



LIVERPOOL
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Climate Tech ecosystem mapping

Liverpool City Region

July 2023

sustainable
ventures

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Executive summary

The Liverpool City Region has an ambitious target to invest 5% of GVA into R&D by 2030 - nearly double the national target. Net Zero is a £1.4 trillion, once in a generation investment opportunity that can help LCR to achieve this, delivering on levelling up, environmental targets and ensure the future prosperity of the LCR.

New technologies are required in the UK and globally to enable the decarbonisation required across sectors to meet regional, national and global Net Zero targets and mitigate the catastrophic impacts of climate change. The UK has the opportunity to develop these technologies domestically and benefit not only in terms of Net Zero, but economically through increased productivity and job creation.

However, many UK regions are at risk of missing out on this opportunity, with the number of Climate Tech scaleups in northern cities in single digits compared with 37 across the central belt in Scotland, and over 250 in London, who receive 70% of all UK venture capital (VC) Climate Tech investment.

Furthermore, in 2019, northern universities attracted only 1.8% of early stage venture funding, compared to the 90% that went to the golden triangle. To deliver national levelling up strategy, scaleups are critical as they are, on average, 54% more productive than their peers.

The Liverpool City Region has a number of unique assets and attributes that underpin its strong potential as a future Climate Tech cluster.

- The LCR has long been an industrial hub, supported by its port and logistics infrastructure and high levels of connectivity to the rest of the UK and Europe. This **industrial base** provides significant opportunity for supply chain decarbonisation and the export of regionally developed technologies.
- The region has demonstrated its **capability in building innovation clusters**, as a leader in health and life sciences, digital and creative, and advanced manufacturing in particular. The region is home to innovation campuses that bring sectoral stakeholders together and facilitate collaboration and innovation.

- The region has key strengths in its **talent pipeline**, with 63,000 enrollments in higher education each year and **centres of excellence** in a number of research areas, with particular strengths in science and technology.

This report references examples of successful global Climate Tech clusters alongside local examples of successful cluster building in other sectors. Analysing their success factors, this report examines the Liverpool City Region and its key strengths and opportunities as a prospective Climate Tech innovation hub.

£1.4trn

Is the investment required to deliver Net Zero in the UK alone, offering a critical opportunity for regional productivity growth under the right conditions.

As a result, four priority sectors are identified that should be leveraged as key opportunities to foster local innovation, attract investment and boost economic growth:

Electrification of transport: The Liverpool City Region is a world-leading hub for automotive manufacture and also a leader in research and development in battery technologies. As such, this sector provides significant opportunity to establish the LCR as a global leader in electrification.

Marine and Maritime: The River Mersey has long been a central pillar of the LCR's economy. The arrival of the offshore wind sector and the development of the Mersey Tidal Power project provides the opportunity for the LCR to establish itself on the forefront of coastal green energy.

Sustainable Chemicals: Chemical research and innovation has a long history in the LCR, and will continue to play an important role in Net Zero. The LCR's world-leading assets in this sector have the potential to support countless industries to decarbonise with the appropriate collaboration and investment.

Manufacturing Innovation: Automation and artificial intelligence are among the key toolkits that can support the transition to Net Zero. The LCR is home to unique facilities, namely the STFC Hartree Centre, that can inspire the development of ambitious highly technical solutions across sectors.

Building on regional strengths has been identified as a key factor in the successful growth of innovation clusters. Each of the sectors identified see high levels of regional activity and large local stakeholder networks, which together provide unique opportunities for technology development and deployment at scale to drive improvements in efficiency and reduce environmental impact.

Often, interventions are required to act as a catalyst for innovation, convening relevant stakeholders, providing sector expertise and opening up access to funding to create an environment that supports the inception and growth of ideas.

Different models have emerged for such interventions to foster innovation (See section 1.3), and can generally be categorised by:

Venture Development: Activities that foster the creation and development of solution concepts and often the forming of nascent founding teams.

Venture Support: Often at the early stage, targeted business and commercialisation support to take concepts to investment and/or market readiness.

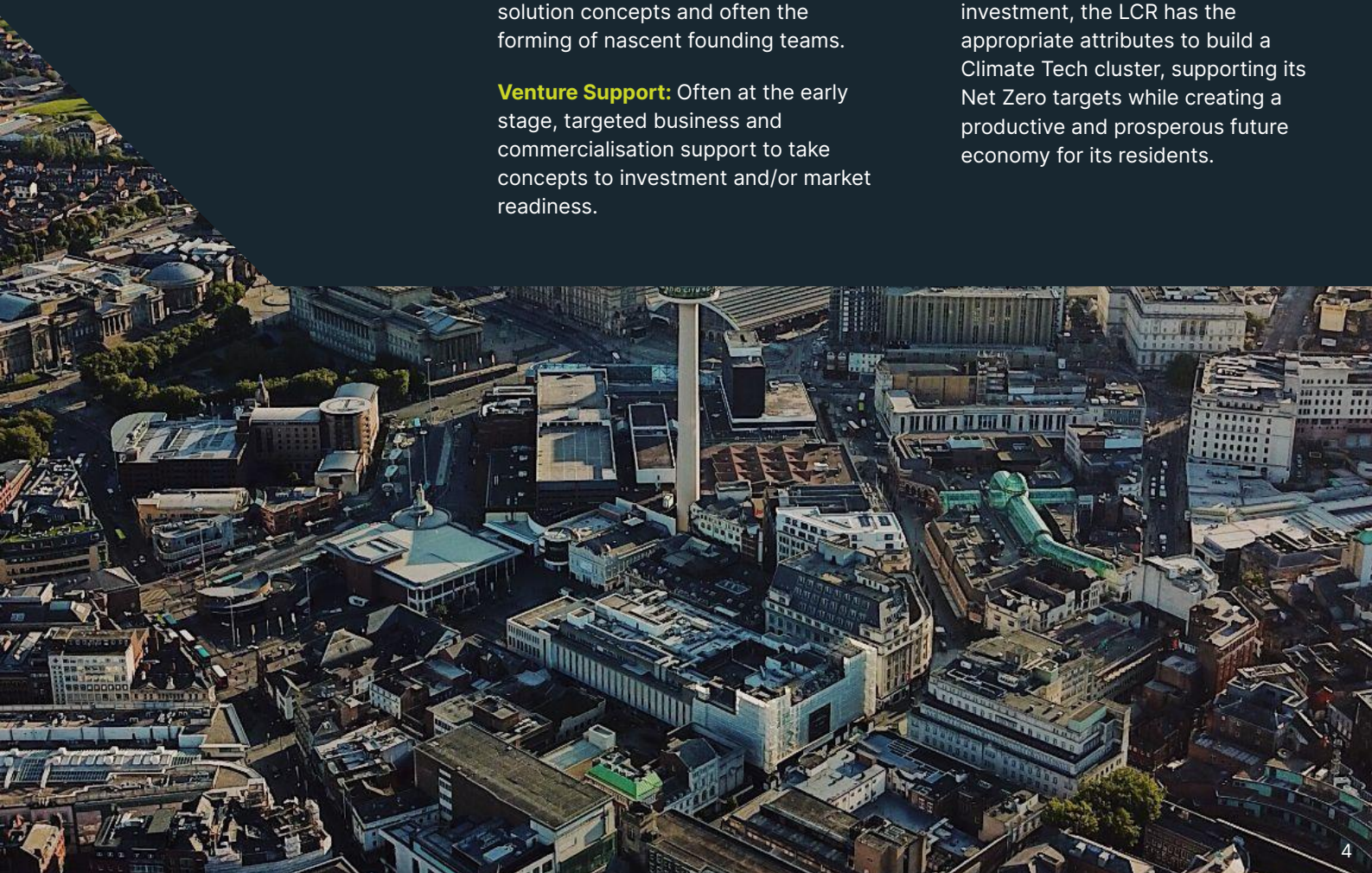
Investment: Equity investment via a number of different individuals and/or organisations from seed stage to series B to fund the development and scale of high potential solutions. This also includes equity accelerators that take a % equity and also provide intensive development support.

Workspace: Office and/or lab space created with the intention of co-locating businesses and entrepreneurs with common interests e.g. at a similar stage or sector, to foster community and collaboration.

Partnerships: Interventions that seek to foster connections between different sector stakeholders that can offer the potential for innovation partnerships and co-design, from pilot testing to large commercial contracts.

This report sets out proposed interventions, such as those in the categories above, for each of the priority sectors identified. These interventions are proposed based on an understanding of the stage of evolution of the sector, current level of investment and support, and the anticipated level of innovation opportunities in the short and long term.

With appropriate interventions and investment, the LCR has the appropriate attributes to build a Climate Tech cluster, supporting its Net Zero targets while creating a productive and prosperous future economy for its residents.



1. Successful Climate Tech clusters

1.1. International Climate Tech landscape

In the face of widespread, rapid, and intensifying climate change and resource scarcity, Climate Tech startups will play a critical role in achieving Net Zero targets.

- The IPCC's 2022 Climate Change Report confirmed that the world faces unavoidable multiple climate hazards over the next two decades with global warming of 1.5°C. Even temporarily exceeding this warming level will result in additional severe impacts, some of which will be irreversible.¹
- Due to continued weak delivery of climate policy nationally, the need for commercially scaleable Climate Tech startups who develop technologies that are explicitly focused on climate change and resource scarcity is increasing in importance.²
- These innovations will underpin the decarbonisation of carbon-intensive sectors, including the transport, energy, industry and food sectors that jointly constitute over 80% of global emissions.³



Climate Tech encompasses a wide array of technologies and innovations to tackle key challenge areas across industries.

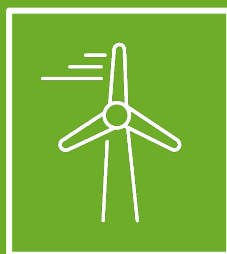
- Climate Tech startups are categorised by the challenge areas they address. The most prevalent areas are building technology, future energy, agritech & food, mobility and circular economy (Figure 1).
- However, capital is not being deployed in line with climate impact potential, with sectors such as mobility attracting 48% of Climate Tech investment globally in 2022, despite being responsible for only 15% of global emissions.⁴
- More funding is needed across all challenge areas, and targeting funding to nascent technology areas can enable breakthrough innovations, trigger sectoral tipping points to accelerate adoption and achieve meaningful financial returns as well as sectoral decarbonisation.
- There is a need to focus on creating and funding commercially scalable businesses in areas of critically underfunded technologies that have a higher emissions reduction potential to drive deep decarbonisation of the economy.
- For example, in 2022, Estonia topped the list of countries for the highest investment into Climate Tech per tonne of carbon emitted at \$79/tonne. The UK invested less than a quarter of this at \$17/tonne of carbon emitted in 2022.⁵
- As PWC's State of Climate Tech Report in 2022 stated, as society grapples with how to halve emissions by 2030, more discussion is needed on the solutions and structural transformation required for a fair and just transition. More investment is needed into Climate Tech - not just at the top level, but with better spread across sectors and solutions, across different startup sizes and across different technological maturity levels.⁶



Agritech & Food



Building Technology



Future Energy



Circular Economy



Mobility

Figure 1. Climate tech verticals

Given this opportunity, the Climate Tech sector is growing rapidly, with \$260bn invested in Climate Tech between 2018 and 2022 (Q3)⁷

- Investment in Climate Tech is booming, with more than \$50bn invested in the sector between Q1 and Q3 2022. Whilst 2021 proved a stronger year for the total amount invested, the percentage of funding going to Climate Tech companies as a percentage of all investment has remained at a historic high.⁸
- For every venture capital dollar invested, Climate Tech now accounts for 26 cents.⁹ Given this accelerating investment, the number of Climate Tech companies valued at more than \$1bn now stands at 240.¹⁰
- However, data shows that the number of early VC, seed and series A investments has remained largely stagnant since 2018¹¹, so for the sector to achieve continued growth, a series of interventions are necessary to enable the next wave of startups to launch and scale.
- In addition, although capital is pouring into Climate Tech for series A+, further attention is needed at pre-seed and seed stages to drive breakthrough

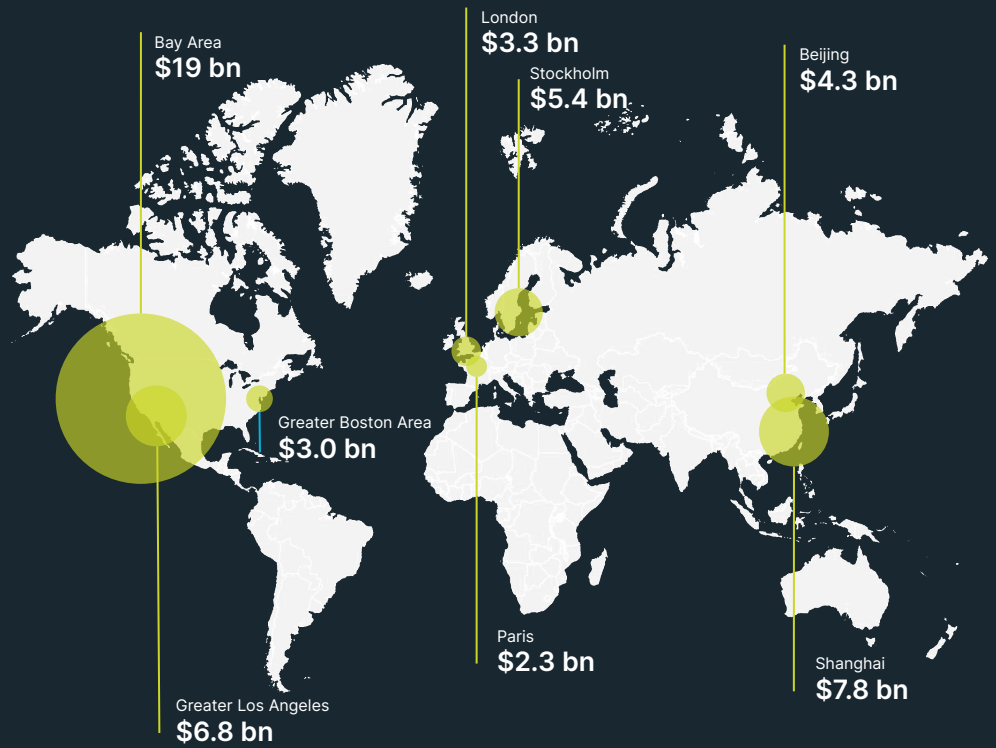


Figure 3. Global Climate Tech clusters (adapted from Dealroom 2021)

commercial innovations, advance and scale future technologies to help tackle the climate crisis.¹² (Figure 2)

Around the world, Climate Tech clusters have started to emerge to support the scaling up of climate businesses. (Figure 3)

- San Francisco, London, Los Angeles, Shanghai, Stockholm and Beijing are the top five Climate Tech investment hubs at present.¹³
- Notable rounds from 2021 included Stockholm’s Northvolt, who raised \$1.1bn, aimed at

financing the expansion of its battery cell and cathode material production in Europe.¹⁴ In San Francisco, TeraWatt also raised \$1bn to build out a network of electric vehicle charging centres for EV fleets.¹⁵

- Clusters have shown to be most effective as a result of unified goals and objectives to help each other achieve Net Zero. Productivity in clusters is 25% higher than average, which translates not just to local economic gains but, most importantly, to accelerated progress toward a Net Zero economy.¹⁶

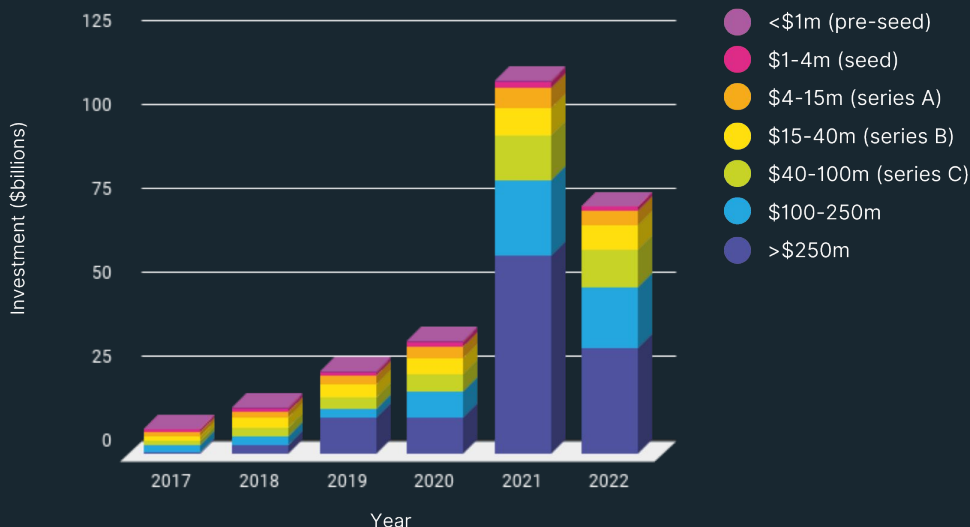


Figure 2. Global investment in Climate Tech by stage 2017-2022 (Tech Nation, Net Zero Insights 2022 data)

However, since the deployment of investment and creation of Climate Tech businesses is geographically uneven, many areas are at risk of missing out on the economic growth and social inclusion benefits of this transition.

- Oxford Economics projects that the green economy will create an opportunity worth \$10.3 trillion to 2050 Global GDP, in 2020 prices. Of this, \$4 trillion of this economic value will be captured directly by those enterprises developing and producing green goods and services, amplified by the \$6.3 trillion coming from the wider supply chains of those industries.¹⁷
- But, to enable a just and inclusive Net Zero transition, national and local governments around the world need to work together to ensure that these economic and social benefits are distributed equitably across and within countries.
- By 2030, the Net Zero transition is expected to create more than 25 million jobs around the world.¹⁸ On average across OECD countries, startups account for about 20% of employment and are responsible for creating almost half of new jobs.¹⁹
- Scaleups are also on average 54% more productive than other businesses in the same sector, therefore creating more jobs with higher GVA,

addressing productivity imbalances and improving economic performance.²⁰

- Currently, around 65% of investment in Climate Tech has been invested in the US, and only 21% in Europe.
- The UK Net Zero Strategy sets the intention for the UK to be a leading manufacturer of sustainable technologies. However, lessons could be learned from the growth of the wind power industry, where the UK was slower than other European economies to build manufacturing capability and is now more reliant on imports for many of its turbines (despite having the world's largest offshore wind energy market).²¹
- From 2020 to 2022, the UK's share in European electric vehicle assembly and battery production fell by 1 percentage point. If this does not recover by 2030, the UK will have lost £3bn in projected value in total across both areas. Similarly, production of hydrogen electrolyzers saw a more significant fall of 4 percentage points, equivalent to the loss of £1.3bn.²²
- There is also a risk that the UK will fall behind other global economies due to a £1.5 trillion growth funding gap for tech companies, which it needs to close to compete on a global scale with countries like the US.²³

1.2 UK Climate Tech ecosystem

The UK Climate Tech sector is growing, with UK Climate Tech companies raising a total of \$7.45bn in 2022.²⁴

- The UK is second only to the United States for the number of Climate Tech startups and scaleups - with over 5,200 Climate Tech pioneers now operating, compared to the US' 14,300. 6% of the global unicorns valued over \$1bn are based in the UK.²⁵
- Notable raises by UK based companies over the past 12 months include clean energy company Gridserve who raised £200m in August 2022 and carbon capture and storage company Carbon Clean Solutions, who raised \$150m during their series C round in May 2022.
- There are 9 Climate Tech unicorns in the UK, and a further 19 future unicorns, currently valued at between \$250-800m.²⁶ The majority of the UK's current unicorns are clean energy companies such as Octopus Energy and OVO Energy.

The opportunity in Climate Tech in the UK

- The global market opportunity for UK companies producing goods and services to feed the green capital expenditure revolution could be worth more than £1 trillion by 2030.²⁷
- There are almost 20,000 businesses currently within the green economy, contributing £71bn in Gross Value Added (GVA) to the UK economy, more than double that of the energy sector.²⁸
- In general, UK green jobs are more highly paid in comparison to non-green jobs and are at lower risk of automation.²⁹ GLA data shows that in London, employees in green jobs earned around 12.9% more.³⁰



- The UK is one of the top 2 European investment hubs, attracting a significant proportion of investment and home to 18.9% of Net Zero scaleups in Europe.
- As noted previously, capital investment is not in line with climate impact needs, creating untapped opportunities for innovation across a wide range of sectors.
- The Climate Change Committee has warned that the UK is not on track to fulfilling its climate commitments and that the government is not responding quickly enough. It warns that a major programme of investment is required to meet the UK's adaptation needs, but with a lack of government prioritisation to define priorities, uncertainty is preventing progress on appraising the country's investment needs and closing the adaptation gap.³¹

Given its booming technology ecosystem and high access to capital, London is the current hub of Climate Tech in the UK and Europe.

- Climate tech startups in London raised \$1.7bn in VC investment in 2022 alone, a 672% growth since 2018 and representing 11% of Europe's total.³² (Figure 4)
- Scaleups in London account for over 70% of UK Climate Tech startup funding, including 3 Climate Tech unicorns and 6 potential future unicorns.³³
- London is home to over 20 Climate Tech VC firms such as 2150, Sustainable Ventures, Kiko and Green Angel Syndicate.
- London & Partners offer three supporting factors underpinning London's thriving Climate Tech ecosystem: investment opportunities, access to talent and access to numerous growth programmes and initiatives.³⁴

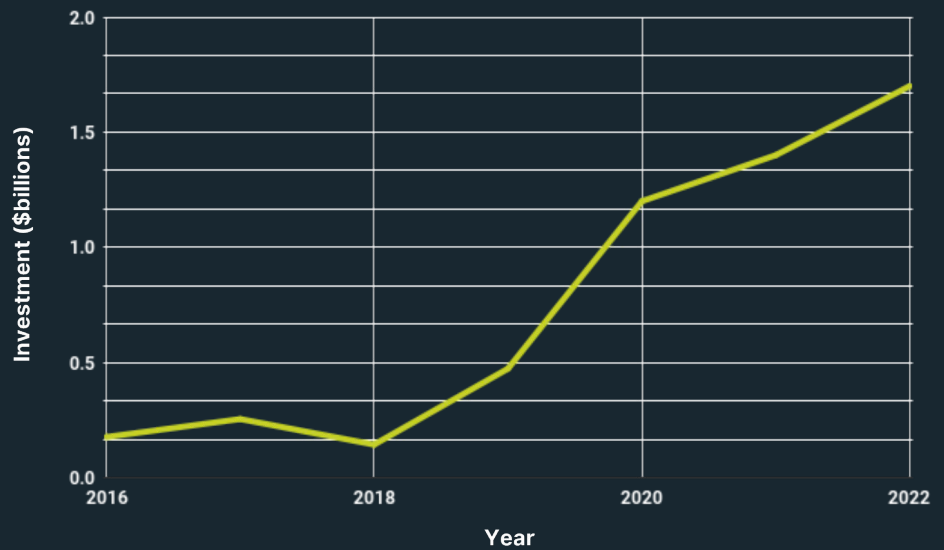


Figure 4. Investment in London Climate Tech 2016-2022 (Dealroom 2021 and L&P 2022 data)

Whilst London is the current primary hub for Climate Tech in the UK, startups based in the city encounter challenges with high costs and limited access to industrial space.

- The high staff costs, office costs and limited access to industrial space in London mean that it can be a challenging environment to build and scale successful Climate Tech startups, particularly those focused on Deep Tech.
- Given its size, it is also challenging to develop a well connected and concentrated innovation ecosystem for Climate Tech in London.
- Although many early stage Climate Tech ventures start in London, once they are ready to manufacture, they often look to move due to a lack of affordable space and facilities for manufacture, a limited number of engineers with manufacturing experience and the lack of local manufacturing supply chains.
- The Office of National Statistics suggests that many small London-based businesses are looking to relocate. 24% of firms in the capital said that they would consider relocating their office to a different part of the UK³⁵, where they can access lower rents, new talent and

have more space to expand operations.

- In the most recent Startup Cities Index report, Liverpool was rated as the third best city in the UK for starting a business against five criteria: business support, infrastructure, talent, wellbeing and business activity.³⁶ Liverpool was rated highest for its digital infrastructure, a factor which is of course key for remote working as more businesses, and specifically startups, shift operations in this direction.

5,200

The UK ranks only 2nd globally to the USA with 5,200 Climate Tech startups

Opportunities for the growth of Climate Tech are currently not being leveraged to their potential in other major UK cities.

- Rapidly growing innovation and technology clusters have been emerging in a number of major UK cities. A recent report by Tech Climbers has stated that 75% of tech businesses in the Liverpool City Region are seeking investment in 2023, largely across seed and series A capital.³⁷
- World-leading climate research is taking place at a number of universities across the UK. The University of Manchester houses the Tyndall Centre for Climate Change Research, one of the UK's largest climate research centres. The University of Liverpool was ranked the top university in the world in 2022 out of 1,438 institutions for its partnership work in support of the UN Sustainable Development Goals.³⁸
- A recent report by Bruntwood SciTech estimated that the transition to Net Zero has the potential to create 47,000 new jobs by 2050 in the North West in the science and tech industries, the most of any UK region.³⁹

The largest decarbonisation opportunities within the UK are also typically in regional cities and rural areas.

- Major industrial clusters will require significant innovation to decarbonise and as such, an untapped opportunity exists to co-locate innovators in, or close to, these clusters to capitalise on the knowledge and expertise that exists and promote collaboration and partnership.
- For example, the North West has always been a centre for UK manufacturing and many traditional carbon intensive industrial companies are based across Cheshire, the Liverpool City Region and Greater Manchester.
- Jaguar Land Rover, Ford and Vauxhall have all recently committed significant investment to the production of electric vehicles in the North West. In December 2022, Ford announced an additional £125m would be invested in their Merseyside Halewood plant, increasing production capacity by 70% and securing 500 jobs.⁴⁰
- Tata Chemicals Europe set up the UK's largest CCU plant in Cheshire as part of a future industrial cluster scheme.⁴¹ This follows Siemens' relocation of their head office to Manchester in 2019.

However, Climate Tech clusters are still highly nascent in the majority of UK cities.

- Whilst London has 252 Climate Tech scaleups, the next biggest UK hub (Glasgow) only has 19. Manchester, a regional hub for digital innovation, still only has 9 Climate Tech scaleups.
- Regions outside of the golden triangle are also attracting very little investment to support innovation and growth. In 2019, northern universities attracted only 1.8% of early stage venture funding, compared to the 90% that went to Oxford, Cambridge and London.⁴²
- As such, interventions need to be made to leverage the regional assets that exist, provide a springboard for Climate Tech innovation and startup growth, and attract significant investment to city regions outside of London.

Net Zero scaleups distribution by city

1. London - 252
2. Glasgow - 19
3. Edinburgh - 18
4. Bristol - 14
5. Cambridge - 13
6. Oxford - 9
7. Manchester - 9
8. Nottingham - 7
9. Leeds - 7
10. Birmingham - 6

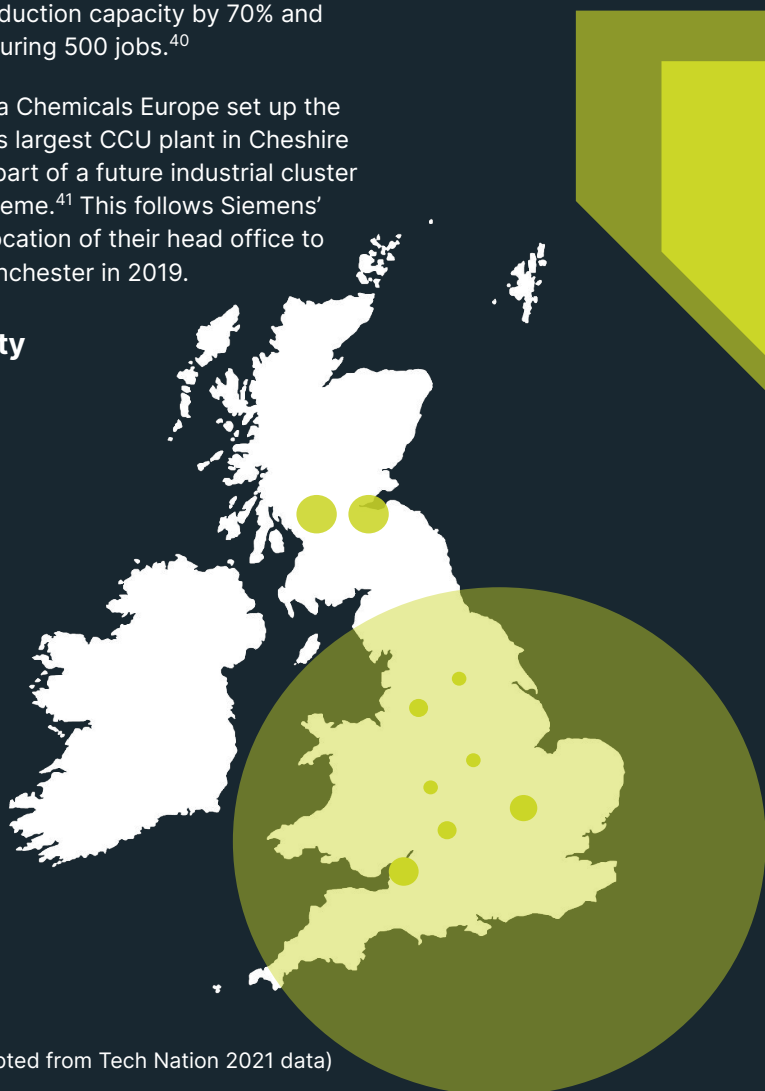


Figure 5. Distribution of Climate Tech scaleups in the UK (adapted from Tech Nation 2021 data)

1.3 Innovation models

To support the development of technologies to address the climate crisis, different types of innovation support have emerged to support startups and scaleups at different lifecycle stages.

Innovation models	Activity	Examples
Venture Development e.g. venture builders, hackathons	Create new startups from individuals or nascent teams	Carbon13; Ebico Affordable Warmth (SV), Deep Science Ventures, Zinc (UK), Founders Factory; Universities.
Venture Support e.g. Business support programmes	Support focussed at early stage development, often grant-led. Many have been European Regional Development Funded (ERDF)	Imperial Greenhouse Accelerator (UK); Climate-KIC ClimAccelerator (Global); BEIS NZIP Programme; Better Futures, Business Growth Hub.
Investment - Equity accelerators	Invest at pre-seed stage	Y Combinator (US), Sustainable Accelerator (UK), Rockstart (global)
Investment - Angel investors and venture capital	Invest at pre-seed, seed, series A & B stages	LowerCarbon Capital, ClimateVC, Green Angel Syndicate (UK)
Partnerships e.g. Innovation challenge	Facilitating connections between startups and large companies to collaborate on pilot projects and / or invest into startups.	Siemens 47 unit (UK); Rainmaking (global); Techstars (global); SV Corporate Innovation programmes (UK)
Workspace	Workspaces co-locating businesses - either sector agnostic or co-locating by sector/stage.	Sustainable Workspaces (UK), Second Home (Global), PlusX (UK), WeWork.
Other service providers	Specific fee services (e.g. graphic design, grant writing, recruitment etc). Typically generalists, but boutique service providers for the Climate Tech sector are increasing in number.	Acre Recruitment (UK HQ), Climate Social (UK), Hyperion Search (UK), Sustainable Ventures (UK)

By combining these types of support into specific innovation clusters, startups can access sector specific and holistic support.

- Climate innovation clusters consist of a mix of startups, scaleups, SMEs, investors, corporates, research organisations, academia, community actors and public bodies.
- To form a cluster, these organisations are:⁴³
 - Physically located close together, for example within a city district;
 - Committed to learning from each other;
 - Focused on turning ideas into solutions that are positive for the climate and the economy.
- Harvard professor Michael Porter introduced the clustering concept (1990), encouraging communities to analyse their existing business and industrial bases and build their economic development on those strengths.⁴⁴
- Developing industry clusters has become fundamental for regional economic strategies as they have been shown to strengthen competitiveness by increasing productivity, stimulating innovative new partnerships and presenting opportunities for entrepreneurial activity. They attract talented, high-earning people, which generates higher tax revenues and increases the demand for cultural goods and other services.⁴⁵
- Strong domestic clusters also help attract investment. If clusters are leading centres for their industries, they will attract key players from both home and abroad.⁴⁶
- This cluster model can also accelerate the pace of innovation, enabling the rapid development and deployment of novel and commercial climate technologies.
- A number of ingredients will support the creation and growth of Climate Tech innovation clusters. This includes political leadership, proximity to low carbon research and to relevant markets for climate-related goods and services. This includes the presence of large anchor institutions with climate change-relevant profiles that are making significant research and

Climate technology clusters in the US and Europe have catalysed billions of dollars in funding for Climate Tech startups and created thousands of jobs in local areas.

- In Boston, Greentown Labs has incubated more than 500 Climate Tech companies, supporting them to raise more than \$4bn in funding (see case study 1).
- Climate-KIC has supported more than 5,000 Climate Tech and sustainability startups globally, helping them to attract over €2bn in investment (see case study 2). Across the world, these Climate Tech clusters incentivise greater private sector funding for climate innovation, improve startup survival rates and create new jobs for local communities.
- In London, Sustainable Ventures has developed a Climate Tech cluster, bringing together more than 450 companies that have raised over \$1bn, creating over 4,500 jobs. Sustainable Ventures is a full service ecosystem providing workspaces, investment, business support and other services exclusively to Climate Tech SMEs.⁴⁸

Case study 3, **Sci-Tech Daresbury**, demonstrates the LCR's capability and expertise in building an innovation cluster, the learnings from which will be fundamental to the creation of a Climate Tech cluster in the region.

Case study 1

Greentown Labs⁴⁹

Location: Somerville, MA (HQ); Houston, TX

Estimated annual budget: \$15 million (2023)⁵⁰

Target businesses: Early stage Climate Tech businesses (Technology Readiness Level (TRL) = 5; 4 employees)

Types of support offered:

- Workspaces: More than 100,000 square feet of office space for Climate Tech startups, featuring prototyping and wet lab space, shared office space, a machine shop, and an electronics lab.
- Business support: Lunch and Learns, expert panels, and industry specific workshops.
- Partnerships: Partners support Greentown Labs' (GL) startups by becoming strategic partners, investors, customers, and pilot sites.

Critical success factors:

- Building partnerships across startups, policymakers, corporates and investors to tackle the climate crisis.⁵¹ GL has seen particular success through Greentown Go, which builds partnerships between startups and corporates. Their 2022 programme saw 20 startups participate, with over 55% finishing the program with a corporate partnership.⁵²

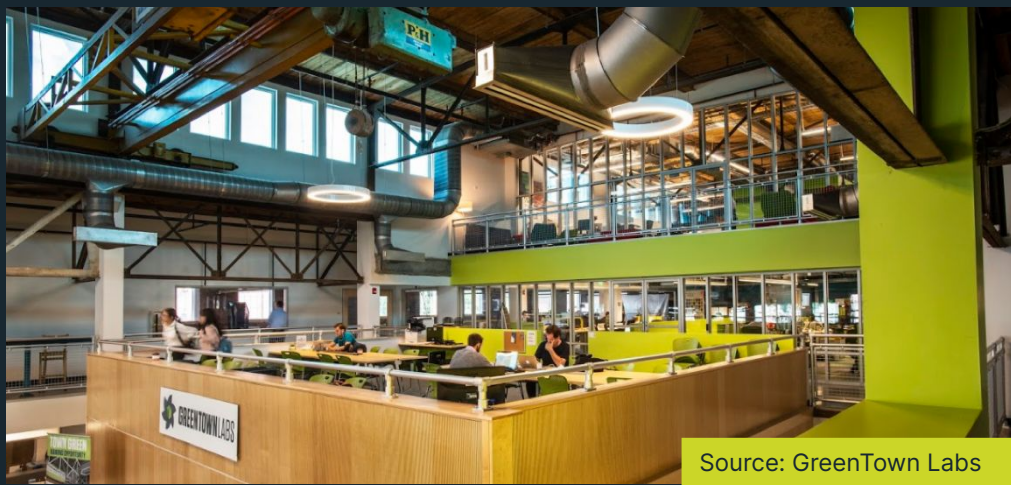
Through this focus on partnerships, Greentown startups have received more than \$20m in investment from corporates to date.

- The number of companies jumped from 4 to 55 in a few short years, with GL expanding to a 100,000 sqft campus in December 2017. It is now home to over 200 Climate Tech startups.
- A key factor for Greentown Lab's relocation to Somerville was the intention to move the laboratories into the community, to regenerate the area, create a vibrant community that had the possibility to commute to work by walking or cycling, whilst being close to the city centre.⁵³
- In light of its success in Boston, GL has now expanded to Houston's innovation district, where its 40,000 sqft incubator harnesses the deep Climate Tech expertise it has built to support a second city region; it is already home to over 75 Climate Tech startups.

- Believing that the City of Houston has a critical role to play in helping solve the climate crisis, Greentown aims to make Houston the "energy transition capital of the world". They aim to do this by engaging global corporations headquartered in the city to facilitate the incorporation of Climate Tech solutions into their supply chains at scale. By doing so, their objective is to create a replicable model that decarbonises the city while simultaneously building a local, diverse energy workforce.⁵⁴
- The installation of more incubators like GL could spur entrepreneurship and the number of startups in lagging underperforming regions, especially in a growing sector like Climate Tech.⁵⁵

Impact achieved⁵⁶:

- 500+ companies incubated
- \$4bn+ funding raised
- 94% startup survival rate
- \$9.8bn in revenue
- 24,000 jobs created



Source: GreenTown Labs



Source: Climate KIC

Case study 2

EIT Climate-KIC ⁵⁷

Location: 24 countries with 28 offices across Europe

Estimated annual budget: €104.44m (2023)⁵⁸

Target businesses: Climate startups

Types of support offered:

- Ideation and venture builder: Climate Launchpad is a green business ideas competition run by Climate-KIC and open to innovators around the world. Selected ideas received support to fast-track the idea to a sustainable business, with regional prizes also available to entrepreneurs.⁵⁹
- Non-equity accelerator: ClimAccelerator is one of Climate-KIC's flagship programmes which supports innovators in the climate space. The accelerator has 3 stages: 1) Business model development, 2) Customer traction and business model validation, 3) Investor readiness where teams are connected with investor contacts and partners.⁶⁰ Sustainable Ventures previously ran the national

programme with Imperial College in the UK.

- Investment: Climate-KIC runs a Startup Investment Programme in collaboration with Seedrs.

Critical success factors:

- Focus on developing local innovation. EIT Climate-KIC is working with 15 mayors, municipalities and city communities in Europe as part of the *ClimAccelerator - Cities* to enable innovations across all city systems including waste, health, transport and energy.
- Support businesses at multiple stages. EIT Climate-KIC has supported ventures from ideation through to investment readiness. By supporting both the development and scaling up of early stage ventures, Climate-KIC has built the foundation of the Climate Tech sector.

Impact achieved:⁶¹

- 5000+ startups supported
- €2B+ investment attracted to startups
- 15,000+ full time jobs created
- €4.6B+ climate funding leveraged



Location: Daresbury in Halton, Liverpool City Region UK

Target businesses: Science and technology businesses of all sizes.

Types of support offered:

- Access to world-leading research and technology assets: open access to these facilitates for innovators and businesses creates an environment for collaboration and idea generation, boosting productivity and the pace of innovation. Facilities include the STFC Hartree Centre, home to some of the most technically advanced computing, data analytics and artificial intelligence (AI) technologies and experts in the UK.⁶³
- Tailored support: to startups and scaleups to expedite their journey to market and to growth.

Also attracting large businesses to collaborate and build partnerships with these innovators.

- Community building: providing business space for businesses of all sizes on an innovation campus that facilitates community and partnerships. Initiatives include Daresbury Green Group and Women in STEM.⁶⁴

Critical success factors:

- As the only UKRI asset in the North West of England, Daresbury leverages support from seven UK research councils, Innovate UK and Research England to provide a unique campus that is built upon world-leading research and expertise.
- A focus on partnerships and collaboration between research and businesses of all sizes to boost

growth. Eight out of ten companies based at Sci-Tech Daresbury actively collaborate with another company or organisation on site.⁶⁵

- A focus on jobs and skills: Sci-Tech Daresbury has the ambition to create 10,000 high-value jobs in 15 years, ensuring that individuals best take advantage of the opportunities and expertise on campus. As such, skills are retained, supporting productivity growth and job creation in the region and the wider North West.

Impact achieved:⁶⁶

- 150+ businesses based on site (2021)
- 16% of these are pre-revenue startups
- 95% business survival rate.
- £135m sales generated by Sci-Tech Daresbury companies in 2020.
- 1,600 people employed on site.



Summary - Successful Climate Tech clusters

Successful Climate Tech clusters are emerging globally and the examples referenced demonstrate the value that these clusters can bring to local and regional economies.

Technology clusters are key to regional economic development, and Climate Tech cluster development in particular offers a unique opportunity to increase GVA while also decarbonising key industries and tackling regional and national Net Zero targets.

Successful Climate Tech clusters have common features:

A focus on partnerships, engaging local and regional stakeholders in innovation and building pathways to long-term collaboration.

Leveraging local strengths and opportunities to build on the existing identity of the region, its workforce and its unique assets. This has the potential to establish the cluster as a leading centre within its industry, attracting innovators, large businesses and investment to the region.

Support for innovators across all stages of development, to expedite the path to deployment at scale.

A diverse mix of funders, but in particular those willing to support early stage innovation.

Engagement with academic institutions who provide a springboard for innovation as well as leading research and facilities.

Section 2 of this report looks to assess the LCR for its potential as an emerging Climate Tech innovation cluster, highlighting key strengths and barriers to growth.

2. Liverpool City Region Climate Tech ecosystem:

2.1 The Context

While the Liverpool City Region has built clusters across life sciences, chemicals and manufacturing innovation, it is not fully commercialising this activity, and has significantly more potential to leverage its Net Zero assets.

- Despite being home to world-class innovation assets, the number of scaleups in the LCR is below its potential, at 63 scaleups per 100,000 working age residents. The UK average is 80, excluding London.⁶⁷
- In terms of Net Zero scaleups specifically, London leads the way at 252, followed by Glasgow at 19 and Edinburgh at 18, with the LCR yet to produce a recognisable scaleup in the Climate Tech sector despite significant relevant research, human talent, innovation and Net Zero assets.
- The number of people employed in UK Impact Tech grew from 37,500 in 2021 to 53,500 people in 2022⁶⁸, in line with a significant increase in investment into the sector over the same period. Creating a successful Climate Tech hub in the LCR has the potential to create a large number of local sustainable jobs.
- LCR's world-leading innovation assets across life sciences, chemicals and manufacturing innovation have significant overlap with the Climate Tech sector, and the LCR has a major economic

opportunity to leverage this and become a hub for cross-sectoral innovation to achieve its Net Zero targets and build a prosperous and sustainable future economy.

To achieve its ambitious Net Zero targets, the Liverpool City Region will need to partner with private sector innovators to develop and deploy new technologies across sectors.

- The Liverpool City Region has set a target to reach Net Zero by 2040 or sooner.
- However, the LCR is behind on these targets, and will need to partner with and attract investment from the private sector to accelerate progress.⁶⁹ The recent report *Pathway to Net Zero* states that £45bn of investment will be required over the next 20 years to meet the 2040 target.⁷⁰
- Greenhouse gas emissions in the LCR have remained fairly constant, at around 7,000 kilotonnes (kt) since 2018, just breaching this level in 2020 producing 6,929 ktCo2e.⁷¹ Emissions from transport remained at a similar level between 2008 and 2019, then reducing by 15% in 2022.⁷² Whilst this demonstrates that efforts to decarbonise transport in the LCR are starting to have an impact, there is still much work to do, with £1bn investment needed in transport alone each year by 2025, and new technologies required to improve

the efficiency, and reduce the cost, of electrification.

- The LCR already has strong partnerships and public sector structures, however there is scope to improve delivery. A step change in the level of investment is required into commercial and scalable solutions delivered by the private sector in close collaboration with local, regional and national governments.
- Business density in the LCR is 541 per 10,000 working age residents, the third lowest amongst all LEP/CA areas. 24,000 new businesses would need to be created to match the national average. Survival rates amongst businesses are also below the national average.⁷³ Interventions are needed to boost SME growth and to provide support to future proof the region's business base.
- Considering regional innovation policy, the creation of innovation clusters has a number of broader impacts when considering the growth of innovation activity that cluster creation encourages.⁷⁴ There is also evidence to suggest that investment into less innovation intensive areas generates strong returns and little leakage. Furthermore, as well as returns for the region there are wider spillover impacts which could benefit the North of England as a whole.

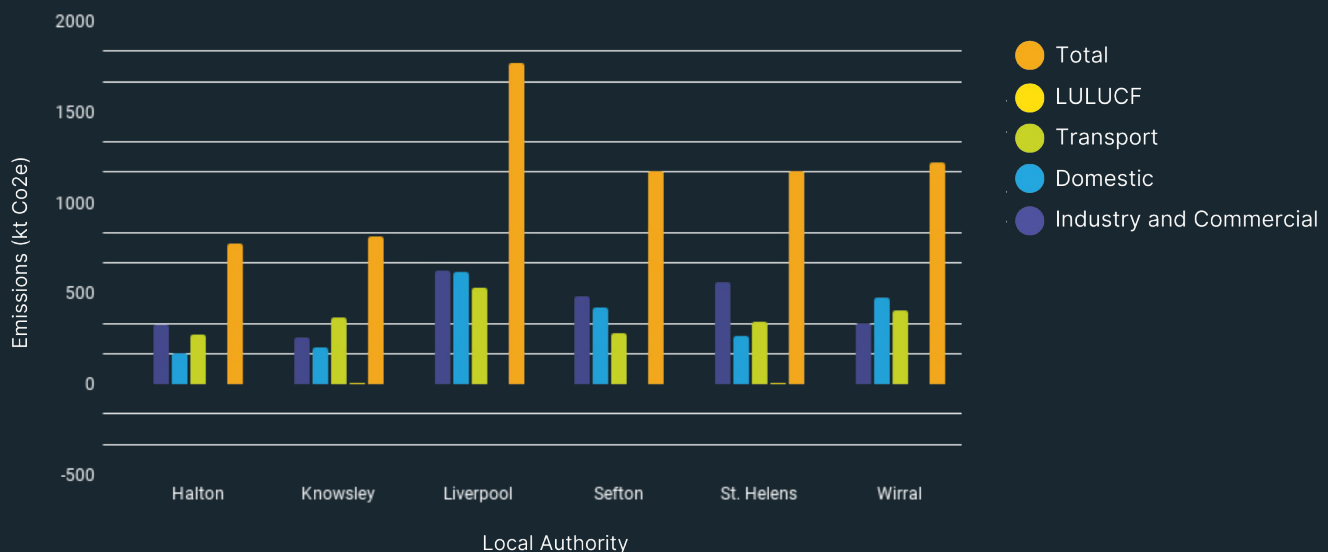


Figure 6. LCR CO2 emissions by Local Authority and category, 2018.



The Liverpool City Region will need to work closely with startups, scaleups and high growth SMEs to accelerate deployment to meet its Net Zero ambitions.

- There is inequality of deployment of decarbonisation activity in the UK. For example, there are five times as many electric vehicle chargers in London per capita than in the LCR, despite the greater reliance on private vehicles in the latter.⁷⁵
- Investment into Impact Tech (companies addressing the UN Sustainable Development Goals) totalled \$4.21bn over the last decade, \$3.2bn of which went to companies in London and only \$0.12bn going to companies in the North West.⁷⁶
- By increasing the number of Climate Tech startups in the region, deployment of decarbonisation products and services is expected to accelerate due to proximity and connections between businesses and customers. This facilitates both regional economic growth, as well as decarbonising existing businesses in the LCR as they adopt low carbon technologies into their supply chains.
- Startups' natural strengths in business model innovation are critical as 50% of the technology required for Net Zero is already in place but often lacking scalable models. This will play an important role in developing and deploying innovations at a local level such as low carbon energy infrastructure (e.g. solar PV, heat networks, heat

pumps), decarbonising transport systems (e.g. EV infrastructure), and low carbon construction, amongst others.

- By better integrating place into capital allocation decisions and building capacity at the local level, the financial sector and related institutions can ensure that finance is channelled to the places that, socially and economically, stand to gain the most in the transition.⁷⁷
- When city regions are able to adopt the most socially cost-effective combination of low carbon measures based on the specific characteristics, needs and opportunities of their location, it requires significantly less investment, whilst creating nearly double the energy savings.⁷⁸

2.2 The Potential

With a strong collaborative approach between the public and private sector, there is an opportunity to build on the existing industrial strengths of the LCR and create an example of a successful transition to a thriving Net Zero regional cluster.

- **Industry and Manufacturing:** The North West is home to the largest concentration of advanced manufacturing and chemical production in the UK. The manufacturing industry in the LCR supports around 50,000 jobs in 3,000 companies, contributing £3.2bn to the economy.⁷⁹
- **Recycling and Waste Management:** **Veolia's** Garston site is one of only two plants in Europe that can

recycle lithium ion batteries, a key asset given the region's significant car manufacturing industry that turns over £95bn annually.⁸⁰

Olleco's state-of-the-art biorefinery is the largest facility of its kind in the UK and converts used cooking oils into biodiesel.

- **Port Infrastructure:** The LCR is home to over 3,400 port and logistics businesses, with the maritime economy in the region worth £5bn annually.⁸¹ Almost £1.5bn has been invested in intermodal infrastructure, including £400m of investment into **Liverpool2**, the port's deep water terminal capable of accommodating the world's largest ships.

The strength of skills and talent in the Liverpool City Region should be utilised to its full potential to advance its Net Zero objectives.

- The LCR has a large student population, with a catchment of 12 universities in the region and 63,000 new enrolments to higher education institutions each year⁸², allowing businesses to tap into an emerging talent pipeline.
- 50% more people aged 16-64 in the region are qualified to Level 4 or above than a decade ago, higher than both the North West and national averages. 42% of those in employment in the region are in senior management, professional or technical roles.⁸³

42%

Of those in employment in the LCR are in senior management, professional or technical roles.



Source: Wirral Met College

- A number of partnerships are forming in the region to encourage, train and upskill people to support growth sectors such as digital and creative, low carbon and advanced manufacturing.
- More than 1,000 employers are engaged in a skills partnership with **Wirral Met College** to ensure that the skills are being developed to match industry needs. The college boasts a number of assets supporting the low carbon transition including a STEM Centre and Microturbine Hybrid Energy Centre.
- In addition, modular housing manufacturer **Starship** has partnered with Wirral Met College to create a Construction Campus, siting its manufacturing operations in Wirral and creating a manufacturing centre within **Peel L&P's** Wirral Waters.
- **The City of Liverpool College** has invested £250,000 in facilities to support green skills training, including a full size 'green' home that can be used to educate students about the application of low carbon technologies.

The Liverpool City Region has already been identified as a promising region for building a climate innovation hub.

- The LCR was selected as one of only two Innovate UK Launchpad pilots for Advanced Manufacturing, reflecting the existing innovation activity in the region and its potential to become a leading cluster.
- UKRI granted the **Glass Futures** R&D facility £15m to support world-leading research and innovation to

decarbonise glass manufacturing and lead the way in building efficient, zero carbon supply chains.⁸⁴

- The **STFC Hartree Centre** has secured £172m from UKRI and £38m from IBM to develop the Hartree National Centre for Innovation, including a supercomputer centre with the primary aim of supporting UK industry to leverage global research and technology to drive progress to Net Zero.⁸⁵
- These strong roots in innovation will provide a springboard for Net Zero innovation with effective interventions and public and private sector support.

Given the proximity to world-class climate research facilities and universities, the Liverpool City Region is an ideal location to develop a robust Climate Tech ecosystem.

- The **University of Liverpool** is a world-leading research institution, with the Research Excellence Framework rating 91% of the university's research as world-leading or internationally excellent.⁸⁶
- The **Stevenson Institute for Renewable Energy** at the University of Liverpool is a leading research centre for energy materials, looking to understand how science and technology can inform the future of renewable energy generation and storage at scale. £18m of funded research is being carried out by its staff at any given time.⁸⁷

- The **National Oceanography Centre** manages the National Marine Equipment Pool – Europe's largest fleet of autonomous and robotic vehicles.⁸⁸
- The **Materials Innovation Factory** at the University of Liverpool is an £81 million facility dedicated to the research and development of advanced materials, with one of the highest concentrations of materials science automation robotics in the world.⁸⁹
- The **Manufacturing Technology Centre (MTC)** is part of the High Value Manufacturing Catapult and supported by Innovate UK, houses some of the most advanced manufacturing equipment globally. The centre supports innovation and growth in the manufacturing sector across the LCR.⁹⁰
- The **Logistics, Offshore and Marine Research Institute (LOOM)** at Liverpool John Moores University conducts research to improve the efficiency and productivity of the marine and transport industries, working with over 50 UK and Global partners.
- **Knowledge Quarter Liverpool** is developing a centre for global innovation, investing in leading research and supporting the 54,000 students based in the area to drive forward innovation across science, technology, health and education. The area is home to the Materials Innovation Factory and Liverpool Science Park alongside other leading research and innovation facilities.

The Liverpool City Region also has a strong local market for low carbon products given its proximity to industrial and manufacturing activity.

- **Pilkington**, one of the world's largest glass manufacturers, is collaborating with startup partners on Glass Futures, a £50m project to reduce the carbon footprint of glass manufacturing and make glass the low carbon material of choice.⁹¹
- 250,000 cars are manufactured in the LCR annually, 15% of the UK's total output.⁹² Recent investments into EV capacity in the region by **Ford** and **Jaguar Land Rover** are setting sights firmly on the LCR as a national hub for EV manufacture and innovation.
- The LCR is part of Europe's biggest bio-manufacturing cluster⁹³, and the region has a deep history and world-class expertise in chemical manufacturing. Whilst much of the activity in the LCR in this area is focused on health and life sciences, this expertise is highly valuable and relevant to the development of Net Zero technologies.
- **Unilever's** manufacturing facility on the Wirral is the largest in the UK and they also opened a new R&D facility in the Knowledge Quarter in 2022, developing new research spanning biotechnology, advanced materials and microbiomics. The R&D based at the site supports ⅓ of Unilever's turnover. Unilever is also a funder and founding partner of the Materials Innovation Factory.

- The LCR has extensive academic and industrial lithium battery expertise. The University of Liverpool is a key partner in a major project, funded by the Faraday Institute, to improve the optimisation of battery materials and cells, and to extend the life of batteries while reducing their cost and enhancing safety levels.
- The LCR is home to one of the world's largest concentrations of offshore wind, with the Burbo Bank wind farm and Burbo Bank extension producing enough electricity annually to power 310,000 homes.⁹⁴ The LCR's port infrastructure provides accessibility for offshore wind supply chain innovation, particularly in operations and maintenance.
- The maritime sector in the LCR supports 48,200 jobs, and contributes £5bn annually to the regional economy.⁹⁵ Peel Ports is working with a consortium led by the University of Liverpool to bid for the UK's flagship national Clean Maritime Research Hub.

The Liverpool City Region is also building effective private-public partnerships and networks to address the climate crisis, creating new opportunities for Climate Tech in the region.

- LCR's **Innovation Board** was created in 2014, convening members from across industry, academia, innovation bodies and the Combined Authority (CA). The board provides strategic leadership for the innovation activity in the region and ensures that Net Zero

remains at the forefront of the region's innovation strategy.

- **HyNet North West** is an industry-led project with a core consortium of eight partners (Eni UK, Progressive Energy, Cadent, CF Fertilisers, Essar, Hanson, INOVYN, and the University of Chester).⁹⁶ The project is focused on: 1) Capturing and storing carbon emissions (CCS); and 2) Producing, transporting and storing low carbon hydrogen.
- The **North West Business Leadership Team** brings together many of the key business leaders with substantial interests in the North West to deliver sustainable prosperity for the wider region.
- The **Peel Ports Group** has recently established a first-of-its-kind partnership with the University of Liverpool's Management School to support its Innovation Forum. The forum aims to foster innovation within its supply chains, collaborating with entrepreneurs and startups to address its most pressing challenges. The port operator is also looking to create a Green Automotive Hub in their Mersey cluster, to facilitate more sustainable logistics in the automotive industry, aiming to replace the need for 14,700 annual lorry journeys by road across the UK and Europe.⁹⁷
- **Net Zero North West** brings together businesses, regional leaders and academia, to develop and deliver a co-ordinated Net Zero vision for the North West region and deliver decarbonisation of the NW industrial sector.⁹⁸



The public sector is also actively supporting the development of green initiatives in the Liverpool City Region.

- The Mersey Tidal Power project is one of the anchors of the LCR's Net Zero strategy, with the potential to generate 2 TWh of electricity annually to power the region's homes and businesses. If successful, the project will act as a key demonstration for harnessing tidal power in the UK and globally.⁹⁹
- The LCR's Community Environment Fund aims to fund grassroots projects that improve the sustainability of the local environment, supporting the region's Net Zero goals whilst also improving health and wellbeing.
- The LCR has invested £105m to date to tackle fuel poverty and reduce carbon emissions, focusing on improving accessibility for low income households to energy efficiency improvements and low carbon heating sources.¹⁰⁰ There are 700,000 homes in the region, and with approximately 60% rated below EPC Band C, more investment and innovation will be required to retrofit homes at scale.
- With the LCR selected by Innovate UK as a Launchpad for Advanced Manufacturing innovation, 23 projects in the region have been awarded a combined £5.5m to drive forward digital and Net Zero innovation.¹⁰¹
- Liverpool City Region has been actively investing in hydrogen related projects and initiatives. The region recognizes the potential of hydrogen as a key component of their clean energy strategy, aiming to reduce carbon emissions and transition towards a more sustainable future. Projects include support of the large scale HyNet initiative aforementioned, and the recently launched fleet of hydrogen powered buses.

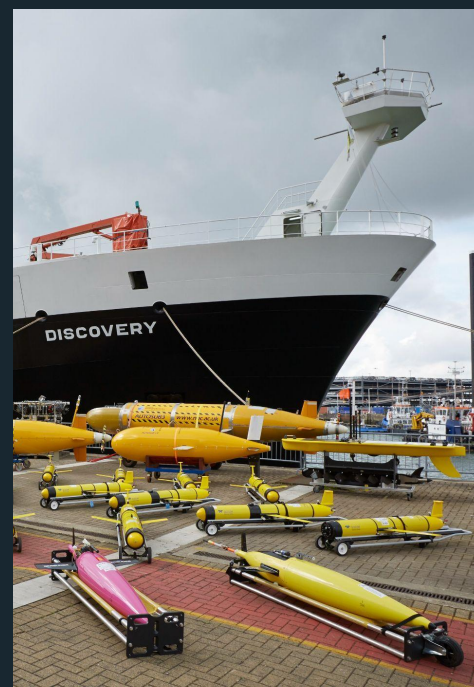
2.3 The Challenges

There are limited local opportunities for startups to access support from venture builders, incubators and accelerators, and this is particularly limited in the Climate Tech sector.

- Liverpool City Region Combined Authority (LCRCA) has committed to investing 5% of GVA in R&D by 2030 and as such, is investing in a number of innovation activities in the region. Whilst the following initiatives have been successful at supporting startups in the region, there remains a gap in climate specific support, particularly for innovators and early stage ventures.
- **Baltic Ventures**, funded by the Liverpool City Region Combined Authority, has recently launched their tech accelerator, offering expert mentoring and support alongside a £50,000 grant for each startup that joins their cohort.¹⁰²
- **LYVA Labs** has been selected to manage the new cluster created through Innovate UK's Advanced Manufacturing Launchpad, and will deliver commercialisation support to the successful recipients of the funding to maximise the project's outcomes.
- **Startup Grind** is a community of startups, entrepreneurs and innovators that looks to support founders from concept to scale with events, education and community.¹⁰³
- The **Low Carbon Eco Innovatory** at Liverpool John Moores University looks to connect industry and academia, to increase access to research and facilities for SMEs and boost innovation.¹⁰⁴ The majority of activity focuses on innovation and decarbonisation within existing SMEs, leaving a gap for the support of early stage concept development in Climate Tech.

While the Liverpool City Region already has a number of research and innovation hubs and business networks, startups could benefit from deeper and more climate specific support.

- **The Growth Platform** exists to support businesses of all sizes in the LCR to achieve their growth ambitions. Their activities help to improve access to networks, funding and support with the goal of strengthening the business community in the region and attracting investment.¹⁰⁵
- **The North West Business Leadership Team**, based at Daresbury Laboratory, endeavours to connect leading businesses in the North West to foster collaboration and growth. With the ambition to promote the North West as a leading clean industrial cluster long into the future, the NWBLT is also partnered with Net Zero North West, Glass Futures and the National Retrofit Hub as key strategic growth partners.¹⁰⁶



Source: National Oceanography Centre

5%

LCR target of 5% investment of GVA into R&D by 2030; 2x the OECD average.

→ Key research facilities in the region such as the National Oceanography Centre and Materials Innovation Factory, whilst making significant contributions to R&D in the region, are not focused on the commercialisation of technologies or providing development support to innovators.

Access to private green capital and investment in the Liverpool City Region remains limited.

→ Whilst there are a handful of VCs active in the LCR, very few have expanded into the Climate Tech space and there are no climate specific VCs. A successful ecosystem needs a wide range of investors that work together to invest at various different stages of growth and industry specialisation. The challenges for securing early stage funding are particularly acute in the Liverpool City Region.¹⁰⁷

→ **River Capital** is one of the investment firms that have started to invest in companies offering sustainable products and services.¹⁰⁸ They offer a range of equity finance and debt products, and also have a venture capital arm aimed at startups. The company has started to demonstrate interest in

low carbon solutions, such as their recent investment into retrofit installer Zenith Eco Solutions through the Northern Powerhouse Investment Fund, but is yet to make major investments into innovative Climate Tech companies.

→ **Liverpool City Region Combined Authority** are committed to setting up a seed fund to support early stage businesses in the region and expedite their rate of growth.

→ **The LCR Angel Network** was established to attract investors to the region and to be a catalyst for more significant investment into early stage businesses. In May 2023, climate startup Heatio secured £560k from the network to develop their smart home energy management system.¹⁰⁹

→ Whilst there is clearly increasing interest in Net Zero and Climate Tech amongst existing VCs, there is a need to bring in further private sector capital to the LCR to expedite progress, including building clearer pathways to London's capital pool.

→ Physical proximity has been identified by Climate KIC as a key feature for building a successful Climate Tech cluster. By locating SMEs physically close together, startups have greater opportunities for collaboration and shared learnings.

→ There are a range of flexible workspaces in the LCR but they do not intentionally concentrate and support Climate Tech activities:

- **Bruntwood SciTech**, part of the Bruntwood group that operates 100+ buildings across the North and Midlands, part-owns Liverpool Science Park and offers office and lab space on the site to support innovators with a focus on the science and technology sectors.¹¹⁰

- **Sciointec**, a spin-out from the Knowledge Quarter Liverpool, offers flexible office space in the city's research centre and has recently announced plans to build HEMISPHERE, the LCR's first Net Zero carbon office building.

There is also a lack of physical space for Climate Tech startups to connect and work alongside each other.

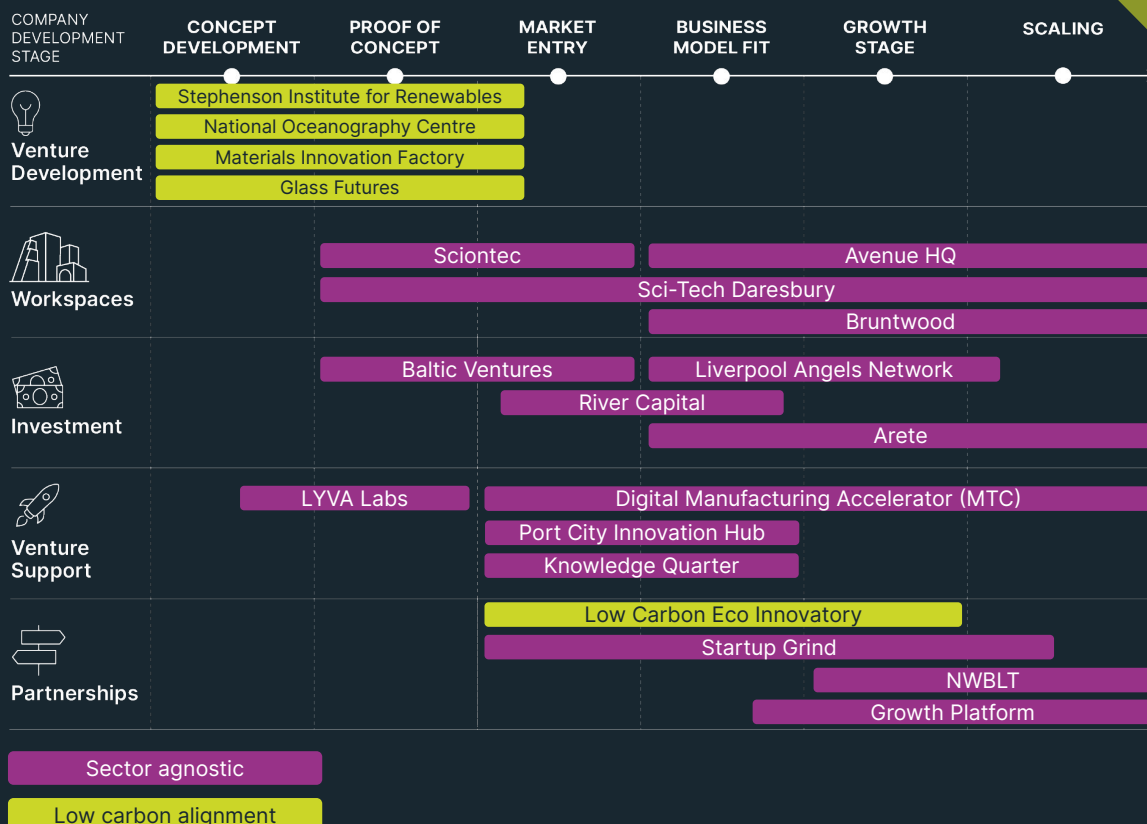


Figure 6. Current innovation support ecosystem in the Liverpool City Region by focus and stage of development.

Summary - Liverpool City Region Climate Tech ecosystem

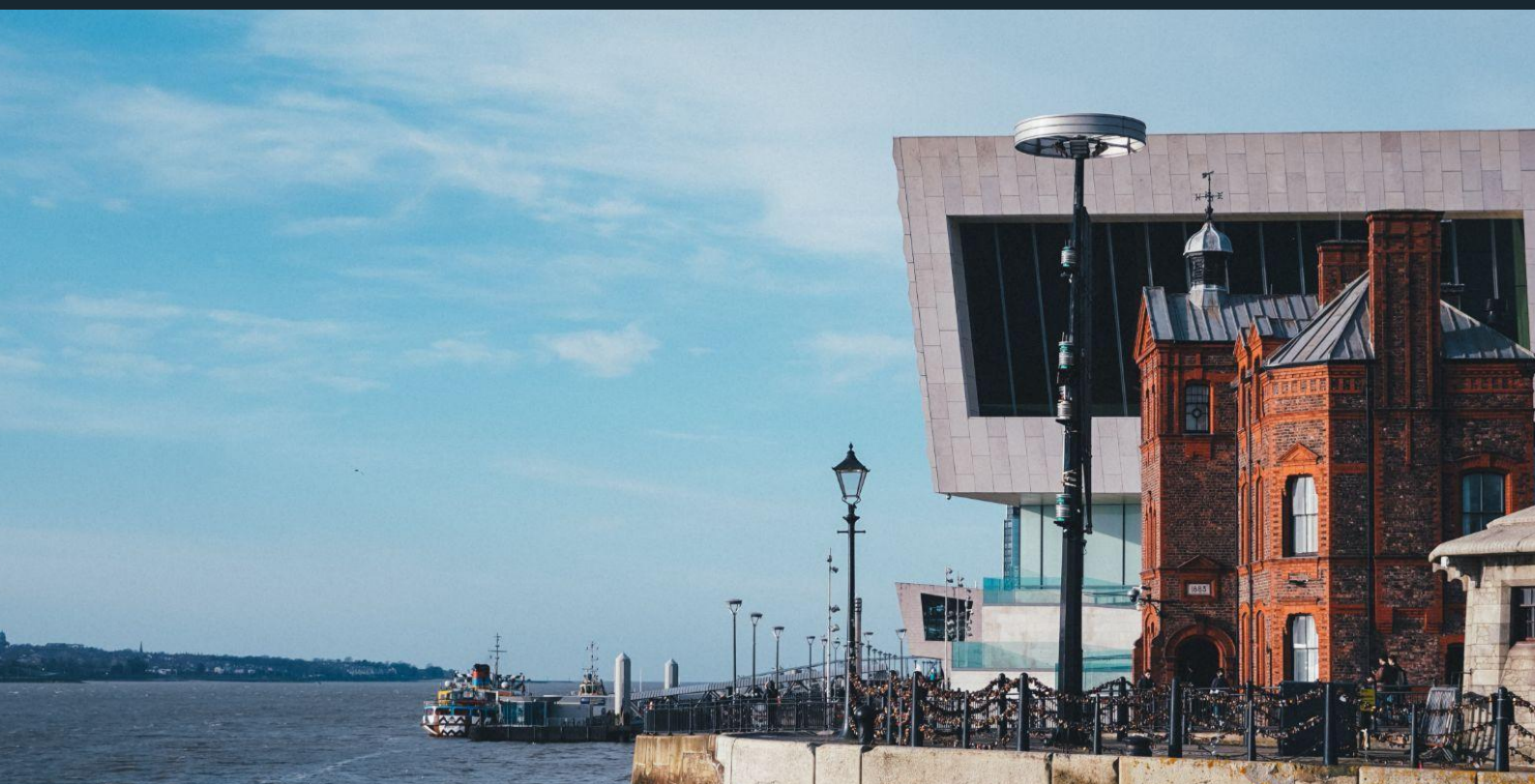
The Liverpool City Region has a number of key attributes that underpin its potential as a future Climate Tech cluster. However, to date, the region has not tapped into these opportunities effectively to create an environment that can support this growth.

- A confluence of macro trends is driving unprecedented opportunity in the Climate Tech sector. Yet the Liverpool City Region is not currently capitalising on the potential of its political, industrial and academic strengths, whilst other city regions are starting to accelerate in Climate Tech.
- A number of activities have been identified throughout Section 2 of this report that demonstrate the region's existing activity and strengths across the areas aforementioned, relevant to its green economic growth.
- As a result, this research has highlighted four key sectors of focus that, with appropriate interventions, can support the growth of a Climate Tech innovation cluster in the LCR.
- **Electrification of transport:** The Liverpool City Region is a world-leading hub for automotive

manufacture and also a leader in research and development in battery technologies. As such, this sector provides significant opportunity to establish the LCR as a global leader in electrification.

- **Marine and Maritime:** The River Mersey has long been a central pillar of the LCR's economy, and the arrival of the offshore wind sector and the development of the Mersey Tidal Power project provides the opportunity for the LCR to establish itself on the forefront of coastal green energy.
- **Sustainable Chemicals:** Chemical research and innovation has a long history in the LCR, and will continue to play an important role in Net Zero. The LCR's world-leading assets in this sector have the potential to support countless industries to decarbonise with the appropriate collaboration and investment.
- **Manufacturing Innovation:** Automation and artificial intelligence are among the key toolkits that can support the transition to Net Zero. The LCR is home to unique facilities, namely the STFC Hartree Centre, that can inspire the development of ambitious highly technical solutions across sectors.

- However, there are barriers to this growth in the region that need to be overcome in order to support the development of a thriving Climate Tech cluster.
- While the LCR has demonstrated its ability to build innovation clusters that can attract investment and contribute to regional GVA, there is limited climate specific support available for innovators looking to develop solutions in this space.
- Opportunities to secure investment across the startup lifecycle are very limited, prohibiting the development and scaling of high potential green solutions.
- While climate-related groups and partnerships are emerging, there are few initiatives that look to convene sector stakeholders and identify opportunities for innovation and growth.
- By investing in appropriate interventions in these key sectors, the LCR has the ability to foster the growth of a Climate Tech cluster in the region, supporting local businesses to decarbonise their supply chains while establishing itself as a leading example of a successful regional green economy.



3. Opportunities for Climate Tech ecosystem growth:

3.1 Theory of Change

As demonstrated in Section 1 of this report, innovation clusters are critical for convening stakeholders and galvanising activity to drive sector growth, attract investment and boost job creation. Successful clusters have a number of common success factors and related activities that contribute to their growth.

- In Climate Tech specifically, this activity is highly significant to cities with ambitious Net Zero targets as it can facilitate the development of technologies that can enable decarbonisation of a number of industries.
- Successful Climate Tech clusters are built upon a significant co-location of innovators who have

access to the support and investment that they need to grow at scale.

- The below Theory of Change model demonstrates how a number of core activities, or interventions, contribute to key outputs and related outcomes that support the growth of the Climate Tech sector. Here, this growth is measured by the number of innovators active in the sector, and their respective rate of growth. Fundamentally, for the sector to grow, interventions must support both factors to increase.
- This third and final section of this report outlines a number of proposed interventions that could boost Climate Tech innovation growth across a number key strategic sectors in the Liverpool City Region.

- Research shows that cluster building is most impactful when a region's key assets and strengths are built upon as a basis for these activities. Sectors with significant levels of activity and importance regionally can be leveraged to identify supply chain opportunities, attract innovators to leading facilities, or to large customer bases or talent pools.
- Interventions are proposed for each respective area based on an analysis of the current level of innovation activity, existence of large sector organisations and the existing level of coordination between relevant stakeholders.
- Section 3.2 highlights some successful case studies where interventions have been launched to support the growth of Climate Tech at a borough, and national, level.

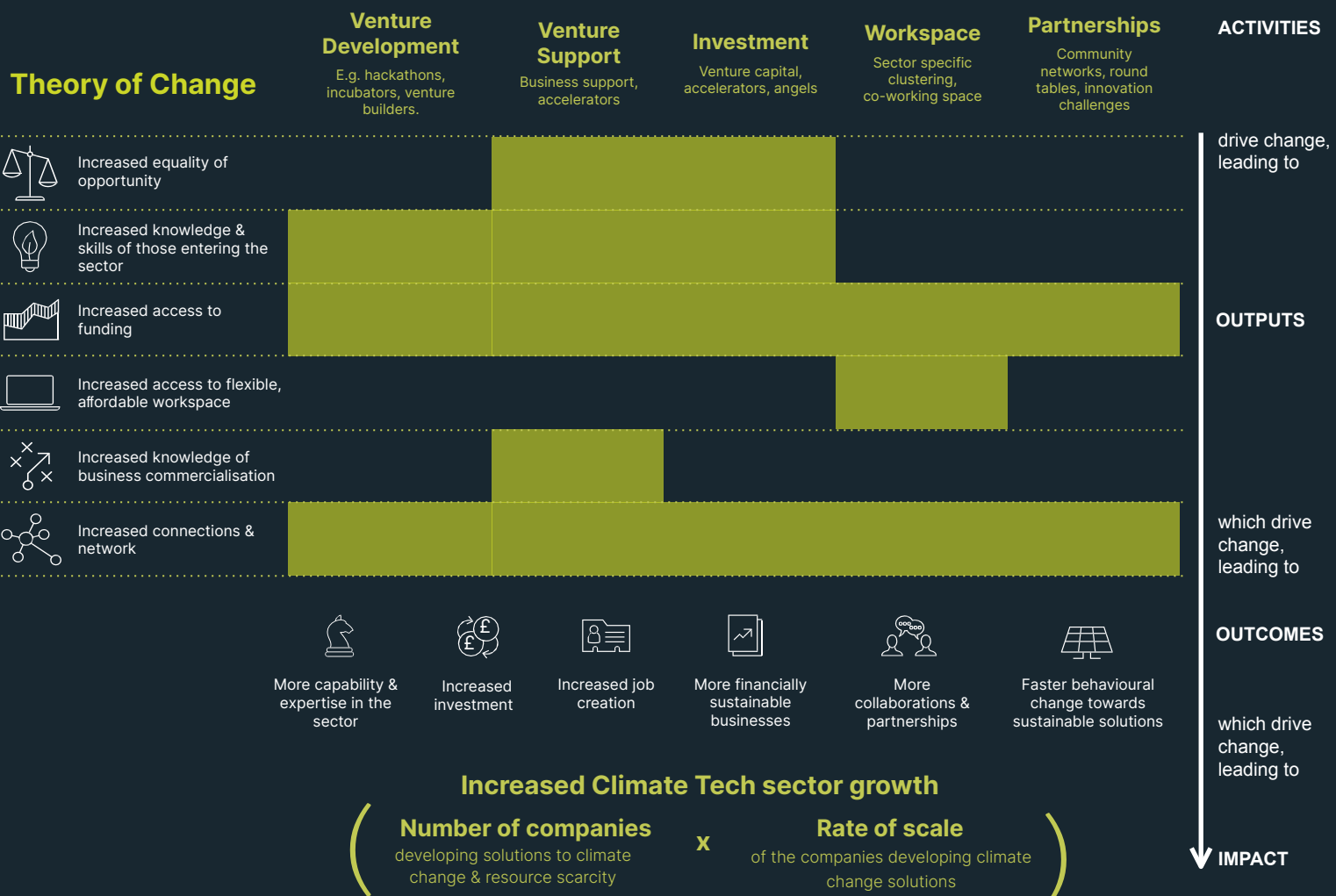


Figure 7. Theory of Change for increased Climate Tech sector growth.

3.2 Case studies

The below case studies demonstrate the impact of interventions in innovation clusters and their potential to drive growth and decarbonisation.

Case study 1

Innovation challenge

One element of Sustainable Ventures' Lambeth Economic Resilience Programme, funded by Lambeth Council, was an innovation challenge, that brought together established businesses and innovators in Lambeth to facilitate partnership building.

- **5 established businesses** and **9 innovators** attended the initial pitch day.
- **5 partnerships** created.
- Additional conversations facilitated in regards to potential future collaboration.
- **3 months of facilitated engagement** between the innovators and established businesses to support partnership development.
- **1 showcase event**, for participants to share insights and findings.
- **Two product trials** took place as a result of partnership discussions.

National Theatre

X

propelair[®]

Opportunity to fix a major ongoing operational issue



X

verv

Explore energy saving alternatives

SOUTHBANK CENTRE

X

jonee

Opportunity to explore single use packaging alternatives



King's College Hospital
NHS Foundation Trust

X

AIREX

Relevant to strategy, healthcare and potential to implement

urbanest

X

lightfi

Impact potential on new building projects, as well as scope for retrofitting for the buildings already built

Activity outputs



Increased equality of opportunity



Increased access to funding



Increased connections & network

Case study 2

Investment

The Sustainable Accelerator offers pre-seed investment to Climate Tech startups alongside a year-long accelerator programme, to prepare companies for their next funding round and associated key milestones.

£6.8m

Investment fund size

41

Pre-seed investments

>85%

Survival rate

£110m

Further funds secured

(Since Oct 2017)

2.8x

Valuation uplift at next round

Activity outputs



Increased equality of opportunity



Increased knowledge of business commercialisation



Increased access to funding



Source: Biophillica - SA portfolio company

3.3 Proposed Interventions for Liverpool City Region

Electrification of transport

- The region is known for automotive manufacture, with the industry in the LCR turning over £95bn annually. Vauxhall, Jaguar Land Rover and Ford have all made significant investment into manufacturing facilities in the region to expand EV capacity. With 81% of all cars manufactured in the UK exported, port proximity is a key long term advantage.
- With Veolia's Garston site being one of the only two plants in Europe that can recycle lithium ion batteries, alongside the region's existing strengths in advanced manufacturing, battery research and significant electricity generation capacity, there is an opportunity for the LCR to be at the centre of manufacturing for low carbon road transport.


Intervention	Details	Indicative Budget	Potential funding sources	Activity outputs
Workshop / Roundtable series	<ul style="list-style-type: none"> → The existing ecosystem for automotive manufacture in the region is well placed to facilitate collaborative workshops to explore in detail the future of the sector in the LCR. These workshops would bring together key sector stakeholders to identify key challenges and opportunities for continued growth. → Specific challenges identified could become the basis of follow-on interventions such as hackathons and innovation challenges. → This would also be a great way to build relationships with large businesses in this sector located in the region who may be interested in funding further activities. 	£10-15k	<ul style="list-style-type: none"> → Sector groups/networks with a number of large businesses who may be interested in funding efforts to activate the sector; → Small pots of public sector funding that can contribute towards sector productivity growth. 	 Increased connections & network
Innovation Challenge	<ul style="list-style-type: none"> → These types of interventions have the opportunity to form strong partnerships between local businesses and innovators who can work together to create mutual value and regional growth opportunities. As such, they are best delivered with key sector partners on board e.g. in this instance, the anchor car manufacturing businesses in the region. → The innovation challenge would aim to explore innovation opportunities and technologies to expedite and improve the efficiency of EV production in the LCR, whilst raising the profile of the region's leading industrial and research assets. → This activity typically has a strong promotional and marketing component and would accelerate the delivery of tangible evidence of progress in the LCR. 	£75-100k	<ul style="list-style-type: none"> → Public sector funding may be relevant to fund a series of innovation challenges across key strategic areas to boost productivity; → Large businesses will often also sponsor innovation challenges to gain access to innovators. E.g. Schneider collaboration with Sustainable Ventures through the Net Zero Home programme. 	 Increased equality of opportunity  Increased access to funding  Increased connections & network
Early stage accelerator (pre-seed)	<ul style="list-style-type: none"> → The aim of the above interventions is to attract innovators to the region and also inspire locally grown innovation. Research has shown that there is a significant gap in early stage funding in the region and as such, there is an opportunity to fill this gap with a pre-seed accelerator, making equity investments at the proof of concept stage. → This intensive support helps to de-risk investment and prepare innovators for the next stage of their funding pathway. The accelerator will ensure that there is a strong pipeline of commercially viable enterprises that can be scaled up, boosting productivity and job creation in the region. 	£250-300k	<ul style="list-style-type: none"> → Philanthropic funding, often aimed at supporting entrepreneurs and particularly those facing barriers to scaling businesses; → Public sector funding, often through intermediaries such as Catapults and other innovation agencies, targeted at scaling technologies in specific sectors. 	 Increased equality of opportunity  Increased access to funding  Increased knowledge of business commercialisation

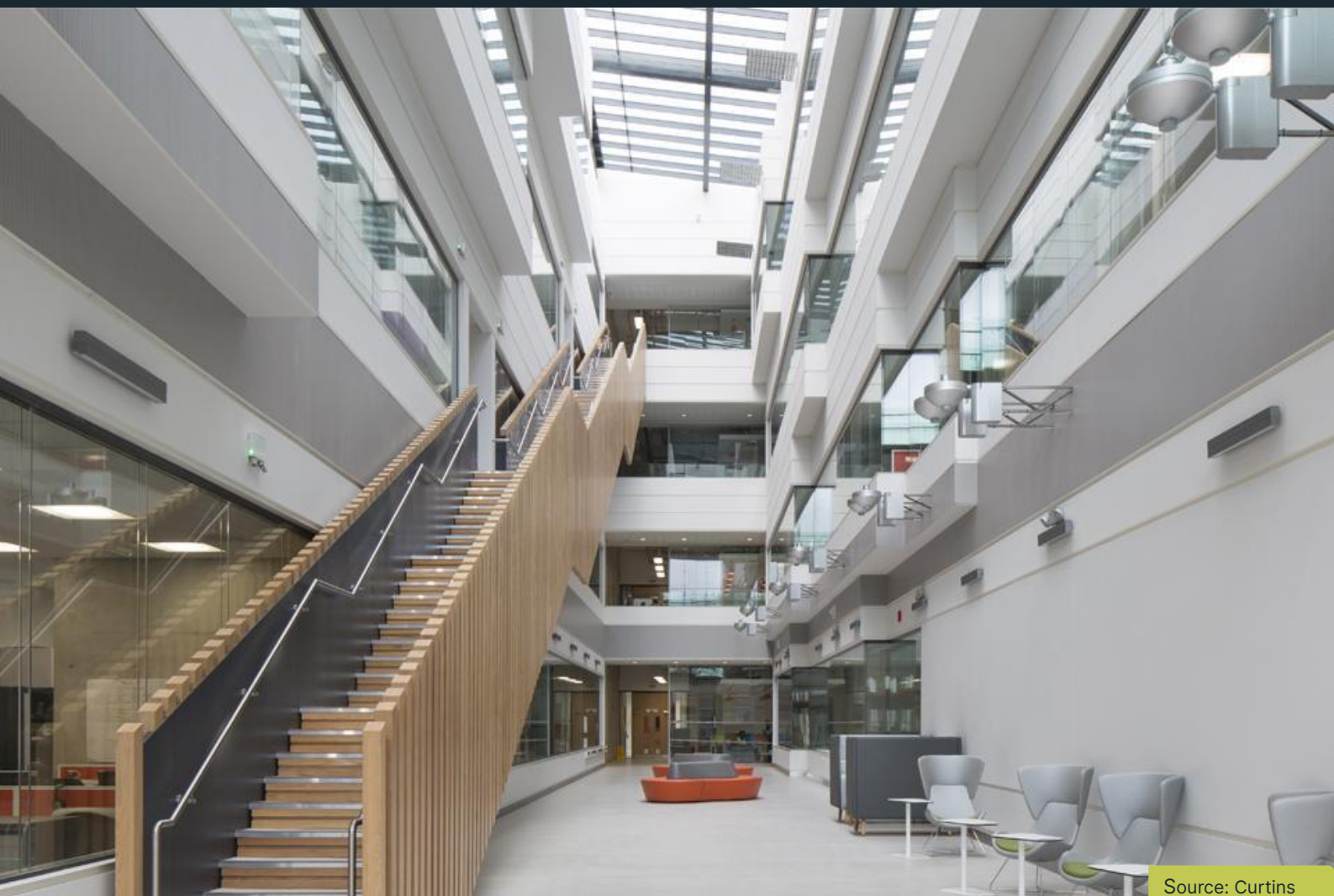
- With the port at its centre, the region is home to significant transport and logistics activity and as such, offers numerous opportunities for supply chain decarbonisation.
- The LCR is home to the UK's second largest cluster of wind farms, supported by its port infrastructure and maritime history. Plans are also progressing for a tidal barrage (the Mersey Tidal Power project) that could power up to a million homes.
- The National Oceanography Centre manages the National Marine Equipment Pool; Europe's largest fleet of autonomous and robotic vehicles.
- The combined natural assets, infrastructure and research strengths in biotechnology also create an opportunity to explore marine cultivation and carbon capture. The LCR has a unique opportunity to become a world leader in marine innovation.

Intervention	Details	Indicative Budget	Potential funding sources	Activity outputs
Maritime hackathon	<ul style="list-style-type: none"> → The LCR's long maritime history and investment in port infrastructure and marine energy, alongside world-leading research assets, provide a unique environment for maritime innovation. However, levels of such innovation in the region remain low, and as such, intervening to increase the number of CT startups being created in the region is required. → Hackathons are a great opportunity to bring together innovators in a creative environment, creating space for idea generation while showcasing the region's innovation assets. They are also a great opportunity to create sector networks between innovators, large businesses and other stakeholders. 	£25-50k + prizes	<ul style="list-style-type: none"> → Philanthropic funding to boost innovation in the sector; → Large businesses funding innovation that could offer new technologies for their supply chains. 	<ul style="list-style-type: none">  Increased equality of opportunity  Increased knowledge & skills of those entering the sector  Increased connections & network
Innovation challenge	<ul style="list-style-type: none"> → Innovation challenges look to connect innovators with large businesses, exploring collaboration opportunities with the aim of facilitating the starting point for commercial partnerships that contribute to regional GVA. → The challenges could have a broader marine and maritime theme to explore a number of challenges concurrently, or separate competitions could be hosted to focus on key decarbonisation opportunities within wind supply chain, transport and logistics etc. → Innovation challenges can also provide the opportunity to facilitate cross-sector collaboration, building on and galvanising key regional specialisms (e.g. wind power decarbonising car manufacture?) 	£75-100k	<ul style="list-style-type: none"> → Public sector funding may be relevant to fund a series of innovation challenges across key strategic areas to boost productivity; → Large businesses will often also sponsor innovation challenges to gain access to innovators. 	<ul style="list-style-type: none">  Increased equality of opportunity  Increased access to funding  Increased connections & network



- The Liverpool City Region is well known for its expertise in waste transformation, with Olleco and ReFood operating large anaerobic digestion and biorefining facilities in the region. Converting waste to energy provides a significant Net Zero opportunity, and improving the efficiency of these processes provides countless opportunities for innovation.
- The region's industrial and academic background in chemicals provides a clear foundation for chemical manufacture to support cross-sector decarbonisation. Key assets include: University of Liverpool Materials Innovation Factory, Unilever, INEOS, battery research expertise at the University of Liverpool, Ultramex and ULEMCo.

Intervention	Details	Indicative Budget	Potential funding sources	Activity outputs
Workshop / Roundtable series	<ul style="list-style-type: none"> → There is significant expertise and assets in this sector located in the region, and a clear overlap with other regional strengths such as materials and advanced manufacturing, making it highly suitable for a low carbon innovation cluster. → It is not yet entirely clear how this can come together to create unique local opportunities for innovation, nor specifically where these opportunities are the most significant. → Workshops to bring together key sector stakeholders and innovators would therefore be recommended at this stage to explore the opportunities that the sector can bring to the region and how to capitalise on these. → Further interventions could then be designed, based on workshop outcomes. 	£5-10k	<ul style="list-style-type: none"> → Large businesses operating in the region who are likely to be interested in funding efforts to activate the sector, access talent and foster innovation that could support their supply chains; → Small pots of public sector funding that can contribute towards sector productivity and growth. 	 <p>Increased connections & network</p>



Manufacturing Innovation

- The manufacturing industry in the LCR supports around 50,000 jobs in 3,000 companies, contributing £3.2bn to the economy.
- This industrial base alongside the LCR's significant manufacturing research assets provides a test bed for innovation necessary for Net Zero, but also for future-proofing the region's manufacturing jobs.
- World-leading assets such as the supercomputer at Hartree and Glass Futures have the potential to attract innovators to the region to access their facilities.

Intervention	Details	Indicative Budget	Potential funding sources	Activity outputs
Manufacturing innovation hackathon	<ul style="list-style-type: none"> → The region's key assets provide a catalyst for innovation to solve local, national and international challenges. For example, a hackathon could be run in collaboration with the Hartree Centre to explore how the supercomputer can be applied to support the transition to low carbon manufacturing. → Hackathons inspire local innovation and draw in sector innovators to the LCR, creating awareness of its significant facilities and assets. 	£25-50k + prizes	<ul style="list-style-type: none"> → Philanthropic funding to boost innovation in the sector; → Large businesses funding innovation that may then result in new technologies for their supply chains; → Public sector funding via innovation agencies. 	<ul style="list-style-type: none">  Increased equality of opportunity  Increased knowledge & skills of those entering the sector  Increased connections & network
Innovation challenge	<ul style="list-style-type: none"> → The LCR's broad manufacturing base offers high levels of opportunity for collaboration across technologies and across sectors. → An innovation challenge focused on manufacturing innovation for Net Zero could prove a powerful catalyst for bringing together some of the region's largest manufacturers with pioneers in research and innovation. This could result in commercial partnerships and scale the adoption of low carbon technologies and solutions. → Similarly to maritime, the competitions could have a broader manufacturing innovation theme to explore a number of challenges concurrently, or targeted at specific sectors and challenges. 	£75-100k	<ul style="list-style-type: none"> → As previously mentioned, public sector funding may be relevant to fund a series of innovation challenges across key strategic areas to boost productivity, and large businesses often will also sponsor innovation challenges to gain access to innovators. 	<ul style="list-style-type: none">  Increased equality of opportunity  Increased access to funding  Increased connections & network
Early stage accelerator (pre-seed)	<ul style="list-style-type: none"> → Manufacturing innovation is a key strength in the LCR, and with the opening of some key facilities in the region in the last couple of years, there is likely to be some startups created in response. There is a risk, however, that these startups will not be able to scale, without appropriate support and funding available. → As such, an early stage accelerator focused on manufacturing innovation could fill this gap, and help to fully capitalise on the activity and assets of the region in this area by commercialising technologies that have the potential to reimagine supply chains. 	£250-300k	<ul style="list-style-type: none"> → Philanthropic funding, often aimed at supporting entrepreneurs and particularly those facing barriers to scaling businesses; → Public sector funding, often through intermediaries such as Catapults and other innovation agencies, targeted at scaling technologies in specific sectors. 	<ul style="list-style-type: none">  Increased equality of opportunity  Increased access to funding  Increased knowledge of business commercialisation



Cross-sector interventions

Net Zero Programmes

- The creation of locally grown Climate Tech innovation brings a number of benefits to the LCR's existing business base:
 - Bringing new technologies to the market that can decarbonise supply chains and support pathways to Net Zero.
 - Net Zero / climate focused campaigns draw attention to the LCR and its decarbonisation efforts and therefore are likely to attract more funding for Net Zero.
 - Galvanising this activity is likely to expedite the pace of progress towards Net Zero, creating more examples amongst the business community of Net Zero actions that act as inspiration.
- A key factor in supporting SME progress to Net Zero is building understanding and clear pathways to action. Programmes can be designed and delivered that help to build this expertise and to facilitate the sharing of knowledge between businesses of different sizes and sectors.
 - An example of this is Sustainable Ventures' Lambeth Economic Resilience Programme that supports Lambeth based, sector-agnostic SMEs to decarbonise in a number of ways:
 - **Net Zero bootcamp:** A series of workshops targeted at SMEs, to support them to build their knowledge of Net Zero and to create a roadmap for their own Net Zero strategy, referencing key tools and frameworks.
 - **Innovation challenges:** Connecting established businesses in Lambeth with innovative startups to facilitate collaborative discussion, and look to establish partnerships with the view to commercial contracts. The partnerships support the startups to gain commercial traction, while supporting the established businesses to decarbonise their operations and supply chains.



Conclusion

Climate tech innovation offers a significant opportunity for regions to successfully transition to a Net Zero economy, while boosting GVA and creating high numbers of sustainable jobs. The LCR is home to world-leading research and innovation assets that can significantly support the route to Net Zero, and combined with its industrial base and infrastructure, has high potential for green economic growth.

- Currently, London is taking a large share of the economic benefit of Climate Tech both in the UK and in Europe. However, significant decarbonisation assets exist in a number of regions across the UK that pose opportunities to foster local innovation. The LCR has unique assets that will underpin a successful green economy if leveraged effectively, such as the port infrastructure and connectivity that it provides, renewable energy capacity and world-leading chemical and manufacturing research and innovation.
- The LCR has set an ambitious target to reach Net Zero by 2040 and although progress has been made, this needs to be expedited significantly. This will require significant investment, alongside appropriate interventions to promote innovation and collaboration across key sectors to decarbonise supply chains. The LCR has already demonstrated its ability to bring together key sector stakeholders and galvanise collaboration, but this must be built upon for Net Zero with a key focus on commercialising technologies.
- The alternative will see UK regions, including the Liverpool City Region, miss this critical opportunity, instead sourcing necessary technologies from elsewhere and losing out on billions in potential prosperity for generations to come.

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