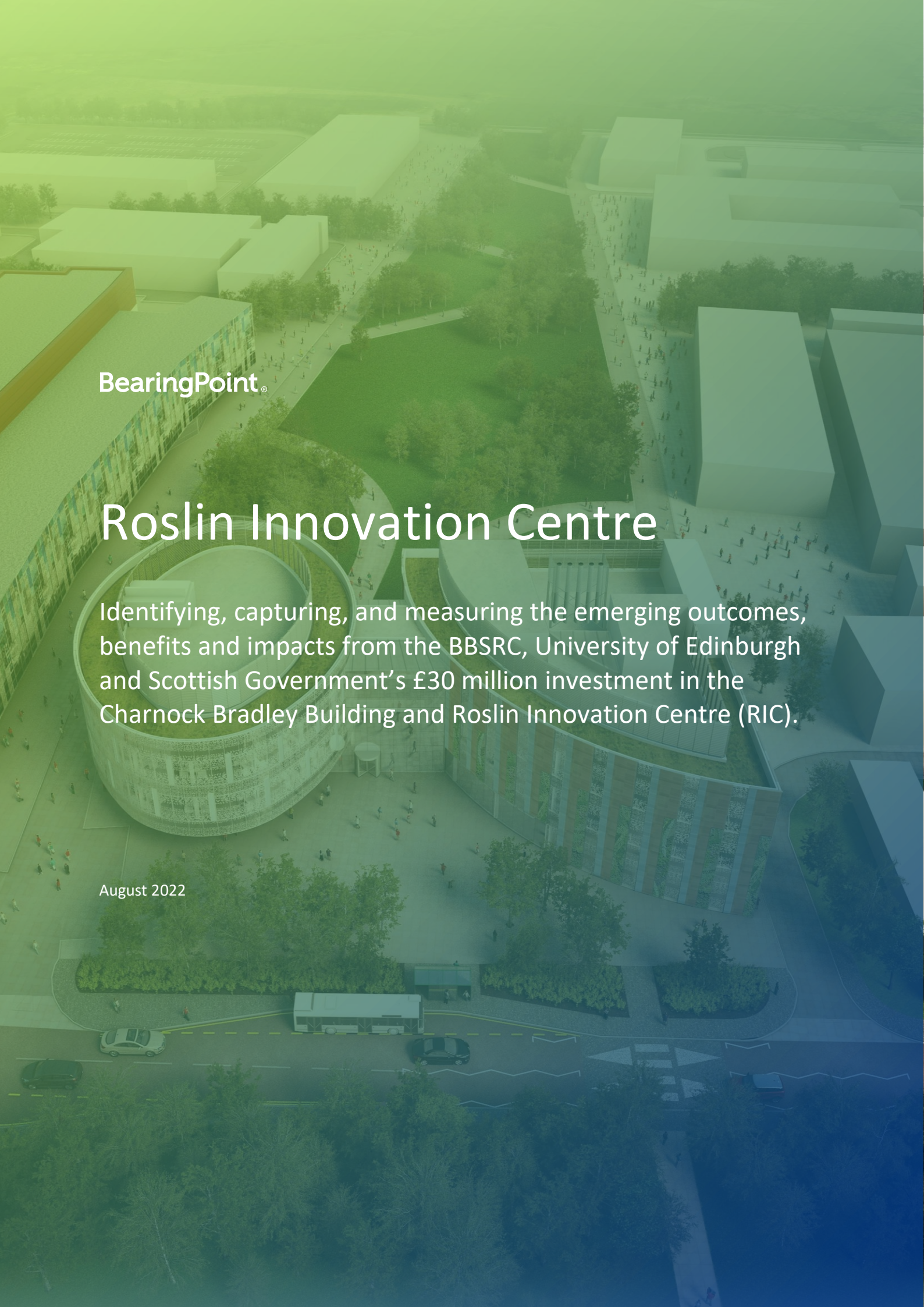

BearingPoint®

Roslin Innovation Centre

Identifying, capturing, and measuring the emerging outcomes, benefits and impacts from the BBSRC, University of Edinburgh and Scottish Government's £30 million investment in the Charnock Bradley Building and Roslin Innovation Centre (RIC).

August 2022

BearingPoint®

ROSLIN INNOVATION CENTRE

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The Biotechnology and Biological Sciences Research Council (BBSRC), Roslin Innovation Centre (RIC) and The Roslin Institute commissioned Bearing Point Ltd to independently identify and demonstrate the emerging outcomes, benefits and impact from the investment in RIC at Easter Bush Campus, Edinburgh. The outputs from this project will enable a comprehensive and evidence-based demonstration of the emerging outcomes, benefits, and impact of the RIC to society and the local, regional and national economy.

Research, data analysis and development of this report were conducted by the Bearing Point team, particularly Gill Walker, Darren Waite, and Paul Marshall.

We would like to thank members of the Steering Group for their input and help during the course of this project, which greatly benefited from discussions with Mr John Mackenzie (Former CEO, RIC), Dr Noriane Simon (Senior Portfolio Manager – Ventures, BBSRC), Dr Adam Bowen (Head of Translation and Innovation Capability, BBSRC), Dr David Johnson (Lecturer in Entrepreneurship, University of Glasgow), and Mrs Val Hughes-White (COO, Easter Bush Campus). We would also like to thank the many companies, organisations and stakeholders who have generously given their time throughout this project, including through completing surveys, engaging in interviews, and input into the workshop. Finally, we are extremely grateful for all of the invaluable help and assistance provided by Mrs Hazel Robertson (Senior Administrator and Tenant Liaison, RIC).

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Executive Director,

Capability and Innovation, BBSRC

Prof Bruce Whitelaw

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The Roslin Institute

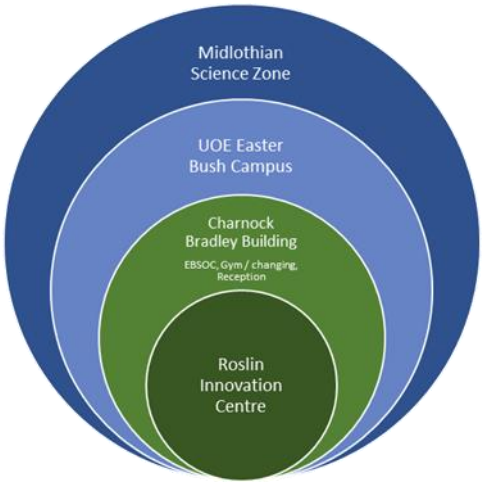
The Easter Bush Campus Key Partners and Stakeholders

2 Executive Summary

Background and scope

Following a £30 million investment by BBSRC, the University of Edinburgh and the Scottish Government, the Roslin Innovation Centre ('RIC') opened its doors in August 2017 as the business gateway to the University of Edinburgh's Easter Bush Campus. Nestled at the foot of the Pentland Hills in Midlothian, the RIC comprises two floors of the University's Charnock Bradley Building and is co-located with the neighbouring Roslin Institute.

Development of the RIC was part of a 20-year masterplan to develop the University's Easter Bush Campus, which intends to forge closer and more effective links with industry and increase the impact and market competitive position of the University globally.



The RIC has a strong focus on Knowledge Exchange and Commercialisation and has a defined vision of *'delivering solutions to address global challenges within livestock industries and in both veterinary and human medicine'* by *'providing a dynamic, vibrant working environment with world-class facilities, equipped with the latest technologies'*, within the Easter Bush Campus which boasts the largest concentration of animal science-related expertise anywhere in Europe[i]. It has set out to be *'the business location of choice for companies undertaking strategic, commercial and collaborative research in the Animal and Veterinary Sciences, Agri Tech and One Health industries.'*

The RIC offers over 285 laboratory workstations and office space for up to 380 scientists as well as a 'research hotel' interim solution for established companies and start-ups. The Centre now has occupancy of over 85% including tenants from New Zealand, the USA and Europe. It facilitates access to:

- The Edinburgh BioQuarter (scientists, clinicians, patients)
- The College of Medicine and Veterinary Medicine, and College of Science and Engineering (University of Edinburgh)
- Business professionals, mentors, non-executives, and investors
- Investment opportunities in research projects (including via Roslin Technologies and the UK Innovation & Science Seed Fund)
- Company growth opportunities
- On-campus international and national knowledge centres
- Other on-campus scientific facilities
- Supporting laboratory services

The RIC is an important and successful component of Easter Bush Campus. It provides a unique innovation environment where established companies, multinationals, new and existing R&D strategic partners, spin-outs, spin-ins, start-ups, and scale-ups can co-locate with world-leading research and capabilities.

In particular, the RIC provides:

- Flexible office and laboratory accommodation equipped at a high standard, attracting, and developing bioscience companies at different stages of maturity. This includes local follow-on space for growing companies.
- Business development, translation, acceleration, and service opportunities.
- A dynamic culture of engagement, collaboration, and co-creation, with dedicated support available for industry-academic collaborations and strong ties with the Roslin Institute, University of Edinburgh, and other key partners.

The scope of this study is an evaluation of the wider socio-economic outcomes and benefits of the RIC. This is not purely about academic benefits (new knowledge being generated) but is an appraisal of the totality of business, commercial, economic, people, cultural and social benefits that the RIC has realised.

The requirement covered three components as follows:

1. Identification and agreement of the breadth and nature of benefits realised from the £30m investment, and an agreed portfolio of indicators
2. A robust methodology for capturing quantitative and qualitative data for the agreed indicators, and a methodology for maintaining and developing the datasets and supporting evidence
3. A baseline dataset and evidence, and an assessment of benefits achieved at key timepoints between that baseline and the time the research was carried out

Because the scope of the study was focused on benefits delivered by the £30m joint investment in the Charnock Bradley Building and RIC, it was necessary to ensure that benefits being delivered by the Charnock Bradley Building were also included in the analysis. It was clear from the outset that the close relationship between the building and the RIC would make it difficult to disentangle the logic model that gives rise to benefits in many cases. For these reasons, benefits arising from the building, the immediate built environment, facilities management services, as well as the RIC are all included in the modelling.

Context

Existing conditions for success

Prior to completion of the Charnock Bradley Building and the opening of the RIC, there was already a thriving research ecosystem in place in what is now the Midlothian Science Zone, and specifically within the Easter Bush Campus. Despite – or perhaps due to – the recession of 2007-2009, the need to secure economic recovery in Midlothian was closely tied to plans for leveraging the potential of the Easter Bush site based on its established global reputation in animal biosciences.

The 2008 Easter Bush Masterplan put in place a 20 year staged development plan for the Campus, supported by infrastructure developments under the 2012 Bush Masterplan. These two documents gave a more strategic focus to the future direction and development of the Campus than had previously been the case. The RIC, located within the UOE's new Charnock Bradley Building, was included as a key element of phase three of the Easter Bush Masterplan.

Commercialisation Model

The RIC offers a different commercialisation model than the UOE 'Edinburgh Innovations' model, with no requirement for an equity stake in a young company and less need to be administratively bound by UOE policies and processes. This model offers more flexibility in

decision-making and may be more attractive to small companies seeking inward investment from technology and bioscience firms, as it does not afford any IP rights to the UOE.

Relationship with the built and natural environment

The RIC makes good use of the built and natural environment to create a 'wow' factor for visitors and investors alike. Qualitative interviews with tenant companies, and findings from the tenant survey, lend additional credence to the proposed existence of benefits arising from the RIC and tenant companies' relationship with the quality of the building and its surrounding built environment.

A porous and collaborative ecosystem

The ecosystem that surrounds the RIC and its tenant companies remains highly respected, with several of its elements recognised nationally and internationally as world-leading centres of excellence. The ecosystem can be described as 'porous' and highly collaborative, with knowledge transfer and collaborative research at the heart of its agenda. Qualitative interviews have confirmed this perception of porosity and collaborative opportunity among tenant companies, all of which are reluctant to consider leaving the ecosystem despite some current physical constraints on growth.

Opportunities for enhanced critical mass

Several recent policy factors have converged to enhance the critical mass behind the future development of the Campus, including the RIC. The 2015 Science and Innovation Audit and Scottish Government Economic Strategy began to lay the groundwork for the City Region Deal and the Data Driven Innovation (DDI) Initiative, which will see the introduction of a dedicated Agri-Epi centre on the Campus. The Agri-Epi centre will further enhance the national and international reputation of the Campus and will provide more opportunities for collaboration with tenant firms in the RIC, offering potential for them to contribute to world-leading research with significant impacts. The DDI also encourages greater contribution to national policy. Recent examples include encouraging scientists, including RIC tenants, to participate in DEFRA and Scottish consultations on gene editing regulations. The emerging Regional Prosperity Framework will also lend further weight to developments in the Easter Bush Campus and Midlothian Science Zone which can only be beneficial to the RIC, and in which tenant companies are well placed to participate.

Market sizing

The UK has always enjoyed a reputation for scientific excellence, producing 29% of European scientific journal articles, and ranking fourth on the Global Innovation Index (116,815 jobs created, and R&D spending projected to rise to 2.4% by 2027). The life sciences sector is a major component of the UK's economic base, generating £64 billion turnover and employing more than 233,000 people. Globally, the life sciences sector is expected to reach $2 trillion in gross value by 2023.

Within the global life sciences sector, despite the Covid-19 pandemic, the global biotech sector is flourishing. Private and public funding, including global venture capital investments, deals, and IPOs, hit record highs in 2020 to the point where the sector is outperforming both the pharmaceuticals and consumer goods and technology sectors. The UK is Europe's leading biotech hub in breakthrough life-sciences start-ups; average growth in UK biotechs' share price was 32% in 2020, surpassing that of Europe (22%) and the US (2%). In total, UK biotechs raised £2.8 billion in 2020. Despite this, research by McKinsey & Co suggests that the UK struggles in

Translation and Impact measures – that is, forming new biotech companies who are converting science into IP, raising early-stage capital, and getting approved products to market.

Another estimate by McKinsey, based on a non-exhaustive library of 400 biotechnology use cases, suggests that there is a strong pipeline from research to commercialisation in the agriculture, aquaculture, and food domain, which could be conservatively valued globally at between $0.8 trillion and $1.2 trillion over the next 10-20 years. While adoption rates for agriculture, aquaculture, and food technologies is expected to require 10-25 years, the possible spillovers to upstream, downstream, and ancillary sectors which give rise to this market value are suggested as:

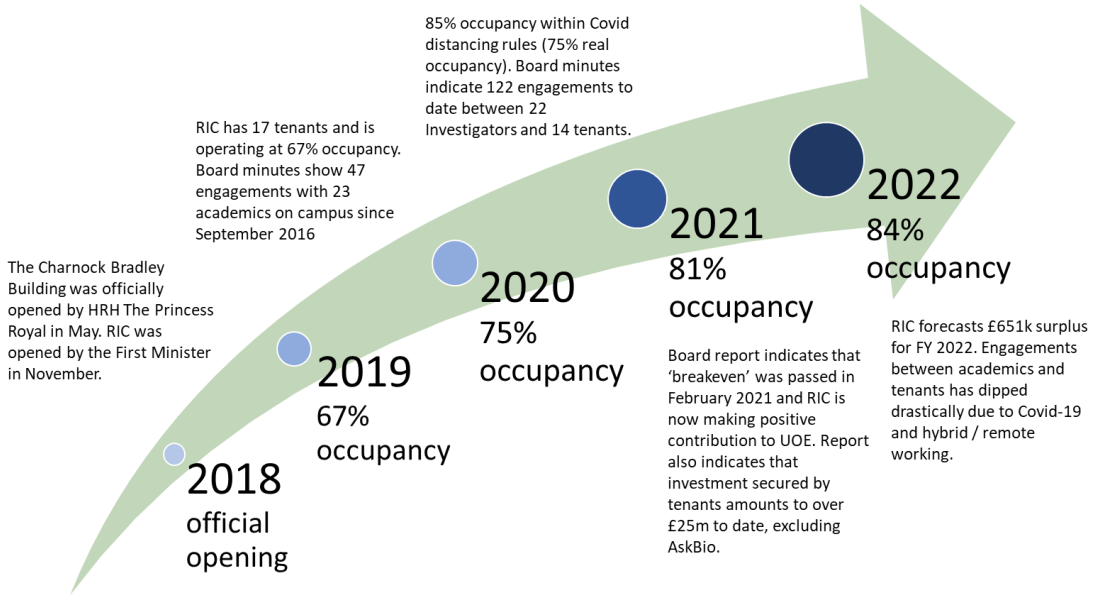
- Food retail and restaurants, due to food with new properties such as plant-based and cultured proteins. It has been suggested in a different report that the alternative protein market alone will be valued at $290 billion by 2035, and that by that same date, every tenth portion of meat, eggs, dairy, and seafood eaten around the globe will be made from alternative proteins. The 2021 State of the Industry report on Cultivated Meat and Seafood goes as far as to suggest that the world is on the cusp of a global race for alternative protein innovation. By 2021, the total invested capital in the industry had topped $1.9 billion.
- Real estate, due to reduced land use arising from more efficient agriculture, and lab-grown meat
- Transport and logistics, due to produce having new properties such as improved shelf-life, and the ability to grow in new geographic regions
- Environment, due to reductions in carbon footprint in agriculture and meat production. For example, a shift to alternative proteins has been forecast to save more than 1 gigaton of CO_2 equivalent by 2035 and to save 39 billion cubic metres of water.

The same report also points to two clear areas in which there is potential for large-scale societal effects; mitigating climate change (for example by reducing deforestation, reducing pressure on cropland, and adopting more sustainable inputs into production methods) and food security (for example, by improving fertilisers and pesticides, and introducing genetically engineered crops, along with tools to help farmers better fight crop disease).

Even without factoring in the potential global impacts of using biotech to prevent, diagnose, and better treat human diseases, there is clearly a significant potential social and economic benefit to be generated to Scotland, the UK, Europe, and the world, in enabling the effective commercialisation of innovative solutions being generated by tenant companies in the RIC.

Milestones achieved by the RIC

Review of Board papers from 2018 – 2021 indicates a positive trajectory in achieving the aims and objectives of the RIC, despite the impact of the Covid-19 pandemic on distancing and occupancy, and limitations on organic interaction between people due to the introduction of hybrid working arrangements. Indeed, the projections for occupancy set out in the original 2013 business plan for the Easter Bush Innovation Centre (section 4.2 above) have been exceeded and the RIC is now making a positive £651k contribution to University of Edinburgh finances. RIC has already exceeded the expectations set out in the original 2013 business plan.



Typical tenants

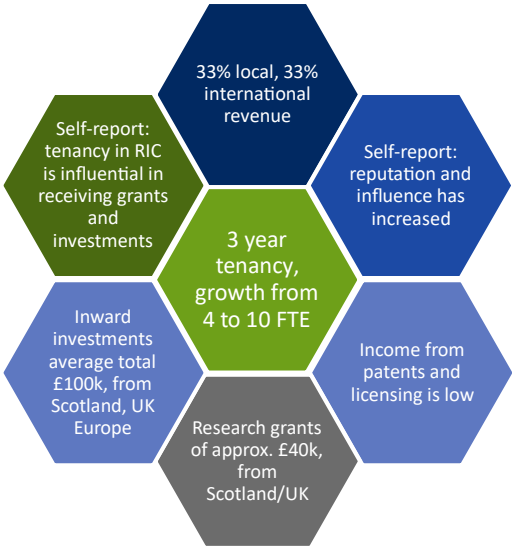
The typical tenant has been at RIC since 2019, for approximately three years. At the time of becoming a tenant, organisations typically employed an average of four FTE; this rises to an average of ten FTE over those three years. Gender balance tends to improve as tenants grow.

Initially, tenants' revenue is one third local, one third international (excluding Europe) with the rest split across Scotland, rest of UK, and Europe. There is some evidence that over time, revenue sources are more even across, local, rest of UK, Europe, and other international locations.

Tenants typically indicate that their reputation and influence across most geographies has increased in the time they have been at RIC.

Overall, patents, licences and income from licensing is at a low level for the typical tenant.

A typical tenant receives one or more research grants a year. Each grant is worth approximately £40k, although the figures do vary greatly. Typically, 80% of these grants originate from elsewhere in Scotland or the wider UK.



Tenants have typically received one or more inward investments totalling >£100k on average whilst at RIC. Numbers do vary, but most investments are >£10k. By volume, most of these investments come from across Scotland, the UK, and Europe. However, larger investments have tended to come from Scotland and/or the UK in particular.

Typically, tenants feel that locating in the RIC is influential in them receiving research grants and inward private investments.

Benefits achieved

Economic Benefits

There is clear evidence that the £30m investment in the Charnock Bradley Building, and the establishment of the RIC, has resulted in positive economic benefit at the local, Scotland, and rest of UK levels. These benefits largely take the form of direct and indirect jobs created and associated spillover benefits, as well as several qualitative benefits which are discussed further below. In line with the Green Book, this study has evaluated three scenarios, based on optimistic (upper case), reasonable (mid case), and pessimistic (lower case) assumptions for direct, indirect, and spillover benefits; the resulting range of GVA arising from the investment lies between £32.8m and £186.3m over the period since the building was opened. The mid case sits at £85.6m.

Analysed between local (Midlothian), Scotland, and rest of UK level impacts, the GVA can be summarised as follows:

	Upper Case	Mid Case	Lower Case
	Total £m	Total £m	Total £m
Total local impacts - Midlothian	60.4	29.1	9.6
Total national impacts - Scotland	56.6	25.9	8.8
Total national impacts – Rest of UK	69.3	30.6	14.4
TOTAL	**186.3**	**85.6**	**32.8**

Easier access to funding

The tenant survey provided good original evidence that most tenant companies believe their location in RIC is influential in them securing research grants, and approximately half of tenants felt that their tenancy is influential in them securing private investments. Qualitative interviews expanded that this is largely due to the credibility and legitimacy they enjoy from the Roslin brand and the reputation of the ecosystem as a whole. The tenant survey indicates that half of all research grants received by RIC tenants originate from the wider UK, excluding Scotland. A further quarter come from Scotland with only a relatively small proportion originating from wider European and international sources. It also indicated that over time, geographical revenue sources diversify and that tenants experience improved revenue share coming from wider UK and European sources in particular.

Culture

It was clear from an early stage in this study that it would be important to understand whether the prevailing organisational culture within the RIC was enterprising, and conducive to nurturing and scaling up early-stage ventures as well as anchoring established companies within the Easter Bush ecosystem. If true, this would strengthen the argument that the RIC was enabling qualitative benefits to tenant companies, including around staff satisfaction and wellbeing.

The Organisational Culture (OCAI) assessment that was undertaken has provided strong evidence that the prevailing culture within the RIC is entrepreneurial and innovative, rather than being hierarchical. Furthermore, it highlighted congruence between the prevailing culture and the type of culture that tenants expect and prefer to work in. The effect of this is that any workplace stress and tension that might arise as a result of a clash between prevailing and preferred cultures is unlikely to occur within the RIC; the prevailing organisational culture is seen as a positive attribute of life in the centre.

Collaboration within a porous ecosystem

Opportunities for collaboration with the Roslin Institute, other parts of the UOE, and other tenants within the Easter Bush ecosystem are plentiful for tenant companies at the RIC. This is greatly aided by the porosity of the ecosystem and is enabled by the effective use of the built environment to provide open plan, shared workspaces, as well as facilities in which staff from different organisations can meet informally and enjoy ad-hoc conversations over coffee. Several interviewees reported during the study that these organic interactions have given rise to research collaborations.

Prior to the opening of the RIC, there was already a significant cluster of related organisations within the Midlothian Science Zone and in particular as part of the Easter Bush Campus Masterplan. However, the addition of the RIC has added further weight to the Campus' critical mass. The RIC has enhanced the existing ecosystem, supporting tenants to deliver world-leading science, enhance national capabilities, and leverage the specialist facilities and infrastructures already in place in the Easter Bush campus.

It is also evident from the qualitative research undertaken that RIC has contributed to the growth of a connected and collaborative local ecosystem, where the exchange of ideas and knowledge is leading to innovation with the potential to deliver significant value to national policy and to address global issues.

Legitimacy and credibility

There is strong qualitative anecdotal evidence from interviews carried out with tenant companies that location on campus, links with the Roslin Institute brand (and the association with 'Dolly') and the University of Edinburgh brand, all contribute to perceptions of legitimacy and credibility among tenant companies. Several companies cited these factors as directly influencing their decision to locate at RIC and that they believe that their own credibility with clients and investors is enhanced as a result of association with these brands and the reputation of the location's ecosystem.

Findings from the tenant survey also indicate that overall, tenants feel that their reputation and influence locally in Midlothian, in Scotland, and in the UK and Europe has increased considerably during the time they have been a tenant at RIC. Tenants did report a feeling of increased reputation and influence at wider international level, but this was less marked than at other levels.

Built and natural environment

The qualitative interviews undertaken as original research have provided strong positive anecdotal evidence of the high quality of the Charnock Bradley Building and the surrounding built and natural environment, and the impact this has on the staff experience. Factors such as the good use of natural light, and the wider facilities and services that are available in the building have been demonstrated to deliver a sense of working in a dynamic and vibrant environment, which enhances staff satisfaction and wellbeing.

Furthermore, the role played by the RIC in attracting additional funding to the area will result in additional local infrastructure improvements as part of future phases of the Easter Bush Campus Masterplan.

Sustainability

The Charnock Bradley Building was designed with sustainability in mind; one very visible example of this is the use of 'living walls' throughout the interior and exterior of the building. In addition to its own design, much research work goes on within the RIC that furthers local,

national, and global efforts to mitigate climate change and make positive contributions to environment. For example, as a result of collaboration between the Midlothian Science Zone and BeeBytes Analytics, the Easter Bush Campus is now recognised on the Scottish 'B-Lines Pollinator Pathway' map.

Other benefits in the local Midlothian area

In addition to the economic benefits set out above, there is evidence that activity within the Charnock Bradley Building, including tenant companies from the RIC, has benefited local schools and communities in the Midlothian area.

There is evidence of positive engagement with schools, colleges, and citizens in Midlothian and the Edinburgh area which can be directly traced to the activity of the EBSOC team in the Charnock Bradley Building. It is likely that this positive engagement – which often involves collaboration with scientists at the Roslin Institute and RIC, has increased local participation in citizen science. While the link has not been proved by the current study, it is conceivable that this may have contributed in a small way to an uptick in numbers of students presenting for SQA National 5, Higher, and Advanced Higher level biology in the Midlothian region.

There is also evidence of job opportunities that may be suitable for students in the area being advertised on behalf of tenant companies by the Midlothian Science Zone team. There is robust documentary evidence that since March 2021 the team have advertised 46 jobs on behalf of tenant companies at the RIC. These jobs range from business-focused roles to specialist scientific or technical roles suitable for graduates or for more experienced scientists. In addition to this, they also advertised an internship at EBSOC, based in the Charnock Bradley Building.

Contribution to policy and global issues

The nature of the work being undertaken by tenant companies is designed to address some of the most pressing global issues facing the world today, including the climate crisis, food shortages, and animal and human health issues including Covid-19. It is less clear at the moment that these companies are making direct contributions to Scottish and UK Government policy in these matters; however, plans are in place via the University's DDI Programme to encourage a more direct contribution to policy consultations in future.

There is emerging evidence that this is now occurring, but it is too early to measure any tangible outcome. For example, the pan-Scotland Animal Health, Agri-tech, and Aquaculture Industry Leadership Group (AAA ILG) is setting up a short life working group on Gene Editing to help drive and influence new innovation regulation policy.

Attractiveness of Scotland and the UK as a life sciences (AAA) destination

There are several examples of inward investment into RIC tenant companies from outside the UK - the tenant survey provided original evidence that geographical revenue sources diversify over time and that tenants become less reliant on very local sources with more revenue share coming from wider UK and Europe in particular as they grow. This is a good indicator that the RIC is enabling tenant companies to become attractive to international investors, which itself speaks to the attractiveness of Easter Bush, and by implication Scotland and the rest of the UK, as a destination which is attractive to life science (particularly AAA) research.

Translation effects

Finally, with partners investing a significant £30m in a new building and the RIC, it was important to consider whether the industry-academic partnership environment that was created could be found to have translated that investment into real-world impacts and wealth creation for the UK economy.

There is quantifiable evidence of economic benefits being delivered in return for the initial £30m investment. However, at this time, this study did not uncover any direct evidence of improvements to the efficacy with which research findings can be translated into real-world impacts. While RIC has been in operation for 5 years, adoption for agriculture, aquaculture, and food technologies is expected to require a 10-25 year timeframe. This lack of currently demonstrable translation effect should not be considered a failure on RIC's part. Based on evidence presented in the recent BBSRC-funded evaluation of the Babraham Institute, it is reasonable to assume that this benefit will arise in future years.

In its first 5 years of operation, RIC has exceeded estimates from the original business plan, delivering economic benefits ranging between 109% (£1.09 for every £1 invested) and 621% (£6.21 for every £1 invested) of the value of the original £30 million investment. Using realistic assumptions, it is estimated to have delivered benefits equivalent to £2.86 for every £1 of that investment (a return of 286%).

RIC has also delivered qualitative benefits, including establishing an entrepreneurial and innovative culture, enhancing the Easter Bush Ecosystem and enabling tenant companies to access research grant and inward investment funding.

We recommend that BBSRC, the University of Edinburgh and the Roslin Innovation Centre should continue to monitor these (and other) benefits on a regular basis.

3 Introduction

3.1 The Roslin Innovation Centre

Following a £30m investment by BBSRC, the University of Edinburgh, and the Scottish Government, the Roslin Innovation Centre ('RIC') opened its doors in August 2017 as the business gateway to the University of Edinburgh's Easter Bush Campus. Nestled at the foot of the Pentland Hills in Midlothian, the RIC comprises two floors of the University's Charnock Bradley Building and is co-located with the neighbouring Roslin Institute.

Development of the RIC was part of a larger 20-year masterplan to develop the University's Easter Bush Campus, including forging closer and more effective links with industry and increasing the impact and market competitive position of the University globally.

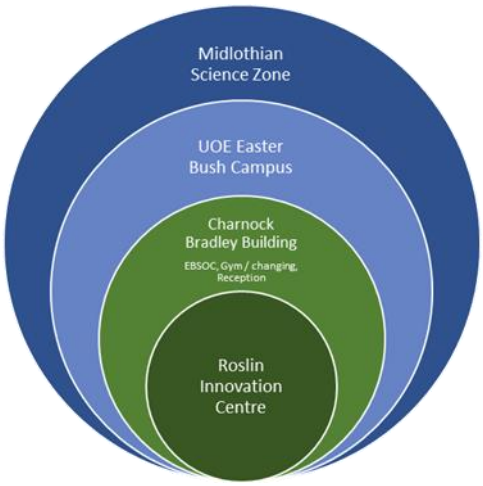


Figure 1: Relationship between RIC and the ecosystem

The RIC has a strong focus on Knowledge Exchange and Commercialisation and has a defined vision of *'delivering solutions to address global challenges within livestock industries and in both veterinary and human medicine'* by *'providing a dynamic, vibrant working environment with world-class facilities, equipped with the latest technologies'*, within the Easter Bush Campus which boasts the largest concentration of animal science-related expertise anywhere in Europe[ii]. It has set out to be *'the business location of choice for companies undertaking strategic, commercial and collaborative research in the Animal and Veterinary Sciences, Agri Tech and One Health industries.'*

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- Business professionals, mentors, non-executives, and investors
- Investment opportunities in research projects (including via Roslin Technologies[iii] and the UK Innovation & Science Seed Fund[iv])
- Company growth opportunities
- On-campus international and national knowledge centres
- Other on-campus scientific facilities
- Supporting laboratory services

The RIC is an important and successful component of Easter Bush Campus. It provides a unique innovation environment where established companies, multinationals, new and existing R&D strategic partners, spin-outs, spin-ins, start-ups, and scale-ups can co-locate with world-leading research and capabilities.

In particular, the RIC provides:

- Flexible office and laboratory accommodation equipped at a high standard, attracting, and developing bioscience companies at different stages of maturity. This includes local follow-on space for growing companies.
- Business development, translation, acceleration, and service opportunities.
- A dynamic culture of engagement, collaboration, and co-creation, with dedicated support available for industry-academic collaborations and strong ties with the Roslin Institute, University of Edinburgh, and other key partners.

3.2 BBSRC Perspectives

Background: current relationships with Easter Bush Campus

BBSRC is a strategic investor in The Roslin Institute. Between 2016/17 and 2020/21, the Roslin Institute received £64.4 million from BBSRC. It is also a strategic investor in the Roslin Innovation Centre (£5 million) and a member of the RIC Development Board.

The organisation is also a member of the Easter Bush Development Board, which brings together wider Easter Bush Campus partners including SRUC, Moredun, Pentlands Science Park, Edinburgh Technopole, Scottish Government, Scottish Enterprise, and supported by Midlothian Council.

The five Research and Innovation Campuses

BBSRC's strategic goal is to support the development of distinct research and innovation ecosystems that are centred on, and draw value from, the world-leading bioscience and national capability of the institutes that receive strategic funding from BBSRC.

To date, BBSRC is working with partners and stakeholders to develop five national Research and Innovation Campuses, centred around seven institutes that receive strategic funding from BBSRC. The Campuses are each distinct and at a different stage of maturity. Each Campus has a different bioscience focus area, unique flagship facilities and a diverse range of support, such as accelerator programmes.

The five BBSRC Campuses are:

- Easter Bush Campus (Edinburgh), centred around The Roslin Institute
- Aberystwyth Innovation and Enterprise Campus (Aberystwyth), centred around the Institute of Biological, Environmental and Rural Sciences (IBERS)
- Babraham Research Campus (Cambridge), centred around the Babraham Institute
- Norwich Research Park (Norwich), centred around the John Innes Centre, Earlham Institute and Quadram Institute
- Rothamsted Campus (Harpenden), centred around Rothamsted Research

As key players and contributors to the UK research and innovation system, these research and innovation Campuses aim to:

- nucleate regional clusters and work with key stakeholders (for example LEPs, regional bodies, combined authorities) to deliver local strategies and impact, attracting and nurturing highly innovative businesses, creating high-value jobs, attracting inward investment, enhancing collaboration, and accelerating scientific impact by businesses.
- add significant value to the wider regional, national, and international innovation ecosystem, delivering wide-ranging social and economic benefits to the UK.

- create a unique, defined, and dynamic research and innovation ecosystem nucleated by a critical mass of world-leading science, talented people, national capability, specialist research-led facilities and infrastructures at each location.

As part of this, the Campuses:

- grow a connected and collaborative community, where discovery scientists, engineers, innovators, entrepreneurs, and businesses converge to advance scientific understanding and accelerate innovation through the exchange of ideas and knowledge
- promote and embed an enterprising culture on Campus, nurturing very early-stage ventures, accelerating scale-up, and anchoring established companies in an interconnected and collaborative ecosystem
- drive innovation, stimulating more value from fundamental research and meeting the needs of the diverse sectors that research underpin.

The five BBSRC Campuses are part of a wider network of UKRI Research and Innovation Campuses, including those supported by the Science and Technologies Facilities Council.

Vision and objectives at the time of investment

The investment in the RIC was part of a multi-phase development programme for the research and innovation Campus at Easter Bush.

At the time of investment, the vision for the RIC was to "allow location of specialised infrastructure and facilities such as ARK Genomics and the Pathology Centre to be available for use to commercial tenants, together with a business and enterprise support 'ecosystem'." This would permit the "natural development of the Easter Bush Research Consortium's expanding business development and knowledge exchange activities, outside the zero-rated Roslin building, allowing the spin out companies or business collaborators to have laboratory and office space located close to the science expertise and clinical livestock expertise and populations." As part of the wider development of the Easter Bush Campus and site, this Centre would "provide accommodation next door to Roslin Institute and Dick Vet, with access to its infrastructure, as well as specialist research centres that would serve the entire UK Bioscience R&D community and complement the facilities at other Edinburgh Science Triangle locations."

The investment in the RIC would build on the academic campus, bringing academic and commercial research together to advance and commercially exploit emerging technologies. In particular, the RIC would:

- Enable co-location of major industry partners adjacent to the research and clinical activity, providing them with access to the resources and expertise of the Campus.
- Provide flexible research facilities to start up and SMEs who are at very early stages of development, as such require flexible short-term leases in order to assist businesses in their planning process – it is recognised that many new companies struggle to commit to a lease over 3 years, as they often struggle to secure investment (banks or other) which is beyond a 1-2 year period at the early stages This space will provide a market niche which allows a company to develop in a supportive environment.
- Provide research and/or office facilities for both the International Centre for Livestock Improvement and the Centre of Comparative Pathology
- Provide campus facilities (shop, gym, nursery, and outreach centre) – these facilities are essential for the overall Campus Development, where it is recognised that staff and students need these facilities, but it also provides additional enhancement to resources available to our industry partners.

Expected Benefits

Overall, BBSRC aim to achieve the high-level objectives and benefits outlined above for each and every one of our Research and Innovation Campuses. This includes the Easter Bush Campus and, as a key component of Easter Bush Campus, the RIC.

Expected benefits from this investment (as part of the wider development of the Campus) include:

- Help improve efficiency, help grow critical mass needed to compete in emerging markets and help attract industry collaboration by sharing cutting edge technology and resources more cost effectively
- Secure new national and international research funding
- Attract co-location of large and small industry research and development partners
- Leverage investment through local government for the infrastructure requirements
- The industry-academic partnership environment will translate the investment in campus development into international food security and wealth creation for the UK economy (i.e. increased revenue, new products and services, greater research capacity and innovation, employment growth)

Please note that, at the time of investment, neither a logic model nor a benefits realisation framework were produced. As such, there are no defined quantitative or qualitative benefits associated with this investment. (This was a key driver for commissioning this benefits realisation and baseline study on the RIC).

Perceptions of value

The RIC delivers value by playing a central role within the research and innovation ecosystem at Easter Bush Campus. In particular, it supports entrepreneurship and accelerates innovation, through:

- providing flexible, well-equipped office and laboratory space and associated support, which is crucial for early-stage start-ups and scale-ups
- fostering a dynamic entrepreneurial and collaborative culture, both within the building and across the wider Campus with strong, two-way connections to the researchers based at the Roslin Institute, University of Edinburgh, and neighbouring science parks.

By doing so, the RIC attracts and nurtures highly innovative businesses, enabling them to grow, create high-value jobs, attract inward investment, advance scientific understanding, and accelerate innovation. These include start-ups, scale-ups, spin-ins from the FAST programme, and spin-outs from the Roslin Institute and University of Edinburgh, as well as key R&D strategic partners.

This key role and value-add of the RIC is similar to that observed for the:

- Multi-occupancy, flexible lab/office buildings for start-ups at the Babraham Research Campus (Cambridge), including the Minerva, Meditrina, Maia, and Moneta bioincubators and the Jonas Webb and Bennett buildings for follow-on space. Further information can be found in the published Babraham Campus Impact Report[v].
- Rothamsted Agri-tech Business Centre, particularly the Daniel Hall building (incubation space for start-ups) and Lawes Open Innovation Hub (grow-on space) which both provide flexible office and lab spaces at the Rothamsted Campus (Harpenden)

- The Centrum (office space for growing companies) and Innovation Centre (high quality office and lab units for start-ups, SMEs and expanding small companies) at the Norwich Research Park (Norwich)
- AberInnovation Innovation Hub, with office accommodation for start-ups and SMEs and access to specialist R&D facilities (Aberystwyth Innovation & Enterprise Campus, Aberystwyth)

3.3 Background to the study

The scope of the study is provision of an evaluation of the wider socio-economic outcomes and benefits of the RIC. This is not purely about academic benefits (new knowledge being generated) but is an appraisal of the totality of business, commercial, economic, people, cultural and social benefits that the RIC has realised. The sponsors required adoption of best practice Magenta Book compliant methods (incorporating mixed methods and maximising use of existing evidence wherever possible), and which build on the existing work of Dr David Johnson and Mr John Mackenzie, published in the European Business Review[vi].

The requirement covered three components as follows, all of which were incorporated into the methodology:

1. Identification and agreement of the breadth and nature of benefits realised from the £30m investment, and an agreed portfolio of indicators
2. A robust methodology for capturing quantitative and qualitative data for the agreed indicators, and a methodology for maintaining and developing the datasets and supporting evidence
3. A baseline dataset and evidence, and an assessment of benefits achieved at key timepoints between that baseline and current day

Because the scope of the study was focused on benefits delivered by the £30m joint investment in the Charnock Bradley Building and RIC, it was necessary to ensure that benefits being delivered by the Charnock Bradley Building were also included in the analysis. It was clear from the outset that the close relationship between the building and the RIC would make it difficult to disentangle the logic model that gives rise to benefits in many cases. For these reasons, benefits arising from the building, the immediate built environment, facilities management services, as well as the RIC are included in the modelling.

The method applied was tailored to the particulars of the RIC's ecosystem and complex stakeholder group in several ways, for example by ensuring that it included:

- Engagement with tenants of the RIC itself to determine their view of what they have been able to achieve that would not otherwise have happened. The method included two tenant surveys and a series of 1-1 qualitative interviews with tenant companies to develop case studies.
- Engagement with wider stakeholders. The method included interviews and written feedback with wider stakeholders in the building, the campus, and the Midlothian Science Zone.
- Learnings from the work of Dr David Johnson. This was included in the research which formed the 'theory of change' and benefits map at the outset of the project. In addition, Dr Johnson was a member of the project Steering Group and attended regular meetings throughout.
- Consideration of the model for commercial venture formation and level of entrepreneurial culture before the RIC. The study considered the current

commercialisation model at Edinburgh Innovations, the University of Edinburgh's commercialisation service, as well as considering how the RIC's model has benefited tenant companies as part of the tenant survey and interviews.

- Consideration of benefits and outcomes for recent initiatives, including the creation of the "Food & Agriculture Science Transformer" (FAST) programme, where it will be too early to measure outcomes, but indicators are needed for a comprehensive benefits framework to remain fit for purpose in the future. The impact of the FAST programme was explicitly considered by the inclusion of Rhizocore – a graduate of the programme - as a case study.
- Consideration of the objectives of the funding provided by partners and whether they feel that benefits have been delivered. Views of the funding partners have been sought and, where provided, are represented at appropriate points throughout the report.

4 Context

The study began with a short, focused period of desk research, drawing on documentation provided by the RIC, BBSRC, the University of Edinburgh, and through a general independent search for relevant information from public sources. This section of the report describes some of the key themes that emerged from that review.

4.1 The Easter Bush ecosystem

The Midlothian Science Zone

The Midlothian Science Zone team provides a supportive community, offering access to knowledge, expertise, resources and facilities, new technologies, accommodation and services, business support and networks. The MSZ works to present the region as a centre of science and research excellence to a wider audience and is supported by Midlothian Council's Economic Development Unit as well as other partners. The team is based on the second floor of the RIC.

Figure 2: Midlothian Science Zone, indicating the location of the Charnock Bradley Building

The MSZ area benefits from local, national, and international transport links and comprises a variety of commercial and industrial sites and premises. It also includes veterinary academic and research facilities, all of which create a critical concentration of expertise in the '3 As' of Agri-Tech, Aquaculture, and Animal Health as well as research which will benefit human medicine.

During engagement with wider stakeholder groups, interviews were carried out with representatives from Midlothian Council's Business Gateway, and the Midlothian Science Zone. Views from Midlothian Science Zone are also incorporated into the thematic analysis of pros and cons of life in the RIC presented later in this report.

The Business Gateway team is keenly interested in offering support to young businesses within the RIC but feels unable to 'push' their services out to tenant companies who might have a need for legal, tax, and accounting support. Their role is highly supportive of B2B interaction and community wealth-building projects such as some of the work that takes place in RIC, and they believe that the work undertaken by the University's EBSOC team is having a positive impact on uptake of STEM education in local schools despite the challenges of running outreach events during Covid-19.

The Midlothian Science Zone team were originally based in the Roslin Biocentre but are now supported and housed by the RIC on a hotdesking basis. Like their colleagues in the Business Gateway, the team is highly supportive of finding opportunities for young people in STEM roles, and they regularly advertise jobs on behalf of tenant companies.

Both stakeholder groups were very appreciative of the work undertaken in and by the RIC, and the benefits and opportunities created for young people and other local businesses. They are keen to maintain strong, positive relationships with the Centre, EBSOC, and tenant companies.

Pentlands Science Park

Pentlands Science Park comprises 22 acres of land and hosts 25 tenant companies in around 160,000 square feet of lab and office space. Historically, the Park has been almost fully occupied and there is now outline planning permission in place for a 20-acre extension. The Park is owned by the Moredun Foundation and is a thriving scientific community providing an ideal location for research and commercial groups. It is active in encouraging collaboration with tenants as part of its commitment to the biotechnology sector and provides a wide range of support services including IT, security, engineering, waste disposal, central stores, catering, cleaning, café, library, meeting rooms and conference facilities. Tenants also benefit from further wider facilities provided by the Moredun Research Institute. The Moredun Communications Centre was established in 2007; since its inception the MCC has developed new knowledge sharing initiatives and seeks to forge stronger links and additional benefits to a wide range of stakeholders including farmers, vets, the scientific community, policymakers, and educational organisations. Moredun Scientific is an accredited contract research organisation specialising in animal health and aquaculture product development, and biosafety testing of biopharmaceuticals.

Bush Estate

The Bush Estate plays host to several companies and organisations with links to the 3As, including Scotland's Rural College, which was formed in 2012 after the merger of the Scottish Agricultural College and Barony, Elmwood, and Oatridge Colleges. With campuses all over Scotland, SRUC has based its consulting arm – SAC Consulting – in the Bush Estate. SAC Consulting offers expertise in agricultural production and management, climate change

mitigation and adaptation, economic and policy analysis, rural business diversification, and product development for land-based businesses.

Edinburgh Technopole (We are Pioneer Group)

'We Are Pioneer Group' is a company specialising in the operation of life science technology campuses in ten locations across Europe, including offering serviced office space in Bush House, a grade A listed classical mansion surrounded by parkland. The company provides life science and technology focused lab and office space, facilities, and support services, as well as wraparound support for companies who are starting up, scaling, and raising investment. We Are Pioneer Group has substantial development and expansion plans for its land, which may present an opportunity for growing companies to relocate from smaller facilities in the MSZ without a significant shift in geographical location.

BioCampus

BioCampus is a bio-manufacturing science park initiative that was instigated over ten years ago by Scottish Enterprise, to add value to the strong and growing cluster of similar organisations in the local area. It comprises around 12 hectares of serviced development land including a 27,000 sq. ft building for bio-manufacturing, a 15,000 sq. ft outline design for a second phase, and various development plots for bespoke builds. The facility is custom designed to meet the needs of companies involved in specialist manufacture of next generation biotechnology related products. Quotient Ltd, a commercial-stage diagnostics company, completed a new 96,000 sq. ft product development and manufacturing facility in 2017, allowing it to consolidate all of its existing activities in Scotland into a single site. In 2012, the Scottish Government designated the BioCampus as part of a life sciences enterprise area – those areas with the most dynamic industries and the greatest potential to create new employment opportunities, stimulate private investment, and boost economic growth.

University of Edinburgh Easter Bush Campus

Opened in 1583, The University of Edinburgh is a world-leading, research-intensive University, once of Scotland's four ancient universities and the sixth oldest university in continuous operation in the English-speaking world. The Easter Bush Campus was opened by the Princess Royal in September 2011, under a phased development Masterplan from 2008 to (currently) the end of phase 3 in 2025. Work on the campus focuses on delivery of solutions to global challenges within the veterinary and livestock industries; the campus aims to become internationally recognised in animal science by 2025, leading efforts to address livestock improvement, food security, and alleviation of poverty in developing countries. It provides a dynamic and vibrant working environment with world class facilities equipped with the latest technologies, allowing the University to continue to attract scientists

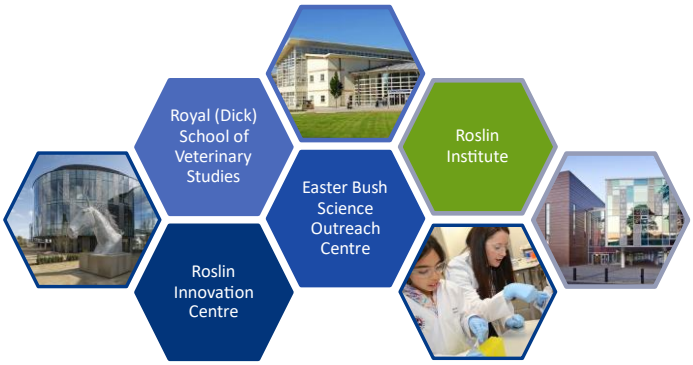


Figure 3: Components of the Easter Bush Campus

and clinicians of the highest quality to enhance the collaborative research environment, sustaining and expanding links with industry[vii].

The Easter Bush Campus has the largest concentration of animal science related expertise in Europe, with research and innovation focusing on areas including animal health, one health, veterinary sciences, aquaculture, agricultural technology, food security, data driven innovation and international development.

Its vision is to deliver a European Centre of Excellence for research and innovation in animal sciences and food security.

The Roslin Institute

Following a series of mergers and reorganisations, the Roslin Institute was established in 1993 as an independent research institute wholly owned by BBSRC. It is now part of the University of Edinburgh's College of Medicine and Veterinary Medicine but retains a strong strategic relationship with the BBSRC. It is a world-leading institute for animal science research, which shot to fame in 1997 when scientists announced that they had successfully cloned 'Dolly the Sheep', the first mammal from an adult cell[viii]. The Roslin Institute's mission is to gain fundamental understanding of genetic, cellular, organ and systems bioscience underpinning common mechanisms of animal development and pathology, and to use this knowledge to prevent and treat important veterinary diseases and develop sustainable farm animal production systems[ix].

The Roslin Institute's research and translation work has been demonstrated to help improve productivity in the world's agriculture and aquaculture sectors, including in low and middle income countries. Its expertise in genomics is valued by global breeding companies. Researchers at the Institute also made vital contributions to the battle against SARS-CoV-2, the virus that causes Covid-19, and work to develop large livestock animal models of human disease, and efforts to limit the spread of animal disease that can infect humans such as bird flu and rabies.[x]

The Royal (Dick) School of Veterinary Studies

The Royal (Dick) School of Veterinary Studies (R(D)SVS), commonly known as the 'Dick Vet') is part of the University of Edinburgh's College of Medicine and Veterinary Medicine. The School is a world-leader in veterinary education, research, and clinical practice, providing outstanding veterinary education at both undergraduate and postgraduate level, using an award-winning curriculum, innovative teaching methods, and an interdisciplinary environment. The School's research spans all aspects of veterinary medicine, from molecules and genes through to animal and human populations. In 2014, the School made a joint submission to the Research Excellence Framework (REF) with the SRUC which resulted in an assessment ranking them as the most powerful in the UK for agricultural and veterinary research[xi].

The School also provides small animal, equine, and farm animal clinical services which are among the most influential for clinical care in the UK. The Hospital for Small Animals and Dick Vet General Practice provide routine and emergency care for dogs, cats, small mammals, birds, and exotic animals in their referral hospital and general practice. Services provided include specialist cardiology, ophthalmology, orthopaedic, soft tissue surgery, oncology, neurology, dermatology, internal medicine, and exotics clinics together with Emergency and Critical care. These admitting disciplines are supported by diagnostic imaging, anaesthesia, interventional radiography, and physiotherapy services.

The Dick Vet Equine Hospital is the most advanced equine hospital in Scotland, with more specialists under one roof than anywhere else in the country. The Hospital provides services including routine and emergency care for all Equidae (horses, donkeys, and mules) and surgical

services for some other species including large exotic species, alpacas, and farm animals. Specialist services provided at the hospital include soft tissue and orthopaedic surgery, dentistry, internal medicine, diagnostic imaging, poor performance, neurology, behaviour, ophthalmology, interventional cardiology, anaesthesia, specialist farriery, acupuncture, and physiotherapy to name but a few.

The R(D)SVS operates a first-opinion Farm Animal Practice serving dairy, beef, sheep, pig and camelid farms in Edinburgh and the Lothians. The practice also operates referral services for specialist investigations and surgery, and the Dairy Herd Health and Productivity Service has provided specialist farm animal advisory services since 1977, focusing on nutritional monitoring and improvement of herd and flock health.[xii]

Easter Bush Science Outreach Centre (EBSOC)

EBSOC is based on the ground floor of the Charnock Bradley Building and provides a programme of lab focused community engagement and citizen science work in STEM subjects. As well as learning programmes at primary and secondary level, supporting the S1, S2, National 5, Higher and Advanced Higher syllabus. It also provides College level education at HNC, HND, NC Applied Science, SWAP courses, and science refresher courses for teachers, alongside community and adult learning programmes.

One strong example of RIC tenant companies working in collaboration with EBSOC lies in the citizen science work undertaken with BeeBytes Analytics, Wobble Genomics, and the Roslin Institute. In one such programme, local beekeepers were trained in genomic DNA extraction and PCR, performed research into bee disease, assisted a veterinary undergraduate student with a survey of anti-Varroa treatments used in Scotland and their efficacy

The programme enabled understanding of how beekeepers would like science to help honey bee health and research in Scotland[xiii]. In 2019, the Royal Society partnered with EBSOC to enable students from Kelso High School and Annan Academy to undertake cutting-edge experiments examining the parasitic burden of their schools' bees as part of their studies toward the SQA's National Progression Award in beekeeping[xiv].

In 2019, scientists from the centre became involved with the IVVN schools outreach programme in Africa. This programme aims to provide women scientists working in veterinary vaccinology across Africa with the training and resources (in the form of a mobile laboratory in a suitcase) to host schools outreach workshops in their own countries, with the overall goal of inspiring the next generation of scientists.

In 2021, 3,000 primary school children from across the Edinburgh City region were invited to take part in the 'Big Balloon Blow Up', an activity designed to encourage pupils to explore production of carbon dioxide and relate this to research into gut microorganisms in cattle that produce greenhouse gases. The activity was scheduled to coincide with COP26, the UN Climate Change Conference in Glasgow. Online versions of the session, supported by digital materials, were made available to schools which could not be accommodated in the live event.

Between 2019 and 2021, EBSOC's usual schedule of activities was badly impacted by the Covid-19 pandemic, as face-to-face events were not feasible. The centre did adapt as far as possible and introduce more online and digital content, but any data that might have been provided regarding numbers of engagements would be badly skewed and would not provide a robust measure of output which could then be relied on to estimate impacts relating to public attitudes to science.

2013 Business Plan for Easter Bush Innovation Centre: Market and Financial Assessment

In November 2013, BiGGAR Economics provided a financial and market analysis in relation to the proposal for the (then named) Easter Bush Innovation Centre[xv]. Based on analysis of several comparable facilities elsewhere in the UK, the report suggested several sources of potential demand for the type of space that would be created in the RIC:

- Start-up and spin-out companies, which are unlikely to find suitable premises in the private sector due to the high level of risk involved in providing the facilities required by early-stage companies
- Overseas offices, those wishing to establish a low risk, limited financial commitment, easy set-up in the UK
- Growth companies, established businesses requiring space to grow, particularly combined with the opportunity to co-locate with relevant academic institutions
- Academic contract research, requiring space to host academic research projects, and which benefit from collaboration opportunities between industry and academia
- Large companies, again typically in the shape of organisations who would benefit from the opportunity to collaborate with academic researchers on campus
- Companies and public sector agencies providing services to the businesses located in the RIC
- Existing tenants from the Roslin BioCentre; in 2013 the BioCentre offered approximately 10,000 sq. ft of let office space, 5,000 sq. ft of let lab space, as well as a 10,000 sq. ft annex. This facility was scheduled to close in 2017 and tenants from that building would need to find suitable alternative accommodation. It was estimated that demand from Roslin BioCentre tenants would be for approximately 36% of the planned available office and lab space in the RIC.

The management model for the RIC was also considered to be extremely important. Independence from the associated academic institution (the University of Edinburgh) was felt to be important, enabling the opportunity for quicker decision-making and for operation on a more commercial basis.

The business plan was based on an expectation that the Centre should be able to achieve at least 40% occupancy within its first year of operation, and that it should comfortably be able to achieve at least 80% occupancy within four to five years. Rental assumptions were made as follows:

- Rental of around £35/sq. ft for office space (inclusive of all service charges)
- Rental of around £45/sq. ft for lab space (inclusive of all service charges)

4.2 Wider economic context

There are several wider economic and policy initiatives which have helped create the conditions for a successful innovation centre at Easter Bush, and for its ongoing operation. These are summarised below.

Midlothian Economic Development Framework: Animal Biosciences Sector Action Plan

In late 2007, Midlothian Council and Scottish Enterprise published an Economic Development Framework for the area (MEDF), followed by Action Plans for key industry sectors including Life Sciences. Recognising that for many years, Scotland had 'punched above its weight' in the field of veterinary education and animal related research, and acknowledging Midlothian's existing strength in this area, a further action plan on the animal biosciences sector was commissioned.

This report noted the following general economic conditions for the animal life sciences sector in the area[xvi]:

- Four organisations being central to the sector; the Roslin Institute, the Moredun Group, the Scottish Agricultural College, and the Royal (Dick) School of Veterinary Studies
- A small cluster of 17-20 animal biosciences companies, some not-for-profit and many being spin-outs from the Moredun Research Institute, most of which employ between 6 and 24 people
- Four existing science parks with many tenants involved in animal biosciences activities: Pentlands Science Park, Roslin BioCentre, Edinburgh Technopole, and BioCampus, all in the Easter Bush area. These sites were noted as being key drivers of growth of an industry cluster around the concentration of academic research and associated facilities.
- Total estimated employment in the sector of around 1,375 people, representing around 5.1% of total employment in Midlothian, and a significant portion of the estimated total of 2,500-3,000 Scottish jobs in animal biosciences
- GVA for the sector in Midlothian was estimated at approximately £115.2 million per year.

UOE Easter Bush Masterplan

The UOE published its four-phase plan for the Easter Bush Campus in March 2008[xvii]. Phase one began in 2008 and completed at the end of 2012, involving three capital building projects including:

- A new building for the Roslin Institute (£60m) to become home to around 500 scientists from the Roslin Institute and the Scottish Agricultural College
- A new Vet School (£42m) to create a new home for the R(D)SVS, and on which to co-locate all components of the existing vet school
- A new Veterinary Oncology & Imaging Centre, completed in 2009 to provide a diagnostic scanning service for large and small animals and a new radiotherapy treatment facility for small animals. This is now recognised as Europe's leading Veterinary Oncology Centre.

Phase two was completed in 2014, including two projects linked to the National Avian Research Facility. Phase three included the Charnock Bradley Building and the Roslin Innovation Centre, as well as further campus infrastructure and an Energy Centre, and completed in 2017.

Bush Framework Masterplan

In 2012, Midlothian Council, Scottish Enterprise, and the UOE published the Bush Masterplan to help link physical environment and infrastructure proposals and recommendations to the MEDF with other key strategic plans. This included recommendations for improvements to pedestrian, vehicular, and cyclist connectivity, as well as bus routes to and around the site to enable Easter Bush to achieve its full economic potential[xviii].

Science and Innovation Audit

In Autumn 2015 the UK Government announced a series of Science and Innovation Audits (SIAs) to catalyse a new approach to regional economic development. The 2016 SIA for Edinburgh and South East Scotland Region reported that 'the ubiquitous and disruptive nature of Data-Driven Innovation within the digital economy offers substantial opportunities for cross-sectoral GVA growth'. It goes on to propose that there is substantial opportunity for industry to build on an already impressive technology cluster in the region, which would be enhanced by, among other things, stimulating innovation and entrepreneurship in the City Region by creating sector-focused open innovation locations bringing together industry, the public sector, students, and academia in collaborative environments [xix] such as the Easter Bush Campus.

Scottish Government Economic Strategy

Also in 2015, the Scottish Government set out its Economic Strategy, including two mutually supportive objectives of boosting competitiveness and tackling inequalities, underpinned by four key strategic priorities of investment, innovation, internationalisation, and inclusive growth. This strategy led to the introduction of the City Region Deal as a mechanism for thematic intervention to target the challenges faced by the region.

Regional Prosperity Framework 2021-2041

The Regional Prosperity Framework (RPF) was approved by the Edinburgh and South East Scotland City Region Deal Joint Committee in September 2021. The RPF builds on the City Region Deal and is designed to help shape and target public and private investment in a way which makes the most contribution to driving the region forward in a sustainable and inclusive manner.

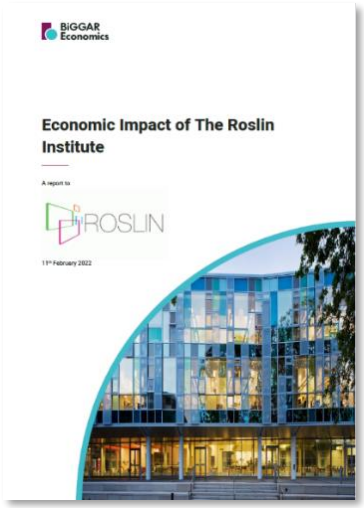
The Framework sets out 9 'big moves', major regional opportunities which will support the vision and strategic objectives of the Framework. The 'big move' to becoming a Data Driven Region explicitly includes delivery of the major Agri-tech programme at Easter Bush and aligning this with health innovation activity at the Usher Institute and the wider BioQuarter programme.

Economic Overview of the region

The region is a home to 1.4m people, 65% of whom are of working age, and delivers approximately 30% of Scotland's total economic output. In 2020, total GVA for the region was over £38 billion, an increase of 7.5% from 2010, and equates to around 2.2% of UK GDP. There is significant disparity throughout the region, however; its local authorities show varying levels of economic resilience according to the Oxford Economics Vulnerability Index; City of Edinburgh Council and Midlothian Council are the 1st and 4th most resilient respectively while Borders Council is the 3rd least resilient in Scotland. Regional economic growth is forecast to continue at a suggested rate of 2.4% per annum, which is higher than projected growth for Scotland.

Around 93% of school leavers in the region transition into positive destinations, including Higher or Further Education. Nearly 50% of school leavers went directly into employment in 2019/20.

Economic Impact of the Roslin Institute



Just prior to this present study, BiGGAR Economics completed an Economic Impact Assessment of the Roslin Institute, co-located alongside the Roslin Innovation Centre within the Easter Bush Campus ecosystem. The BiGGAR study was based on a single year view, which contrasts with the current study's five-year retrospective view. However, similar assumptions were used and the findings from the two studies are not in conflict.

While the focus of the BiGGAR study was on the Institute rather than the RIC, the report does refer to the role that the RIC plays in the ecosystem at Easter Bush, including statistics on employment in tenant companies, Gross Value Add, and statistics relating to the outreach centre located on the ground floor of the Charnock Bradley Building.

Key insights from the BiGGAR analysis were:

- RIC became a profit centre within its first three years of opening and at the time of the report was operating at around 85% capacity
- The centre was operating with approximately 50% of space leased to 'anchor tenants' (with 5–10-year leases) and 50% other smaller tenants with annual leases
- In 2019/20 there were 25 companies (excluding spin-out companies) located in the Centre, employing 137 people
- The combination of opportunity for cross-fertilisation of ideas, links with the Roslin Institute, collaborations, geographical location, and state of the art facilities results in tenants that choose to 'stick' at the Centre
- This strong demand for limited space, with tenants preferring to remain for longer terms rather than 'graduating' into larger premises, does have implications for the continued growth of the economic benefits that the Centre creates
- By providing space for businesses to locate, and excluding impacts from four spin-out companies, the Centre supports an estimated £8.5m GVA and 145 jobs in Edinburgh and Southeast Scotland
- At UK level, using economic multipliers, RIC supports an additional £6.4m GVA and 100 jobs
- Globally, using economic multipliers, RIC supports an additional £1.2m GVA and 18 jobs
- In 2019, the University's outreach centre worked with around 3,000 visitors

	Edinburgh & SE Scotland	Scotland	UK	Global
GVA (£m)	8.5	7.8	6.4	1.2
Employment	145	140	100	18

Figure 4: BiGGAR Economics Findings: Economic Impact of the RIC

4.3 City Region Deal

The City Region Deal is a mechanism for accelerating growth by pulling in significant government investment, with a view to improving regional performance and tackling inequality and deprivation. Six local authorities (City of Edinburgh, Fife, West Lothian, East Lothian, Midlothian, and Borders Councils) along with regional Universities, Colleges and private sector organisations signed the deal with the UK and Scottish Governments in August 2018, in a deal worth over £1.3 billion. Of this, £751 million was earmarked for the theme of Research, Development, and Innovation.[xx]

It is fair to say that the ability to demonstrate a clear commitment to delivering progress in this theme was a key factor in the award of the £751 million funding stream for Research, Development, and Innovation. It is also true to say that work undertaken by the Roslin Institute and plans for the Easter Bush Campus, including the RIC, was an important factor in evidencing that commitment.

The City Region Deal explicitly set out a commitment to the development of the Easter Bush Campus into a global location of Agri-tech excellence. This included provision for improvements

to on-site infrastructure and the local road network which would enable commercial partners to co-locate at scale and commercialise Agri-tech breakthroughs.

The Data Driven Innovation Initiative

The Data Driven Innovation initiative (DDI) is part of the Edinburgh and South East Scotland City Region Deal and aims to help organisations and citizens in the region to benefit from the data revolution. Within the DDI, the University of Edinburgh and Heriot-Watt University are working together with industrial partners on data-led projects. Agri-tech is one of ten key sectors being addressed by the initiative, focusing on delivering improvements in the wellbeing and supply of livestock using data-related technologies such as the Internet of Things and genomic selection techniques. Researchers at the Easter Bush Campus have partnered with many world-leading organisations in agriculture, pharmaceuticals, and genetics to bring improvements to the industry, such as reduced risk of disease.

The Agri-tech Hub at Easter Bush described below is one element of the DDI which has a direct relationship with the RIC, and it seeks to leverage existing world-class facilities on campus to help Easter Bush become a global location of Agri-tech and veterinary excellence. It will do this through a campus-wide network that will generate and collate, in real time, a multitude of local and global data, (e.g. veterinary activities, animal genetics, food species genetics, soil condition, weather and market drivers).

The Easter Bush Campus is part of a network of five hubs in the Data-Driven Innovation (DDI) Programme, and a mechanism for driving productivity and accelerating growth[xxi]. The RIC hosts the Agri-tech Sector Team Lead and Innovation Manager.

City Deal Funding for Agri-tech Hub at Easter Bush

In March 2021, a £74m investment in a new Agri-tech hub was announced at the Easter Bush Campus. The virtual hub will aim to develop world-leading research capabilities in data science and will foster collaboration between researchers and companies to contribute to global food systems, work towards net zero carbon in the Agri-tech sector and inform food and environmental policy as part of the DDI. The investment includes £27m from the UK Government, and £1.3m from the Scottish Government as part of the Edinburgh and South East Scotland City Region Deal.

> "This is a very exciting time for agriscience, with transformative technology and data sharing opening up new approaches for fair and inclusive growth. The City Region Deal will drive an innovation pipeline nucleated from Easter Bush campus in Midlothian, with reach both across our country and internationally, all built around novel research, fuelling a step change in upskilling, talent development and enterprise activities."
>
> *Professor Bruce Whitelaw, Director, Roslin Institute*

This will transform the scale and impact of agricultural technology in outputs from teaching, research, and innovation, and will address skill shortages and gaps in the industry. It will also encourage graduates to set up or join micro-Agri-tech companies such as those based in the RIC.

The hub will bring together researchers from the University of Edinburgh and other higher education institutions, along with commercial, public and third sector organisations in collaboration with Midlothian Council. Researchers will work with the Scottish and UK public sector, including the Animal and Plant Agency (APHA), Scottish Government's Animal Health and Welfare Division, UK Department for Environment, Food and Rural Affairs (DEFRA) and other organisations such as the Agri-tech Centres.[xxii]

4.4 The Food and Agriculture Science Transformer (FAST) Programme

On 30th April 2020 Deep Science Ventures (DSV) and the University of Edinburgh launched the FAST Programme, creating the first venture studio in Scotland. Based in the RIC, the programme was designed to provide scientists with opportunities to research, design and then start their own companies at the intersection of agriculture, food security and ecological sustainability, with the possibility of receiving investment of up to £500,000 from DSV.

The programme combines the RIC's expertise and facilities in genomics, veterinary biosciences, biotechnology, and agriculture with DSV's expertise in launching science companies. It has the specific aim of attracting founder talent to Scotland; the ecosystem at the Easter Bush Campus, including the opportunity to locate a start-up company in the RIC, was a key driver of attracting entrepreneurs into the programme.[xxiii]

The existence of the FAST Programme, including RIC's close involvement, was subsequently a key element in securing investment in the Easter Bush Campus as one of five Scottish hubs named in the Data-Driven Innovation Initiative as part of the City Region Deal.[xxiv]

"Based out of the Roslin Innovation Centre on the University Easter Bush Campus, Scotland's first venture studio FAST will help deliver the Edinburgh and Southeast Scotland City Region Deal Agri-tech ambitions and our university's Data-Driven Innovation entrepreneurship offering."

Professor Bruce Whitelaw, Director, Roslin Institute

One company involved in this study with roots in the FAST Programme is Rhizocore, which is currently thriving within the RIC.

4.5 The role of the built environment in UCEEs

It became clear from an early stage in this study that the £30m investment in the Charnock Bradley Building was a key factor in driving benefits from the RIC. A previously published study by Dr David Johnson and John Mackenzie[xxv] highlighted the importance that the built environment has in fostering relationships and a culture of collaboration, as well as a sustainable University-centred entrepreneurial ecosystem (UCEE).[xxvi]

UCEEs are embedded networks of actors and the built environment which reinforce specific technologies or related technologies toward attainment of functional outcomes. In this study, the development of UCEEs is proposed as the function of individual, organisational and institutional relations, and the authors report that healthy UCEEs remain vibrant even when technological and commercial pathways for specific individuals or organisations are frustrated or blocked.

"Being part of the [Roslin] Innovation Centre looks good for us, it builds our reputation, that's really important as a startup…we've secured projects due to the close proximity to the Roslin Institute…The flexible, open plan space creates collaborative opportunities…in fact, we're talking to two companies right now…These discussions wouldn't have happened without the culture for entrepreneurship here at the [Roslin] Innovation Centre."

(Founder, startup venture)

Johnson and Mackenzie suggest that "*The high cost and complex science commercialisation pathways, particularly in life sciences, has led universities to focus on the built environment to support science venturing at the university-industry boundary*'. This built environment traditionally consists of physical infrastructure, and more recently has expanded into science

parks, innovation centres, research hotels, incubators, and accelerators. The authors suggest that despite the criticality of the built environment to UCEEs, the direct contribution that the built environment makes to the UCEE remains 'fuzzy'.

The 2021 EBR study proposed several 'benefits' which were incorporated into our assessment, and in particular into the benefits map that formed the basis for validating the logic that underpins our study:

- The legitimacy of the RIC provides its tenants with credibility, through association with internationally renowned 'brands' of the Roslin Institute and the University of Edinburgh and via the aesthetics of the Charnock Bradley building and its surroundings.
- The RIC's location in the Easter Bush campus, surrounded by research and clinical institutions, provides additional credibility for tenants as well as opportunities for knowledge exchange, collaboration, and partnerships.
- This supports increased collaboration and partnership opportunities as well as increased sale and investment opportunities – these opportunities are more important to smaller and medium-sized tenants and start-ups than they are to larger, well-established tenants.
- In addition to a wider university entrepreneurial culture, the entrepreneurial and innovative culture in the RIC is equally important in attracting tenants to the centre. Academic-industry networking events, social gatherings and innovation 'showcase' days are seen as important elements of this culture.
- Flexibility in 'turn-key' spaces is important to enable and support tenants to develop and scale up without needing to find alternative facilities. Additionally, sharing 'turn-key' spaces provides opportunities for informal mentoring and knowledge sharing, as well as sharing of resources.
- Easily accessible meeting rooms and breakout spaces overcome challenges relating to intellectual property and client confidentiality
- A culture in which it is possible and acceptable to 'fail fast' is important for young companies and their understanding of market forces; 'turn-key' shared spaces can help support early market feedback.
- Dynamic, two-way interactions between individuals and the built environment better support and encourage commercialisation and high-growth, sustainable UCEEs than standalone technology transfer policies.

4.6 Edinburgh Innovations; the existing UoE commercialisation model

Edinburgh Innovations ('EI') is the University of Edinburgh's commercialisation service. It works to connect companies to world-leading research, expertise and facilities through collaborative partnerships and contract research, consultancy and facility services, studentships, secondments, and internships. EI manages 'Old College Capital' ('OCC'), the University's in-house venture investment fund which aims to support the University's research, staff, and students by investing in high-growth, early-stage businesses associated with the University.

Old College Capital follows a co-investment model, partnering with experienced private sector investors to leverage the greatest support for companies within the University of Edinburgh ecosystem. The average first investment raised is £150,000, with follow-on investments averaging £250,000 – typically representing between 10% and 30% of the total being raised. OCC has currently 26 companies in its portfolio, including £14m in committed funds and £50m+ of partner co-investment. Founding shares are typically held by the Edinburgh Technology Fund (ETF) on behalf of the University. The ETF is a wholly owned subsidiary of the UoE but has a degree of autonomy from UoE structures and processes.

OCC will co-invest in a company on the same terms as those set by the lead investor, and they will seek modest investor rights in line with the company's stage and market practice. Typically, these include pre-emption rights and limited matters of consent. No arrangement or monitoring fees are charged, but the investee company is expected to pay any external legal costs incurred. Following the investment, continued support is available to leverage the expertise and networks of UoE alumni, other portfolio companies, co-investment partners, and other partners in the OCC ecosystem. OCC often looks to appoint a non-executive director and/observer to the board of the investee company.

Typically, OCC invests in three forms of new company; spin-outs (in which UoE owns founding shares in return for exclusive licencing of IP, support services, or other assets), start-ups (new companies formed by UoE students or staff, and in which the related IP will be owned by the founder and transferred to the company), and spin-in companies (in which a UoE student or staff member is actively involved in developing the company's underlying technology or IP).

4.7 BBSRC Strategy

Institute Strategy

While the BBSRC Institute Strategy is directly concerned with the funding of Research Institutes (including the RIC's neighbouring Roslin Institute) rather than Innovation Centres, it offers relevant insight into the vision, principles, and strategic goals of BBSRC investment..[xxvii]

BBSRC's vision is for a portfolio of vibrant, dynamic, and diverse bioscience National Capabilities with deep connections across the research and innovation ecosystem. Institutes which receive strategic investment funding from BBSRC should therefore adhere to the following principles:

1. Deliver a unique area of national strategic research need within the BBSRC remit that requires critical mass and long-term investment
2. Be exemplars of scientific leadership and integrated research excellence, delivering (academic, societal, economic, policy) impact in their areas of focus
3. Play a key role in training the next generation of researchers, technical specialists, entrepreneurs, and innovators
4. Be enabled to successfully translate fundamental research discoveries through effective support, collaboration, and knowledge exchange with key stakeholders
5. Act as national co-ordinating 'hubs' for research in their area, having a clear and distinct identity and role within the ecosystem
6. Actively engage nationally and internationally with research communities, be involved in leading strategic partnerships, and connect across disciplines to add value and strengthen the outcomes of UKRI and BBSRC's investments in research and innovation
7. Be strong advocates for their sector and the UK through, for example, contributing to policy making and encouraging public dialogue
8. Be exemplars for best research practice by promoting a positive research culture, providing an inclusive environment which promotes equality and diversity, develops leaders, and operates within an effective governance framework

Strategy for Research and Innovation Campuses

BBSRC's strategic goal is to support the development of distinct research and innovation ecosystems that are centred on, and draw value from, the world-leading bioscience and national capability of the institutes that receive strategic funding from BBSRC.

To date, BBSRC is working with partners and stakeholders to develop five national Research and Innovation Campuses, centred around seven institutes that receive strategic funding. The Campuses are each distinct and at a different stage of maturity. Each Campus has a different bioscience focus area, unique flagship facilities and a diverse range of support, such as accelerator programmes.

The five Campuses are:

- Easter Bush Campus (Edinburgh), centred around The Roslin Institute
- Aberystwyth Innovation and Enterprise Campus (Aberystwyth), centred around the Institute of Biological, Environmental and Rural Sciences
- Babraham Research Campus (Cambridge), centred around the Babraham Institute
- Norwich Research Park (Norwich), centred around the John Innes Centre, Earlham Institute and Quadram Institute
- Rothamsted Campus (Harpenden), centred around Rothamsted Research

As key players and contributors to the UK research and innovation system, these research and innovation Campuses aim to:

- nucleate regional clusters and work with key stakeholders (for example LEPs, regional bodies, combined authorities) to deliver local strategies and impact, attracting and nurturing highly innovative businesses, creating high-value jobs, attracting inward investment, enhancing collaboration, and accelerating scientific impact by businesses
- add significant value to the wider regional, national, and international innovation ecosystem, delivering wide-ranging social and economic benefits to the UK
- create a unique, defined, and dynamic research and innovation ecosystem nucleated by a critical mass of world-leading science, talented people, national capability, specialist research-led facilities and infrastructures at each location

As part of this, the Campuses:

- grow a connected and collaborative community, where discovery scientists, engineers, innovators, entrepreneurs, and businesses converge to advance scientific understanding and accelerate innovation through the exchange of ideas and knowledge
- promote and embed an enterprising culture on Campus, nurturing very early-stage ventures, accelerating scale-up, and anchoring established companies in an interconnected and collaborative ecosystem
- drive innovation, stimulating more value from fundamental research and meeting the needs of the diverse sectors that research underpin.

The five BBSRC Campuses are part of a wider network of UKRI Research and Innovation Campuses, including those supported by STFC.

Forward Look for UK Bioscience

The BBSRC Forward Look for UK Bioscience is structured around three themes:

- Advancing the frontiers of bioscience discovery – understanding the rules of life by promoting creative, curiosity-driven frontier bioscience to address fundamental questions in biology, and developing transformative tools, technologies, and approaches that

enable researchers to push the boundaries of scientific discovery and to stimulate innovation

- Tackling strategic challenges – by delivering more productive, healthy, resilient, and sustainable agriculture and food systems, transforming industries through bio-based processes and products in a new low-carbon bioeconomy, and improving animal and human health and wellbeing across the life course; and
- Building strong foundations – by attracting and developing a flexible and diverse workforce for modern bioscience, ensuring that the UK bioscience community has access to the facilities, resources, and services necessary to carry out ground-breaking research and to support its translation into economic and societal impact, and enabling collaborations across disciplines and sectors, with the users of research, nationally and internationally[xxviii]

It is clear that the initial BBSRC investment in the RIC was intended to enable RIC to play a role in achieving these three strategic themes.

4.8 Public attitudes to science

The existence of the EBSOC facility in the Charnock Bradley Building, and the collaborative work that it undertakes with RIC tenant companies to engage with local schools and citizen science, strongly indicates that there should be impacts felt at local level in terms of public attitudes to science. However, in the absence of a local baseline, it is difficult to measure outcomes and impossible to draw conclusions regarding specific individual disciplines. Instead, it is necessary to turn to national and international sources to understand current public attitudes to science in general.

2020 Wellcome Trust – Wellcome Monitor

Every 2-3 years since 2009, the Wellcome Trust has surveyed more than 2,000 adults to understand UK public attitudes about and involvement in science and health research. In 2015 they published data on how informal learning stimulates interest in science, as well as an appreciation of its social, cultural, and historical context. This represents useful baseline information at national level when considering possible outcomes from engagement with schools and citizens in the EBSOC facility. A summary of key findings is presented in Appendix J.

2022 3M State of Science Index

Since 2018, 3M has conducted an annual 'State of Science' index to track attitudes to science through multi-country research.[xxix] The 2022 State of Science Index survey was conducted among a representative sample of 1,000 general population adults, aged 18 years and older, across the US, Canada, UK, Germany, France, Poland, Italy, Brazil, Mexico, Colombia, Japan, Singapore, South Korea, China, India, UAE, and Australia. This represents useful baseline information at national and international level when considering possible outcomes from engagement with schools and citizens in the EBSOC facility. A summary of key findings is presented in Appendix J.

4.9 Conclusions

Existing conditions for success

Prior to the opening of the RIC, there was already a thriving research ecosystem in place in what is now the Midlothian Science Zone, and specifically within the Easter Bush Campus. Despite – or perhaps due to – the recession of 2007-2009, the need to secure economic recovery in

Midlothian was closely tied to plans for leveraging the potential of the Easter Bush site based on its established global reputation in animal biosciences.

The 2008 Easter Bush Masterplan put in place a 20-year staged development plan for the Campus, supported by infrastructure developments under the 2012 Bush Masterplan. These two documents gave a more strategic focus to the future direction and development of the Campus than had previously been the case. The RIC, located within the UOE's new Charnock Bradley Building, was included as a key element of phase three of the Easter Bush Masterplan.

Commercialisation model

The RIC offers a different commercialisation model than the UOE 'Edinburgh Innovations' model, with no requirement for an equity stake in a young company and less need to be administratively bound by UOE policies and processes. This model offers more flexibility in decision-making and may be more attractive to small companies seeking inward investment from technology and bioscience firms, as it does not afford any IP rights to the UOE.

Relationship with the built and natural environment

The RIC has already exceeded expectations set out in the 2013 business plan and makes good use of the built and natural environment to create a 'wow' factor for visitors and investors alike. Qualitative interviews with tenant companies, and findings from the tenant survey, lend additional credence to the proposed existence of benefits arising from the RIC and tenant companies' relationship with the quality of the building and its surrounding built environment.

A porous and collaborative ecosystem

The ecosystem that surrounds the RIC and its tenant companies remains highly respected, with several elements recognised nationally and internationally as world-leading centres of excellence. The ecosystem can be described as 'porous' and highly collaborative, with knowledge transfer and collaborative research at the heart of its agenda. Qualitative interviews confirmed this perception of porosity and collaborative opportunity among tenant companies, all of which are reluctant to consider leaving the ecosystem.

Opportunities for enhanced critical mass

Several recent policy factors have converged to enhance the critical mass behind the future development of the Campus, including the RIC. The 2015 Science and Innovation Audit and Scottish Government Economic Strategy laid the groundwork for the City Region Deal and the DDI Initiative, which will introduce a dedicated Agri-Epi centre on the Campus. The Agri-Epi centre will further enhance the national and international reputation of the Campus and will provide more opportunities for collaboration with tenant firms in the RIC, offering potential for them to contribute to world-leading research with significant impacts. The DDI also encourages greater contribution to national policy. Recent examples include encouraging scientists, including RIC tenants, to participate in DEFRA and Scottish consultations on gene editing regulations[xxx]. It is hoped that RIC tenants will become more involved at that level in future. The emerging Regional Prosperity Framework will also lend further weight to developments in the Easter Bush Campus and Midlothian Science Zone which can only be beneficial to the RIC, and in which tenant companies are well placed to participate.

5 Findings

5.1 Market sizing

The UK has always enjoyed a reputation for scientific excellence, producing 29% of European scientific journal articles, and ranking fourth on the Global Innovation Index (116,815 jobs created, R&D spending is projected to rise to 2.4% by 2027). The life sciences sector is a major component of the UK's economic base, generating £64 billion turnover and employing more than 233,000 people[xxxi]. Globally, the life sciences sector is expected to reach $2 trillion in gross value by 2023[xxxii].

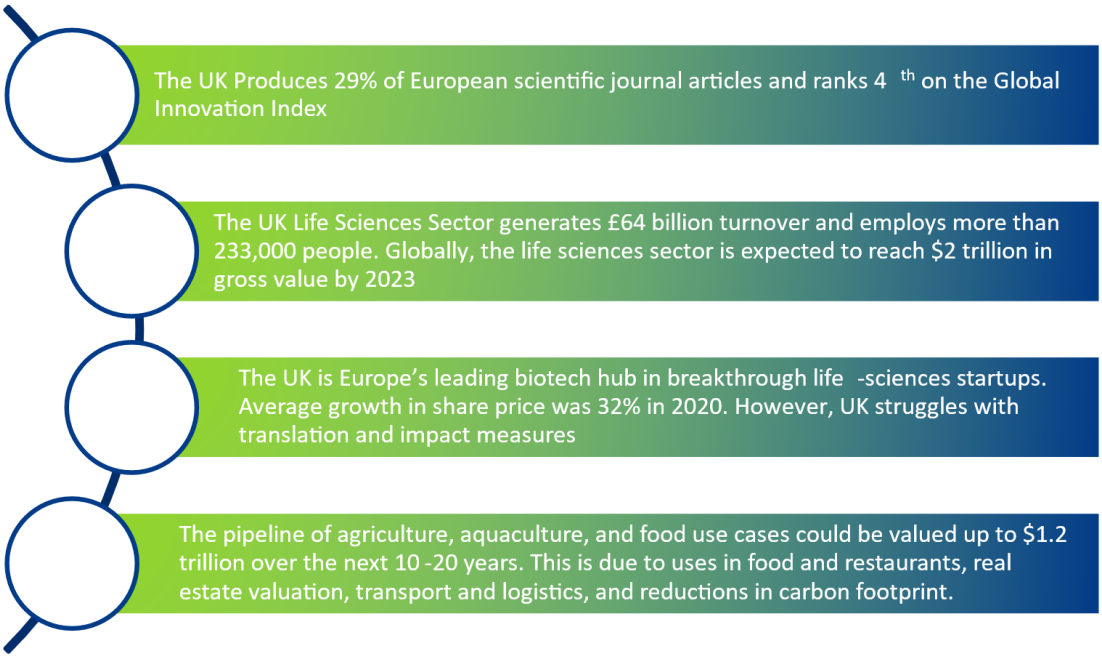


Figure 5: Market Sizing

Within the global life sciences sector, despite the Covid-19 pandemic, the global biotech sector is flourishing. Private and public finding, including global venture capital investments, deals, and IPOs, hit record highs in 2020 to the point where the sector is outperforming both the pharmaceuticals and consumer goods and technology sectors[xxxiii]. The UK is Europe's leading biotech hub in breakthrough life-sciences start-ups; average growth in UK biotechs' share price was 32% in 2020, surpassing that of Europe (22%) and the US (2%). In total, UK biotechs raised £2.8 billion in 2020. Despite this, research by McKinsey & Co suggests that the UK struggles in Translation and Impact measures – that is, forming new biotech companies who are converting science into IP, raising early-stage capital, and getting approved products to market.

Another estimate by McKinsey, based on a non-exhaustive library of 400 biotechnology use cases, suggests that there is a strong pipeline from research to commercialisation in the agriculture, aquaculture, and food domain, which could be conservatively valued globally at between $0.8 trillion and $1.2 trillion over the next 10-20 years[xxxiv]. While adoption rates for agriculture, aquaculture, and food technologies is expected to require 10-25 years, the possible spillovers to upstream, downstream, and ancillary sectors which give rise to this market value are suggested as:

- Food retail and restaurants, due to food with new properties such as plant-based and cultured proteins. It has been suggested in a different report that the alternative protein market alone will be valued at $290 billion by 2035, and that by that same date, every tenth portion of meat, eggs, dairy, and seafood eaten around the globe will be made from alternative proteins[xxxv]. The 2021 State of the Industry report on Cultivated Meat and Seafood goes as far as to suggest that the world is on the cusp of a global race for alternative protein innovation. By 2021, the total invested capital in the industry had topped $1.9 billion[xxxvi].
- Real estate, due to reduced land use arising from more efficient agriculture, and lab-grown meat
- Transport and logistics, due to produce having new properties such as improved shelf-life, and the ability to grow in new geographic regions
- Environment, due to reductions in carbon footprint in agriculture and meat production. For example, a shift to alternative proteins has been forecast to save more than 1 gigaton of CO2 equivalent by 2035 and to save 39 billion cubic metres of water[xxxvii].

The same report also points to two clear areas in which there is potential for large-scale societal effects; mitigating climate change (for example by reducing deforestation, reducing pressure on cropland, and adopting more sustainable inputs into production methods) and food security (for example, by improving fertilisers and pesticides, and introducing genetically engineered crops, along with tools to help farmers better fight crop disease).

Even without factoring in the potential global impacts of using biotech to prevent, diagnose, and better treat human diseases, there is clearly a significant potential social and economic benefit to be generated to Scotland, the UK, Europe, and the world, in enabling the effective commercialisation of innovative solutions being generated by tenant companies in the RIC.

5.2 Milestones in building / RIC history since 2018

Review of Board papers from 2018 – 2021 indicates a positive trajectory in achieving the aims and objectives of the RIC, despite the impact of the Covid-19 pandemic on distancing and occupancy, and limitations on organic interaction between people due to the introduction of hybrid working arrangements. Indeed, the projections for occupancy set out in the original 2013 business plan for the Easter Bush Innovation Centre have been exceeded and the RIC is now making a positive £651k contribution to University of Edinburgh finances.

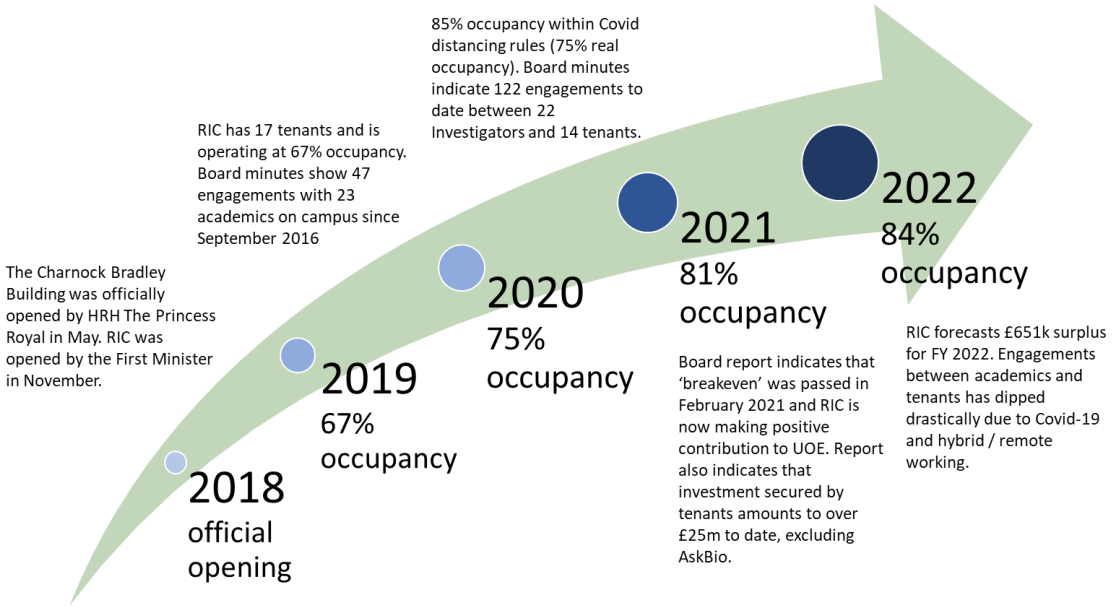


Figure 6: Milestones in Charnock Bradley Building and RIC history, since 2018

5.3 Overview of typical tenants

The typical tenant has been at RIC since 2019, for approximately three years. At the time of becoming a tenant, organisations typically employed an average of four FTE; this rises to an average of ten FTE over those three years. Gender balance tends to improve as tenants grow.

Initially, tenants' revenue is one third local, one third international (excluding Europe) with the rest split across Scotland, UK, and Europe. There is some evidence that over time, revenue sources are more even across, local, UK, Europe, and other international locations.

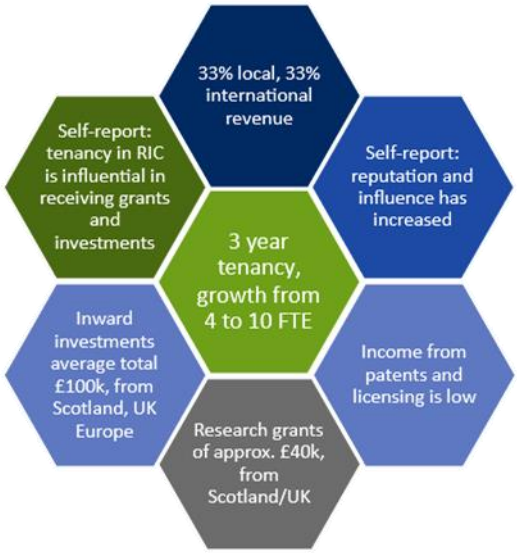


Figure 7: Typical Tenants

Tenants typically indicate that their reputation and influence across most geographies has increased in the time they have been at RIC.

Overall, patents, licences and income from licensing is at a low level for the typical tenant.

A typical tenant receives one or more research grants a year. Each grant is worth approximately £40k, although the figures do vary greatly. Typically, 80% of these grants originate from elsewhere in Scotland or the wider UK.

Tenants have typically received one or more inward investments totalling >£100k on average whilst at RIC. Numbers do vary, but most investments are >£10k. By volume, most of these investments come from across Scotland, the UK, and Europe. However, larger investments have tended to come from Scotland and/or the UK in particular. Typically, tenants feel that locating in the RIC is influential in them receiving research grants and inward private investments.

5.4 High Level Context to Benefits from Increased Employment

Office for National Statistics (ONS) - Enterprises by industry and employment size band

The ONS publishes an annual dataset detailing how many businesses of a particular industry operate in a specific geography. ONS industry code *72110: Research and experimental development on biotechnology* provides a very strong basis for a baseline at a local, Scottish and UK level. Figure 5 below shows the recent history of growth of FTE employed in this sector at both a Scotland and UK national level. This analysis clearly shows that there is a demonstrable trend for job creation in relevant specialisms across Scotland and the UK, approximately doubling since 2016.

While there is a wide range of socio-economic data that might be relevant to baselining and measuring benefits of the Charnock Bradley Building and RIC, four key criteria were considered important when assessing the validity of sources:

- Relevance to the specialist domain
- Breadth & specificity of geographical coverage
- Consistency/regularity of reporting
- Granularity of reporting: number and size of entities

The ONS 'Enterprises by industry and employment size band data[xxxviii] proved the strongest match to our data requirements when assessed on these criteria.

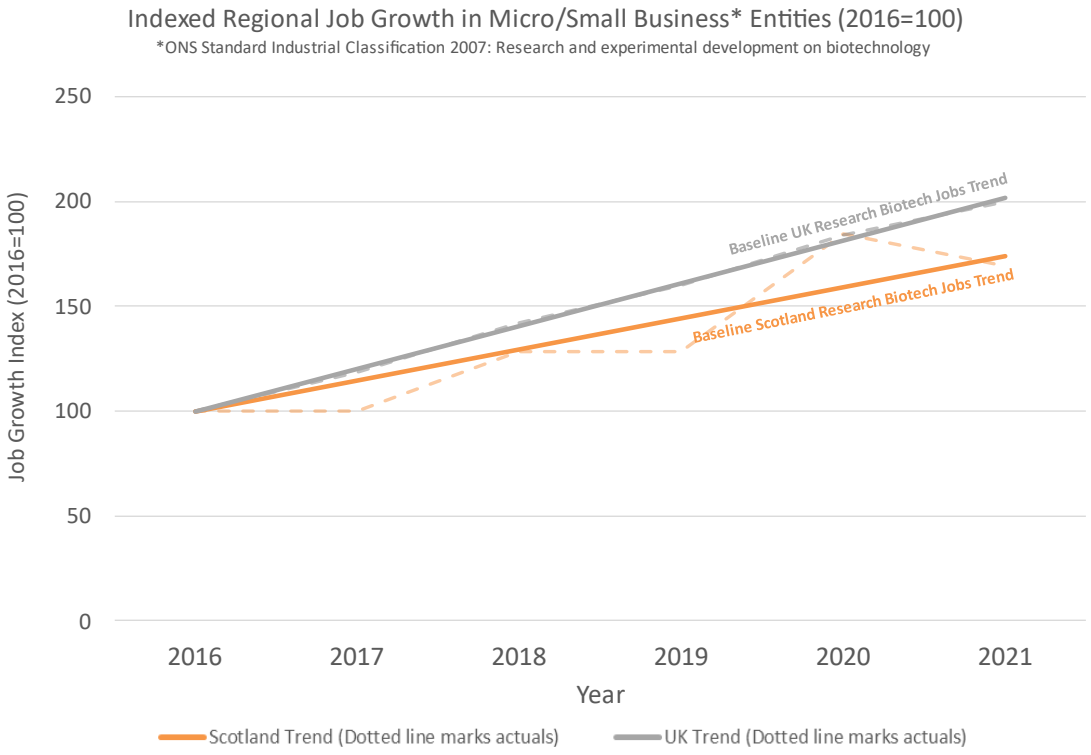


Figure 8: ONS Research and experimental development on biotechnology business, Scotland & UK

Job creation – baseline

Using the ONS data source described above, there is a clear, consistent view of relevant employment trends for different geographies since the formation of the RIC in 2016.

Figure 5 below uses these data to show growth in relevant specialist employment at local, regional levels compared to Scottish and UK baseline levels since 2016.

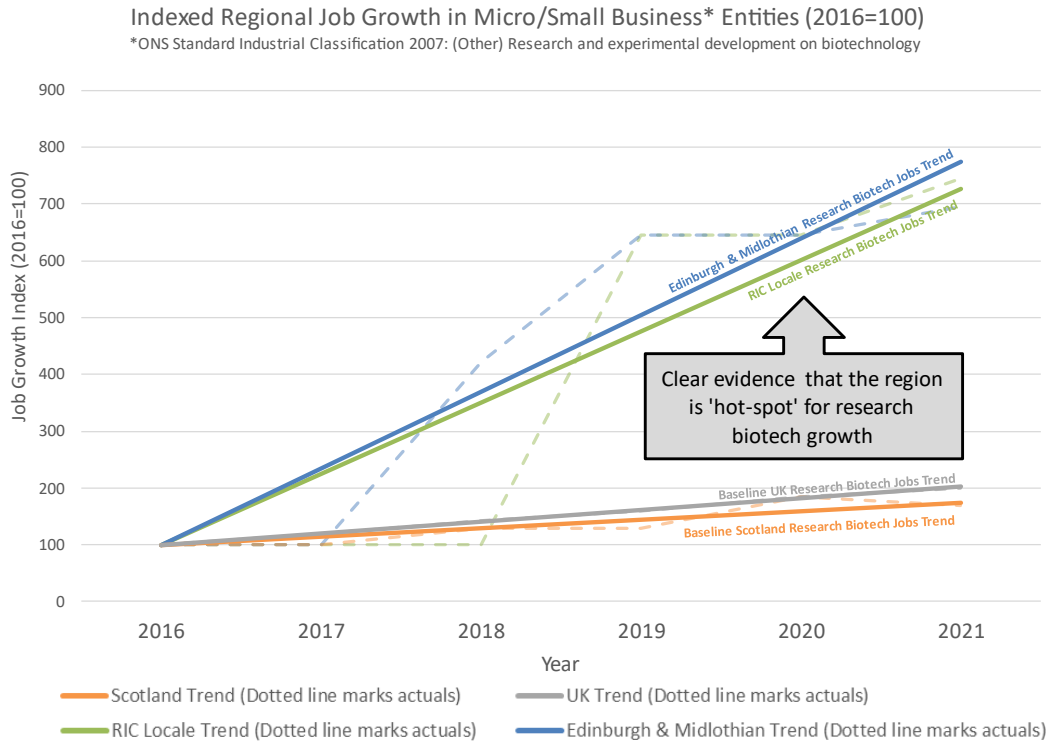


Figure 9: ONS Data, National & Regional Specialist Employment Growth

This analysis shows that whilst there is a general trend for job creation in relevant specialisms across Scotland and the UK, doubling since 2016, there have been six jobs created in the locale of the RIC for every one that is created nationally. Employment in the specialism has grown in the Midlothian and Edinburgh area from an estimated 45 FTE in 2016, to an estimated 313 FTE in 2021. By way of comparison, the UK national picture was an estimated 5k FTE in 2016 and an estimated 10k in 2021.

Unfortunately, from a baseline perspective, it is not possible to produce an absolute 'counter-factual', that is, to state with any certainty what this trend may have looked like without the introduction of the RIC. There are however some useful observations that can be made.

- The growth in specialist companies and employment in the local area of the RIC appears too large to be statistically insignificant
- Growth in local specialist companies and employment appears to be heavily correlated to the presence of the RIC, although causality will always be difficult to prove definitively
- Even assuming that RIC is not wholly responsible for the local specialist business and employment growth, RIC responsibility for driving the growth could still be significant

Relating Regional Growth to the RIC

Using the tenant survey and RIC records, the study collected a detailed dataset of current/former RIC tenants' FTE at the time they entered the RIC and in 2022. Figure 7 shows the data for RIC tenants' FTE over time plotted against the Regional, Scottish and UK baselines.

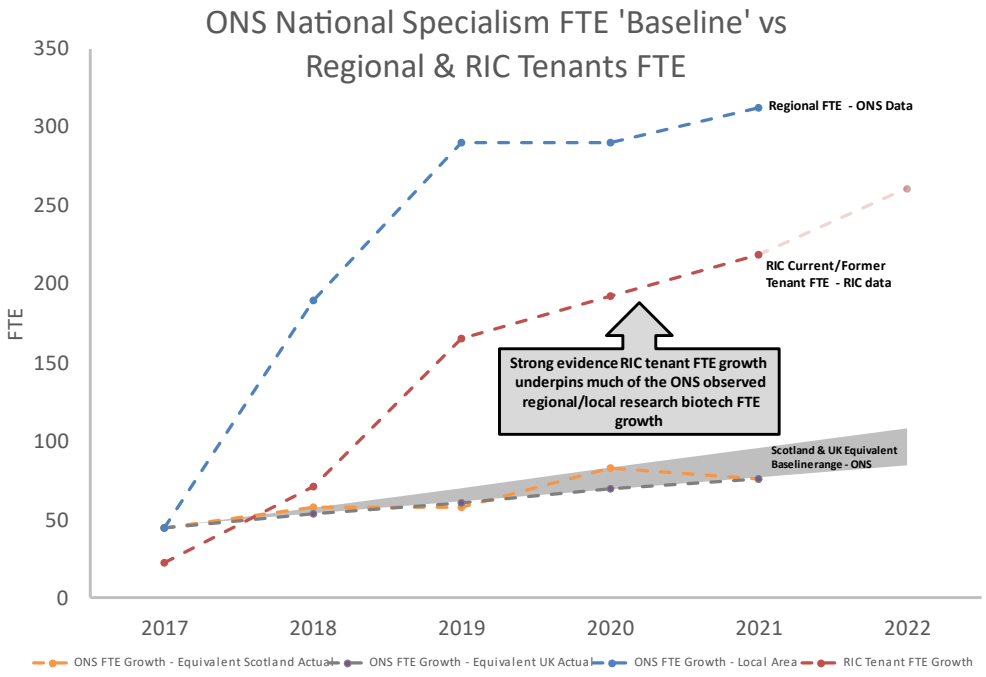


Figure 10: ONS Data, National & Regional Specialist Employment Growth, and RIC tenants FTE growth

It is not possible to confirm that the regional FTE indicated by the ONS, and the tenants' FTE based on bespoke data collection, are one and the same. However, there is likely to be a high degree of overlap given the specific nature of the ONS data and the business of the RIC tenants. Accepting this, the chart demonstrates that RIC tenants are a primary driver of the overall FTE growth within the local region, and that this growth is significantly higher than that occurring at a national level.

5.5 Estimating Economic Benefits

The potential benefits of RIC are presented in the Benefits Register (Appendix B). In this section, where possible, the monetary value of benefits is estimated for the purposes of understanding what has been achieved by the investment in the Charnock Bradley Building and the RIC.

Benefits have been classified according to the following categories:

- Quantifiable (£) Non-Cash Releasing: e.g. direct and indirect economic benefits, including spillover effects, which do not provide an injection of cash to a specific recipient but will be experienced by the economy in a specific geography
- Quantifiable (n): e.g. number of engagements with schools carried out by EBSOC – these are benefits which can be measured in numbers but cannot robustly be attributed a financial or economic value
- Qualitative: e.g. benefits relating to the entrepreneurial culture within the RIC

For the purposes of the economic evaluation, and in keeping with the category definitions described above, quantifiable (n) and qualitative benefits are not evaluated as part of the

economic benefits assessment. After considering materiality and the availability and strength of supporting evidence, the following Quantifiable Non-Cash Releasing economic benefits have been evaluated:

BEN001	New jobs created within RIC	Quantifiable (£)
BEN002	New jobs created by current RIC tenants	Quantifiable (£)
BEN003	New jobs created by past RIC tenants	Quantifiable (£)
BEN004	Indirect employment in the local Midlothian area	Quantifiable (£)
BEN005	Other spillover effects in the local Midlothian area	Quantifiable (£)
BEN006	Indirect employment in Scotland	Quantifiable (£)
BEN007	Other spillover effects in Scotland	Quantifiable (£)
BEN008	Indirect employment in the UK	Quantifiable (£)
BEN009	Other spillover effects in the UK	Quantifiable (£)

Figure 11: List of quantifiable non-cash releasing economic benefits

Other quantitative benefits that were identified in the benefits map as possible candidates for economic evaluation were rejected on the grounds of materiality and/or lack of supporting evidence.

Dealing with uncertainty

Evaluations of this type are subject to several causes of uncertainty within the data and assumptions used to support the analysis. In the case of this evaluation examples include:

- Uncertainty due to estimation/interpolation of factual data points
- Uncertainty in establishing the level of job creation and sustainment enabled by the RIC
- Supporting academic evidence tends to be presented as a range
- Assumptions, where limited real-world information exists, are by their nature estimates

The analysis deals with uncertainty by presenting lower, middle, and upper evaluations for all evaluated benefits based on optimistic, realistic, and pessimistic sets of assumptions regarding how much benefit might be attributed to RIC. Details of the differing approaches taken in the case of each benefit to derive the lower, middle, and upper evaluations can be found in Appendix D and the Master Data and Assumptions List is presented in Appendix E.

The purpose of this approach is to reflect the underlying uncertainties in a fair manner and provide reassurance that while the true value is uncertain, there is a bounded range within which it can be reasonably expected to lie. This is consistent with the approach set out in the HM Treasury Green Book[xxxix] which quotes 'Place Based (i.e., Sub-UK) Employment multipliers' on a low, mid, and high basis.

Additionality Analysis (Adjusting for Deadweight)

Owing to the nature of the investment in RIC, very few of the expected economic benefits require significant adjustment for additionality and deadweight.

Benefits relating to the creation of jobs and economic activity in the region are an exception to this rule. Adjustment for deadweight is incorporated into the benefit quantification process according to the standard formula for deadweight adjustment[xl]. The gross direct effects estimated for these benefits are offset according to the anticipated displacement and substitution of jobs.

5.6 Quantifiable (£) Benefits - Results

Ref:	BEN 001	Title:	New jobs created within RIC		
Class:	Quantifiable (£)	Type:	Economic	Proximity:	Direct
Recipient:		Midlothian economy			
Measure:		Number and value of new jobs created within the RIC, calculated using BiGGAR economics values			
Findings:		The RIC employs 5 FTE, all of which are assumed to provide incremental economic benefit to the local area. In their study of 'Economic Impact of The Roslin Institute' BiGGAR Economics argued that the GVA for these jobs within RIC & tenants was £58.6K per annum and this study has used this value as the basis for estimates. There is deemed to be little uncertainty around the estimate of these benefits.			

Ref:	BEN 002	Title:	New jobs created by current RIC tenants		
Class:	Quantifiable (£)	Type:	Economic	Proximity:	Direct
Recipient:		Midlothian economy			
Measure:		Number and value of new jobs created by current RIC tenants, calculated using the Tenant Survey, RIC records, and BiGGAR economics values			
Findings:		Data from the Tenants Survey, RIC records & RIC knowledge has been triangulated to estimate the number of FTE employed by current RIC tenants at 256. Furthermore, the study has created an estimated profile of FTE employed by current tenants since RIC launched until present. This has required some reasonable interpolation against known data points. These profiles, along with the RIC FTE years totals, are shown below in figure Like BEN001, BiGGAR Economics argued that the GVA for these jobs within RIC & tenants was £58.6K per annum and this study has used this value as the basis for estimates. Uncertainty in evaluating these benefits has accounted for the subjective nature of crediting RIC with the benefit of these jobs. In the lower case, the study has assumed that RIC may only receive credit for 50% of jobs created. In the mid case RIC can claim credit for creation of all new jobs within tenant companies. In the best case the RIC can claim credit for all tenant jobs. It is reasoned that by providing a credible, reputation enhancing, investment and grant attracting environment, the RIC may claim credit not only for the growth of tenant companies, but also for the sustainment of these companies FTE levels.			

	16/17	17/18	18/19	19/20	20/21	21/22	FTE Years Total
Total FTE in RIC Tenants	23	64	157	183	214	256	**895**
Of which, added FTE in RIC Tenants	0	29	97	114	124	163	**528**

Figure 12: New jobs created by current RIC tenants

Ref:	BEN 003	Title:	New jobs created by past RIC tenants		
Class:	Quantifiable (£)	Type:	Economic	Proximity:	Direct
Recipient:		Midlothian economy			
Measure:		Number and value of new jobs created by past RIC tenants, calculated using the Tenant Survey, RIC records, and BiGGAR economics values			
Findings:		Tenants Survey, RIC records & RIC knowledge has been combined to estimate the number of FTE employed by previous RIC tenants at 0. Furthermore, the study has created an estimated profile of FTE employed by current tenants since RIC launched until present. This has required some reasonable interpolation against known data points. These profiles, along with the RIC FTE years totals, are shown below in Figure 8. Like BEN001, BiGGAR Economics argued that the GVA for these jobs within RIC & tenants was £58.6K per annum and this study has used this value as the basis for estimates Uncertainty in evaluating these benefits has accounted for the subjective nature of crediting RIC with the benefit of these jobs. In the lower case, the study has assumed that RIC may only receive credit for 50% of jobs created. In the mid case RIC can claim credit for creation of all new jobs within tenant companies. In the best case the RIC can claim credit for all tenant jobs. It is reasoned that by providing a credible, reputation enhancing, investment and grant attracting environment, the RIC may claim credit not only for the growth of tenant companies, but also for the sustainment of these companies FTE levels. However, it is noted that these figures are not material to any case with respect to past tenants.				

	16/17	17/18	18/19	19/20	20/21	21/22	FTE Years Total
Total FTE in previous RIC Tenants	-	2	4	5	-	-	**10**
Of which, added FTE in previous RIC Tenants	-	-	1	-	-	-	**1**

Figure 13: New jobs created by past RIC tenants

Ref:	BEN 004	Title:	Indirect employment in the local Midlothian area		
Class:	Quantifiable (£)	Type:	Economic	Proximity:	Indirect
Recipient:		Midlothian economy			
Measure:		-			
Findings:		BEN004 significantly overlaps with the benefits calculated for BEN002 and as such has not been calculated separately.			

	Information on Tenant FTEs was not specific as to location/immediacy to RIC. This is consistent with the approach taken by BiGGAR Economics, that jobs within RIC tenants, whether FTE were exclusively sited within RIC, represented the benefits to, in the case of BiGGAR Economics study - "Edinburgh and SE Scotland" That study concludes that BEN002 & BEN004 are an indivisible total. There are no implications to this.

Ref:	BEN 005	Title:	Other spillover effects in the local Midlothian area		
Class:	Quantifiable (£)	Type:	Economic	Proximity:	Indirect
Recipient:		Midlothian economy			
Measure:		Broad benefits and returns of R&D investment			
Findings:		This study has evaluated spillover effects by estimating the broad benefits and returns of R&D investment which is deemed a primary purpose of RIC tenants. 'In a review of the economic literature, the net rate of private return on R&D investment is estimated to be in the region of 20-30% with the indirect or social rate of return estimated to be in the range of 20-100% from R&D investment, with an average close to 50% return'.[xli] These values reflect return on a national basis, so to provide more granularity this study has attempted to prorate the private and social returns across the geographies. The baseline estimate of the value of R&D represented by RIC tenants is assumed to be the operating costs of the tenant companies. It is reasoned that Tenant companies are overwhelmingly engaged in 'R&D' activity and operating costs are largely funded by a mixture of individual & corporate investments, grants and retained income. To incorporate uncertainty the base R&D investment figures used are upper case £43m, mid case £25m and low case £13m. This variation represents the credit, like BEN002, BEN003 & BEN004 given for additional R&D investment enabled by RIC. Assumptions were: • Upper case private return 30%, social return 100% • Mid case private return 20%, social return 40% • Lower case private return 10%, social return 20% These returns are evaluated as a national level, so for the local benefits, 75% of the private return is assumed to be local, and 10% of the social returns are attributed locally.		

Ref:	BEN 006	Title:	Indirect employment in Scotland		
Class:	Quantifiable (£)	Type:	Economic	Proximity:	Indirect
Recipient:		Scottish economy			
Measure:		Multiplier on local employment, consistent with BiGGAR Economics estimation			
Findings:		Estimation of GVA benefits for indirect employment generated is performed using a multiplier upon the local employment generated past and present. BiGGAR Economics estimated this multiplier to be 95-100%, and this study has deemed these reasonable and therefore used the same estimate. As with BEN002, BEN003 & BEN004, uncertainty in evaluating these benefits has accounted for the subjective nature of crediting RIC with the benefit of enabling these estimated jobs. In the lower case, the study has assumed that RIC may only receive credit for 50% of jobs created. In the mid case RIC can claim credit for creation of all new jobs within tenant companies. In the best case the RIC can claim credit for all tenant jobs. It is reasoned that by providing a credible, reputation enhancing, investment and grant attracting environment, the RIC may claim credit not only for the growth of tenant companies, but also for the sustainment of these companies FTE levels.			

Ref:	BEN 007	Title:	Other spillover effects in Scotland		
Class:	Quantifiable (£)	Type:	Economic	Proximity:	Indirect
Recipient:		Scottish economy			
Measure:		Multiplier on local employment, consistent with BiGGAR Economics estimation			
Findings:		These spillover effects are calculated on the same basis as BEN005. However, the geographical attribution assumptions are different, so for the Scotland benefits, 25% of the private return is assumed to be local, and 25% of the social returns are attributed to Scotland.			

Ref:	BEN 008	Title:	Indirect employment in the UK		
Class:	Quantifiable (£)	Type:	Economic	Proximity:	Remote
Recipient:		UK economy			
Measure:		Multiplier on local employment, consistent with BiGGAR Economics estimation			
Findings:		Estimation of GVA benefits for indirect employment generated is performed using a multiplier upon the local employment generated past and present. BiGGAR Economics estimated this			

	multiplier to be 65-70%, this study has also deemed these reasonable and therefore used the same estimate.

Ref:	BEN 009	Title:	Other spillover effects in the UK		
Class:	Quantifiable (£)	Type:	Economic	Proximity:	Remote
Recipient:		UK economy			
Measure:		Broad benefits and returns of R&D investment			
Findings:		These spillover effects are calculated on the same basis as BEN005. However, the geographical attribution assumptions are different, so for the UK benefits, 0% of the private return is assumed to be rest of UK, and 65% of the social returns are attributed to rest of UK.			

Summary Findings

The result of the economic evaluation for each of the benefits set out above is presented in the following table.

		Upper Case	Mid Case	Lower Case
Ref:	Description	Total £m	Total £m	Total £m
BEN001	New jobs created within the RIC	1.2	1.1	0.7
BEN002	New jobs created by current RIC tenants	44.6	23.2	7.7
BEN003	New jobs created by past RIC tenants	0.5	0	0
BEN004	Indirect employment in Midlothian	*Evaluated as part of BEN002*		
BEN005	Other spillover effects in Midlothian	14.1	4.8	1.2
BEN006	Indirect employment in Scotland	42.5	22.3	7.8
BEN007	Other spillover effects in Scotland	14.1	3.6	1.0
BEN008	Indirect employment in the UK	41.1	24.4	12.8
BEN009	Other spillover effects in the UK	28.2	6.2	1.6
TOTAL		**186.3**	**85.6**	**32.8**

Figure 14: Economic benefits summary, three-point estimates

The figure below shows how the above benefits have accumulated over time as well as demonstrating the bounds of uncertainty the study has considered (the 'range').

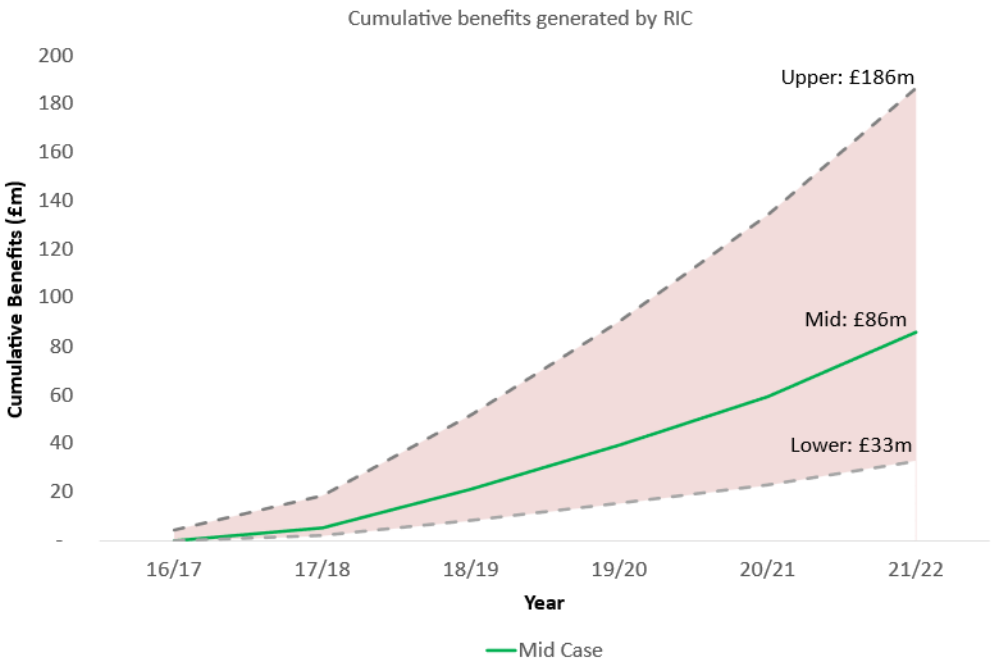
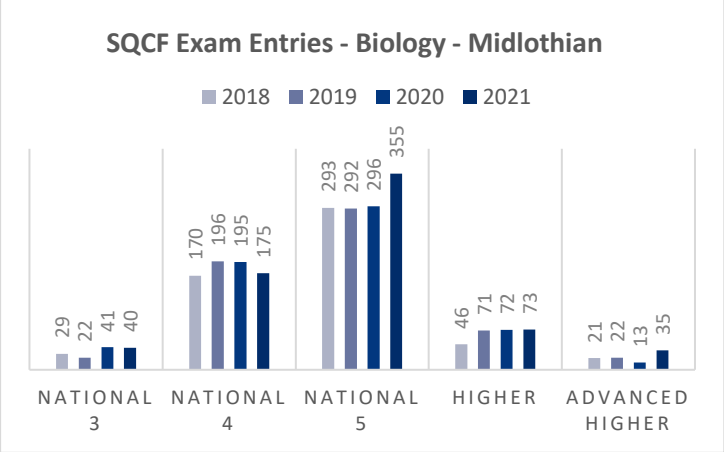


Figure 15: Cumulative economic benefits range

5.7 Other Quantifiable Benefits

Ref:	BEN013	Title:	Increased participation in citizen science		
Class:	Quantifiable (n)	Type:	Social	Proximity:	Direct
Recipient:		Schools, colleges, and citizens in Midlothian and Edinburgh			
Measure:		Output measure – engagements with schools and other citizen groups by the EBSOC team.			
Findings:		There is clear evidence of positive engagement with schools, colleges, and citizens in Midlothian and the Edinburgh area, which can be directly traced to the activity of the EBSOC team in the Charnock Bradley Building. However, given the extreme negative impact of Covid-19 on that activity, any statistics that could be provided that include the period from 2019 to 2021 would be highly skewed and not representative of normal activity. It is therefore not possible, at present, to rely on historic figures to estimate this benefit. Re-baselining the measure for 2022 and tracking this output would provide a useful measure of benefit in future years and is highly recommended.		

Ref:	BEN 020	Title:	Increased uptake of life science courses at school		
Class:	Quantifiable (n)	Type:	Social	Proximity:	Remote
Recipient:		School age students in Midlothian			
Measure:		Proxy measure: SQA Data – number of entries for Biology Exams in Midlothian			
Findings:		While there is evidence that supports an uptick in the number of students sitting National 5, Higher, and Advanced Higher level biology in the Midlothian region, there is no direct, provable link between the outreach activity being run in EBSOC and the uptick in those statistics. Logically, it is reasonable to assume that the activity may be responsible for a small proportion of this increase, but the link remains unproved and must be considered remote. 			

Ref:	BEN 030	Title:	Increased opportunity for students to find local jobs in industry		
Class:	Quantifiable (n)	Type:	Social	Proximity:	Enabled
Recipient:		Students and school leavers in the Edinburgh and Midlothian area			
Measure:		Proxy measure – number of jobs advertised by Midlothian Science Zone relating to tenant companies			
Findings:		There is robust documentary evidence that since March 2021 the Midlothian Science Zone team have advertised 46 jobs on behalf of tenant companies at the RIC. In addition to this, they also advertised an internship at EBSOC, based in the Charnock Bradley Building. A list of these jobs is provided in Appendix H. The jobs range from business-focused roles through to specialist scientific and technical roles. It is not possible to place an economic value on creation of these jobs without double-counting the economic benefit of job creation, or to say with certainty that they were filled by local			

	students or school leavers. However, this evidence is useful as a proxy measure of opportunities becoming available to students and school-leavers seeking work in the area.

5.8 Qualitative Benefits

Ref:	BEN 011	Title:	Improved posture of Scotland as a destination for life sciences, including AAA		
Class:	Qualitative	Type:	Commercial	Proximity:	Enabling
Recipient:		Companies in Scotland			
Measure:		Proxy measure: Existence of data provided on inward award of investment and research grant funding during the tenant survey			
Findings:		The tenant survey and qualitative interviews with staff from tenant companies has provided strong direct evidence of inward award of investment and research grant funding to companies based in the RIC. This may be considered good proxy evidence that work being undertaken by companies in the RIC, and indeed the collaborations between tenant companies, academics, and wider industry, is enabling improvements to the overall posture of Scotland as a destination for life sciences including AAA.		

Ref:	BEN 012	Title:	Improved posture of the UK as a destination for life sciences, including AAA		
Class:	Qualitative	Type:	Commercial	Proximity:	Remote
Recipient:		Companies in the UK			
Measure:		Proxy measure: Existence of data provided on inward award of investment and research grant funding during the tenant survey – extrapolated to UK			
Findings:		By extension of the logic applied to BEN011, there is evidence that work being undertaken by companies in the RIC, and the collaborations between tenant companies, academics, and wider industry, is enabling improvements to the overall posture of the UK as a destination for life sciences, including AAA. However, the contribution must, by its nature, be more remote than the contribution made at Scotland level.		

Ref:	BEN 014	Title:	Increased acceptance of ethical research methods and outputs		
Class:	Qualitative	Type:	Social	Proximity:	Remote
Recipient:		Companies in the UK			
Measure:		-			

Findings:	This is a difficult benefit to track at local level without access to a survey dataset which disaggregates attitudes at a local level of detail. As such, it is not possible to demonstrate that the outreach work that has taken place from the Charnock Bradley Building has directly contributed to improvements in acceptance of ethical research methods and outputs. Logically, however, it remains a reasonable assumption that there has been at least an indirect contribution between increased participation in citizen science and engagement with schools and some of the improvements in engagement and public attitudes reported by the Wellcome Trust and State of Science survey, for example (see page 35).

Ref:	BEN 016	Title:	Improved personal wellbeing of staff working in the building		
	BEN 023		A dynamic and vibrant work environment		
	BEN 017		Improved staff satisfaction		
Class:	Qualitative	Type:	People	Proximity:	Direct
Recipient:		Staff of tenant companies			
Measure:		Qualitative – Anecdotal from tenant interviews			
Findings:		There is strong qualitative anecdotal evidence that staff working within the RIC / Charnock Bradley Building consider the work environment to be dynamic and vibrant, and that the built environment does offer good personal wellbeing and staff satisfaction. Specific mention was made by several interviewees of the good use of natural light, the availability of the gym and catering facilities on campus, and the 'wow' factor[xlii] of the built environment for clients and other visitors.			

Ref:	BEN 018	Title:	An improved culture of collaboration		
Class:	Qualitative	Type:	Cultural	Proximity:	Direct
Recipient:		Tenant companies			
Measure:		Qualitative – OCAI Survey			
Findings:		There is strong baseline evidence in the results of the OCAI Cultural Assessment Survey that the RIC demonstrates a strong culture of collaboration. This is backed up by statistics quoted in Board Reports regarding the number of engagements between PIs and tenant companies before the Covid-19 outbreak and is further evidenced by anecdotal evidence in the interviews carried out with tenant companies.			

Ref:	BEN 019	Title:	Award of City Deal Funding		
Class:	Qualitative	Type:	Economic	Proximity:	Enabling
Recipient:		Citizens in Edinburgh and South East Scotland			
Measure:		Qualitative – anecdotal			
Findings:		There is qualitative anecdotal evidence that the ability to clearly demonstrate a commitment to innovation (at least partly due to plans for the Easter Bush campus) was a factor in the award of £751 million of Research, Development, and Innovation City Deal Funding to the Edinburgh and South East Scotland region. Furthermore, there is qualitative anecdotal evidence that the existence of the RIC was a factor in the award of £74m investment from that larger pot of City Deal funding in a new Agri-tech hub to be based at the Easter Bush Campus. However, it is not possible to robustly attribute a figure to the weight of influence. As such the benefit must remain qualitative only.		

Ref:	BEN 021	Title:	Location on site increases perceived legitimacy and credibility of tenant companies		
	BEN 022		A combination of the 'Dolly' brand, the 'Roslin' brand and the 'UoE' brand		
	BEN 027		Enhanced reputation of tenant companies		
Class:	Qualitative	Type:	Business	Proximity:	Direct
Recipient:		Tenant companies			
Measure:		Qualitative – anecdotal			
Findings:		There is strong qualitative anecdotal evidence from interviews carried out with tenant companies that location on campus, proximity to the Roslin Institute brand (and the association with 'Dolly') and the University of Edinburgh brand, all contribute to perceptions of legitimacy and credibility among tenant companies. Several companies cited these factors as directly influencing their decision to locate at RIC and that they believe that their own credibility is enhanced as a result of association with these brands and the reputation of the location's ecosystem.			

Ref:	BEN 028	Title:	Contribution to Midlothian Council's Sustainability Targets		
Class:	Qualitative	Type:	Social	Proximity:	Direct
Recipient:		Citizens in Midlothian			
Measure:		Qualitative – anecdotal			
Findings:		Interviews have provided strong qualitative that work carried out from the Midlothian Science Zone base in RIC and the wider Easter			

	Bush Campus has assisted Midlothian Council to achieve enhanced sustainability. This has been achieved, for example, through tree planting and hedgehog surveys, and work undertaken on campus with the assistance of BeeBytes to become part of the B-Lines 'pollinator pathway' map in Scotland.[xliii]

Ref:	BEN 029	Title:	Research findings can be translated into real world applications with greater impact		
Class:	Qualitative	Type:	Social	Proximity:	Enabled
Recipient:		Tenant companies			
Measure:		Extrapolation from The Economic Impact of the Babraham Research Campus			
Findings:		Recent BBSRC-funded research undertaken by Cambridge Economic Associates into the economic impact of the Babraham Research Campus[xliv] indicated that typically, location on campus has significantly accelerated the scientific discovery, fundraising, and commercialisation processes of tenant companies. For the purpose of the current study, the assumed outcome of this is that research is translated into real world applications with greater impact than it would be without location at the BRC. Qualitative interviews undertaken as part of this study confirm that a similar effect is perceived by tenant companies in the RIC, and the fact of inward investment in tenant companies by large, multinational companies such as Bayer and Bayer Crop Sciences further bolsters this evidence. While acknowledging that the two ecosystems and their constituent parts are not identical, and that differences in impact should therefore be expected, we can conclude that the provision of flexible and affordable space in the RIC might show effects to tenant companies in the region of:			

	Mean	Median
Accelerated scientific discovery by	5.1 months	3 months
Accelerated fundraising by	5.2 months	3 months
Increased fundraising to date by	11.4%	10%

However, as translation into real world effects in this sector may take as long as 10-25 years, it should not be expected that translation benefits could be evidenced at this early stage.

5.9 Addressing global challenges through Data Driven Innovation

The 2021 operational plan for the Data Driven Innovation Programme provides further evidence of contributions made to global Agri-tech problems by scientists working at the Easter Bush campus. This includes work undertaken within and in collaboration with companies in the RIC.

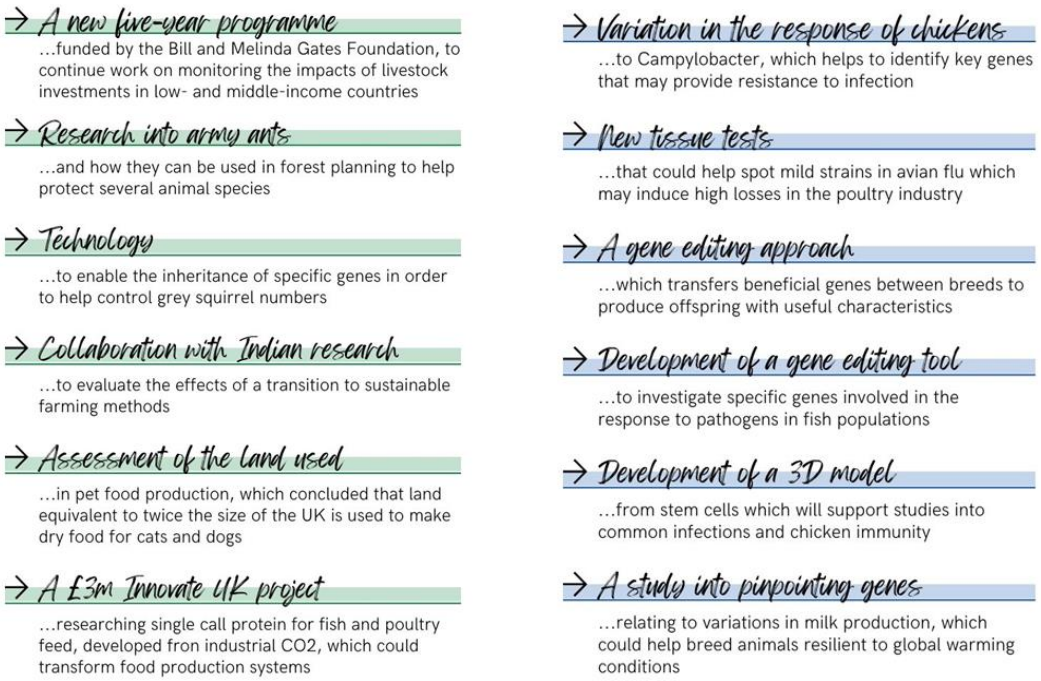


Figure 16: Examples of DDI Programme research

The Agri-Epi Hub at Easter Bush, currently in development, will enable strategic funding applications with DEFRA and EPIC in relation to Agri-tech projects, which has potential to influence Agri-tech policy at Scottish and UK level. Further work is planned to encourage researchers at the Easter Bush campus to actively contribute to Government consultations and initiatives, hosting and/or leading on workshops conferences and other activity where possible. Recent examples include encouraging scientists, including RIC tenants, to participate in DEFRA and Scottish consultations on gene editing regulations.

5.10 Pros and cons of life in the RIC

Qualitative interviews were held with key personnel in several tenant companies and with wider stakeholders. These interviews shed light on the perceived advantages and disadvantages of life in the RIC. These are paraphrased here below, grouped thematically.

PROS – Themes

Opportunities for Collaboration

Several interviewees noted that the organic opportunities for collaboration offered by working in the open plan spaces in RIC were a genuine positive attribute of being based in the building. Specific note was made of opportunities to meet academic staff from the Royal (Dick) School of Veterinary Sciences and PIs from the Roslin Institute in social settings such as Dolly's café. Cross-campus collaboration was highlighted, as was the proximity to other animal health research work, and links with the Roslin Institute and R(D)SVS. While sharing office and lab space did sometimes have disadvantages, several interviewees noted that the opportunity for ad-hoc conversations with others did have positive benefit. Overall, locating in RIC was felt to enhance opportunities for academic collaboration, knowledge sharing, and opportunities for introductions to researchers, finding synergies and leading to opportunities for joint working that would not otherwise have arisen.

Commercialisation model

Interviewees noted that the RIC commercialisation model unblocks IP issues that would otherwise be problematic where an academic institution is a majority shareholder in a company. This makes venture capital easier to access than it would otherwise be.

Leadership

There was all-round praise for the leadership of the RIC, in particular for the outgoing CEO John Mackenzie and the level and type of dialogue that he established and maintained with tenant companies. This relationship made it easier than it might otherwise have been to resolve emerging issues or potential conflicts in the shared spaces; trust in his leadership was often cited as a factor in a company's decision to locate in the RIC.

Facilities in RIC

The availability of turnkey spaces in the RIC was a key factor in tenant companies' decision to locate in the building. There was often very little need to 'bespoke' lab space, which is a big advantage for small, start-up or spin-out companies who lack the resource to fit out their own laboratories and purchase expensive equipment. The rent was generally felt to be at an attractive level, even considering the recently announced increase (the first in 5 years).

Security of tenure was also cited as an advantage, especially for small companies who lack the credibility and financial standing to secure properties on the commercial market. Flexibility of space – largely on a negotiated basis – was also felt to be a positive attribute, and there was a general feeling that the RIC team made it 'easy to do work there'.

Smaller companies also spoke positively about having space to grow within the centre, in a way and at a pace that suited them.

Roslin 'brand'

Several interviewees cited the prestige and reputation of the Roslin brand as a key factor in their decision to locate in the RIC, and a sense that their own reputation and credibility was enhanced by association with that and the University of Edinburgh.

Built environment and wider facilities in the Charnock Bradley Building

All interviewees noted the impact of the built environment and the wider facilities available within the Charnock Bradley Building had a positive impact on their decision to locate in the RIC, and their desire to remain in the centre. Particular benefit was reported regarding:

- The friendly staff and administrative support that is available in the building
- The quality and 'wow factor' of the building and surrounding environment, which was felt to impress clients and visitors. Specific mention was made of the building design and the use made of natural light and large windows with panoramic views, which creates a particularly pleasant work environment and assists with staff wellbeing.
- Other indoor facilities were also mentioned as having positive benefit, including having access to the gym and changing rooms (at reduced rates compared to commercial gyms)
- Additional services which are included in the rent, such as mail, waste, and cleaning
- Ease of vehicular access and parking on campus, and proximity to wider transport links including an international airport
- The outdoor environment was considered very positive

Wider campus facilities

Most interviewees cited the wider facilities available on campus as a factor in their decision to locate at RIC and in their desire to remain in the centre, or at least on (or adjacent to) campus. These facilities do offer room for expansion either as an alternative or addition to space at the RIC. Other positive aspects of wider campus facilities referenced in interviews included:

- Access to University technical and scientific facilities on campus
- The availability of technical support onsite
- Access to 'Dolly's' cafeteria for lunches and informal meetings; and 'coffees with scientists'
- Public transport links from the city
- Network of supporting organisations and services e.g., shared laundry service for lab coats (informally organised by tenants)

CONS – Themes

It should be noted that interviewees spoke overwhelmingly in favourable terms about their experience of tenancy in the RIC, but that there were some 'niggles' that, if addressed, would make the experience even more positive.

Opportunities for collaboration

Interviewees did note a desire for more interaction between companies, and between companies and the Roslin Institute and RIC, and with other organisations on campus / within the Midlothian Science Zone. While the difficulties of managing these events during Covid 19 was acknowledged, there was a clear desire for more social events after work to encourage informal chat and to encourage collaboration.

Leadership

Staff spoke in overwhelmingly positive terms regarding the outgoing leadership of the RIC. There is however now an element of concern that there is a period of risk to the leadership, direction, and reputation of the RIC during the gap between the outgoing leadership and new arrangements being put in place.

Facilities in RIC

While staff spoke in overwhelmingly positive terms about the facilities available to them in the RIC, there were some 'niggles' noted which, if addressed, would enhance their experience of tenancy. The shared lab facilities were appreciated; however, the flip side of shared facilities is that they are not optimal for any one company. Some interviewees felt that a modular 'design your own' lab space would be more beneficial and more versatile; at the very least that some form of partitioning would be helpful. Sharing of laboratory space can sometimes cause conflict between different user needs, and this requires careful management.

An inevitable constraint of having attracted successful tenant companies and having successfully achieved a high level of occupancy is that tenants are seeking to grow within a finite space; several interviewees reported that they are now struggling to find the additional space they need to scale up their operations within the RIC. This presents a clear opportunity for additional service provision elsewhere on (or adjacent to) campus. Noise in the open plan office areas was also noted as an issue by a small number of interviewees, as was lack of privacy for commercially sensitive conversations and a lack of space for private and confidential work. One interviewee acknowledged that this had improved recently. Some interviewees questioned the

decision to provide space for university research groups at the expense of space that commercial tenants could grow into.

While the flexibility of the RIC management in agreeing to make modifications to shared workspaces was regarded as overwhelmingly positive, some interviewees noted that the consequences of modifications were sometimes perceived as unfair on other users of the shared space. This is an issue that requires careful ongoing management.

Many interviewees commented on the availability and setup of meeting rooms in the RIC, citing a lack of meeting rooms, that those which are available are not the right size (too big), and that booking is pressured. Some suggested the provision of 'quiet pods' would be a good solution for people to make phone calls without being overheard or interrupting other users of the shared office space. Breakout spaces for group work were noted as an addition that would be beneficial.

Many interviewees, particularly smaller companies, noted that there is little or no business support service available, for example for legal, tax, and other accounting services. While it is possible to make this available via the Midlothian Science Zone team, tenant companies did not appear to be aware of that option.

Other facilities which are not currently available in RIC, which tenants would find helpful, were:

- A dry ice facility – outsourcing the postage of dangerous goods (i.e., things packed in dry ice) is expensive and has to be negotiated separately from tenancy
- Additional freezer space – one company reported having to use public space in the building to transport samples from the lab to the -80 facility
- Microwaves for reheating tenants' own food

RIC Branding

Interviewees spoke overwhelmingly positively about their association with the Roslin brand. However, a small number did note that they felt that the RIC could have more of a distinct visual identity in the Charnock Bradley Building – for example the RIC itself is not signposted from outside the building – and that the RIC's vision, mission and purpose would benefit from being more consistently and obviously reiterated. The rationale for this feeling was that the strength of the RIC's identity impacts directly on their company's own identity and credibility with visitors and clients.

Built environment and wider facilities in the Charnock Bradley Building

Again, while tenants spoke overwhelmingly positively about wider facilities within the building, there were some 'niggles' which, if addressed, would enhance their experience of tenancy. For example:

- Wi-fi provision – tenants are paying for access via Janet or installing their own Wi-Fi. Concerns were raised re: confidentiality of proprietary information and the risk to data from using a shared network, and some tenants reported reverting to using EduRoam (University of Edinburgh network) instead of the RIC network. Some tenants also noted that there is a need to use cabled connections for laptops at desks, this restricts movement between labs and office space, and that there are not enough ports. One tenant quoted a 3 month wait to change ports over to different desks, which inhibits flexibility in the shared workspace.
- Mobile phone reception inside the building was almost universally reported as poor, despite a strong signal outside the building. This is preventing international customers from being able to make or receive calls in the meeting rooms and inhibits tenant companies from being able to use their phones in the shared workspace.

- There is no workshop space in which tenants can build items they need for their research and development e.g., polytunnels or incubation boxes
- Access to the gym is on a commercial basis (albeit at a cheaper rate than private gyms) and is not included in the tenancy package
- Health & Safety management is unclear – one tenant noted that each CEO is responsible for their own staff in shared lab spaces, but are not sighted on the risk assessments of other users of the shared space
- The building's toilets are all on one side of the building and not immediately accessible for staff in labs. It is not clear what can be done to address this without alteration to the building design, which would incur significant cost.

Wider campus facilities

Regarding facilities on the wider campus, common themes emerging from interviews can be summarised as:

- Lack of more formal/impressive catering facilities – both Dolly's and the canteen in the LAH cater mainly to students and are not always suitable for clients. This is linked to a lack of facilities on campus for out of hours socialising and a general lack of wider retail facilities.
- Lack of electric car charging points
- Aside from the gym in the building, there was felt to be a lack of general sports facilities on campus – the closest is in Penicuik.

5.11 Conclusions

Economic Benefits

There is clear evidence that the £30m investment in the Charnock Bradley Building, and the establishment of the RIC, has resulted in positive economic benefit at the local, Scotland, and UK levels. These benefits largely take the form of direct and indirect jobs created and associated spillover benefits, as well as several qualitative benefits which are discussed further below. This study has evaluated three scenarios, based on upper, mid, and lower case assumptions for direct, indirect, and spillover benefits; the resulting range of GVA arising from the investment lies between £32.8m and £186.3m over the period since the building was opened. The mid case sits at £85.6m.

Analysed between local (Midlothian), Scotland, and rest of UK level impacts, the GVA can be summarised as follows:

	Upper Case	Mid Case	Lower Case
	Total £m	Total £m	Total £m
Total local impacts - Midlothian	60.4	29.1	9.6
Total national impacts - Scotland	56.6	25.9	8.8
Total national impacts – rest of UK	69.3	30.6	14.4
TOTAL	186.3	85.6	32.8

Figure 17: GVA estimates - local, Scotland, Rest of UK levels

Easier access to funding

The tenant survey provided good original evidence that most tenant companies believe their location in RIC is influential in them securing research grants, and approximately half of tenants felt that their tenancy is influential in them securing private investments. Qualitative interviews expanded that this is largely due to the credibility and legitimacy they enjoy from the Roslin brand and the reputation of the ecosystem as a whole. The tenant survey indicates that half of all research grants received by RIC tenants originate from the wider UK, excluding Scotland. A further quarter come from Scotland with only a relatively small proportion originating from wider European and international sources. It also indicated that over time, geographical revenue sources diversify and that tenants experience improved revenue share coming from wider UK and European sources in particular.

Culture

It was clear from an early stage in this study that it would be important to understand whether the prevailing organisational culture within the RIC was enterprising, and conducive to nurturing and scaling up early-stage ventures as well as anchoring established companies within the Easter Bush ecosystem. If true, this would strengthen the argument that the RIC was enabling qualitative benefits to tenant companies, including around staff satisfaction and wellbeing.

The Organisational Culture (OCAI) assessment that was undertaken as original research has provided strong evidence that the prevailing culture within the RIC is entrepreneurial and innovative, rather than being hierarchical. Furthermore, it highlighted congruence between the prevailing culture and the type of culture that tenants expect and prefer to work in. The upshot of this is that any workplace stress and tension that might otherwise as a result of a clash between prevailing and preferred cultures is unlikely to occur within the RIC; the prevailing organisational culture is seen as a positive attribute of life in the centre.

Collaboration within a porous ecosystem

Opportunities for collaboration with the Roslin Institute, other parts of the University, and other tenants within the Easter Bush ecosystem are plentiful for tenant companies at the RIC. This is greatly aided by the porosity of the ecosystem and is enabled by the effective use of the built environment to provide open plan, shared workspaces, as well as facilities in which staff from different organisations can meet informally and enjoy ad-hoc conversations over coffee. Several interviewees reported during the study that these organic interactions have given rise to research collaborations.

Prior to the opening of the RIC, there was already a significant cluster of related organisations within the Midlothian Science Zone and in particular as part of the Easter Bush Campus Masterplan. However, the addition of the RIC has added further weight to the Campus' critical mass. It is clear that the RIC has enhanced the existing ecosystem, supporting tenants to deliver world-leading science, enhance national capabilities, and leverage the specialist facilities and infrastructures already in place in the Easter Bush campus.

It is also clear from the qualitative research that was undertaken that RIC has contributed to growth of a connected and collaborative local ecosystem, where the exchange of ideas and knowledge is leading to innovation that has the potential to deliver significant value to national policy as well as addressing global issues.

Legitimacy and credibility

There is strong qualitative anecdotal evidence from interviews carried out with tenant companies that location on campus, links with the Roslin Institute brand (and the association with 'Dolly the

sheep') and the University of Edinburgh brand, all contribute to perceptions of legitimacy and credibility among tenant companies. Several companies cited these factors as directly influencing their decision to locate at RIC and that they believe that their own credibility with clients and investors is enhanced as a result of association with these brands and the reputation of the location's ecosystem.

Findings from the tenant survey also indicate that overall, tenants feel that their reputation and influence locally in Midlothian, in Scotland, and in the REST OF UK and Europe has increased considerably during the time they have been a tenant at RIC. Tenants did report a feeling of increased reputation and influence at wider international level, but this was less marked than at other levels.

Built and natural environment

The qualitative interviews that were undertaken have provided strong positive anecdotal evidence of the high quality of the Charnock Bradley Building and the surrounding built and natural environment, and the impact this has on the experience that staff have of on a daily basis. Factors such as the good use of natural light, and the wider facilities and services that are available in the building have been demonstrated to deliver a sense of working in a dynamic and vibrant environment, which enhances staff satisfaction and wellbeing.

Furthermore, the role played by the RIC in attracting additional funding to the area will result in local infrastructure improvements as part of future phases of the Easter Bush Campus Masterplan and Bush Masterplan.

Sustainability

The Charnock Bradley Building was designed with sustainability in mind; one very visible example of this is the use of 'living walls' throughout the interior and exterior of the building. In addition to its own design, much research work goes on within the RIC that furthers local, national, and global efforts to mitigate climate change and make positive contributions to environment. For example, as a result of collaboration between the Midlothian Science Zone and BeeBytes Analytics, the Easter Bush Campus is now recognised on the Scottish 'B-Lines Pollinator Pathway' map.

Other benefits in the local Midlothian area

In addition to the economic benefits set out above, there is evidence that activity within the Charnock Bradley Building, including tenant companies from the RIC, has benefited local schools and communities in the Midlothian area.

There is evidence of positive engagement with schools, colleges, and citizens in Midlothian and the Edinburgh area which can be directly traced to the activity of the EBSOC team in the Charnock Bradley Building. It is likely that this positive engagement – which often involves collaboration with scientists at the Roslin Institute and RIC, has increased local participation in citizen science, and while the link has not been proved by the current study, that this may possibly have contributed in a small way to an uptick in numbers of students presenting for SQA National 5, Higher, and Advanced Higher level biology in the Midlothian region. This would require further original research in future to establish or rule out any possible causality.

There is also clear evidence of job opportunities that may be suitable for students in the area being advertised on behalf of tenant companies, by the Midlothian Science Zone team. There is documentary evidence that since March 2021 the team have advertised 46 jobs on behalf of tenant companies at the RIC. These range from business-focused roles to specialist scientific or

technical roles suitable for graduates or for more experienced scientists. In addition to this, they advertised an internship at EBSOC, based in the Charnock Bradley Building. A list of these jobs is provided in Appendix H.

Contribution to policy and global issues

The nature of the work being undertaken by tenant companies is designed to address some of the most pressing global issues facing the world today, including the climate crisis, food shortages, and animal and human health issues including Covid-19. It is less clear at the moment that these companies are making direct contributions to Scottish and UK Government policy in these matters; however, plans are in place via the DDI Programme to encourage a more direct contribution to policy consultations in future. There is emerging evidence that this is now occurring, but it is too early to measure any tangible outcome.

Recent examples include encouraging scientists, including RIC tenants, to participate in DEFRA and Scottish consultations on gene editing regulations as part of the pan-Scotland Animal Health, Agri-tech, and Aquaculture Industry Leadership Group (AAA ILG) short life working group on Gene Editing to help drive and influence new innovation regulation policy.

Attractiveness of Scotland and the UK as a life sciences (AAA) destination

There are several examples of inward investment into RIC tenant companies from outside the UK - the tenant survey provided original evidence that geographical revenue sources diversify over time and that tenants become less reliant on very local sources with more revenue share coming from wider UK and Europe in particular as they grow. This is a good indicator that the RIC is enabling tenant companies to become attractive to international investors, which itself speaks to the attractiveness of Easter Bush, and by implication Scotland and the rest of the UK, as a destination which is attractive to life science (particularly AAA) research.

Translation effects

Finally, with partners investing a significant £30m in a new building and the RIC, it was important to consider whether the industry-academic partnership environment that was created could be found to have translated that investment into real-world impacts and wealth creation for the UK economy.

There is quantifiable evidence of economic benefits being delivered on that initial £30m investment. However, at this time, this study did not uncover any direct evidence of improvements to the efficacy with which research findings can be translated into real-world impacts as a result of locating in the RIC. While RIC has been in operation for 5 years, adoption for agriculture, aquaculture, and food technologies is expected to require a 10-25 year timeframe[xlv] and this lack of currently demonstrable translation effect should not be considered a failure on RIC's part. Based on evidence presented in the recent BBSRC-funded evaluation of the Babraham research institute, it is reasonable to assume that this benefit will arise in future.

6 Case Studies and Success Stories

The case studies and success stories presented in this section of the report are intended to provide deeper qualitative insight into the experience of tenant companies in the RIC, as well as the contributions being made to some of the world's most pressing problems. All case studies were shared with the interviewees prior to inclusion in this report.

6.1 Case Studies

Abacus Bio

AbacusBio is a New Zealand head-quartered science and technology firm, specialising in genetic improvement programmes and agri-improvement consulting for food and fibre production, with a particular focus on converting science and technology expertise into commercial outcomes. Their growth has largely taken place outside the UK, having been formed in 2005 by four owners who established a global client base by 2012 and then decided it was necessary to establish a base outside New Zealand.

CONTRIBUTION TO GLOBAL ISSUES: David Attenborough famously highlighted the finite scale and size of our beautiful blue planet. His point was, we cannot simply expand the planet further to make more room for growing crops and raising animals. In the future, agribusinesses will need to work smarter and more efficiently to survive and thrive. They will need to engage with, and embrace, new science, and new technologies. There is no other way to meet the world's dramatically increasing demand for food.

After a market assessment of suitable business locations, the RIC was selected as the most advantageous largely due to its position in the Easter Bush Campus / Midlothian Science Zone and the area's reputation for excellence in animal sciences. The company established its base initially in the Roslin Institute/ Scotland's' Rural College in 2017 (their clients on site) while the Charnock Bradley Building was being constructed and moved into the Centre in 2018 with four staff.

The company now employs ten staff in Edinburgh, one in London, with three more joining this year. Revenues have grown by 140% per year over the five years they have been based at RIC. The company still provides services locally to the Roslin Institute and others.

In 2020, Abacus Bio announced a deal with Bayer's Crop Sciences division, to provide their specialist services in trait prioritisation and valuation to advance products that will anticipate grower and market needs through computational integration of bio-economic, trait preference, and socio-demographic data. This will improve market predictions to drive market segmentation and economic potential more effectively..[xlvi]

BeeBytes Analytics

CONTRIBUTION TO GLOBAL ISSUES: Concerned about the global decline of pollinators, the conservation of the native honey bee and the fact that the understanding of honeybee genetics lags far behind other livestock species, Beebytes was established to try to answer some of the questions facing those working with pollinators and offer testing and consultancy services to increase the available knowledge on honeybee genetics.

Beebytes Analytics is a social enterprise specialising in honeybee genetics and DNA analysis to characterise admixture and identify the sources of forage visited by honeybees, bumblebees, and solitary bees. The company was founded by Dr Mark Barnett, Dr David Wragg (both of the Roslin Institute) and Matthew Richardson of the University of Edinburgh. The company's aim is to give beekeepers more control over the types of honeybees kept in their apiaries and enable them to select preferred stock themselves without the need for importation of queen bees which carries a risk of introducing new pests and diseases.

The company joined the RIC in April 2021, bringing with it expertise in low cost and low input genotyping of bees, particularly the 'dark bee' or 'black bee' – *Apis mellifera mellifera* – the subspecies that is native to the UK, Western and Northern Europe. Populations of this bee have been threatened by hybridisation with other subspecies, largely due to challenges in selectively breeding honeybees as a result of 'open mating' between a colony's queen and drones from many other different colonies. BeeBytes is also researching the genetic diversity of other pollinators including bumblebees and solitary bees, using genetic analysis of flora and fauna to research issues of genetic diversity, health, forage, and habitat.

They offer M/C Lineage Admixture Assay services for single colonies or apiaries, and mitochondrial DNA ancestry analysis, on a commercial basis, making use of the genotyping facility they set up in an NHS location in Newcastle.

The company cited proximity to the Roslin Institute and close links with another tenant company (Wobble Genomics) as important reasons for BeeBytes joining the RIC. The ability to rent lab bench space on a pay-as-you-go basis, alongside access to expensive equipment such as centrifuges and a real-time PCR machine, were also cited as a big advantage for a small not-for-profit company.

Beta Bugs

Founded in 2017, Beta Bugs is an insect genetics company, developing and distributing black soldier fly breeds to the insect farming sector.

Black soldier flies are farmed globally as an alternative protein source for use in aquaculture, pork, and poultry feed. They can be reared on waste streams including agricultural and food waste, in a green, circular industry which provides an alternative to environmentally damaging products such as soy and fish meal, both of which are important causes of deforestation, loss of biodiversity, and overfishing. Beta Bugs' product - the 'HiPer-Fly' - is unique in that they have been genetically improved for large-scale production. The company aims to double the output of the entire industry through these genetic improvements, enabling black soldier fly to be commercially competitive in the market.

"Once I heard of the Easter Bush Campus [moving] was a very easy choice to make. The opportunities and benefits for collaboration with other local stakeholders are unique as well as opportunities for growth between the businesses and academic organisations. The state-of-the-art facilities available at Roslin Innovation Centre and the wider Easter Bush Campus are also ideal for company incubation and future growth, and we do see the company maintaining a significant presence at this Campus"

Thomas Farrugia, CEO and Founder, Beta Bugs Ltd

CONTRIBUTION TO GLOBAL ISSUES: The global population is expected to rise to more than 9 billion by 2030, according to the UN Food and Agriculture Organisation. This will create unprecedented issues with demand for food, and there are already concerns regarding future protein shortages. Beta Bugs is committed to making an impact in transforming the way the world's human and livestock population is fed.

The company was originally founded in London and then moved to Rothamsted Research, a BBSRC-funded campus. In June 2018 the founder, Thomas Farrugia, was awarded a Royal Society of Edinburgh Unlocking Enterprise Fellowship, granting him a £45k package including space for Beta Bugs at the RIC. He moved the company to the Campus that year. At the time, they employed 3 people; at the time of writing, they employ 14.

In 2019, Beta Bugs won an Easter Bush Tenant-Staff Collaboration Award as a result of working together with the Roslin Institute. In 2021, the company reported that they had secured £133k of private investment over the previous 18 months, and £1.2m in grant funding[xlvii], including £100k from the Scottish Government's 'Unlocking Ambition' programme and £84k from the Pivotal Enterprise Resilience Fund which allowed them to continue to grow their business during the pandemic.

Location within the Midlothian Science Zone has also been beneficial to the company. They have received support from Business Gateway Midlothian and the wider Scottish Enterprise ecosystem, and during the pandemic collaborated with the Kickstart initiative in conjunction with the MSZ and Midlothian Chamber to establish a local young apprenticeship scheme for the region.[xlviii]

The company cites the opportunities for collaboration between businesses, academics (particularly the Roslin Institute, with whom a 'water cooler conversation' led to a collaborative research opportunity) and industry, the sense of community and the state-of-the-art facilities on site, and the ability to grow within the ecosystem, as key to its decision to relocate their operation to Easter Bush. The Roslin 'brand' is felt to be valuable. The company recently relocated its dedicated insect genetics nucleus facility to the Easter Bush Campus.

Ingenza Ltd

Ingenza is a biotechnology company specializing in the design, development and manufacture of diverse, high value industrial products and therapeutic proteins. It exploits synergies between synthetic and evolutionary biology, providing next generation microbial and mammalian manufacturing platforms, addressing key challenges in human health and the global environment.

CONTRIBUTION TO GLOBAL ISSUES: Ingenza is working to address global issues in human health and in environmental sustainability. Their work has recently included a high-throughput replacement of costly and inefficient mammalian cell production of the SARS-Cov-2 viral antigens required for vaccine production, and production of bio-based solutions to replace fossil carbon feedstocks and carbon-intensive processes.

Founded in 2003, the company has been an anchor tenant in RIC since 2017. Following 20 years of organic growth it employs 30 staff including apprentices and local residents. It is six years into its ten-year lease and occupies dedicated lab space on the second floor of the Charnock Bradley Building.

In February 2019 the company announced that University of Plymouth spin-out Amprologix, in which Ingenza has a stake, was awarded a £1.2 million contract from the UK Department of Health and Social Care to accelerate the development and scale up its lead antibiotic candidate, Epidermicin NI01. Epidermicin has the potential to tackle MRSA and other superbugs by decolonising the nasal cavity, thereby preventing spread and infection, with immense potential benefits for patients and for the NHS[xlix].

The company has also recently completed a six-month project with Johnson Matthey, a specialty chemicals and sustainable technologies supplier, and the Edinburgh Genome Foundry. This work has resulted in development of new, efficient approaches for the production of industrially relevant enzymes, including Cytochromes P450 which are essential for the metabolism of many medications.

Dr. Martin Hayes, Biotechnology Lead at Johnson Matthey, has said of the collaboration: "*We are very happy with the outcome of our collaboration with Ingenza, which has resulted in the successful expression of two very valuable enzymes. Ingenza was able to promptly deliver cell banks of different microbial strains, along with comprehensive reports, enabling us to conduct our in-house work in a timely manner. The company's team of experts has shown great capacity to help us on this project, and we look forward to working with Ingenza again in the future.*"[l]

In 2021, Ingenza received a £454k grant from Innovate UK and Eureka[li] to support acceleration of the commercialisation of P.putida bio-manufacturing pipeline as a viable alternative to fossil fuel-derived plastics (Perspex®). The research is being undertaken in collaboration with Mitsubishi Chemical Corporation (Japan) and Mitsubishi Chemical Methacrylates (UK).[lii]

During the Covid-19 pandemic, Ingenza was actively involved in developing and manufacturing a cost-effective vaccine, in collaboration with Oxford University. The company also offers modern apprenticeships, part-time degree studies, and sponsorship if PhDs. This activity earned them recognition as an 'Edinburgh Life Sciences Top Youth Employer'[liii].

Rhizocore Technologies

Rhizocore Technologies, founded in 2021, has been based in the RIC since its inception. The company produces locally adapted mycorrhizal fungi to enhance the growth, resilience, and carbon sequestration potential of newly planted forests and woodlands. These fungi create a network among the roots (sometimes known as the 'Soil Wide Web') which aids with water regulation and uptake of nutrients, and also acts as an early warning system for pests as plants exchange stress

"The company's participation in the FAST programme and further support through the Roslin Innovation Centre has helped Rhizocore develop its proposition where it's now ready to scale for significant growth"

Charlotte Waugh, Enterprise and Innovations Programme Lead, Edinburgh Innovations
Scottish Financial News, 31 March 2022

CONTRIBUTION TO GLOBAL ISSUES: The problems being solved by Rhizocore's work are some of the world's largest and most pressing issues, including carbon sequestration and the climate crisis, while at the same time enhancing the potential of commercially planted woodlands.

hormones to activate their own defences early. This can help ward off pests and diseases for a longer period than would otherwise be possible. While this network is common in ancient woodlands, it is absent in newly planted woodland, which can often have a mortality rate of 80% in the first three years.

Rhizocore was developed with support from the RIC and in particular the Food & Agriculture Science Transformer ('FAST') Programme. The company's co-founders, Toby Parkes and David Satori, had originally developed a different business idea, and approached Deep Science Ventures for a place on the FAST Programme. The Programme provided 12 months' salary which allowed deeper investigation of the proof of concept for eight different ventures, focusing on which had the biggest upside for the planet's ecology as well as the highest commercial potential.

During this Proof of Concept phase, it became clear that the idea which became Rhizocore had the biggest potential benefit to the environment as well as having higher commercial potential than the original business idea. As a direct result of the FAST Programme, Rhizocore was provided ringfenced time and resources to develop a robust business plan, which would otherwise have been difficult for a PhD graduate working in a research role. Rhizocore now employs seven staff and is involved in several pilot projects including one with 'Trees for Life' in the Caledonian Rainforest, and another with Tilhill.[liv] in the Scottish Borders.

In March 2021, Rhizocore announced that they had secured £370,000 in equity investment from several sources, including:

- £85,000 from the Edinburgh Technology Fund
- £85,000 from Deep Sciences Ventures
- £70,000 from climate tech investors
- £130,000 from Berlin-based Nucleus Capital

Since becoming a tenant at the RIC, the company has also secured £180,000 in additional grants from SMART: SCOTLAND, Scottish Edge, the Forestry Commission, and Graduate Career Advantage Scotland.[lv]

Roslin Technologies

Roslin Technologies was formed in 2017 as a joint venture between the University of Edinburgh and two investment partners with strong global industry networks and a track record of successful commercialisation in animal agriculture. Initially they employed only 2-3 staff, but quickly grew to a team of 15, investigating different ventures. It soon became clear that the company needed to focus on biotechnology innovations, and in particular the creation of self-renewing cells. As a JV with the University of Edinburgh, Roslin Technologies has preferential rights to IP from the Roslin Institute.

"The Easter Bush Campus has the largest concentration of animal science related expertise in Europe. Being in the midst of a burgeoning community of animal health spinout and spinin companies attracted to the Roslin Innovation Centre is the perfect place for us to locate"

Glen Illing – Partner, JB Equity and CEO, Roslin Technologies

CONTRIBUTION TO GLOBAL ISSUES: Roslin Technologies is working on solutions to address the global protein deficit by finding alternative means to produce proteins and accelerate the transition into a more sustainable global food system offering affordable access to nutritious, ethically produced protein.

The company works closely with the Roslin Institute and has been based in the RIC since it opened and has developed unique animal cells that work to create cultivated meat – real meat grown directly from cells without the need to raise or farm animals. This addresses consumer concerns, makes cultivated meat more affordable, and simplifies regulatory approvals. Roslin Technologies supplies other companies across three continents with all the components and instructions necessary to grow animal protein in a tank.

Unlike other technologies, the cells produced by Roslin Technologies can differentiate into any tissue, including both muscle and fat, and do so without the need for any foetal bovine serum.

Their team comprises 24 experts from eight countries, and is playing a major role in bringing tasty, affordable, eco-friendly, and cruelty-free meat to the dinner table around the world. The firm has already received more than £11m in funding and support from a range of sources[lvi] and was highlighted as 'futurecorn'[lvii] in new research by Dealroom, a global database of promising companies, and the Digital Economy Council..[lviii]

By the end of June, the company will have completed a Series A raise of £15m and it will employ over 40 staff by the end of 2022. Roslin Technologies is gearing up to expand and is in discussion about how to make this possible within RIC as they do not wish to move due to their close links with the Roslin Institute. They currently use office and lab space.

In March 2022, Agronomics Ltd, an investor focused on cellular agriculture, announced a partnership with Roslin Technologies to launch 'Good Dog Food Ltd', a joint venture focused on developing pet food derived from cultivated meat, without the need to rear or slaughter animals. After the announcement, Shares in Agronomics rose 2.8% to 18.50 pence.[lix]

In addition to developing cells for cultivated meat, Roslin Technologies is also investigating the potential use of pluripotent stem cells in animal therapies (particularly focusing on chronic diseases such as diabetes and arthritis) and is developing superior and cheaper insect lines for protein production. The company has established a breeding programme for black soldier fly, one of the most used sources for insect protein and is evaluating multiple lines that are being tested with commercial producers.

Wobble Genomics

Wobble Genomics is a spin-out of the University of Edinburgh, providing biochemical and bioinformatic solutions for gene biomarker discovery. The team specialises in maximising RNA and DNA sequencing efficiency for the discovery and detection of nucleic acid biomarkers which could help boost the diagnosis and treatment of a wide range of diseases by unlocking new potential from RNA sequencing.

CONTRIBUTION TO GLOBAL ISSUES: The company has developed biochemical and software technologies that greatly increase the efficiency and accuracy of RNA sequencing. RNA sequencing has emerged in recent years as a key technique for studying gene expression, which can give scientists and clinicians unprecedented insights into disease and could revolutionise how we understand, treat and monitor a huge variety of diseases.

The company moved to the RIC in 2021. It occupies both lab and desk space, and currently employ 7 local staff, an FD and Chair on a consultancy basis, and other paid Directors and advisors.

In September 2021 the company raised a £1.2 million investment from Eos Advisory, which will support expansion of the team at the RIC, strengthen company IP, help drive sales and demonstrate the company's ability to improve clinical outcomes.

The investment is part of a £2.15 million seed round including a deeptech venture capital firm, and a small number of private investors. The company has also received a £100,000 grant from Scottish Enterprise's High-Growth Spin-out Programme in 2020, and a £300,000 grant from Innovate UK[lx].

The company is currently looking to expand and is keen to stay local.

6.2 Other Success Stories

Carcinotech – Award-winning female leadership in the MedTech sector

In partnership with Barclays Eagle Labs, the AccelerateHER Awards celebrate women excelling in their sectors. In March 2022, Ishani Malhotra, Founder and CEO of Carcinotech, won the Science and Medtech category. Carcinotech manufactures 3D printed tumours developed from patient-specific cancer stem cells, primary cells, and established cell lines. Carcinotech devices are used for drug testing, cancer drug discovery, and studies of cancer biology. They can replace animal testing in clinical trials and can be used as a device for testing personalised medicines.

Ishani has also attended a Scottish Enterprise supported trade mission to California, in an event jointly led by AccelerateHER and the Managing Director of US-based company Golden Seeds, an angel investor group which backs high potential women-led businesses. The event gave Ishani the opportunity to showcase the work of Carcinotech to potential investors from Silicon Valley and other parts of the US.[lxi]

Cytochroma – Partnering and Commercialisation

Founded in 2017, Cytochroma accelerates the rate of new drug development, reducing the need for animal testing and identifying novel therapeutics with global relevance. The company uses robotics to manufacture and test genetically diverse mini-livers to identify novel medicines faster and more efficiently and has also built an ethically sourced stem cell library which contains

backgrounds of ethnic groups that are currently underrepresented in clinical trials.

The company has secured nearly £1m to further commercialise its drug discovers and to scale up its team and facilities at the RIC. This has been generated through multiple grants from Scottish Enterprise and Innovate UK, following an investment round led by Angel Academe and fellow female-focused group Investing Women Angels and Cambridge Capital Group. The company also works in collaboration with world-renowned medical research organisations, including Glasgow's Beatson Institute and the Medicines Discovery Catapult, and is in discussions with several major pharmaceutical groups.[lxii]

Cytomos Ltd - £1.6m Investment

Cytomos Ltd has recently announced (June 2022) that the company has secured £1.6m in funding to progress the development and qualification of its novel cell analysis platform, Cytomos Dielectric Spectroscopy (CDS). The funding round was led by existing investor 'Archangels' with additional participation from Scottish Enterprise and Old College Capital. Dr Alan Raymond, executive chair at Cytomos, was quoted in insider.co.uk as saying of the investment "we now have the growth capital required to advance the development of our novel process analytical technology platform to the next phase…This is an important milestone in the journey to deliver our mission to enable the development and manufacture of life saving biologic therapies".

Greengage Ltd – Tesco Agri T-Jam Finalist with Global Reach

Formed in 2008 in London, Greengage is a leading provider of data, sensors, and lighting for precision livestock farmers to improve animal welfare, productivity and compliance in the poultry and swine sectors. The company is active in 22 countries, with sales agents in 11 countries, and 8 distribution partners. 20% of the broilers in the UK are under their ALIS lighting system; they have sold 10,800 power units, and have registered 75 patents, 11 trademarks, and 2 designs.

They were recently a finalist in the Tesco Agri T-Jam[lxiii], announced at the World Agri-Tech Innovation Summit in September. The company was selected from over 150 applications to participate in a pitching and Q&A session in front of a judging committee, supply chain partners and Tesco colleagues.

Green Bioactives – International Contracts

Green Bioactives was established in 2019 through the Innovate UK 'Innovation to Commercialisation of University Research (ICURe) Programme and opened its research lab at the RIC in 2020. The company has developed a sustainable, reliable, economical plant-cell based biomanufacturing platform, using natural plant biochemistry to produce biomolecules and cell extracts for the cosmetic, pharmaceutical, food and agricultural markets.

Since moving to the RIC, the company has been successful in securing funding and developing new technologies to fine-tune the production of high value molecules in cultured plant cells. In July 2021 the company secured two new contracts to supply its biochemicals to a US chemical company and a Chinese pharmaceuticals manufacturer.

6.3 The impact of Covid-19

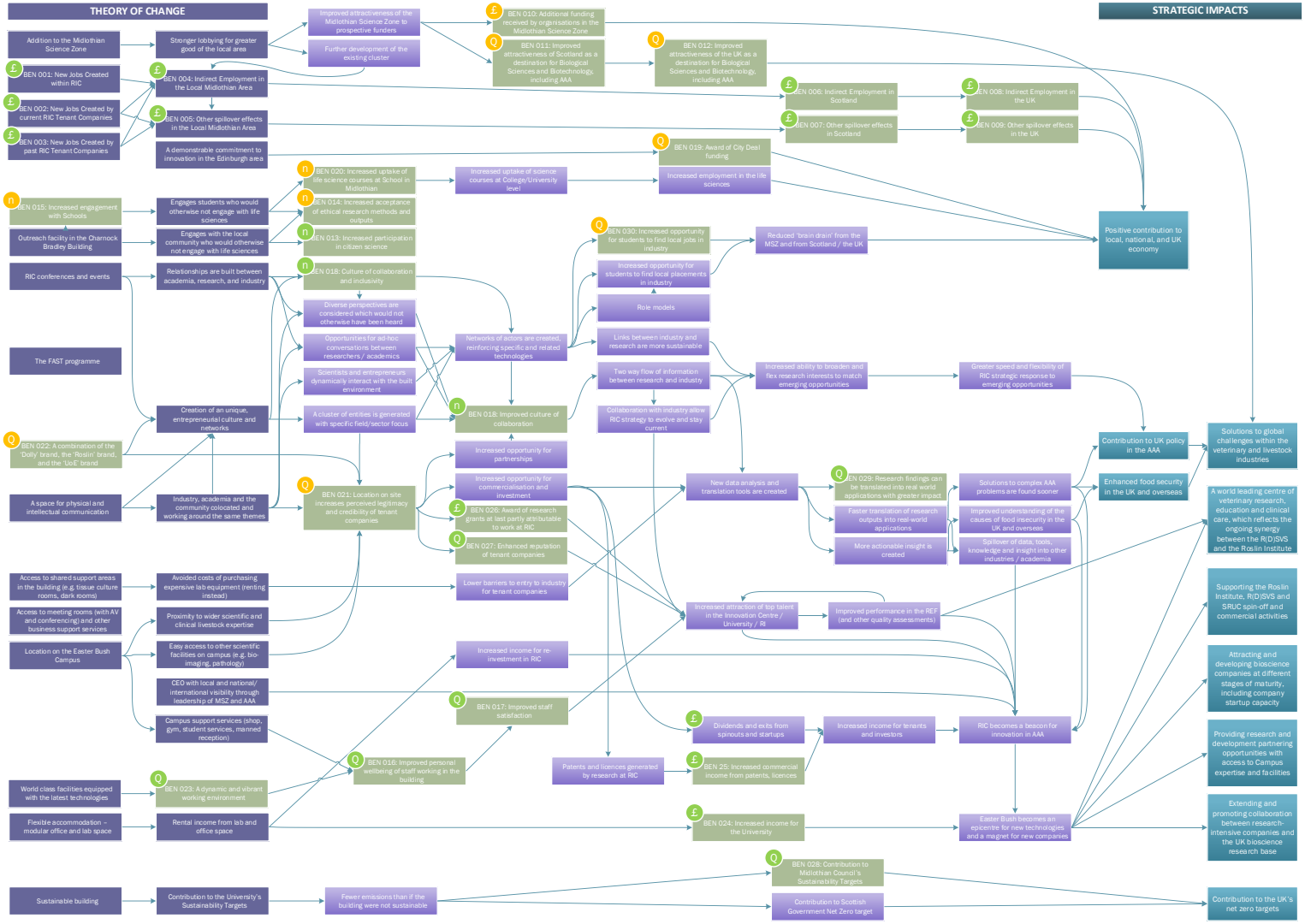
Given events of the past two years, it is impossible to imagine that Covid-19 did not impact on operations in the RIC. Specific impacts that were noted during the research included:

- Hybrid working has reduced the benefits that would otherwise have arisen from informal interactions
- However, hybrid working has helped ease pressures on meeting space, and enables private and confidential conversations to be had from home rather than in an open plan office
- Other companies felt little impact from Covid-19 other than the introduction of protocols around distancing and hygiene[lxiv]
- One company has actively grown their business during the pandemic, thanks to a Pivotal Enterprise Resilience Fund grant.
- EBSOC outreach activities have been negatively impacted by Covid-19, in particular during lockdowns which prevented its usual engagement with schools and the wider community. They did switch to an online model of engagement, but it was not possible to offer the same quality of 'hands-on' experience that is normally delivered.

We are a streamlined operation, so the changes that we needed for Covid were straightforward. Our breeding programmes work continued, but we did have to stop some activities for a while. Many staff were able to work from home, but of course with scientists there are tasks and research activities that need specialist equipment.
For example, the work that we are undertaking with stem cells – the cells from which we are able to build any cell that makes up an animal's body – has to be done by skilled scientists in a laboratory. We went back into the laboratory as quickly as we could but obviously, we've had to introduce protocols about hygiene and social distancing – we feel we're in safe hands at our HQ in the wonderful Roslin Innovation Centre!

Prof. Jacqui Matthews, Chief Technology Officer,
Roslin Technologies

Appendix A: Benefits Map



Appendix B: Benefits Register

Once the initial Benefits Map had been discussed and substantially agreed, potential benefits were distilled into a Benefits Register, assigned unique reference numbers, and analysed according to their type:

Q	Qualitative
n	Quantifiable (numeric)
£	Quantifiable (financial)

This typology is in line with HM Treasury best practice. The benefits were further analysed according to the taxonomy below, as required by the original statement of requirement from UKRI/BBSRC:

- BUSINESS
- COMMERCIAL
- ECONOMIC
- PEOPLE
- CULTURAL
- SOCIAL

Recipients of the benefit have been included in the benefits register in order to inform analysis of where the impact of the benefits will be felt. Finally, the benefits were analysed by 'proximity' to their source (the theory of change) using the below categories:

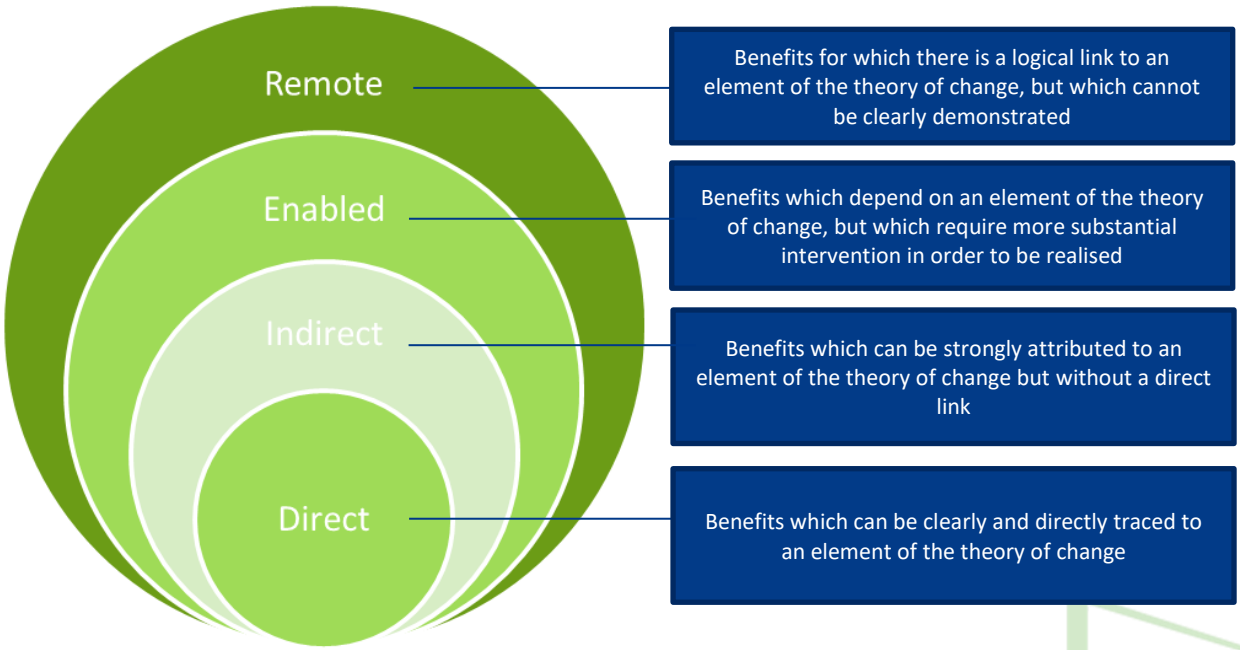


Figure 18: Direct - Remote benefits description

The key benefits that the report tracks are set out on the following page. A full benefits register has been provided to the sponsors as an ancillary file along with the final report.

BEN001	New jobs created within RIC
BEN002	New jobs created by current RIC tenants
BEN003	New jobs created by past RIC tenants
BEN004	Indirect employment in the local Midlothian area
BEN005	Other spillover effects in the local Midlothian area
BEN006	Indirect employment in Scotland
BEN007	Other spillover effects in Scotland
BEN008	Indirect employment in the UK
BEN009	Other spillover effects in the UK
BEN010	Additional funding received by companies in the Midlothian Science Zone
BEN011	Improved posture of Scotland as a destination for life sciences, including AAA
BEN012	Improved posture of the UK as a destination for the life sciences, including AAA
BEN013	Increased participation in citizen science
BEN014	Increased acceptance of ethical research methods and outputs
BEN015	Increased engagement with schools
BEN016	Improved personal wellbeing of staff working in the building
BEN017	Improved staff satisfaction
BEN018	An improved culture of collaboration
BEN019	Award of City Deal Funding
BEN020	Increased uptake of life science courses at school
BEN021	Location on site increases perceived legitimacy and credibility of tenant companies
BEN022	A combination of the 'Dolly' brand, the 'Roslin' brand, and the 'UoE' brand
BEN023	A dynamic and vibrant work environment
BEN024	Increased income for the University
BEN025	Increased commercial income from patents and licences
BEN026	Award of research grants at least partly attributable to work at RIC
BEN027	Enhanced reputation of tenant companies
BEN028	Contribution to Midlothian Council's Sustainability Targets
BEN029	Research findings can be translated into real world applications with greater impact
BEN030	Increased opportunity for students to find local jobs in industry

Figure 19: Extract from Benefits Register

Appendix C: Tenant Register

1. ABACUSBIO LTD

Applying world class science and technology to improve and enhance performance, resilience, competitiveness, responsiveness, and profitability of client enterprises.

2. ASKBIO EUROPE

Leading the way in end-to-end gene therapy technology and AAV therapeutic assets. European headquarters of the AskBio family following acquisition of Synpromics Ltd.

3. BEEBYTES ANALYTICS CIC

Social enterprise specialising in honeybee genetics and DNA analyses to characterise genetic admixture and identify the sources of forage visited by different bee species.

4. BETA BUGS LTD

Insect breeding company that creates high performance breeds for the rapidly growing 'insects-as-protein' sector.

5. CARCINOTECH LTD

Cancer microfluidics technology company, manufacturing 3D printed bio chips using patient specific stem cells for personalised cancer drug testing, discovery, and trials.

6. CARUS ANIMAL HEALTH LTD

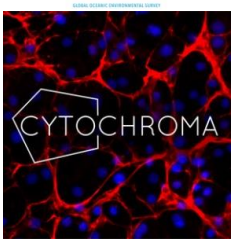
Researching, identifying, and developing novel and emerging technologies that have application in the animal health environment.

7. CENSO BIO LTD, AN AXOL BIOSCIENCE COMPANY

Provider of iPSC-derived cells, media, and characterisation services. Merged with Censo Bio, a cell biology CRO with iPSC-related technology expertise.

8. CLEAN WATER WAVE LTD

Blending advanced technology with robust engineering, to transform polluted ground and surface water into clean water, safe for consumption and discharge.



9. CYTOCHROMA LTD

Producing stem cell derived liver models and tailored toxicity testing to support a variety of life science companies in the acceleration of drug discovery.

10. CYTOMOS LTD

Developing and providing integrated, predictive analytics systems for intelligent bioprocessing in biopharma and cell therapy domains.

11. DEEP SCIENCE VENTURES

Bringing together teams of scientists to seize crucial opportunities and redefine industries. With the Roslin Institute, DSV has launched the Food & Agriculture Science Transformer (FAST), creating Scotland's first venture studio.

12. DYNEVAL LTD

Creating the new standard for semen quality assessment to improve efficiency of livestock reproduction with innovative Dynescan technology for easy-to-use, automated, and portable instrument for reliable measurement on farm.

13. FOOD CHAIN ENTERPRISES LTD

Providing global business consulting services and comprehensive support to integrated food production and manufacturing to optimise processes and profit.

14. GREEN BIOACTIVES LTD

Innovative, start-up from the University of Edinburgh, working with nature to create sustainable sources of plant biomolecules and extracts.

15. GREENGAGE ENLIGHTENED FARMING LTD

Delivering LED agricultural lighting, sensors and control systems for improved farming environments for poultry, pigs and cattle.

16. INGENZA LTD

World leader in the application of industrial biotechnology and synthetic biology; and established inABLE®, a proprietary combinatorial genetic platform.

17. LANDCATCH LTD

Part of Hendrix Genetics, a global multi-species breeding company with activities in layer poultry, turkeys, pigs and now aquaculture.

18. MV DIAGNOSTICS LTD

Development and provision of innovative immunoassays and reagents for use in clinical and research laboratories worldwide.

19. N2 PHARMACEUTICALS LTD

Developers of a unique injectable drug N2-01, proven to dramatically increase the effectiveness of artificial insemination of dairy cattle, a major problem in agriculture.

20. RHIZOCORE TECHNOLOGIES LTD

An applied mycology start-up working with symbiotic fungi to grow healthy, resilient forests that sequester more carbon.

21. ROSLIN FOUNDATION

Founded in 1995 to promote the advancement of education, research and knowledge in agriculture, agricultural related areas, other biological sciences and biotechnology.

22. ROSLIN TECHNOLOGIES LTD

Delivering impact from cutting edge innovations in animal health and providing opportunities for investors looking to capitalise in food and agricultural products.

23. SUPPLY CHAIN IN-SITES LTD (SCI)

Providing innovation and enhanced delivery for supply chain management technical services and certification needs from farm to fork.

24. WOBBLE GENOMICS LTD

Providing biochemical and bioinformatic solutions for gene biomarker discovery, specialising maximising RNA and DNA sequencing efficiency.

HOTDESKING

25. BUSINESS GATEWAY MIDLOTHIAN

Offering expert help and support to new and existing businesses, including directing to grants and funding opportunities through connections associated funding bodies.

26. DATA-DRIVEN INNOVATION – CITY REGION DEAL

Easter Bush Campus is one of a network of five hubs in the Data-Driven Innovation (DDI) Programme, and mechanism for driving productivity and accelerating growth. Hosting Agri-tech Sector Team Lead and Innovation Manager (Health).

27. MIDLOTHIAN SCIENCE FESTIVAL

Annual science festival each October offering a programme of fun, interesting and accessible events and activities across Midlothian.

28. MIDLOTHIAN SCIENCE ZONE

Partnership group of science, technology, and innovation parks; research institutes; academic institutions and tenant companies, all located within Midlothian.

Appendix D: Approach and Method

Governance

Effective project governance has been achieved via three key mechanisms:

- Concise weekly update reports containing a dashboard view of progress against plan, key tasks completed and planned, risks and issues, decisions made, and planned absences for the coming period
- Fortnightly touchpoint meetings with key stakeholders from BBSRC, the University of Edinburgh, and the RIC
- Monthly Steering Group meetings with a wider group of stakeholders, for escalation of any queries or decisions to be approved

Project Plan

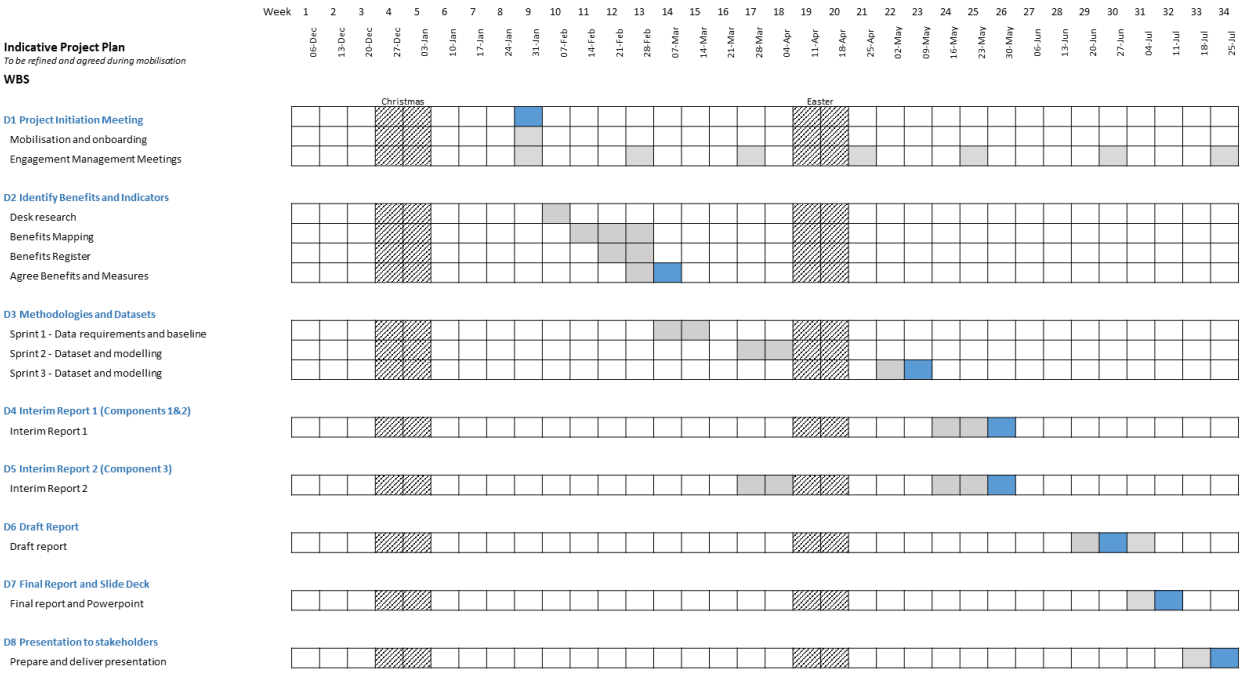


Figure 20: Project Plan

The above project plan was agreed with the Steering Group at the commencement of our engagement. It was agreed at the Steering Group meeting of 10th March that due to changes from the original schedule as a result of a later than planned start, Deliverables 4 and 5 would be merged into one Interim Report. It was later agreed at the Steering Group meeting of 12th May that the culture and tenant surveys would be extended to allow more time for respondents to complete their input, and that as such the Deliverable D3 would be extended to coincide with this Interim Report.

Public Data

The key common issue for data sources relating to economic development is that they are not granular in terms of the types of enterprises and jobs growth occurring.

The major exception to this, and our preferred data source, is the ONS Labour Market Survey. This provides extremely detailed information on numbers of businesses, by number of employees, location,

and year for the whole of the UK. Interrogating the ONS database, we were able to extract datasets relating to:

1. Industry: Through review of the ONS Industry classifications, and hotspots for specialist employment, including the geography of RIC, we were able to identify ONS Industry Class *72.110 Research and experimental development on biotechnology* as being heavily related to the companies and employment located within the RIC.

2. Geography: The ONS collects data at a granular level of geographical detail, allowing us to compare trends at local, regional, Scottish and UK levels

3. Frequency: ONS data for this topic is updated and published on a regular annual basis

4. Consistency: ONS seek to provide maximum ongoing consistency between datasets. Annual updates usually include re-presenting previous data to reflect latest classifications

Other Sources investigated

Potential Source	Industry Coverage	Geographical Coverage	Frequency & history	Consistency
Statistics.Gov.Scot	High level	All of Scotland only	Quarterly, 2010-2018	High
City of Edinburgh Council 'Edinburgh Ecomony Watch'	No specifics	Edinburgh only	Quarterly	Variations
Edinburgh by Numbers	High level	Edinburgh only	Annual, since 2007	High, NOMIS data
Department for Business, Energy & Industrial Strategy - Business population estimates	High level	National/ Regional	Annual, since 2014	High, NOMIS data

Figure 21: Other potential public data sources reviewed

Figure 21 clearly shows that the common weakness for most data sources is the lack of industry specific information for a specific sector that is perhaps <0.1% of the economy. This, combined with other strengths of the ONS dataset, and the fact it underpins many of the alternative sources listed, suggests ONS is by far the best source of baseline data.

Benefits Identification and Mapping

The approach taken in this study is founded in a robust, tried, and tested benefits management framework, based on 'Theory of Change', and incorporating best practice from sources such as Managing Successful Programmes® and the HM Treasury Magenta Book. This framework was used to identify the breadth and nature of benefits and impacts that have been achieved, and to identify a portfolio of indicators. The team has successfully used this framework in evaluations of socio-economic benefits for research and innovation institutes, as well as other areas including the Home Office, where it has been the subject of detailed scrutiny by economists.

This methodological framework was combined with a robust mixed methods approach to gathering and synthesis of qualitative and quantitative data to provide a baseline dataset and evidence on benefits being realised by the RIC. In doing so, reference was made to many sources of existing research on the

benefits of research and innovation to the UK economy, including the work of Dr David Johnson undertaken at the Centre.

This method offers a pragmatic but robust approach to assessing the quantifiable and qualitative socio-economic benefits of the RIC, in a way which is compliant with the Magenta Book and is achievable within the proposed timescale.

The engagement began with a Project Initiation Meeting (deliverable 1) at which ways of working were agreed and the project plan was refined. The team then began a short, focused period of desk research and interviews with key staff from the RIC, which was used to establish the Theory of Change and an associated outcomes model (hereafter known as the Benefits Map). The Theory of Change sets out at a high level what has changed because of the RIC and was developed into a Benefits Map based on the desk research and initial interviews carried out with key staff. The Benefits Map was further validated in a workshop on 22 February 2022, and provides a clear, logical link between the benefits that this study seeks to evaluate and the changes that occurred when the RIC opened its doors.

A copy of the Map is presented in Appendix A. A copy of the source file will be provided along with our final report.

Benefits uncertainty and confidence

Typically, when producing a forward-looking case for benefits, the following type of 'confidence grid' is applied to allow for uncertain factors within the relationships and desired outcomes assumed to underpin the benefits indicated.

Confidence grid

Assumptions	Dependencies, risks and issues: Possibility of external factors affect benefits realisation – High	Medium	Low	None
Empirical evidence supporting the chain of causality	30-50%	50-70%	70-90%	90-100%
Logical argument for the chain of causality; some evidence, could be tested over time	10-30%	30-50%	50-70%	70-90%
Logical argument for chain of causality; no evidence, hard to test	0-10%	10-30%	30-50%	50-70%

Figure 22: Typical confidence grid to establish Benefits confidence for 'Green Book' assessments

A 'Benefits Realisation' study would not normally rely heavily on this approach since there would be a presumption of known, measurable changes 'after the fact'.

This study required a hybrid approach as there are a number of known facts the study has established e.g., employment generated, estimated GVA, estimated R&D investment, but also a number of assumptions that remain subjective/ranged, for example RIC differential impact, and the private and social value of R&D.

Broadly, the view of this study is, from the grid above, there are no material impacts from dependencies, risk, and issues' to be considered. This is due to the existence of factual measurements and key

performance indicators that have occurred despite dependencies, risk and issues that may have transpired.

However, the study does recognise an ongoing uncertainty around the chain of causality with respect to outcomes. It is not possible to establish the fate of tenant companies since 2017 without the RIC, so it is difficult to exclusively credit the RIC with improving the known measures. Figure 16 summarises the approach taken to dealing with uncertainty around both the chain of causality, as well as the value of the benefits generated where literature tends to present basis figures used as a range.

Code	Benefit	Upper case	Mid Case	Lower case
BEN001	New jobs created within RIC	Observed FTE total within RIC, times BIGGAR GVA per FTE per year, reduced by a modest displacement factor.	Observed FTE total within RIC, times BIGGAR GVA per FTE per year, reduced by a modest displacement factor.	Observed FTE total within RIC, times BIGGAR GVA per FTE per year, reduced by a substantial displacement factor.
BEN002 & BEN004	New jobs created by current RIC tenants & Indirect employment in the local Midlothian area	Observed FTE total within RIC tenants, times BIGGAR GVA per FTE per year, reduced by a modest displacement factor.	Observed FTE increases within RIC tenants, times BIGGAR GVA per FTE per year, reduced by a modest displacement factor.	Observed FTE increases within RIC tenants, times BIGGAR GVA per FTE per year, reduced by a substantial displacement factor.
BEN003	New jobs created by past RIC tenants	Observed FTE total within past RIC tenants, times BIGGAR GVA per FTE per year, reduced by a modest displacement factor.	Observed FTE increases within past RIC tenants, times BIGGAR GVA per FTE per year, reduced by a modest displacement factor.	Observed FTE increases within past RIC tenants, times BIGGAR GVA per FTE per year, reduced by a substantial displacement factor.
BEN005	Other spillover effects in the local Midlothian area	Optimistic view of R&D Investment within RIC tenants Private Returns on R&D investment plus, share of national social returns of R&D Investment	Modest view of R&D Investment within RIC tenants Private Returns on R&D investment plus, share of national social returns of R&D Investment	Pessimistic view of R&D Investment within RIC tenants Private Returns on R&D investment plus, share of national social returns of R&D Investment
BEN006	Indirect employment in Scotland	Observed FTE total within RIC, current & past RIC tenants, with BiGGAR indirect factor applied, reduced by a modest displacement factor.	Observed FTE increase within RIC, current & past RIC tenants, with BiGGAR indirect factor applied, reduced by a modest displacement factor.	Observed FTE increase within RIC, current & past RIC tenants, with BiGGAR indirect factor applied, reduced by a substantial displacement factor.
BEN007	Other spillover effects in Scotland	Optimistic view of R&D Investment within RIC tenants Private Returns on R&D investment plus, share of national social returns of R&D Investment	Modest view of R&D Investment within RIC tenants Private Returns on R&D investment plus, share of national social returns of R&D Investment	Pessimistic view of R&D Investment within RIC tenants Private Returns on R&D investment plus, share of national social returns of R&D Investment
BEN008	Indirect employment in UK	Observed FTE total within RIC, current & past RIC tenants, with BiGGAR indirect factor applied, reduced by a modest displacement factor.	Observed FTE increase within RIC, current & past RIC tenants, with BiGGAR indirect factor applied, reduced by a modest displacement factor.	Observed FTE increase within RIC, current & past RIC tenants, with BiGGAR indirect factor applied, reduced by a substantial displacement factor.
BEN009	Other spillover effects in UK	Optimistic view of R&D Investment within RIC tenants Share of national social returns of R&D Investment	Modest view of R&D Investment within RIC tenants Share of national social returns of R&D Investment	Pessimistic view of R&D Investment within RIC tenants Share of national social returns of R&D Investment

Figure 23: Descriptions of approach to Mid, Upper- and Lower-case benefits calculations

Appendix E: Master Data and Assumptions

Ser No	Entry Date	Area	Title	Value	Source	Last Reviewed	Owner	Description
0001	31-May-22	Benefits Assessment	RIC staffing profile	5	RIC	29/06/22		Assumed 5 per annum
0002	31-May-22	Benefits Assessment	GVA - Upper - FTE (Direct Jobs - Local)	£ 58,621	BiGGAR	29/06/22		
0003	31-May-22	Benefits Assessment	GVA - Upper - FTE (Tenant Jobs - Local)	£ 58,621	BiGGAR	29/06/22		
0004	31-May-22	Benefits Assessment	GVA - Upper - FTE (Former Tenant Jobs - Local)	£ 58,621	BiGGAR	29/06/22		
0005	31-May-22	Benefits Assessment	GVA - Upper - FTE (Added Jobs - Scotland)	£ 55,714	BiGGAR	29/06/22		
0006	31-May-22	Benefits Assessment	GVA - Upper - FTE (Added Jobs - UK)	£ 64,000	BiGGAR	29/06/22		
0007	31-May-22	Benefits Assessment	GVA - Mid - FTE (Direct Jobs - Local)	£ 58,621	BiGGAR	29/06/22		
0008	31-May-22	Benefits Assessment	GVA - Mid - FTE (Tenant Jobs - Local)	£ 58,621	BiGGAR	29/06/22		
0009	31-May-22	Benefits Assessment	GVA - Mid - FTE (Former Tenant Jobs - Local)	£ 58,621	BiGGAR	29/06/22		
0010	31-May-22	Benefits Assessment	GVA - Mid - FTE (Added Jobs - Scotland)	£ 55,714	BiGGAR	29/06/22		
0011	31-May-22	Benefits Assessment	GVA - Mid - FTE (Added Jobs - UK)	£ 64,000	BiGGAR	29/06/22		
0012	31-May-22	Benefits Assessment	GVA - Lower - FTE (Direct Jobs - Local)	£ 58,621	BiGGAR	29/06/22		
0013	31-May-22	Benefits Assessment	GVA - Lower - FTE (Tenant Jobs - Local)	£ 58,621	BiGGAR	29/06/22		
0014	31-May-22	Benefits Assessment	GVA - Lower - FTE (Former Tenant Jobs - Local)	£ 58,621	BiGGAR	29/06/22		
0015	31-May-22	Benefits Assessment	GVA - Lower - FTE (Added Jobs - Scotland)	£ 55,714	BiGGAR	29/06/22		
0016	31-May-22	Benefits Assessment	GVA - Lower - FTE (Added Jobs - UK)	£ 64,000	BiGGAR	29/06/22		
0017	31-May-22	Benefits Assessment	Lower Case (Influence of RIC on New FTE creation)	50%	Assumption	29/06/22		Appendix D - Confidence grid - Low evidence chain of causality
0018	31-May-22	Benefits Assessment	Indirect - Upper - FTE (Added Jobs - Scotland)	97%	BiGGAR	29/06/22		
0019	31-May-22	Benefits Assessment	Indirect - Mid - FTE (Added Jobs - Scotland)	97%	BiGGAR	29/06/22		
0020	31-May-22	Benefits Assessment	Indirect - Lower - FTE (Added Jobs - Scotland)	97%	BiGGAR	29/06/22		
0021	31-May-22	Benefits Assessment	Indirect - Upper - FTE (Added Jobs - UK)	69%	BiGGAR	29/06/22		
0022	31-May-22	Benefits Assessment	Indirect - Mid - FTE (Added Jobs - UK)	69%	BiGGAR	29/06/22		
0023	31-May-22	Benefits Assessment	Indirect - Lower - FTE (Added Jobs - UK)	69%	BiGGAR	29/06/22		
0024	31-May-22	Benefits Assessment	Displacement - Defined percentage of direct FTE at RIC. (Upper Case)	15%	Assumption	29/06/22		Study view, limited displacement
0025	31-May-22	Benefits Assessment	Displacement - Defined percentage of direct FTE at RIC. (Mid Case)	25%	Assumption	29/06/22		Study view, moderate displacement
0026	31-May-22	Benefits Assessment	Displacement - Defined percentage of direct FTE at RIC. (Worst Case)	50%	Assumption	29/06/22		Study view, high displacement
0027	31-May-22	Benefits Assessment	Substitution - Upper Case	0%	Assumption	29/06/22		Study view is substitution not relevant to specialism
0028	31-May-22	Benefits Assessment	Substitution - Mid Case	0%	Assumption	29/06/22		Study view is substitution not relevant to specialism
0029	31-May-22	Benefits Assessment	Substitution - Lower Case	0%	Assumption	29/06/22		Study view is substitution not relevant to specialism
0030	31-May-22	Benefits Assessment	Private Returns on R&D - Upper Case	30%	BEIS	29/06/22		https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/333006/bis-14-990-rates-of-return-to-investment-in-science-and-innovation-revised-final-report.pdf
0031	31-May-22	Benefits Assessment	Private Returns on R&D - Mid Case	20%	BEIS	29/06/22		
0032	31-May-22	Benefits Assessment	Private Returns on R&D - Lower Case	10%	BEIS	29/06/22		
0033	31-May-22	Benefits Assessment	Private returns - Local share	75%	Assumption	29/06/22		Assumption to allocate geography, no consequence to total
0034	31-May-22	Benefits Assessment	Private returns - Scotland share	25%	Assumption	29/06/22		Assumption to allocate geography, no consequence to total
0035	31-May-22	Benefits Assessment	Private returns - UK share	0%	Assumption	29/06/22		Assumption to allocate geography, no consequence to total
0030	31-May-22	Benefits Assessment	Social Spillover on R&D - Upper Case	100%	BEIS	29/06/22		https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/333006/bis-14-990-rates-of-return-to-investment-in-science-and-innovation-revised-final-
0031	31-May-22	Benefits Assessment	Social Spillover on R&D - Mid Case	38%	BEIS	29/06/22		
0032	31-May-22	Benefits Assessment	Social Spillover on R&D - Lower Case	20%	BEIS	29/06/22		
0036	31-May-22	Benefits Assessment	Social returns - Local share	10%	Assumption	29/06/22		Assumption to allocate geography, no consequence to total
0037	31-May-22	Benefits Assessment	Social returns - Scotland share	25%	Assumption	29/06/22		Assumption to allocate geography, no consequence to total
0038	31-May-22	Benefits Assessment	Social returns - UK share	65%	Assumption	29/06/22		Assumption to allocate geography, no consequence to total
0039	31-May-22	Benefits Assessment	FTE Cost (£ per annum)	£ 40,000	Assumption	29/06/22		Assumptions used to estimate R&D represented by RIC 'ecosystem'
0040	31-May-22	Benefits Assessment	Other Costs Uplift	20%	Assumption	29/06/22		

Figure 24: Master Data Assumptions list

Appendix E: FTE Data

The study also relied heavily upon FTE data from Current/Former tenant companies to quantify the benefits associated with company growth. Below is a summary of findings, and assumptions used in the calculations.

Source	Company	From	To	From FTE	Current FTE
Survey	N2 Pharmaceuticals	2019	2022	6	6
Survey	Beta Bugs	2019	2022	3	16
Survey	AbacusBio	2017	2022	3	11
Survey	Food Chain Enterprises	2020	2022	6	6
Survey	Cytomos	2021	2022	6	6
Survey	Roslin Technologies	2017	2022	6	38
Survey	Dyneval	2021	2022	6	16
Survey	MV Diagnostics	2017	2022	3	6
Survey	Roslin Foundation	2022	2022	3	3
Survey	Rhizocore Technologies	2021	2022	3	6
Survey	Cytochroma	2018	2022	3	3
RIC estimate	AskBio				
RIC estimate	Beebytes	Apr-21	Jun-22	2	3
RIC estimate	Carcinotech	Nov-19	Mar-22	1	7
RIC estimate	Carus	Nov-21	Mar-22	2	2
RIC estimate	Censo/Axol	Oct-18	Jun-22	28	13
RIC estimate	Clean Water Wave	Dec-20	Mar-22	2	2
RIC estimate	DSV/Aquanzo	Aug-20	Mar-22	1	1
RIC estimate	Green Bioactives	Aug-20	Mar-22	2	4
RIC estimate	Greengage	Feb-19	Mar-22	18	10
RIC estimate	Ingenza	Sep-18	Mar-22	40	33
RIC estimate	Hendrix	Sep-17	Mar-22	1	1
RIC estimate	SCI	Nov-21	Mar-22	2	2
RIC estimate	Synpronics	Sep-17	Jun-22	39	56
RIC estimate	Wobble	Oct-21	Mar-22	4	4

Figure 25: Tenant FTE data, with sourcing

NB: Survey FTE estimates are based upon response range midpoints i.e., 1 to 5 = 3

Appendix F: Tenant Survey

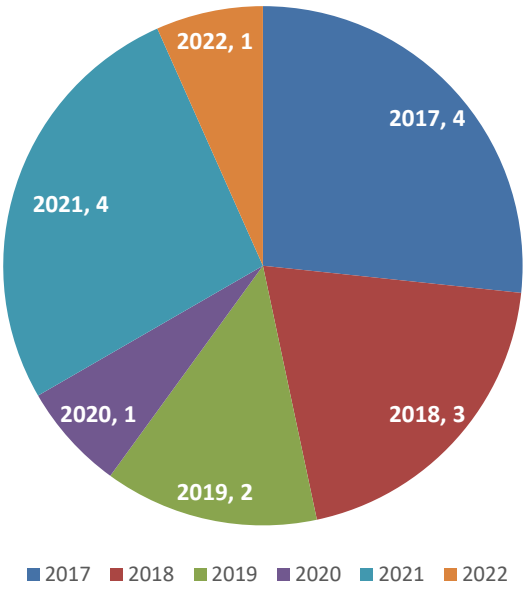
To create a dataset bespoke to the types of benefit that this study sets out to measure, the team designed and initiated a brief survey, which was circulated to the lead representative of each tenant firm. The questions were tailored to the study's specific information needs and were as follows:

Question	Response type
Company Name	Free Text
Company Registration Number	Free Text
In what calendar year did your company become a tenant at RIC	List: 2017; 2018; 2019; 2020; 2021; 2022
Are you still a tenant at RIC	Yes/No
How many FTE equivalents did you employ when you became a tenant, and how many do you employ now?	Numeric, with gender split, by two columns (n employed when you became a tenant, n now)
Rounded to the nearest £000, what was your company's turnover in each year of your tenancy at RIC?	Numeric
Approximately what % of your turnover was from the below geographical locations?	Matrix: Numeric (%), by two rows (% when you became a tenant, % now); local, rest of Scotland, rest of UK, Europe, International
On a scale of 1-5 where 1 is not at all and 5 is having an established reputation and influence in a geography, how would you describe the breadth of your company's reach?	Matrix: 1-5, by two rows (score when you became a tenant, score now); local, rest of Scotland, rest of UK, Europe, International
How many patents has your company been granted since becoming a tenant at RIC?	0; 1-5; 6-10; 11-15; more than 15
How many licences has your company granted in respect of those patents?	0; 1-5; 6-10; 11-15; more than 15
How much income have you received from those licences?	£0; £1-1,000; £1,001-5,000; £5,001-10,000; more than £10,000; Other (please specify (free text))
Approximately what % of income from those licences was from the below geographical locations?	Numeric (%): local, rest of Scotland, rest of UK, Europe, International
How many publicly funded research grants has your company been awarded since becoming a tenant at RIC?	0; 1-5; 6-10; 11-15; more than 15
How much income have you received from those research grants?	£0; £1-1,000; £1,001-5,000; £5,001-10,000; more than £10,000; Other (please specify (free text))
Approximately what % of income from those research grants was from the below geographical locations?	Numeric (%): local, rest of Scotland, rest of UK, Europe, International
How many private company investments has your company been awarded since becoming a tenant at RIC?	0; 1-5; 6-10; 11-15; more than 15
How much income have you received from those investments?	£0; £1-1,000; £1,001-5,000; £5,001-10,000; more than £10,000; Other (please specify (free text))
Approximately what % of income from those investments was from the below geographical locations?	Numeric (%): local, rest of Scotland, rest of UK, Europe, International
On a scale of 1-5 where 1 is not at all influential and 5 is highly influential, how influential do you believe that being a tenant at RIC has been in securing patents / granting	Matrix: select one for each row (patents, licences, research grants, private investments) 1; 2; 3; 4; 5

Question	Response type
licences / receiving research grants / securing private investments?	
All things considered, how badly do you think that the Covid-19 pandemic has impacted your organisation and its ability to go about its business in the RIC? Please select from the dropdown list and use the space provided to expand on your view (if you feel the need to)	Select: Not at all – business continued as usual throughout Moderately – there was some disruption but for the most part business continued as usual Significantly – there was significant disruption, but we did manage to keep going Completely – we were unable to go about our business most if not all of the time Free text box for additional commentary
What are the top three things that attracted you to becoming a tenant in RIC?	Free text, three boxes
What are the top three things that keep you as a tenant in RIC?	Free text, three boxes
What are the top three new or additional things RIC could do to help your business grow?	Free text, three boxes
Is there anything else you would like to tell us about your experience of being a tenant at the RIC, either positive or negative?	Free text

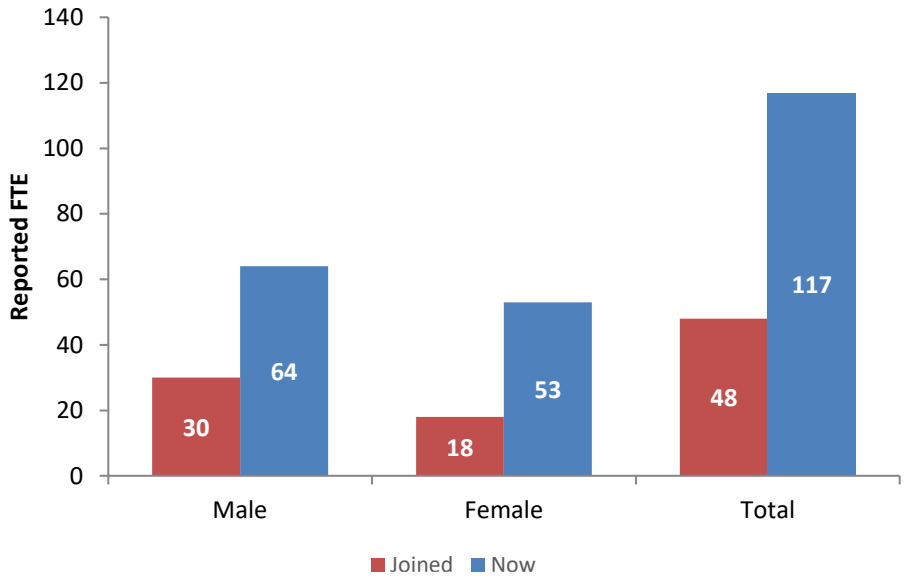
Figure 26: Questions included in the Tenant Survey

In what calendar year did your company become a tenant at RIC?

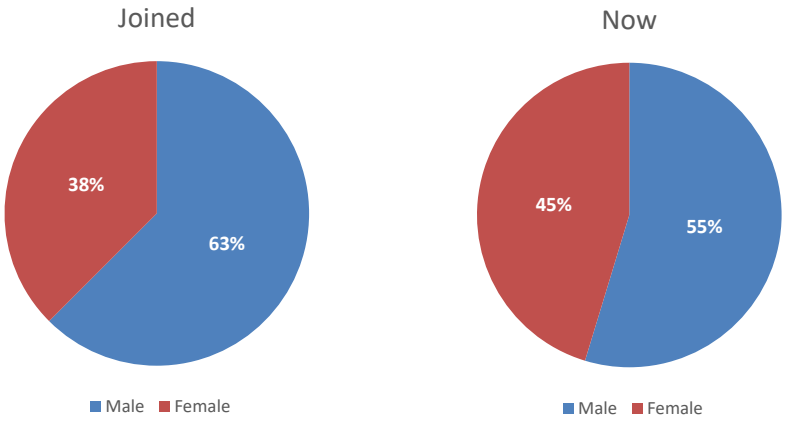


Conclusion: Tenants represent a healthy mix of experience with RIC. On average, tenants who responded have been a tenant for 3 years.

How many people (FTE equivalents) did you employ when you became a tenant at RIC, and how many do you employ now?

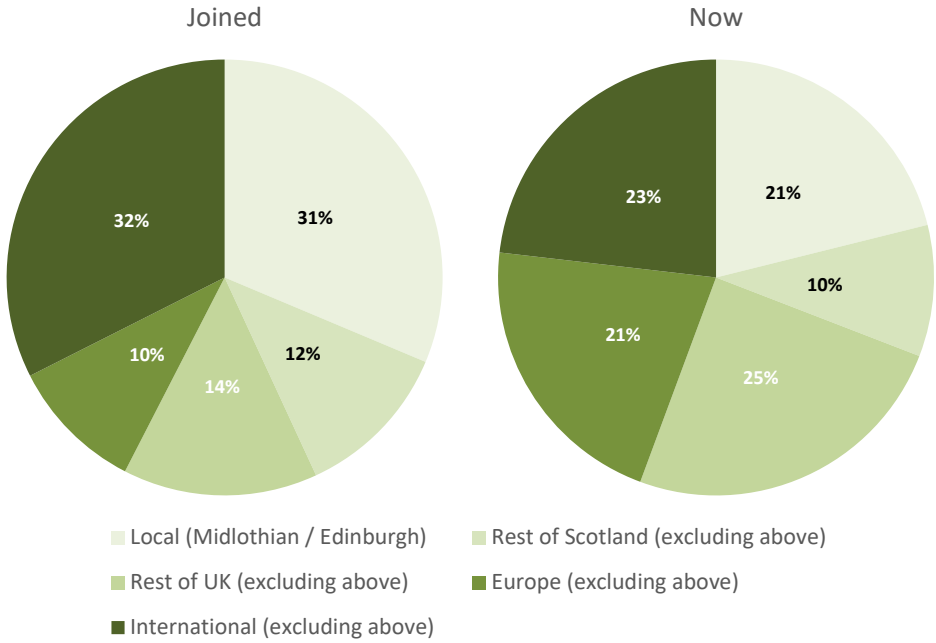


Conclusion: Tenants have more than doubled their FTEs in the time they have been with the RIC. Survey response suggests CAGR for FTE of 34%, so on average tenants are growing by one third each year.



Conclusion: There is evidence that employment gender balance improves as tenants grow.

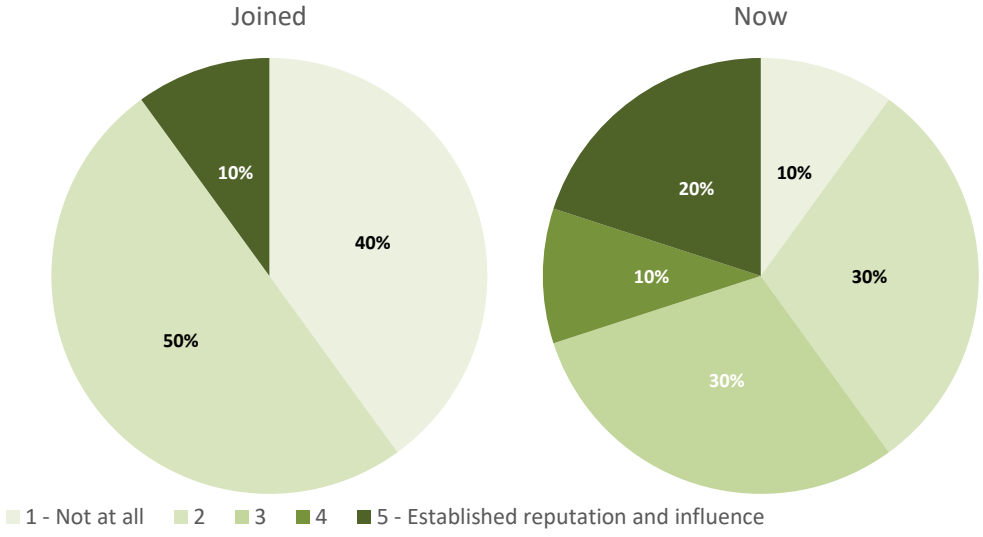
Approximately what % of your turnover was from the below geographical locations?



Conclusion: There is evidence that geographical revenue sources diversify over time and that tenants become less reliant on very local sources and improved revenue share coming from wider UK and Europe in particular.

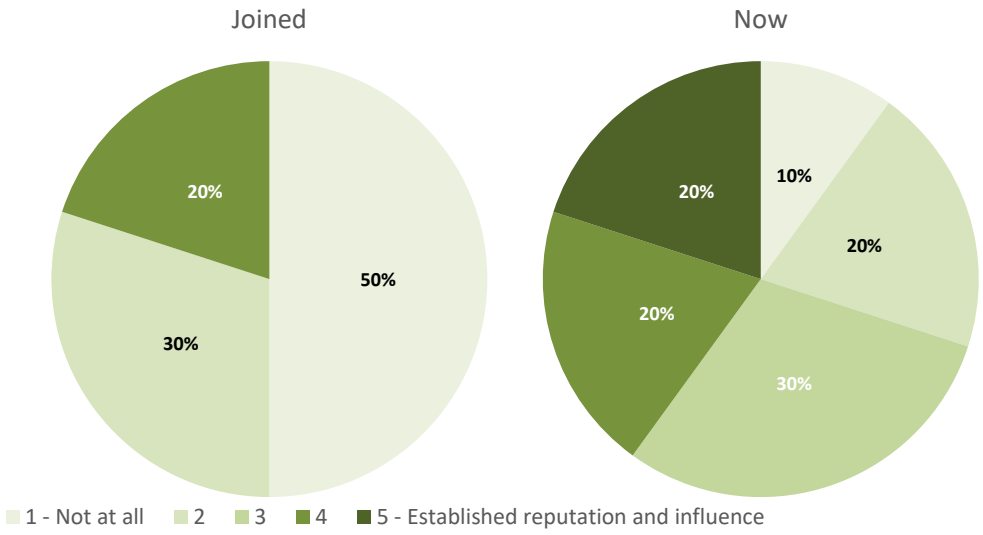
On a scale of 1-5 where 1 is not at all and 5 is having an established reputation and influence in a geography, how would you describe the breadth of your company's reach?

Local (Midlothian / Edinburgh)



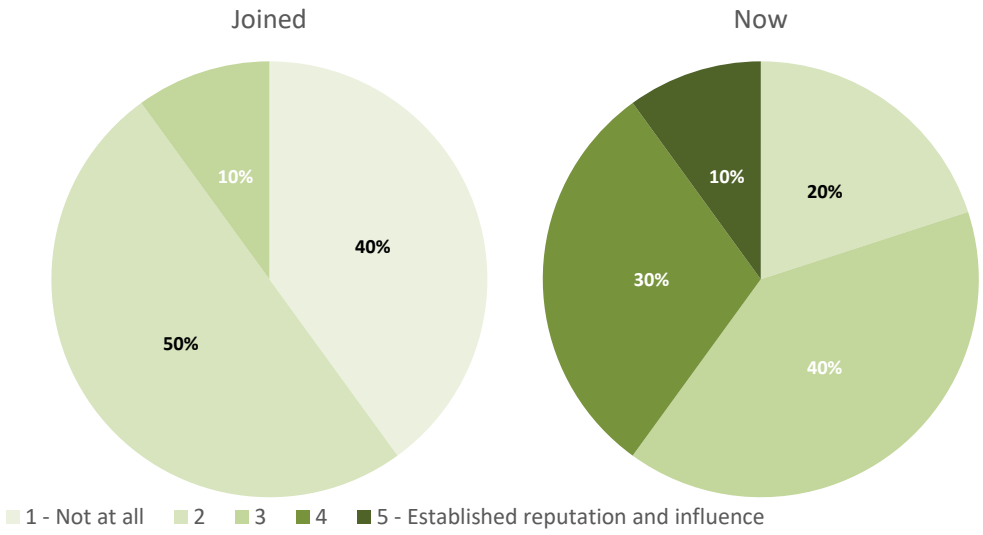
Conclusion: Overall, tenants feel that their local reputation and influence has increased considerably during the time they have been a tenant at RIC

Rest of Scotland (excluding above)



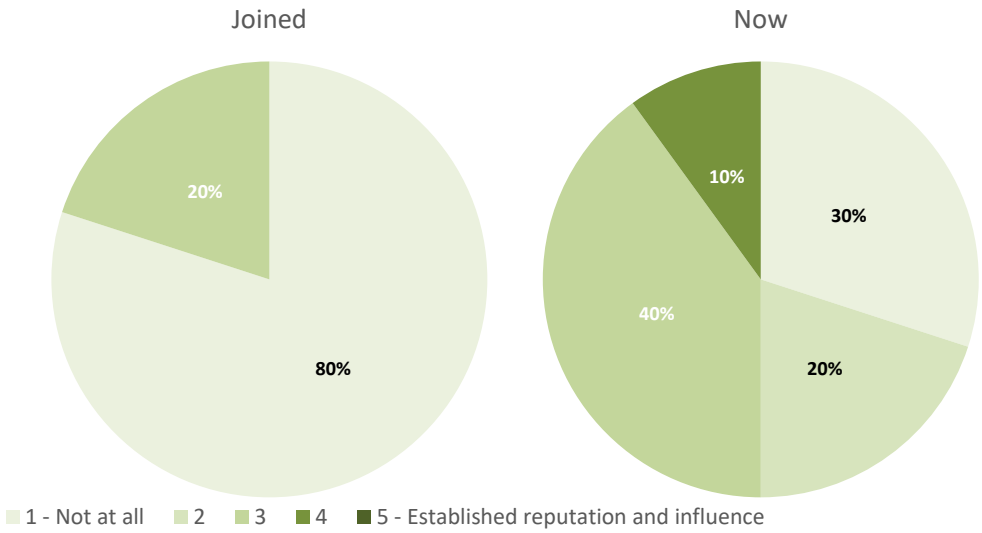
Conclusion: Overall, tenants feel that their reputation and influence in Scotland has increased considerably during the time they have been a tenant at RIC

Rest of UK (excluding above)



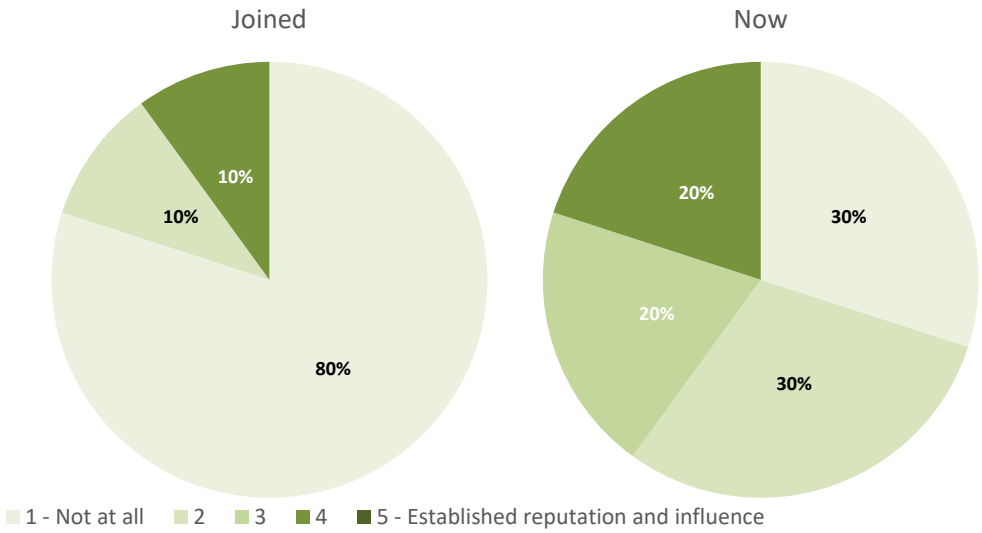
Conclusion: Overall, tenants feel that their reputation and influence in UK has increased considerably during the time they have been a tenant at RIC

Europe (excluding above)



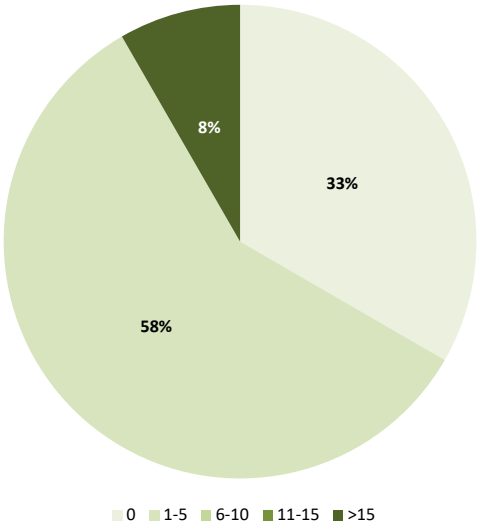
Conclusion: Overall, tenants feel that their reputation and influence in Europe has increased during the time they have been a tenant at RIC

International (excluding above)



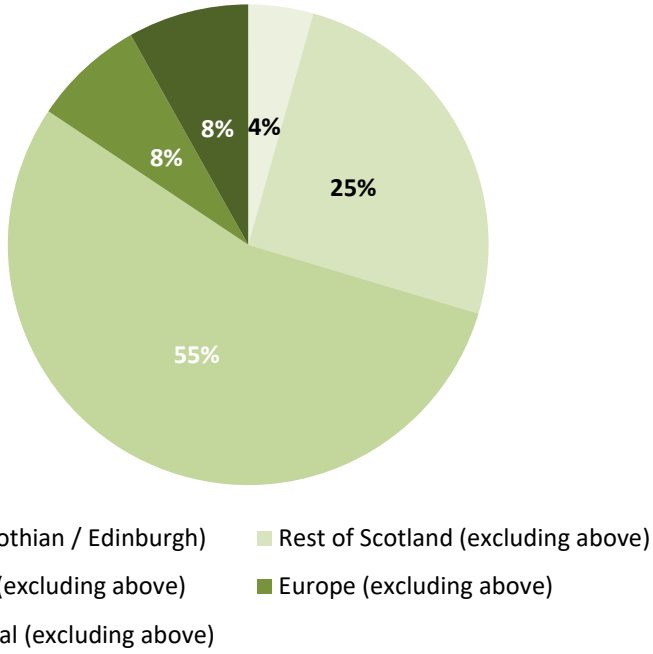
Conclusion: Overall, tenants feel that their international reputation and influence has increased during the time they have been a tenant at RIC

How many publicly funded research grants has your company been awarded since becoming a tenant at RIC? How much income have you received from those research grants?



Conclusion: Majority of respondents report having received at least one Research grant since becoming a tenant. Overall average per tenant estimated to be >£100K received, although there are some outliers. All of those tenants report receiving >£10,000 in research grants

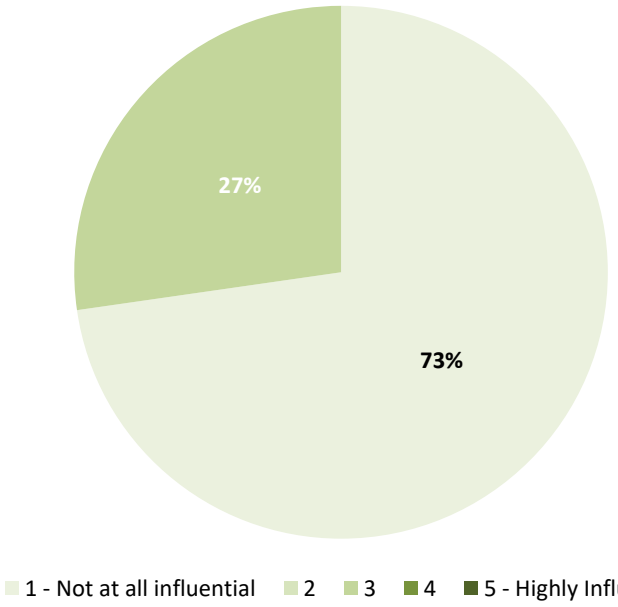
Approximately what % of income from those research grants was from the below geographical locations?



Conclusion: Half of all research grants received by RIC tenants originate from the wider UK, excluding Scotland. A further quarter come from Scotland with only a relatively small proportion originating from wider European and international sources

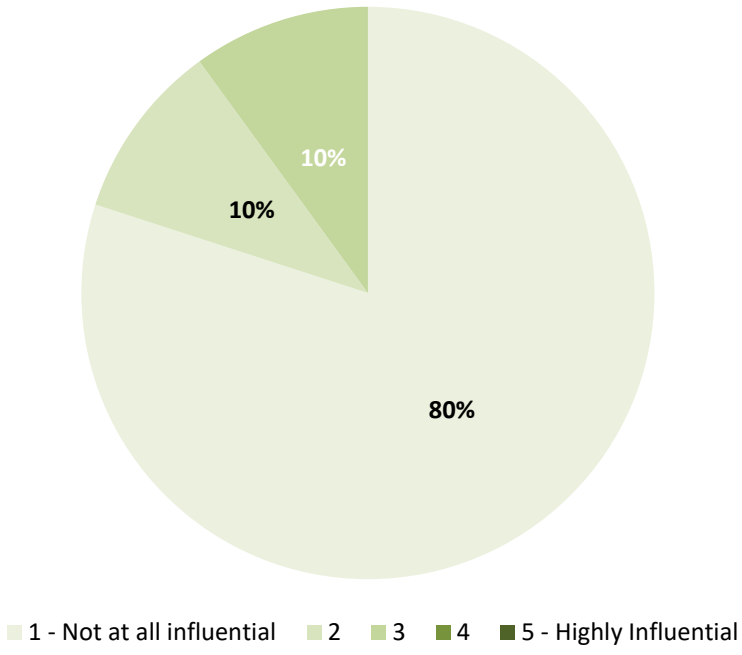
On a scale of 1-5, where 1 is not at all influential and 5 is highly influential, how influential do you believe that being a tenant at RIC has been in securing patents / granting licences / receiving research grants / securing private investments?

Patents



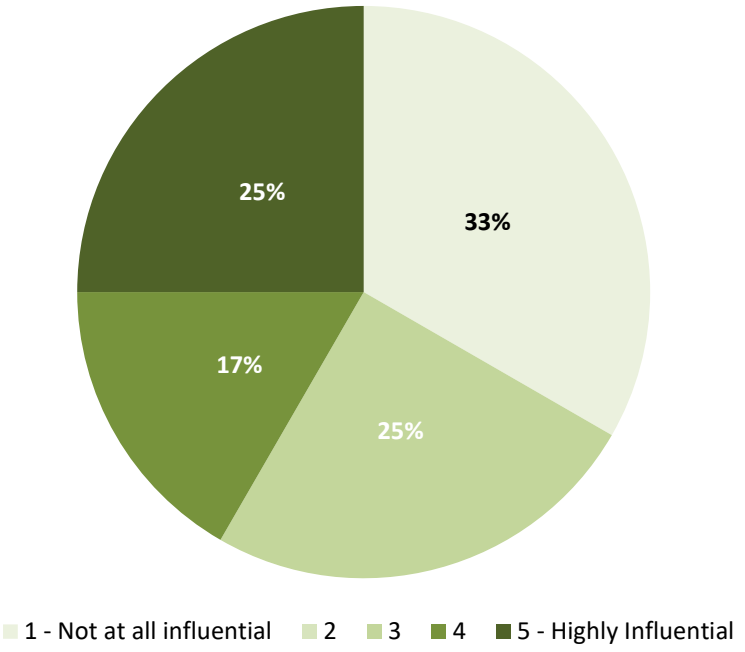
Conclusion: Tenants do not feel that being a tenant of the RIC is influential in them securing patents

Licences



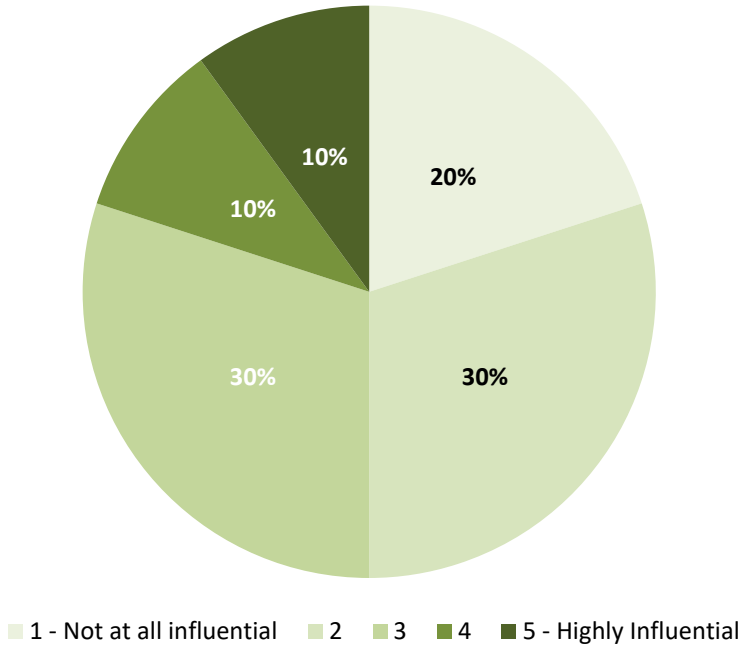
Conclusion: Tenants do not feel that being a tenant of the RIC is influential in them securing licences

Research Grants



Conclusion: Most tenants do feel that being a tenant of the RIC is influential in them securing research grants

Private Investments



Conclusion: Approximately half of tenants do feel that being a tenant of the RIC is influential in them securing research grants.

What are the top three things that attracted you to becoming a tenant in RIC & what are the top three things that keep you as a tenant in RIC?

Conclusion: Overall there are some strong themes emerging as to why Tenants joined and remain at RIC. Tenants consistently refer to the facilities offered by RIC as a key reason. Many tenants refer to being part of RIC as enhancing their credibility, reputation. Value for money, physical location and opportunities for collaboration are also frequently mentioned.

Appendix G: Cultural Baselining Survey

It became clear at an early stage in the benefits analysis that the emerging culture in the RIC was felt to be an important source of benefit to tenants, and it was important to establish a measurable assessment of the culture which is repeatable and can be tracked over time.

The Organisational Culture Assessment Instrument ('OCAI') was developed by the University of Michigan as a validated research method[lxv] to assess organisational culture. It is based in the Competing Values Framework, which focuses on both internally and externally-facing orientations:

	Internal Orientation	External Orientation
Flexibility	Collaborate or Clan Culture	Create or Adhocracy Culture
Stability	Control or Hierarchy Culture	Compete or Market Culture

Figure 27: Elements of OCAI Cultural Assessment

Collaborate / Clan Culture: people oriented and friendly

This is a friendly working environment where people share a lot in common, and it may be described as feeling like a large family in which leaders are seen as mentors or parent figures. Loyalty and tradition are important, and staff are highly engaged. Success is defined by addressing needs of clients and caring for people; values based around teamwork, participation and consensus are actively promoted.

Create / Adhocracy Culture: dynamic and entrepreneurial

This is characterised by a dynamic and creative working environment, where employees are supported to take risks and leaders are seen as innovators and risk takers. Experimentation and innovation are a way of bonding, and the long term goal is to grow and create new resources. The organisation promotes individual initiative and freedom. This culture is typical in technical start-ups, technology-driven industries, and disruptive services.

Control / Hierarchy Culture: process-oriented and structure

This is typified by a formalised and structured workplace, where procedures direct activity and leaders are proud of efficiency-based metrics and co-ordination. Keeping the organisation functioning smoothly is crucial to success, and there are many formal rules and policies that must be complied with. Stability and results are valued, and success is defined by reliability, continuous planning, and low cost.

Compete / Market Culture: results-oriented and competitive

This is a competitive, results-based workplace, emphasising targets, deadlines, and achieving objectives. Staff tend to be competitive and goal-focused, and leaders are perceived as hard drivers, producers, and rivals. They can be tough, with high expectations; the organisation places high emphasis on winning, and reputation and success are important. There is a strong focus on market dominance, through defeating rivals. Competitive pricing and market leadership is also prevalent in this culture.

The Assessment

The assessment is in the form of an online questionnaire tool in two rounds, in which participants are asked to divide 100 points between four statements relating to six aspects of the organisation's current (1st round) and preferred (2nd round) culture. Most points are to be assigned to the statement that they feel is most true, and the least to the statement that least fits with their view of the current and preferred organisational culture. The six culture aspects assessed in the tool are:

- Dominant Characteristics
- Organisational Leadership

- Management of Employees
- Organisational Glue
- Strategic Emphases
- Criteria of Success

By averaging all OCAI profiles completed by an organisation, the tool calculates a collective profile of the current and preferred organisational culture. The culture profile map that is generated shows the dominant current culture, any discrepancy between present and preferred culture, and gives insight into any cultural incongruence which could give rise to tensions and confused and frustrated staff.

It is also possible to compare results for the RIC against typical results for the UK as a whole, and against typical results for the category of *Professional, scientific, and technical activities in the UK*. This allows a fairer comparison against the prevailing and preferred cultures in organisations working in similar fields.

Use of the OCAI survey has allowed empirical measurement of what might otherwise have been considered a qualitative benefit, and the establishment of a 2022 cultural baseline for the RIC.

Results

	UK (n=2957)		UK Professional, Scientific, and technical activities (n=639)		RIC (n=15)	
	Current	Preferred	Current	Preferred	Current	Preferred
Clan	28.42	34.48	30.35	34.42	37.73	37.41
Adhocracy	17.67	23.87	19.89	26.37	24.93	28.39
Market	25.54	19.53	24.17	19.43	14.47	13.38
Hierarchy	28.36	22.11	25.58	19.78	22.87	20.82

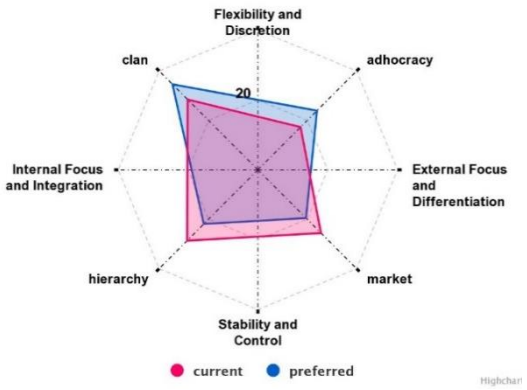


Figure 28: OCAI - UK as a Whole (n=2,957)

Overall, based on 2,957 responses from UK employees, there is a preference for a stronger 'clan' culture and more 'adhocracy' than current perceptions of culture suggest being the case.

Respondents feel, at the UK level, that there is more 'market' and 'hierarchy' focus in their organisational cultures than they would prefer.

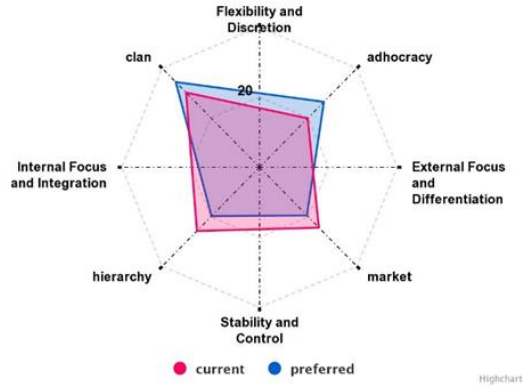


Figure 29: OCAI - UK Professional, Scientific, and Technical Activities (n=639)

Within the UK 'Professional, Scientific, and Technical Activities sector, the results for the UK as a whole are very similar. There is a preference for a stronger 'clan' and 'adhocracy' type of culture than currently prevails, and there is more 'market' and 'hierarchy' than the preferred culture.

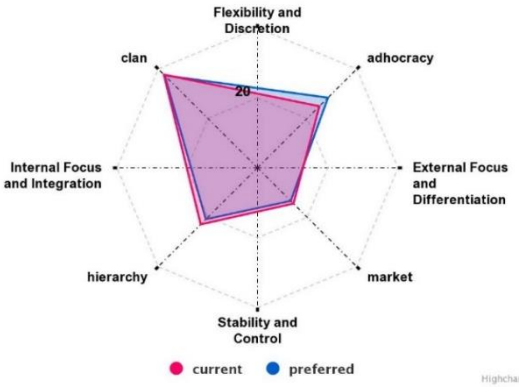


Figure 30: OCAI - RIC (n=15)

Tenant companies within the RIC, however, note very little disparity between the type of culture they experience in the RIC and their preferred type of organisational culture. There is a very strong element of 'clan' (collaborative) culture, and adhocracy (indicative of a dynamic and entrepreneurial culture) prevails over hierarchy.

Appendix H: Contributors

We would like to extend our thanks to the persons below for their contributions to this study:

Name	Stakeholder
Mark Barnett	BeeBytes Analytics
Tim Byrne	Abacus Bio
Rosheen Carr	AskBio
John Clinkenbeard	Roslin Technologies
Thomas Farrugia	Beta Bugs
Val Hughes-White	University of Edinburgh
Richard Kuo	Wobble Genomics
John Mackenzie	Former CEO, Roslin Innovation Centre
Emma McCallum	Midlothian Science Zone
Toby Parkes	Rhizocore
Lesley Parsons	Midlothian Science Zone
Sarah Scott	Ingenza
Noriane Simon	BBSRC
Annie Watt	Midlothian Council Business Gateway

Figure 31: Study Contributors

Primary interviews were combined with secondary desk research to produce the case studies presented and the overview of the pros and cons of life in the RIC.

The team would also like to extend their particular gratitude to Hazel Robertson and Jess Wood of the RIC for their assistance throughout the study.

Appendix I: Vacancies Advertised by Midlothian Science Zone

	Position Advertised	Company/Organisation
March 21	Marketing and Comms	Beta Bugs
	Colony Technician	Beta Bugs
	Production Operative	Beta Bugs
	Senior/Principal Scientist	AskBio Europe
	R&D Scientist, Molecular/Cellular Biology	AskBio Europe
	R&D Animal Technician/Scientist	AskBio Europe
April 21	Production Operative	Beta Bugs
	Colony Technician	Beta Bugs
	Quality Control Scientist	Axol/Censo
	Quality Control Manager	Axol/Censo
	Laboratory Manufacturing Manager	Axol/Censo
	Post-Doctoral Stem Cell Scientist	Roslin Technologies
May 21	-	-
Jun-21	Senior Laboratory Technician	Cytomos
	Post-Doctoral Stem Cell Scientist	Roslin Technologies
Jul-21	-	-
Aug-21	Research Associate: Scale up of artificial cultured meat	UoE/Roslin Tech
	Mycology Lab Technician	Rhizocore
	Cell Line Development Scientist/Senior Scientist (UK)	AskBio
Sep-21	Post-Doctoral Stem Cell Scientist	Roslin Technologies
	Post-Doctoral Bio-Engineer: Bioprocessing/Scale-Up	Roslin Technologies
	Business Development Manager – UK & Europe	Beta Bugs
Oct-21	Stem Cell Scientist	Roslin Technologies
	Cell Culture Technician	Roslin Technologies
	Colony Technician	Beta Bugs
	Veterinary Commercial Lead	Dyneval
	Marketing Manager	Dyneval
	Senior Software Lead	Dyneval
	Full-Stack Software Engineer	Dyneval
	Data Engineer	Dyneval
	Projects Manager	Dyneval
	Product Manager	Dyneval
Nov-21	-	-
Dec-21	-	-
Jan-22	Sales Manager	Cytochroma
Feb-22	Production Operative	Beta Bugs
Mar-22	Molecular Biologist	Ingenza
	Insect Nucleus Technician	Roslin Technologies
	Operations Manager	Cytochroma
	Marketing Executive / Manager	Cytochroma

	Position Advertised	Company/Organisation
	Scientist (Cell Manufacture / Imaging)	Cytochroma
	Marketing & Communications Manager	Roslin Technologies
	Fermentation Research Assistant	Ingenza
	Applied Plant and Animal Breeder	AbacusBio
	Laboratory Technician	Roslin Technologies
Apr-22	-	**-**
May-22	Senior Scientist – Fermentation	Ingenza
	Molecular Biologist	Ingenza
Jun-22	UK Based Independent Director	AbacusBio
	Senior Scientist – Fermentation	Ingenza
	Fermentation research assistant	Ingenza

Appendix J: Public Attitudes to Science

The studies referenced below represent useful context regarding wider public attitudes to science, including the broad types of health science and genetic science that are performed by some tenant companies at the RIC. While it is possible to suggest that the type of public and school engagement being undertaken in the EBSOC portion of the Charnock Bradley Building will be having a positive impact on public attitudes to science, it is not possible to link that contribution to any tangible evidence of changes in public attitude on a national or international level.

2020 Wellcome Trust – Welcome Monitor

Every 2-3 years since 2009, the Wellcome Trust has surveyed more than 2,000 adults to understand UK public attitudes about and involvement in science and health research. In 2015 they published data on how informal learning stimulates interest in science, as well as an appreciation of its social, cultural, and historical context. This represents useful baseline information at national level.

In 2015, 63% of the survey sample reported that they were interested in hearing about the research that scientists conduct, including their latest findings, research which was personally relevant to the respondents, and how the research was done. 31% of those who were interested in hearing about the research indicated that they most wanted to hear about it through lectures, talks, or debates, with most preferring to be informed through TV, radio, or podcasts. 5% of respondents had attended a local community science event.

36% of respondents rated their understanding of the term 'genetically modified' as 'good' or 'very good', while 25% of respondents had little understanding or had not heard the term. 28% of respondents declared interest in research around stem cells, and 45% were interested in how genes work and how they affect health and diseases. Only 2 respondents (less than 1%) indicated interest in understanding animal testing. 94% of respondents believed that medical research will lead to an improvement in the quality of life for people in the UK in the next 20 years.

By 2018, 82% of the survey sample indicated that they were either fairly or very interested in health research; of those, 36% were interested in how health research was conducted, and 44% were interested in social and ethical issues being raised by the research. 36% were interested in how health research is regulated. 38% of those interested declared an interest in stem cells, up from 28% in the previous monitor..[lxvi]

The 2020 study highlighted a further increase in appetite to hear about health research directly from scientists (82%, an increase from 62% in 2015), although the impact of the Covid-19 pandemic is very likely to have positively impacted that figure. There was a general reduction in interest about how genes work (47%, down from 59% in 2018) and a similar reduction in interest in stem cells (28%, down from 38% in 2018). Respondents continue to prefer passive engagement with information on health research..[lxvii]

2022 3M State of Science Index

Since 2018, 3M has been conducting an annual 'State of Science' index to track attitudes to science through multi-country original research..[lxviii] The 2022 State of Science Index survey was conducted among a representative sample of 1,000 general population adults, 18 years and older, across the following 17 countries: US, Canada, UK, Germany, France, Poland, Italy, Brazil, Mexico, Colombia, Japan, Singapore, South Korea, China, India, UAE, and Australia.

The 2022 report indicates that trust in science and scientists is still high, and that people want to hear more from them:

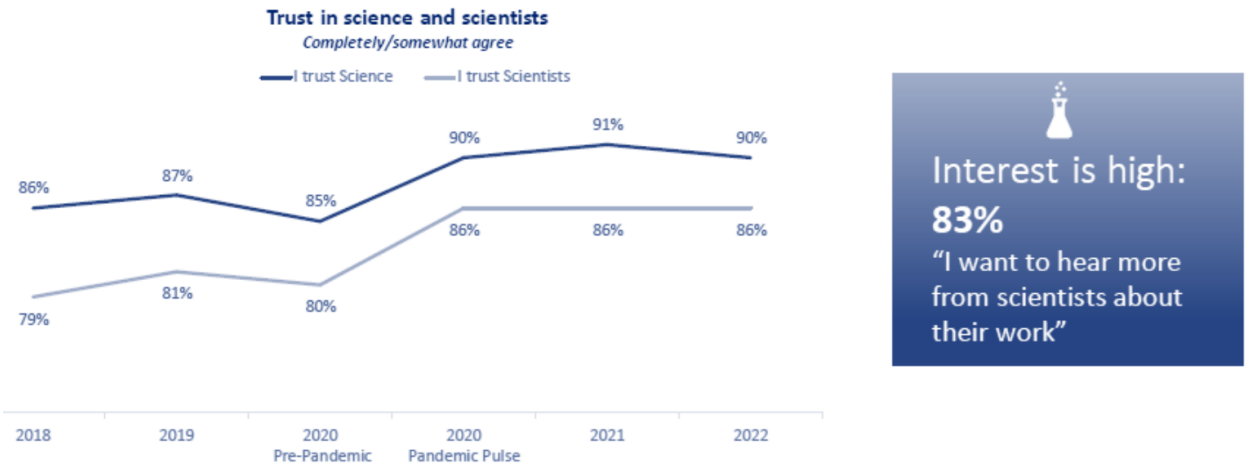


Figure 32: Global Trust in science and scientists, 3M State of Science Index 2022

Since 2018, the importance of science in respondents' everyday lives has risen 8 points from 44% to 52%. 39% of respondents reported that they think a lot about the impact of science on their everyday lives, and there is significant concern about misinformation both in social media and in traditional media (85% and 72% respectively). 83% of respondents agreed that there are negative consequences to society if people do not adequately value science; 61% believe there will be more public health crises, 57% believe that society will become more divided, and 53% believe there will be an increase in the severity of climate change.

84% of respondents believe that there are barriers to students pursuing a STEM education, with the top roadblocks being self-doubt (25%), bias and discrimination (22%) and issues of diversity in representation (19%). 33% of respondents believed that corporations should create resources for children to get involved in science at an early age; 24% believed that programmes like internships, summer camps, and workshops would contribute to STEM education. 53% of respondents believe that a gender gap exists in the STEM workforce, and 44% of those respondents believe it is not improving or is getting worse.

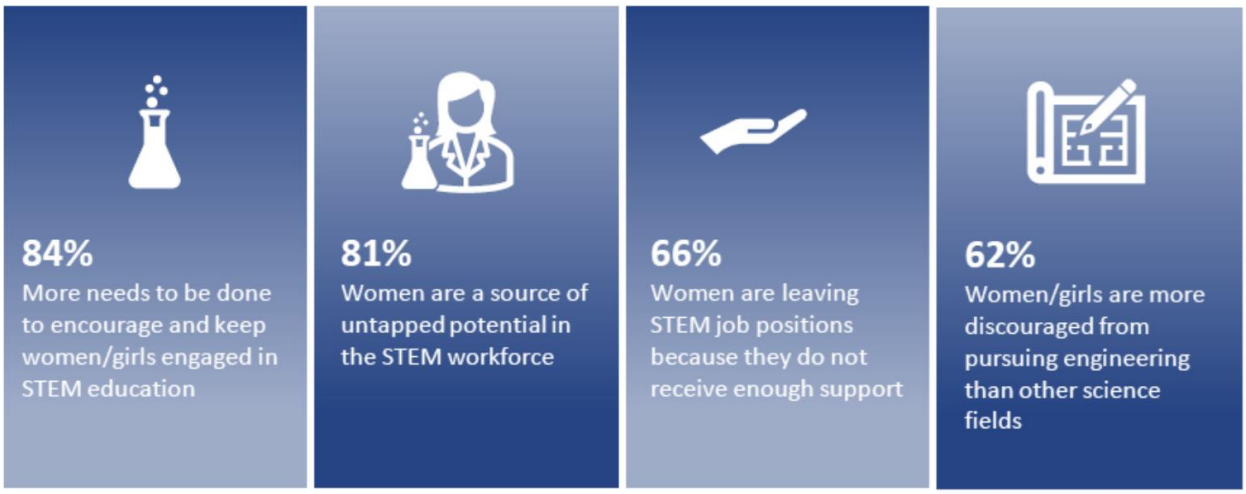


Figure 33: Views on gender diversity in the STEM education and workforce

Environmental concerns have intensified over the past year, with more concern noted regarding all categories of environmental issues including climate change, intensifying natural disasters, ocean plastics pollution, air pollution, and clean water supplies. The top impacts of climate change are reported as being

extreme weather, warmer temperatures, impacts on biodiversity, impacts on disease/illness, and food security. 88% of respondents believed that science could help minimise those impacts.

53% of respondents believe that they will appreciate science more in five years' time than they do now. It should be noted, however, that the UK response to that was only 43%, less than the 17-country average.

Appendix K: Glossary of Acronyms

APHA	Animal and Plant Agency
BBSRC	Biotechnology and Biological Sciences Research Council
DDI	Data Driven Innovation
DEFRA	Department for Environment, Food and Rural Affairs
DSV	Deep Science Ventures
EBSOC	Easter Bush Science Outreach Centre
EI	Edinburgh Innovations
ETF	Edinburgh Technology Fund
FAST	Food and Agriculture Science Transformer
FTE	Full Time Equivalent
GDP	Gross Domestic Product
GVA	Gross Value Added
HNC	Higher National Certificate
HND	Higher National Diploma
IVVN	International Veterinary Vaccinology Network
LEP	Local Enterprise Partnership
MCC	Moredun Communications Centre
MSZ	Midlothian Science Zone
OCC	Old College Capital
ONS	Office for National Statistics
PI	Principal Investigator
R(D)SVS	Royal (Dick) School of Veterinary Studies
REF	Research Excellence Framework
RIC	Roslin Innovation Centre
RPF	Regional Prosperity Framework
SIA	Science and Innovation Audit
SME	Small and Medium Enterprise
SRUC	Scotland's Rural College
STEM	Science, Technology, Engineering, and Mathematics
STFC	Science and Technology Facilities Council
SWAP	Scottish Wider Access Programme
OCAI	Organisational Culture Assessment Instrument
UCEE	University-Centred Entrepreneurial Ecosystem
UKRI	UK Research and Innovation
UOE	University of Edinburgh

Appendix L: Endnotes

[i] Source: Roslin Innovation Centre / Easter Bush Campus promotional literature
[ii] Source: Roslin Innovation Centre / Easter Bush Campus promotional literature
[iii] https://roslintech.com
[iv] https://ukinnovationscienceseedfund.co.uk
[v] https://www.babraham.com/babraham-ecosystem/campus-impact-report/
[vi] https://www.europeanbusinessreview.com/more-than-policies-bricks-mortar-and-entrepreneurship
[vii] Source: Roslin Innovation Centre / Easter Bush Campus promotional literature
[viii] https://dolly.roslin.ed.ac.uk/facts/the-life-of-dolly/index.html
[ix] https://www.ed.ac.uk/roslin
[x] https://www.ed.ac.uk/roslin/about/impact
[xi] https://www.ed.ac.uk/vet/news-events/archive/2014/top-ref-ranking
[xii] https://www.ed.ac.uk/vet/about/vid-welcome
[xiii] https://www.ed.ac.uk/roslin/news-events/latest-news-2022/pupils-use-big-data-to-monitor-bee-health
[xiv] https://www.ed.ac.uk/roslin/news-events/latest-news/archive/2019/beekeeping-citizen-science#:~:text=Participants%20at%20the%20citizen%20science,the%20coming%20months%2C%20stay%20tuned!
[xv] 'Business Plan for Easter Bush Innovation Centre: Market and Financial Assessment', BiGGAR Economics, November 2013
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