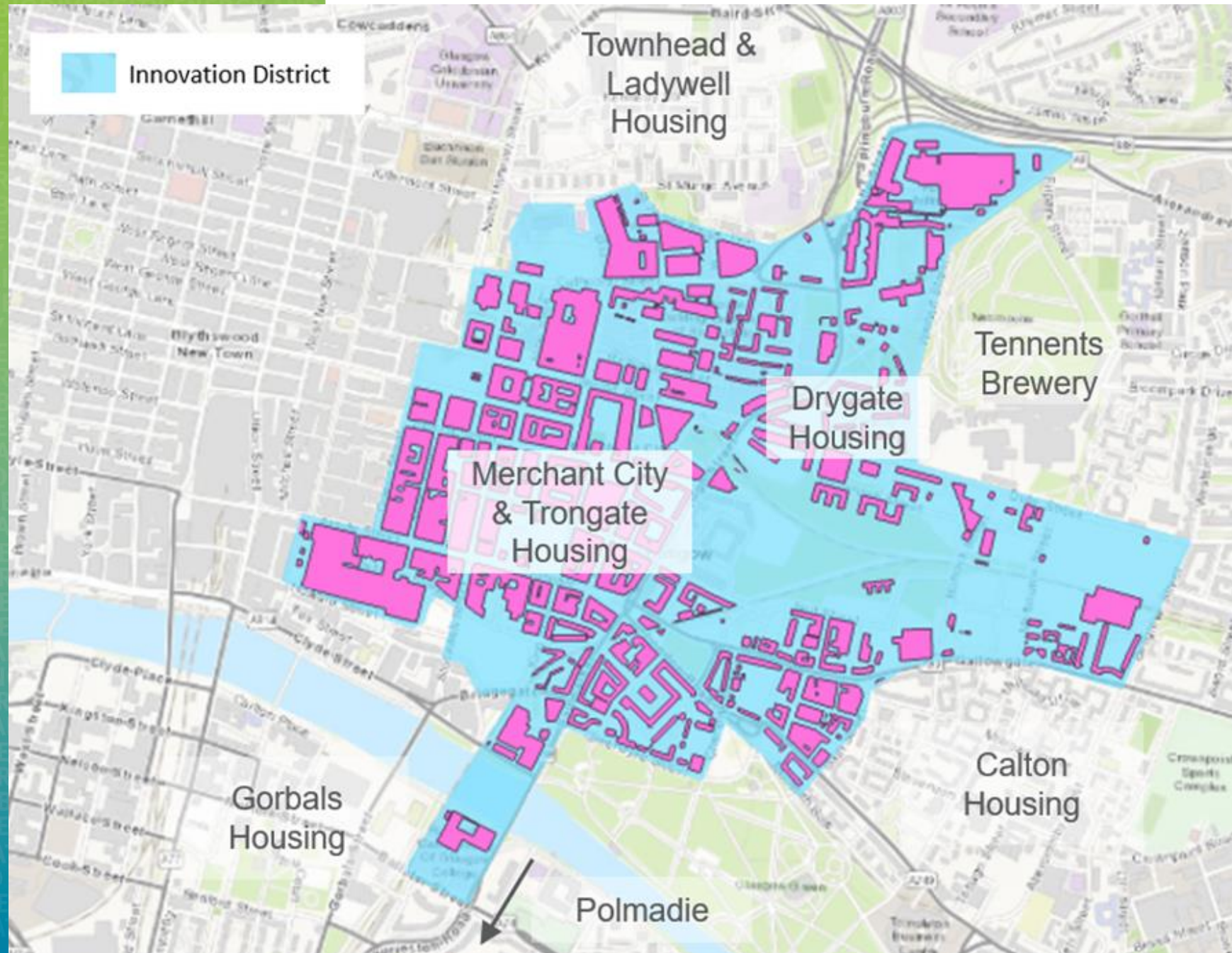


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Scope...



- Buildings and infrastructure are energy carbon neutral and adapted to climate impacts and resilient for communities.
- Integrating with planned development e.g LHEES, Avenues, Clyde Mission, LEZ.
- Affordable heat
- Green Infrastructure – Adaptation, trees and biodiversity.
- Active travel, pedestrians first, access and ‘place making’ at the core of thinking.
- Community health and well being.

Heat Potential in the River Clyde



- 175km long
- 3,250km² catchment
- 10m³/s flow rate over the weir (95%)
- 200MW potential at the weir and pipe bridge, we need 100MW
- Heat discharges added from STWs (circa 20MW)

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Climate corridor vision (Example of High St. Transformation)



High Street today



Is it achievable?



So what work are we doing?

Outputs are in the form of a series of technical reports for each element and an overall report including:

- Prioritised matrix of solutions based on city defined factors e.g. existing plans; emissions reduction, technical integration, deliverability, risk, cost, fundability, operability and whole system integration.
- Cost plans – CAPEX and OPEX with an overall cost model.
- Ranking the solutions and review with partners to agree shortlist to be taken forward for commercial modelling.
- Commercial modelling.
- Finance and Resourcing plan.
- Route Map to delivery.

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Who is doing the work?

- University of Strathclyde
- Glasgow City Council
- Atkins (Lead consultant)
- UK Energy Systems Catapult
- The Weegie Board
 - Star Renewable Energy
 - Comsof
 - Mini Bems
- Ikigai Capital
- Smarter Grid Solutions



Our Steering Group



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What will success look like?

- Solutions identified
- Scale of transformation known
- Commercial options, funding scale
- A 'projectised' framework for deliverability
- Engagement, awareness and support
- Stimulating joined up thinking
- A clearer vision of the path



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The National
Manufacturing
Institute Scotland
- the University's
first energy
carbon neutral (in
operation)
development

Example 2- National Manufacturing Institute for Scotland

3.5km Ambient district heating loop – uses waste heat from STW, circular

An 660kW solar PV roof and car park array and battery storage system

Glulam wood building elements

Heat supply agreement in partnership with Renfrewshire Council, LCI
(Heat Network Fund), Scottish Water

EPC A rated

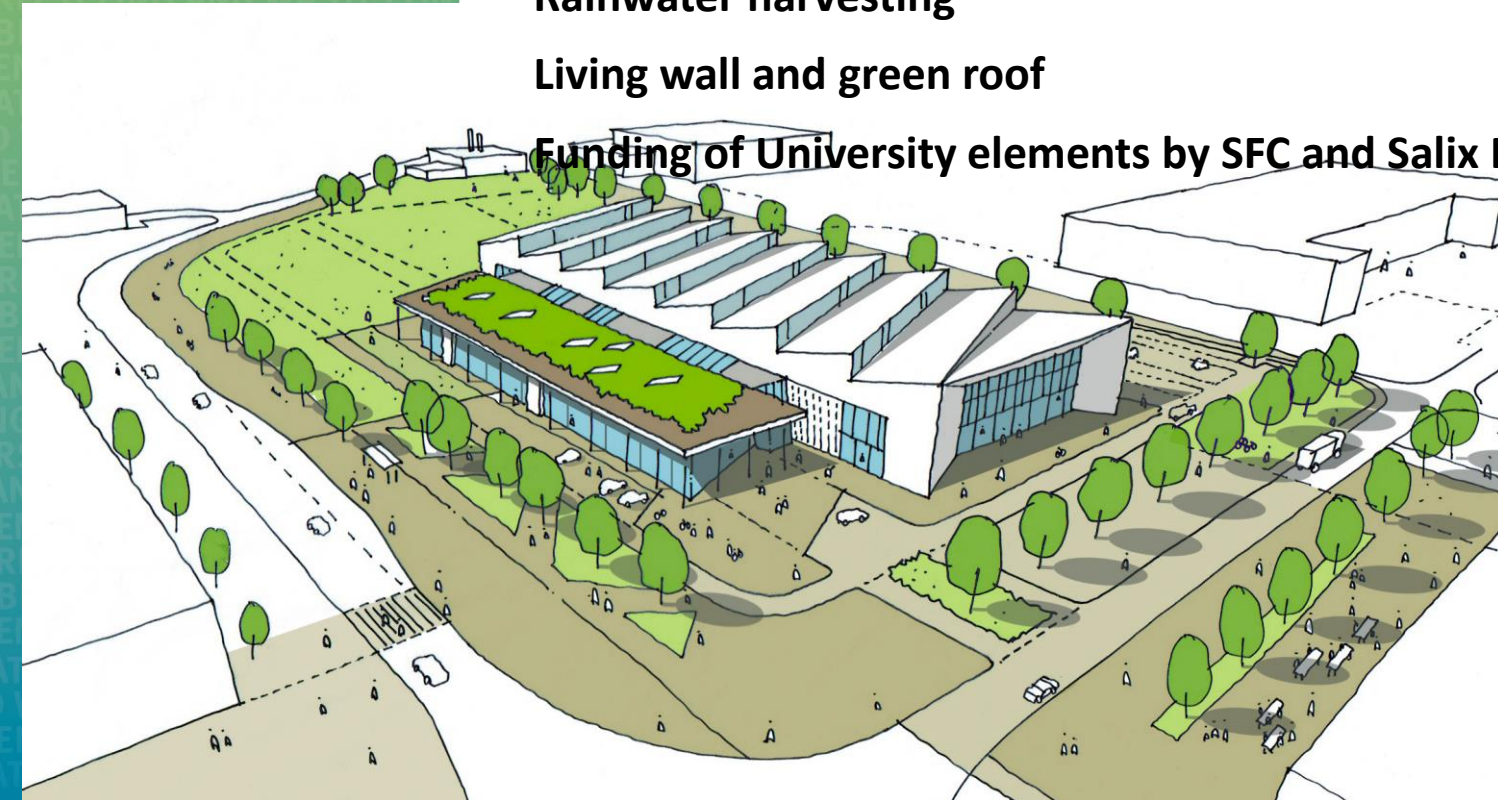
Rainwater harvesting

Living wall and green roof

Funding of University elements by SFC and Salix Finance



Circular waste heat
recovery from Laigh
Park STW



NMIS Construction



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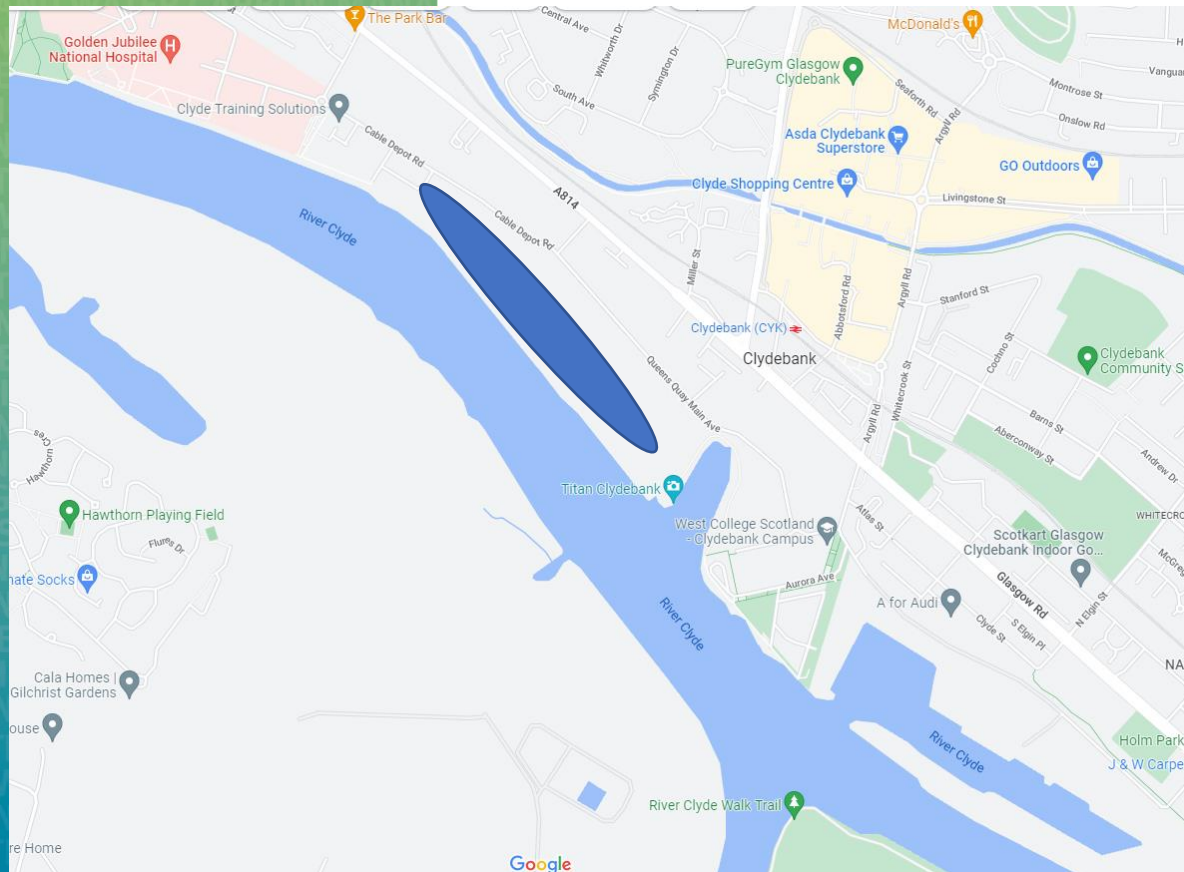
Images courtesy of Currie and Brown

Example 3- Applying this concept across the City Region: Clyde Wind and Solar Energy examples



Project 3 – Cable Depot Road, Queens Quay Heat Pump Asset

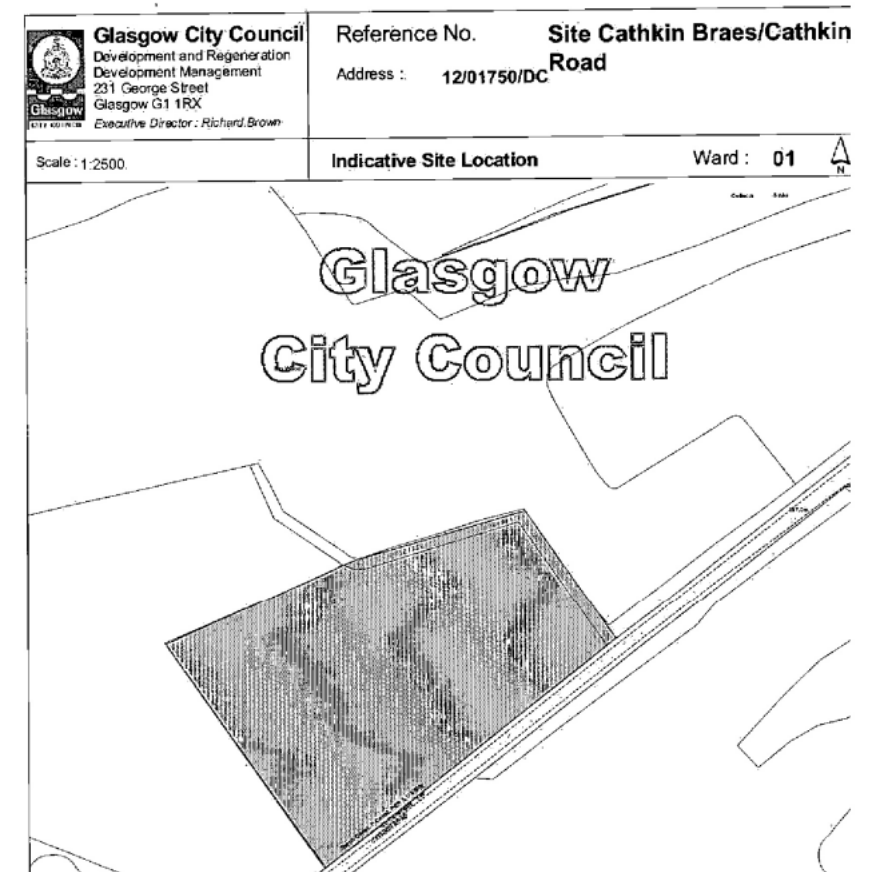
- Aim – to provide a direct wire power and energy storage system to energise the river source heat pump and local network to make it carbon neutral and price resilient for people using the energy.
- **Assess the potential for 3 x 1MW turbines with a tip height of 99.5m**
- **Assess the potential for 1 x 3.5MW wtg with tip height of 163m**
- Located within reach of the Queens Quay site
- Constraints analysis to assess potential impacts and their significance.



Project 5 – The Castlemilk & Carmunnock Community Windpark Trust WTG - extension



- Aim – can this asset be expanded to help provide local generation to local energy assets that need viable and clean power?
- Is there land available to do this?
- **Assess the potential for 3 x 3MW turbines with a tip height of 150m**
- Located within the development site as appropriate or on adjacent land
- Aviation constraints analysis to assess potential impacts and their significance.



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Project 8 – Proposed Vale of Leven Wind Farm

- A proposed 10 x 7MW wind energy development east of Bonhill
- Subject to approval - assess the potential for investment by public sector to secure long term revenue stream
- Subject to planning etc
- A new model of public/private investment for LA and/or City Region?





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Thoughts on Skills and Green Investment

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Context - Potential Green Recovery Opportunities

- Skills gap is also an opportunity for green recovery
 - Local jobs in retrofit for decarbonisation
 - Digital – smart metering and grid services at community scale
 - Green investment in the city and its communities
 - Improved standards and skills to deliver low carbon buildings e.g. Platinum Standard for new build; Passivhaus; Enerphit.
- Infrastructure deployment
 - Construction new and retrofit
 - heat pump deployment at scale
 - pipes in the ground for heat
 - natural rainwater attenuation systems
 - tree planting
 - decentralised energy systems
 - urban realm improvements



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Context - Potential Green Recovery Challenges

- Scale of the challenge
- Capacity and awareness
- Complexity
 - Data acquisition
 - e.g. combining all elements
 - multiple projects already in the pipeline
- Time
 - 2030 working back to 2020/2021
 - Delivery process needs 'projectised'
- Cost
 - Maybe new metrics needed
 - Longer investment timescale
 - Health indicators
 - Wellbeing and quality of life
 - Air quality
 - True cost of carbon £100+/T



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