



**University of Stirling**

**National Aquaculture Technology and  
Innovation Hub (NATIH)**

**Full Business Case**

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0.2	<p>The increased costs of delivering NATIH meant the second phase (laboratories and business incubation space) will no longer be delivered. A new option of a single phase (£18.9m) NATIH project is now the preferred option.</p> <p>The prioritized project elements include experimental aquatic facilities, bio-secure challenge facilities, the provision of collaboration space and business accelerator.</p>	

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# 1. Executive Summary

## Strategic case

- 1.1.1. This Full Business Case (FBC) seeks approval for £17.0 million of City Region Deal (CRD) funding. Together with £1.0 million of funding from the Wolfson Foundation and £0.9 million from the University of Stirling, the funding is required to deliver the National Aquaculture Technology and Innovation Hub (NATIH) project. The NATIH project will be delivered by the University of Stirling's Institute of Aquaculture (IoA).
- 1.1.2. The IoA hosts world leading aquaculture expertise bringing together cross-disciplinary teams. During the 2021 Research Excellence Framework (REF) period, the IoA secured £19.3 million of research funding and engaged in 228 research partnerships across 44 different countries.
- 1.1.3. However, IoA's aquatic facilities badly need to be replaced and upgraded. The bio-secure challenge facilities were lost several years ago with research on disease increasingly relying on facilities elsewhere. Alongside the new facilities the IoA itself is currently developing a new industry focused strategy.
- 1.1.4. The improved aquatic facilities, available through NATIH, will enable the University to apply its research and innovation expertise on global aquatic food systems. The NATIH project will help improve the University of Stirling's position to secure both global impact and secure city region benefits (including investment and jobs) that would otherwise have arisen elsewhere, including outside of the UK.
- 1.1.5. The key features of the NATIH project are:
  - **Experimental aquatic facilities;** flexible facilities with controlled temperature rooms expanding research on temperate and tropical species. This will increase the capacity of research facilities by around 300%.
  - **Bio-secure challenge facilities;** a bio secure level 2 challenge facility to study bacterial, viral and parasitic disease of fish.
  - **Collaboration space;** repurposed buildings to provide high quality business space for the NATIH team to work and meet with stakeholders in the aquaria facility.
  - **Business accelerator;** specialist aquaculture business support facilities to make sure businesses (particularly micro and SMEs) benefit fully and rapidly from new technologies, opportunities and solutions.
- 1.1.6. The increased costs of delivering NATIH mean the second phase (laboratories and business incubation space) will no longer be delivered. A new option of a single phase NATIH project is now the preferred option. The deliverables (above) have been prioritised to ensure that the capacity, capabilities and facilities are in place to tackle current critical challenges faced by industry and wider stakeholders in addition to capitalising on global market opportunities.
- 1.1.7. The project already fast tracked (at OBC stage) Business Accelerator services into the first phase of NATIH and this is retained within the new single phase project. The University will develop NATIH and its other CRD projects in synergy to maximise benefits from the investments, particularly business incubation space.

- 1.1.8. Working closely with other CRD innovation projects will help to mitigate any reduction in benefits from NATIH's second phase. Opportunities will be considered in the context of the University's campus masterplan and a new estates strategy (currently in development).

### **Global growth, global food security and environmental challenges**

- 1.1.9. Aquaculture is the fastest growing food production sector on the planet and since 2016 global aquaculture has provided the main source of fish available for human consumption. Over the last 20 years, global aquaculture of farmed aquatic animals has been dominated by Asia, with an 89% share (United Nations, 2020).
- 1.1.10. With world food fish consumption projected to be 18% higher in 2030 than today, governments and businesses are increasingly seeking support to deliver food security and support livelihoods through sustainable aquaculture. NATIH will focus research on achieving environmentally sustainable growth for the sector including production of sustainable feeds, disease management and climate resilience.
- 1.1.11. The UK has a well-developed, high value aquaculture sector with ambitious plans for growth. In the growth strategy for Scottish aquaculture in Scotland (available [online](#)), industry leaders, supported by the Scottish Government, state an ambition to double the economic contribution of Scotland's aquaculture industry to £3.6 billion by 2030. The Scottish Government's [Vision for Sustainable Aquaculture](#) calls for a renewed focus on innovation to raise productivity and support the growth of Scottish businesses contributing to Scotland's wellbeing economy.
- 1.1.12. The food system is a major driver of environmental change, responsible for a quarter of all Greenhouse Gas (GHG) emissions, occupying half of all ice-free land. The knowledge needed for developing sustainable aquaculture systems requires innovations in collecting information and NATIH can play a key role in helping shape this agenda.
- 1.1.13. There is a risk that the UK aquaculture industry could lose ground against international competition. Global market share is reducing in the face of aggressive expansion while in other parts of the world there has been investment in research, development and innovation.
- 1.1.14. As an example, Norway is already developing technologies that enable opportunities for inshore site and floating closed containment systems removing space as a limiting factor together with many of the negative environmental and societal impacts derived from aquaculture. The rapid development of aquaculture expertise elsewhere in the world is capturing the global market and placing the UK at a competitive disadvantage.
- 1.1.15. There is considerable urgency to reverse this trend if the UK is to maintain and enhance its position as a global leader in aquaculture innovation and technology and so capture the substantial economic benefits offered by this high growth, demand-led market.

### **NATIH**

- 1.1.16. The National Aquaculture Technology and Innovation Hub (NATIH) will create an innovation community centred on aquaculture which will stimulate, deliver, enable and inspire innovation. It will bring together all stakeholders from across the world to develop the innovative solutions, new technologies and services that will drive the next generation of domestic production and export into the global marketplace.

- 1.1.17. NATIH addresses three areas of market failure; the creation of public goods, imperfect information and externalities. There is a reluctance to invest in innovation, new technologies or processes that could easily be adopted by competitors. For example, new approaches successfully tackling pollution and disease would be readily adopted across the industry.
- 1.1.18. This has discouraged the aquaculture industry from investing in R&D with a tendency for firms to collaborate with academic research teams on smaller firm-specific projects rather than industry-wide projects.
- 1.1.19. This has led to a patchwork approach to aquaculture industry engagement. Research facilities across universities tend to focus on specific areas (for example, shellfish or freshwater fish). The research facilities hosted by universities partly reflect the industry's preference to engage on commercially focused shorter term projects.
- 1.1.20. For businesses there are uncertainties about the benefits of academic engagement, and potential issues around the uncertainty of any intellectual property generated through such engagement. Investment in R&D carries a degree of risk given the often unpredictable returns, particularly for longer term projects.
- 1.1.21. The aquaculture industry faces significant negative externalities, specifically environmental concerns and the impact on wild fish and local marine ecosystems. Pollution and environmental concerns represent some of the barriers to expanding production facing the aquaculture industry.
- 1.1.22. The industry also faces positive externalities through potentially markedly lower carbon associated with a move to seafood from products like beef and dairy. The policy action agenda from COP26 (available [online](#)) highlighted the importance of investment in fishing R&D and innovation to scale up technologies and practices.

### **Addressing market failures**

- 1.1.23. Innovation and the use of new technology will be vital components for the future growth of the aquaculture industry. Increased research and development activity is essential if the aquaculture sector is to remain competitive in the global market, overcome barriers to expansion, and meet the ambitious growth targets for the industry.

### **Counterfactual case**

- 1.1.24. The UK has a lack of flexible and future proof environmentally controllable facilities that can cater for both temperate and tropical research. This could result in a reduction of inward investment, restricting most of the UK activity, concentrating mainly on a consolidated salmon aquaculture sector.
- 1.1.25. With existing facilities either limited or already at capacity, the UK cannot offer a globally specialised hub. NATIH will be able to cater both academically and physically at scale for the growth in research and innovation for the range of species across the world. For example, Asia is responsible for around 90% of global farmed seafood including fish and shellfish.

- 1.1.26. NATIH would equip the UK with the capacity coupled with the interdisciplinary specialist expertise to attract research and development opportunities in tropical species of significant importance to the Asian market. This will support inward investment and the ability to export NATIH’s capabilities and expertise to these markets. The learning and technology in NATIH has the capability to be applied to food systems around the world. Additionally, the IoA already imports species from around the world and is regulated by the Home Office.
- 1.1.27. Without the proposed disease challenge function, the ability of the University to study bacterial, viral and parasitic disease of aquatic organisms around the world will remain limited. Work of this nature is currently outsourced to Eastern Europe, Asia and Norway with a limited amount to the Centre for Environment, Fisheries and Aquaculture Science (Cefas) due to capacity limitations. There is not enough capacity in the UK to cope with the demand for disease challenge work and disease management is a key challenge for the sector.
- 1.1.28. Whilst research at the University could still take place, it would be significantly reduced in terms of volume and scope with researchers requiring to use facilities in other countries, such as Norway, who can conduct research of this nature at a scale that the UK cannot.
- 1.1.29. There is therefore a risk that the UK will lose out on domestic and international research activities, intellectual property, development and innovation investment relating to the study of the biggest challenges to achieving sustainable growth targets for the aquaculture sector.

## Economic case

- 1.1.30. Across the city region the NATIH project will generate an additional £72.1 million (Gross Value Added) during the first 15 years of operation and sustain 97 additional jobs in the city region. Over 15 years the Benefit to Cost Ratio (BCR) is 3.3 for the city region and 3.5 for Scotland.

### Cost-Benefit Analysis 15 years

Area	City region	Scotland	UK
Total benefits (-opt. bias)	£72.1	£77.4	£62.3
Project costs	£18.9	£18.9	£18.9
Total costs (incl. carbon)	£21.9	£21.9	£21.9
Net Social Present Value	£50.2	£55.5	£40.4
<b>Benefit to Cost Ratio</b>	<b>3.3</b>	<b>3.5</b>	<b>2.8</b>

- 1.1.31. If projected revenues from research, infrastructure and enterprise activities were to fall by 25% (with a corresponding fall in the cluster effect) then the BCR for Scotland (over 15 years) would fall from 3.5 to 2.8.

- 1.1.32. The cost per job is high at around £190,000 per job for Scotland and higher still at the UK level. This partly reflects the objectives of NATIH to help improve sustainability, environmental outcomes and create relatively high-value employment opportunities.
- 1.1.33. This also reflects the wider benefits and further job creation that will be delivered through synergies with other CRD innovation projects. This includes business incubation space with additional job creation supported by NATIH's activities.
- 1.1.34. Nearly nine out ten of Scotland's aquaculture jobs are found in the Highlands and Islands with Stirling (local authority area) the next largest host of aquaculture jobs. The remote and rural location of aquaculture in Scotland is also present in the sector across England with locally significant aquaculture employment in areas including Cornwall, Wiltshire and Colchester. NATIH has clear potential to both support industry and the economic strategies of both the UK and Scottish Governments.
- 1.1.35. A statement supporting the NATIH project was provided by the Head of the Cefas Weymouth Laboratory:

*"This investment enhances the UK national capability to provide critical infrastructure to underpin aquaculture R&D - which alongside Defra's, Centre for Environment, Fisheries and Aquaculture Science (Cefas) aquaria in Dorset will support the scientific and technical work required for sustainable expansion of a biosecure sector both nationally and internationally. Investment in experimental facilities of this kind, when linked to other national centres, maintains and enhances the UK's position as a leader in sustainable aquaculture – a sector which is set to dominate the supply of global seafood by 2050".*

## Commercial case

- 1.1.36. The National Aquaculture Technology and Innovation Hub is well placed to deliver on significant commercial opportunity on a regional, Scottish, UK and global basis. The proposed establishment of extended and future facing facilities (building on the current Institute location) will provide an academic, research, technical and innovation catalyst that will in turn fuel access to a global aquaculture industry that is projected to reach more than £225 billion value by 2027.
- 1.1.37. This opportunity for global commercial growth is underpinned by an already significant contribution by the Institute of Aquaculture to the Scottish (and therefore UK) salmon industry, which on its own represents a significant contribution. This is through a combination of academic, teaching, research, consulting and business support activities – all of which can be readily expanded through NATIH (expanding current Institute/University activities).
- 1.1.38. This will in turn develop into a world leading positioning in the broad global focus on Blue Food – one of the leading topics and areas of action to come from COP26. The 5 year strategic outcomes for NATIH are;
- Help create sustainable aquatic food systems around the world informed by world leading research delivering improvements in environmental, human and aquatic organism health and welfare.

- Drive the discovery, translation and adoption of solutions, new technologies and innovation driven by collaborations with the global aquaculture community.
- Create a diverse, inclusive skills ecosystem adapting to the needs of the global aquaculture community.

1.1.39. As detailed in the Financial Case a viable and self-sustaining commercial model has been demonstrated over a ten-year period. This model is based on the generation of consistently growing revenues from a blend of related activities.

1.1.40. These activities have different points to reach full maturity but are based upon **RISE** (Research, Infrastructure, Skills and Enterprise) activities that are already within the operational heritage of the Institute of Aquaculture as part of the University of Stirling. They have all been aligned to ensure that the project will:

- Generate joint public/commercial financial gain.
- Play a leading role in building responsible and resilient aquatic food systems that support wellbeing for people and the planet.
- Apply world leading capabilities in research and education, collaborating with the global aquaculture community through scientific discovery and innovation, thereby transforming practice, informing policy and delivering impact.
- Deliver demonstrable socio-economic regional impact.

1.1.41. Partnerships will be underpinned by specifically designed charging models for NATIH services and related outputs. These models will be applied in line with the nature of the commissioning partner.

1.1.42. With well-founded postgraduate teaching, world class research resource, established research funding relationships, established and developing commercial relationships the Institute of Aquaculture achieved an income of £7.3m in 2020/21. NATIH will increase capacity for core activities, at the same time benefiting from related opportunities through introducing new teaching programmes, attracting world class skills and generating a regional cluster of related ventures.

1.1.43. By building on the reputation and achievement of the Institute of Aquaculture, NATIH can deliver additional and wholly separate Year 1 revenues nearing £700,000 to a projected Year 5 outturn of £7m. The outline of these services is as follows:

#### **Research**

1.1.44. This is a key element of qualified and proven growth, firmly within core Institute of Aquaculture and University of Stirling research capabilities. This is a global engagement and geared towards both traditional grant funding and bespoke project commissions from the private sector.

1.1.45. Given the appetite already displayed for NATIH and the proposed related activities, there is a sound case for the growth of Year 1 income of £500,000 to £2.5m in Year 5.

## **Infrastructure**

- 1.1.46. The deployment and charge for any physical assets will be expanded through CRD funding. This may be wholly charged, part charged or, on occasion, free to service. It is envisaged that it will form a vital part of service delivery and contribute greatly to the sustainability of the initial investment.
- 1.1.47. With a working model as designed and tested against current Institute of Aquaculture activity we have based a growth of Year 1 income from £50,000 to £1m in Year 5.

## **Skills**

- 1.1.48. This is underpinned and evidenced through the straightforward expansion of current Institute/University postgraduate and CPD teaching programmes, thereby leveraging the outcomes and innovative outcomes from all NATIH activities. Whilst this experiences a lag of two years (postgraduate) and 4 years (undergraduate) maturation as courses are designed and built, it can be projected that there will be no independent revenue generated in Year 1, but this will grow significantly year on year to £1.5m in Year 5.

## **Enterprise**

- 1.1.49. This is the deployment of senior academic experts and their teams to defined, scoped and fully contracted projects across all sectors. Prior to any work undertaken there will be agreement reached for charging to be based upon defined NATIH rate-cards and service prices. These will be designed against current broader market benchmarks and applied by sector and partner.
- 1.1.50. In line with the current work on related Institute of Aquaculture consulting work we have based a growth of Year 1 income of £150,000 to £3m in Year 5. This is based upon designed rate cards of charge and recruitment into relevant professional fields.

## **Procurement**

- 1.1.51. The NATIH project is supported by the University of Stirling's [procurement services](#). This is aligned with the overall approach to procurement taken by the University and the [procurement strategy](#). The University of Stirling's procurement strategy ensures that all University procurement activity is conducted consistent with the Scottish Government's support, guidance and priorities for [public sector procurement](#). All related procurement activity will be overseen by the University's Head of Procurement.
- 1.1.52. The intent is to design an ecosystem of supply and demand within the wider City Deal Region, driving economic and social change through the NATIH and its outputs. The procurement strategy for NATIH will ensure that there is strong regional market engagement to encourage existing local suppliers to engage with NATIH opportunities and to proactively assist new suppliers to engage with such opportunities. Support for new suppliers will be offered through the Business Accelerator function with links made to the Supplier Development Programme.

## **Financial case**

- 1.1.53. This Full Business Case (FBC) seeks approval for £17.0 million of City Region Deal (CRD) grant funding to deliver the National Aquaculture Technology and Innovation Hub (NATIH) project. The total capital investment in NATIH amounts to £18.0 million which is funded through CRD capital grant (£17.0 million) together with the Wolfson grant (£1.0 million).
- 1.1.54. Staff costs associated with business accelerator activities will be funded from NATIH's commercial income. In the early years of the project the University of Stirling will underwrite the revenue costs of the business accelerator team.
- 1.1.55. The staff (revenue) costs of the business accelerator team are included in the Statement of Comprehensive Income (SOCl). HM Treasury's Green Book guidelines suggest the revenue costs (£0.9 million) should be considered as part of the overall cost of delivering NATIH in determining value for money.
- 1.1.56. The overall project costs including both capital investment (£18.0 million) and the University's initial revenue contribution (£0.9 million) is £18.9 million.
- 1.1.57. The financial case shows a development which, with this initial investment of the CRD capital and Wolfson grant, will be sustainable, and in turn help to leverage £71.5 million of additional income over the 10-year period.
- 1.1.58. The assessment and review undertaken by the University indicates that the associated risk profile is affordable, and the project is capable of being self-sustaining over the longer term, if the capital costs are met in full.
- 1.1.59. The approach set out in an earlier business case focused on repurposed buildings to accommodate the collaboration space. As more detailed plans have evolved all elements of the NATIH project will now make use of repurposed buildings and facilities to realise cost savings and reduce the carbon cost associated with building materials.
- 1.1.60. The CRD delivery costs are the costs of the team who produce the business cases and are responsible for ensuring that the capital project is delivered. The CRD delivery costs have been included up to and during the period of construction of the asset and are fully funded through the CRD grant.
- 1.1.61. In the period leading up to the completion of the asset, it will be necessary to implement an operating model that underpins the delivery of the stated themes and ensures the sustainable success of the overall project. The business accelerator team will help to build the programme of RISE work (and commercial income) while the project assets are being developed. It is expected that the establishment of NATIH will create an asset of £18.0 million.
- 1.1.62. The University will receive no exemption in respect of Value Added Tax (VAT). Irrecoverable VAT on inputs is included in the costs of such inputs. As such irrecoverable VAT has been factored into the cost of constructing and commissioning of NATIH.

## Income

- 1.1.63. The leverage of £71.5 million relates to the additional income expected to be generated as a result of the project, with the contribution of £5.5 million being the difference between that additional income (£71.5 million) and the costs (£66.1 million) associated with generating that additional income.
- 1.1.64. There have been a number of key assumptions applied across the income generating RISE activities. These underlying assumptions are described below.
- 1.1.65. *Research* income is shown to increase by £0.4 million in 2025/26, growing by £0.5 million per annum until 2029/30. From 2030/31 onwards income growth is assumed to be 10% per annum. Associated costs increase in line with the growth of income.
- 1.1.66. *Infrastructure* income is modest in 2025/26, growing until 2028/29 when it settles at £1 million. That income is then assumed to remain stable for the remaining period. Associated costs increase in line with the growth of income.
- 1.1.67. *Skills* income is first shown in 2026/27 from where it makes good growth through to 2029/30. From 2030/31 onwards income growth is assumed to be 10% per annum. Costs increase in 2025/26 as investment is required to develop course provision. Thereafter associated costs increase in line with the growth of income.
- 1.1.68. *Enterprise* income is modest in 2025/26, before growing strongly year-on-year until 2029/30. From 2030/31 onwards income growth is assumed to be 10% per annum. Associated costs increase in line with the growth of income.

## City Region Deal grant funded investment

- 1.1.69. The CRD grant funded investment in NATIH amounts to £17.0 million, the phasing of the expenditure is shown in the table below. This will be the claim profile if there is sufficient funding, which is dependent on the claim profile of other projects and programmes within the Stirling & Clackmannanshire City Region Deal, otherwise the University will initially cashflow the expenditure.

**CRD Grant Funded Investment (£000s)**

	Total	2023/24	2024/25	2025/26
Expenditure	£17,000	£4,979	£10,779	£1,242
Cumulative expenditure	£17,000	£4,979	£15,758	£17,000

## Financial Risks

- 1.1.70. Financial risks can be divided into three broad categories:
- Robustness of the base costs and income which have been used to underpin the financials.
  - Capital project risks: including the accurate appraisal of costs, time overruns, the ability of the academic, Information Services and Estates teams within the University to deliver the project.

- Risks for on-going operations: including the demand for services and long-term financial sustainability.

1.1.71. It is anticipated that any positive net contribution will be used to underwrite the risks of the overall project.

## **Management case**

1.1.72. The programme of University-led projects within the Stirling & Clackmannanshire City Region Deal is led by a Programme Director and supported by a Programme Management Office containing Programme and Project support staff who, as a team, will ensure the successful establishment of the National Aquaculture Technology & Innovation Hub (NATIH).

1.1.73. This team is integrated within the University's Innovation & Enterprise structure, which oversees the commercialisation of research outputs, business engagement and enterprise support.

### **Specialist Advisors**

1.1.74. The establishment of NATIH is underpinned through existing structures that bring expert leadership, guidance and support. Overall management of the project is coordinated through the University's Programme Management structures, based within its Innovation & Enterprise operations within the Directorate of Research, Innovation & Business Engagement.

1.1.75. Technical guidance is provided by the core academic resource aligned to the project, as well as specialist professional areas within the University such as the Information Services and Estates directorates.

### **Governance arrangements**

1.1.76. NATIH will operate within the governance structures of the University of Stirling, as well as those established for the wider Deal. The University Court has delegated authority for the management of the University's City Region & Growth Deal Programme to the University Secretary/Chief Operating Officer, acting through a City Region & Growth Deal Programme Board, the membership for which is executive level.

1.1.77. This Board has responsibility for the governance, management and delivery of all the University's City Region & Growth Deal projects and reports to the University Strategy & Policy Group and on to University Court.

1.1.78. For each University-led project, a Project Board is established and is responsible for project delivery. The Chair of the Project Board oversees developments during the delivery stage of the project, supported by identified leads who represent the interests of those designing, developing, facilitating, procuring and implementing project activities. The Project Board reports to the City Region & Growth Deal Programme Board.

### **Project management arrangements for operational delivery and future management**

1.1.79. The project will be managed in line with established University project methodology using the best practice guidelines provided through the University's Policy and Planning team.

- Establishment of the technical infrastructure for NATIH will be led by the University of Stirling's Property Management team within the Estates Directorate.

- Contract management for capital projects will be led by the University's Estates Directorate.
- All related procurement activity will be overseen by the University's Procurement Team, within the Finance Directorate.

### **Risk management**

- 1.1.80. Risk management processes in relation to NATIH will link with the University's established procedures for managing risk. The University Court and Audit Committee determines risk appetite and sets internal control policies to provide assurance that these are working correctly and NATIH will benefit from this approach.
- 1.1.81. A contingency plan covering delay to both the establishment of NATIH and the initiation of service delivery will be drawn up, based on the University's Business Continuity strategy.

### **Benefits Realisation**

- 1.1.82. It is recognised that the delivery and evaluation of the benefits outlined in the Economic Case for the National Aquaculture Technology & Innovation Hub (NATIH) will ensure that value for money has been delivered with the investment from the UK Government.
- 1.1.83. A Benefits Realisation Plan (BRP) for NATIH sets out the benefits that will be delivered through the specific outputs and outcomes of NATIH. These map directly on to the benefits and strategic objectives that have been defined for the Stirling & Clackmannanshire City Region Deal overall and demonstrate consistency and coordination. These will be monitored through the Monitoring & Evaluation Framework in terms of how and when benefits are delivered.

## 2. Strategic Case

### 2.1. Strategic need for investment

#### Connecting regional needs and outcomes

- 2.1.1. The National Aquaculture Technology and Innovation Hub (NATIH) sits within the Innovation investment theme for the Stirling and Clackmannanshire City Region Deal (CRD). CRD partners have identified four key outcomes that are to be delivered for the city region through the CRD investments; inclusive economic growth, the creation of high value jobs, shared prosperity, and an inclusive skills system (Appendix S5).
- 2.1.2. Investment into NATIH will capitalise on the world leading research capabilities in aquaculture at the University of Stirling to deliver tangible benefits for the region that support the delivery of all four of these outcomes. Alongside the other CRD innovation theme projects, the investment will support improvements in low job density in the city region<sup>1</sup> by encouraging businesses to establish a presence in the city region (detailed in the Economic Case 3.5), support the city region to address the low Business Enterprise Research and Development (BERD expenditure<sup>2</sup> by establishing commercial research partnerships with the business community<sup>3</sup>, and address skill and employment outcomes for local people with a focus on those who are underrepresented within the regional economy.
- 2.1.3. The University will use their established global aquaculture platform to improve the sustainability of the aquatic food system through innovation in established and emerging aquaculture markets around the world. The delivery model proposed for NATIH will capitalise on the increasing demand for expertise of this kind driving investment, businesses, and skilled jobs into the city region.

#### Global growth for global food security

- 2.1.4. Aquaculture is the fastest growing food production sector on the planet. Between 1990 and 2018 global aquaculture production increased by 527% and reached a record high of 114.5 million tonnes equating to a total farm gate sale value of £199 billion (United Nations, 2020).
- 2.1.5. Over the last 20 years, global aquaculture of farmed aquatic animals as been dominated by Asia, with an 89% share. China, India, Vietnam, Bangladesh, Egypt, Norway and Chile have consolidated their share in regional or world production to varying degrees during this time (United Nations, 2020).
- 2.1.6. Nearly 600 species of aquatic organism are farmed in around 190 countries in order feed the growing global population. In 2017, fish, crustaceans and molluscs provided 3.3 billion people with almost 20% of their average per capita intake of animal protein and accounted for 17% of total animal protein consumed globally.

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<sup>1</sup> Job density - Clackmannanshire 0.5 and Stirling 0.86, NOMIS, 2020 (Scottish average 0.84)

<sup>2</sup> BERD 2020 – Clackmannanshire 0.4%, Stirling 0.41% (Scottish average 0.92%), Scottish Government

<sup>3</sup> Investment in research through partnerships is shown in detail within the Financial Case

2.1.7. Since 2016 global aquaculture has provided the main source of fish available for human consumption which reached 52% in 2018. With world food fish consumption projected to be 18% higher in 2030 than in 2018 (United Nations, 2020), it is imperative that sustainable aquaculture development across the world is supported to deliver food security and support livelihoods around the world. NATIH will focus research on achieving environmentally sustainable growth for the sector including production of sustainable feeds, disease management and climate resilience.

### **Sustainable growth for the UK**

2.1.8. The UK has a well-developed, high value aquaculture sector with ambitious plans for growth. In the growth strategy for Scottish aquaculture in Scotland (available [online](#)), industry leaders, supported by the Scottish Government, state an ambition to double the economic contribution of Scotland's aquaculture industry to £3.6 billion by 2030.

2.1.9. The strategy articulates the need to ensure that investment in research, development and innovation in Scotland supports the sustainable growth and global competitiveness of the sector, including the supply chain and reflect the industry's priorities. There is also a need and opportunity to maximise the social and economic benefits from the commercialisation and exploitation of innovation fostering growth within the supply chain.

2.1.10. As technologies and competition change the skills of those in the aquaculture sector also need to evolve. The future workforce needs to be equipped with skills that industry requires to make Scottish aquaculture a world leader.

2.1.11. The strategy for England, published by Seafood 2040 (available [online](#)) outlined the pursuit of a '*thriving and sustainable English seafood industry by 2040*'. Among the five strategic objectives detailed it states ambitions for:

- Growth in freshwater and marine aquaculture in terms of production volume, jobs and number of farms; and
- Business growth enabled by infrastructure improvements across the supply chain.

2.1.12. Recommendations coming from the SF2040 strategy include the need to:

- Engage with academia and funding bodies to enable the identification of and increase the adoption of innovation and new technologies;
- Strengthen relationships and encourage collaboration between academia , industry, government and regulators; and
- Ensure that the future workforce is equipped with the skills to meet the needs of industry and the supply chain.

2.1.13. There are also several emerging challenges in the wider 'blue economy' that have direct relevance to aquaculture:

- Integrated use of infrastructure within the marine environment
- The largely untapped potential of aquatic biotechnology
- Shortage of effective support for growth in innovation intensive SMEs

2.1.14. Research, development and innovation within the aquaculture sector is essential to ensure that strategic ambitions of industry are realised thus securing the long-term sustainability of the sector. Collaboration with stakeholders is essential to ensure that opportunities for research and innovation are effectively applied and adopted. It is also important to ensure these opportunities are maximised to secure economic benefits within Scotland and the UK.

#### **Sustainable food systems**

2.1.15. The food system is a major driver of environmental change, responsible for a quarter of all greenhouse gas (GHG) emissions, occupying half of all ice-free land, and responsible for three quarters of global consumptive water use and eutrophication (Poore et al, 2018), Dubois, O. (2011). Yet, it still fails to meet global nutrition needs according to the Committee on World Food Security (available [online](#)).

2.1.16. Growth in food production required to meet high value market demand and ensure food security for the growing human population must be delivered in a manner which protects and enhances natural resources. Aquatic or 'blue foods' present an opportunity to improve nutrition with lower environmental burdens.

2.1.17. Aquatic organisms and products are recognised as some of the healthiest foods on the planet and also as one of the least impactful on the natural environment in comparison to other animal-based protein sources. Reducing greenhouse gases emissions from food systems is essential in the pursuit of achieving global emissions targets.

#### **Sustainable feeds**

2.1.18. Fed aquaculture emissions result primarily from feeds (including terrestrial and marine ingredients and their relative impacts). A significant proportion of world fisheries production is processed into fishmeal and fish oil as they are still considered to be the most nutritious and most digestible ingredients for farmed fish as they are a source of polyunsaturated fatty acids (PUFAs) which perform a wide range of functions for human health<sup>4</sup>. Support is needed to develop low cost, sustainable nutritional feed sources to reduce the environmental impact of aquaculture.

#### **Circular economy**

2.1.19. Around 35% of the fisheries and aquaculture global harvest is either lost or wasted. This must be addressed by identifying opportunities for turning system 'outputs' into system 'inputs' in order to reduce waste, improve the efficiency and support more sustainable systems.

#### **Climate resilience**

2.1.20. Developing resilience within aquatic food systems in the face of the changing climate is critical for the sustainability of the aquaculture sector and its supply chain. The recent seafood climate change adaptation report (available [online](#)) highlights key risks and opportunities.

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<sup>4</sup> <https://www.fao.org/state-of-fisheries-aquaculture>

2.1.21. Successful adaptation measures are subject to a wide range of interdependencies including supply chains, feed and ingredients, wild capture, domestic and international systems and between sectors (for example, seafood and agriculture). The report recommends underpinning principles to climate adaptation including the importance of collaboration and industry demand-led actions tackling responses to sector wider challenges.

#### **Disease control**

2.1.22. Significant progress has been made in the identification, diagnosis, treatment and zone management of disease in certain sectors, for example the European Atlantic salmon industry. However, disease resistance to treatment or management has been referenced as the major constricting factor for expansion of the aquaculture industry to 2050 with a potential cost of \$6 billion in yield loss each year<sup>5</sup>.

2.1.23. Significant interventions, including those which capitalise on automated detection of disease and even remote sensing applications have potential to mitigate against the most important yield limiting production diseases and to improve the sustainability of the global aquaculture sector.

#### **Precision aquaculture and technologies**

2.1.24. The knowledge needed for developing sustainable aquaculture systems requires innovations in monitoring<sup>6</sup>. The development of precision aquaculture and monitoring technologies has enabled farmers to collect large volumes of data however it has driven the need for farms to be able to process these large data sets. Artificial intelligence (AI) and data processing can help by identifying patterns in feeding activities and presenting strategies to farmers ranging for cost-efficient use of feed to maintaining fish welfare.

2.1.25. DNA technology has become important in fish breeding, the detection of pathogens, early warning systems for detecting plankton-borne threats to the aquaculture base on environmental DNA, and fish authentication and provenance especially for fish products in international trade and regulatory compliance. In Scotland for example, sediment DNA is being trialled as a compliance monitoring proxy as part of the Controlled Activities Regulations license. Moreover, DNA can be used to confirm the authenticity of specific aquaculture products.

2.1.26. In the last ten years, the world has gained access to unprecedented amounts of data on the fishing and aquaculture sector. Big data flows, AI and machine learning will generate reports that will inform authorities and owners of aquaculture farms in real time. High tech and big-data approaches have the potential to improve sustainability and working conditions for fishers and fish farmers and help society to understand better the interdependencies that aquaculture and fisheries have with the environment.

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<sup>5</sup> [Solving the \\$6 billion per year global aquaculture disease problem, Cefas, 2017](#)

<sup>6</sup> [The State of World Fisheries and Aquaculture, FAO, 2020](#)

## **Global competition**

- 2.1.27. There is a risk that the UK aquaculture industry could lose ground against international competition. Despite the value of seafood production increasing by 25% (between 2008 and 2018) production growth has either slowed or stagnated (Black and Hughes, 2017) and global market share is reducing in the face of aggressive expansion while in other parts of the world there has been investment in research, development and innovation.
- 2.1.28. As an example, Norway is already developing technologies that enable opportunities for inshore site and floating closed containment systems removing space as a limiting factor together with many of the negative environmental and societal impacts derived from aquaculture. These have many of the benefits of the Recirculating Aquaculture Systems (RAS) but with lower costs.
- 2.1.29. The rapid development of aquaculture expertise elsewhere in the world is capturing the global market and placing the UK at a competitive disadvantage. As technology is developed that enables offshore farming and land production sites, the relative advantages that fjordic coastlines have, for example in Scotland, will likely diminish and countries with less sheltered coastlines may increase their production.
- 2.1.30. It is important that this trajectory is supported to ensure that Scotland can achieve its production targets. Salmon aquaculture for example was the UK's [largest food export](#) in 2022. The UK is [already benefitting](#) from technologies to bring onshore freshwater production to England. However, disease management, sustainable feeds and health and welfare are still critical challenges for production on such sites. This is where NATIH supports not only Scotland but the UK and beyond.
- 2.1.31. Despite the World Bank model predicting the UK to increase its share of the global farmed salmon market from 5.5% in 2008 to 9% by 2030 the reality is that Norway and Chile will likely expand faster than Scotland and the emergence of new producers for example in Iceland could also reduce the UK's market share of salmon (Black and Hughes, 2017).
- 2.1.32. There is considerable urgency to reverse this trend if the UK is to maintain and enhance its position as a global leader in aquaculture innovation and technology and so capture the substantial economic benefits offered by this high growth, demand-led market.

## **Skills and training**

- 2.1.33. In 2018 a skills review was commissioned by Highlands and Islands Enterprise on behalf of the aquaculture Leadership Group to better understand the demand for and supply of aquaculture and related skills. The review (available [online](#)) highlighted that the sector's potential to grow would only be realised if people with the right skills are in place.
- 2.1.34. The current pipeline of entrants into formal education is currently insufficient to meet the demand from industry. A key challenge highlighted was the need for industry-relevant skills with a demand for more courses. This points to a need to provide aquaculture learning opportunities including vocational and practical components to courses.

- 2.1.35. In addition to skills in production and processing, there is a demand for engineering, business, technology and digital skills. A key driver for innovation in the sector is fish welfare and environmental stewardship. The sector has a need for people who are skilled in up to date approaches to fish husbandry, fish health, feeding and biology. These are lacking in the current workforce and will be increasingly important for the future sustainable development of the sector.
- 2.1.36. Challenges with the regional skills base must be addressed to provide skilled labour that meets the needs of regional employers in the aquaculture sector. Current challenges include:
- Qualification levels within the population of Clackmannanshire sit below the Scottish average NVQ Level 1 – 4. 8.8% of the population have no qualifications at all, higher than the Scottish average of 7.8% (Annual Population Survey, 2021).
  - 8.2% females in the Stirling Council area and 7% in Clackmannanshire Council area started a STEM related apprenticeship framework compared with 11.4% of all starts in Scotland Stirling Equality Summary 2019/20 (Skills Development Scotland Equality Summary 2020/21, available [online](#)).
  - 10% of Modern Apprenticeship ‘starts’ who reside in Stirling and 9.3% of ‘starts’ who reside in Clackmannanshire self-identified an impairment, health condition or learning difficulty compared with 13% of all starts in Scotland (Skills Development Scotland Equality Summary 2019/20, available [online](#)).
- 2.1.37. There is therefore a need and an opportunity for an inclusive aquaculture related regional skills development programmes that meet the skill requirements of the growing aquaculture sector to be made accessible to those living in the region. This would support the region (post Covid) equipping people with the skills to access jobs within a growing industry.

### **Research Investment**

- 2.1.38. Overseas competitors are investing more in research and development (R&D) when compared to the UK. Total R&D expenditure in research and development for the UK was 1.74% of GDP and 1.66% for Scotland (Office for National Statistics, 2019). This is significantly lower than the OECD average of 2.5% (available [online](#)).
- 2.1.39. Achieving the UK Government’s target of 2.4% of GDP by 2027 is significant. Firms that consistently invest in R&D are 13% more productive than firms that don’t invest in R&D (DBIS, 2014). Most companies, including those established in the UK, must make global decisions about where to situate their high-value R&D activities. In this highly competitive and internationalised climate countries must offer a competitive research, innovation, and business environment if they want to attract skilled people and companies.
- 2.1.40. UK public funding is also relatively concentrated on early-stage research compared to commercialisation. Scotland has consistently been behind the UK in terms of business investment in research and development and low private sector research investment is viewed as a significant challenge within the Scottish economy.

- 2.1.41. Historically, the UK has not been as successful at commercialisation and development as it has been at early-stage research. Innovative products and services contribute to economic growth and can help tackle inequalities and sustainability objectives.
- 2.1.42. Introducing new ideas to the market promotes industrial competitiveness, job creation, labour productivity, and efficient use of resources. R&D and innovation are also essential for finding solutions to societal challenges including climate change, active and healthy ageing, clean energy, and security.
- 2.1.43. Scotland’s National Strategy for Economic Transformation (Scottish Government, 2022) identified Scotland’s blue economy as an area of opportunity, including the potential and sustainable management of ocean, sea and coastal resources. The Strategy also identified opportunities within food and drink innovation including Scotland’s premium food and drink products (key export markets).
- 2.1.44. Food and drink was also identified as a key growth sector in Scotland’s previous economic strategy (Scottish Government, 2016). The food and drink growth sector experienced the largest percentage increase between 2019 and 2020 with BERD expenditure increasing by 87.9%, around £12 million (available [online](#)).
- 2.1.45. At a regional level, Business Enterprise Expenditure on R&D (BERD) as a percentage of GDP 2010 – 2020 in the Forth Valley Region has been stubbornly lower than the national average. In 2020 BERD levels for Clackmannanshire and Stirling were 0.4% and 0.41% respectively, both measuring lower than the national average of 0.92 (2020)<sup>7</sup>. There is therefore scope for aquaculture to help improve R&D expenditure within the region.

**Request to governments and deliverables**

- 2.1.46. Table 2.1 outlines how the University of Stirling will invest the £17 million of UK Government investment to create the NATIH innovation community with associated deliverables. The request to governments in this Full Business Case (FBC) is to fund the £17.0 million CRD funding required for the £18.9 million investment in the NATIH project. This includes £1.0 million of capital funding from the Wolfson Foundation and £0.9 million of revenue funding from the University of Stirling.

**Table 2.1: City Region Deal, Wolfson and University of Stirling funding (£m)**

Deliverables	Capital funding		Revenue funding	Total
	CRD	Wolfson	University	
Experimental aquatic facilities	£17.0	£1.0	£0.9	<b>£18.9</b>
Collaboration space				
Challenge facilities				
Business accelerator				

<sup>7</sup> [Business enterprise research and development, Scottish Government, 2020](#)

- 2.1.47. The previous business case was based on a phased approach with deliverables in Table 2.1 comprising the first phase. A second phase would have included laboratories and business incubation space.
- 2.1.48. The phased approach was originally the preferred option as it allowed the project partners to deliver the core (first phase) of the project whilst more fully understanding the likely need for (second phase) new facilities, premises and hybrid working as public health restrictions were lifted. The phased approach reduced risks whilst delivering benefits earlier for the city region.
- 2.1.49. The NATIH project has evolved over the last two years during both the OBC and FBC stages. In March 2022 (OBC stage) phase 1 costs were estimated at £10.9 million. This had risen to £13.8 million by January 2023 (FBC stage) based on estimated costs.
- 2.1.50. The increased costs of the first phase of NATIH inevitably impacted on planning for the second phase. Feedback on the FBC (January 2023) noted that the rising costs of the first phase had left a limited budget to deliver the second phase. Additional revenue funding from the University of Stirling was provided for the first phase to help increase the available CRD funding for phase 2.
- 2.1.51. From February 2023 onwards, costs for the phase 1 were provided by preferred contactor with costs rising significantly again. Simultaneously, it became clear from the costs provided by the contractor (February 2023) that the deliverables set out in Table 2.1 would need to draw on all the available CRD funding.
- 2.1.52. Most of the cost rises were accounted for by the experimental aquatic facilities and the bio-secure challenge facilities. This was due to the complex infrastructure required across both the research facilities which is highly specialised and has proven to be more vulnerable to inflationary pressure.
- 2.1.53. The options were reviewed in terms of their performance against the project's Critical Success Factors (CSFs). The review is set out at part of the economic case and considered whether value engineering could deliver the core elements of the first phase (Table 2.1) and modest business incubation space and laboratories in the second phase.
- 2.1.54. The review concluded that value engineering and a more modest second phase would not be affordable (Critical Success Factor 4). Furthermore, the first phase of NATIH was acknowledged by Cefas as an investment enhancing the UK's national capability to provide critical infrastructure. Reducing the capacity and capability of the core (first phase) project would reduce the project's strategic fit and ability to meet business needs (Critical Success Factor 1).
- 2.1.55. The review also explored whether other CRD innovation projects could provide business incubation space. This review identified the potential to aggregate business incubation space across several CRD innovation projects including the Intergenerational Living Innovation Hub ([ILIH](#)), Scotland's International Environment Centre ([SIEC](#)) and the CRD digital hubs.
- 2.1.56. The move to a single phase project has been reviewed with the RPMO since March 2023. The CRD Joint Committee agreed the Implementation Plan (June 2023) which contained the single phase NATIH project.

## The single phase approach

2.1.57. The deliverables in Table 2.1 have been prioritised to ensure that the capacity, capabilities and facilities are in place to tackle current critical challenges faced by industry and wider stakeholders in addition to capitalising on global market opportunities. The project already fast tracked (at OBC stage) Business Accelerator services into the first phase of NATIH and is also retained within the new single phase project.

2.1.58. The University will develop NATIH and its other CRD projects in synergy to maximise benefits from the investments, particularly business incubation space. Working closely with other CRD innovation projects will help to mitigate any reduction in benefits from NATIH's second phase. Opportunities will be considered in the context of the University's campus masterplan and a new estates strategy (currently in development).

2.1.59. The NATIH funding (£18.9m) will deliver;

- Experimental aquatic facilities
- Bio-secure challenge facilities
- The provision of collaboration space
- Business accelerator

2.1.60. **Experimental aquatic facilities**, flexible aquatic research facilities with multiple secure, controlled temperature rooms will enable an expansion of research on both temperate and tropical aquatic species. There will be approximately 300% increase in the capacity of the research facilities. Due to the environmental controls available, additional efficiency gains will be delivered through improved research capacity management.

2.1.61. The improved aquatic facilities available through NATIH will enable the University to apply its research and innovation expertise on global aquatic food systems. Figure 2.2 highlights the top ten species produced in the global aquaculture sector in 2019. NATIH will enable a more flexible response and better meet the demand for research across a variety of aquatic organism due to the environmental controls that will be available.

**Figure 2.2: Top 10 species in world aquaculture, 2019**

Top 10 species groups		World aquaculture production quantity, 2019				2019 production compared to 2018		
Species group	ISSCAAP division	Number of ASFIS species items in the group farmed in global aquaculture	Number of countries farming the species group	World aquaculture production quantity of the species group (live weight; tonnes)	Share of world aquaculture production quantity of all species (%)	Ranking by quantity in 2018*	Change in quantity (tonnes)	Change in percentage (%)
1. Carps, barbels and other cyprinids*	Freshwater fishes	38	95	29 789 359	24.80	#1	439 927	1.50
2. Red seaweeds*	Aquatic plants	9	32	18 251 474	15.20	#2	- 92 393	-0.50
3. Brown seaweeds*	Aquatic plants	10	14	16 393 764	13.65	#3	1 413 369	9.43
4. Marine shrimps and prawns <sup>b</sup>	Crustaceans	14	62	6 555 315	5.46	#4	509 086	8.42
5. Catfishes <sup>c</sup>	Freshwater fishes	28	86	6 264 326	5.22	#7	496 575	8.61
6. Tilapias and other cichlids*	Freshwater fishes	18	124	6 194 760	5.16	#5	158 901	2.63
7. Oysters*	Molluscs	13	46	6 125 606	5.10	#6	127 625	2.13
8. Clams, cockles, arkshells*	Molluscs	26	22	5 522 876	4.60	#8	- 60 483	-1.08
9. Salmon, trouts, smelts*	Diadromous fishes	23	83	3 855 434	3.21	#9	302 982	8.53
10. Freshwater fishes nei <sup>d</sup>	Freshwater fishes	1	66	2 515 482	2.09	#10	- 57 365	-2.23
Other species		263	n.a	18 630 025	15.51	n.a	1 090 903	6.22
All species		443	196	120 098 422	100.00	n.a	4 329 127	3.74

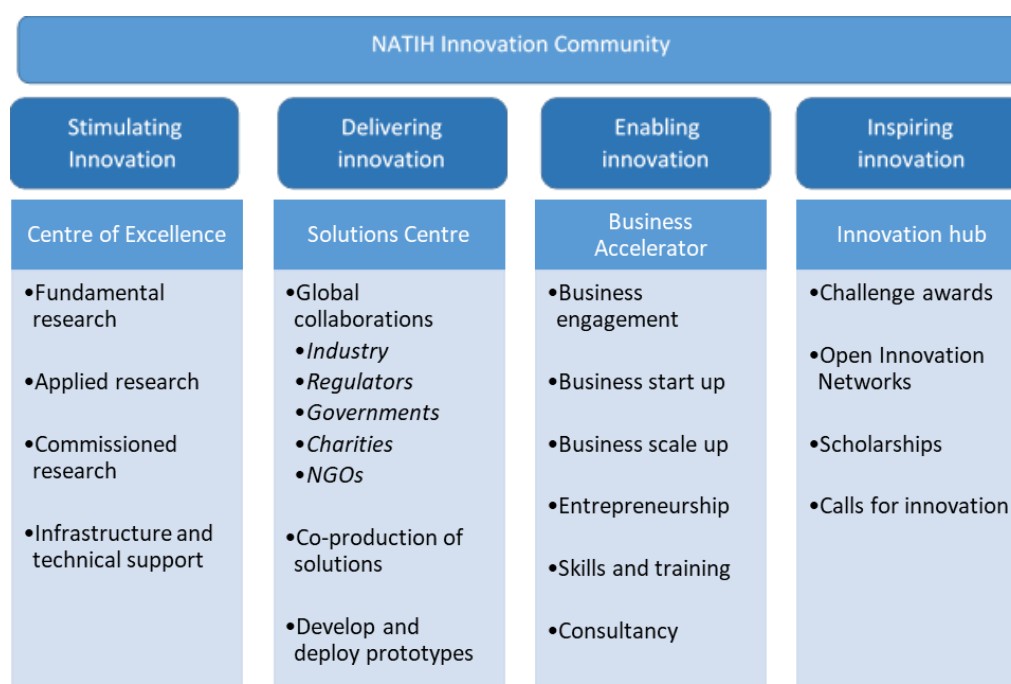
Source: Food and Agriculture Organization (FAO) of the United Nations (2019)

- 2.1.62. **Challenge facilities**, a bio secure level 2 challenge facility will enable the University to enhance its capabilities in the study of bacterial, viral and parasitic disease of fish. Increased volumes of research in this area will catalyse innovation in disease management by tackling industry challenges of this nature.
- 2.1.63. **Collaboration space**, in order for NATIH to be fit for its full purpose, it will incorporate office and collaboration space to enable stakeholders to work and meet with University staff in the aquaria facility. This will also provide additional space for skills training purposes.
- 2.1.64. The project supports the Scottish Government’s infrastructure investment plan (available [online](#)). The infrastructure works will repurpose and expand the existing aquaria facilities currently on the University campus making use of dis-used land around the existing facility. This is further detailed within the options appraisal of the economic case.

### Project overview

- 2.1.65. The National Aquaculture Technology and Innovation Hub (NATIH) will create an innovation community centred on aquaculture which will stimulate, deliver, enable and inspire innovation. Figure 2.3A articulates the four key functions which will operate in an integrated innovation ecosystem.

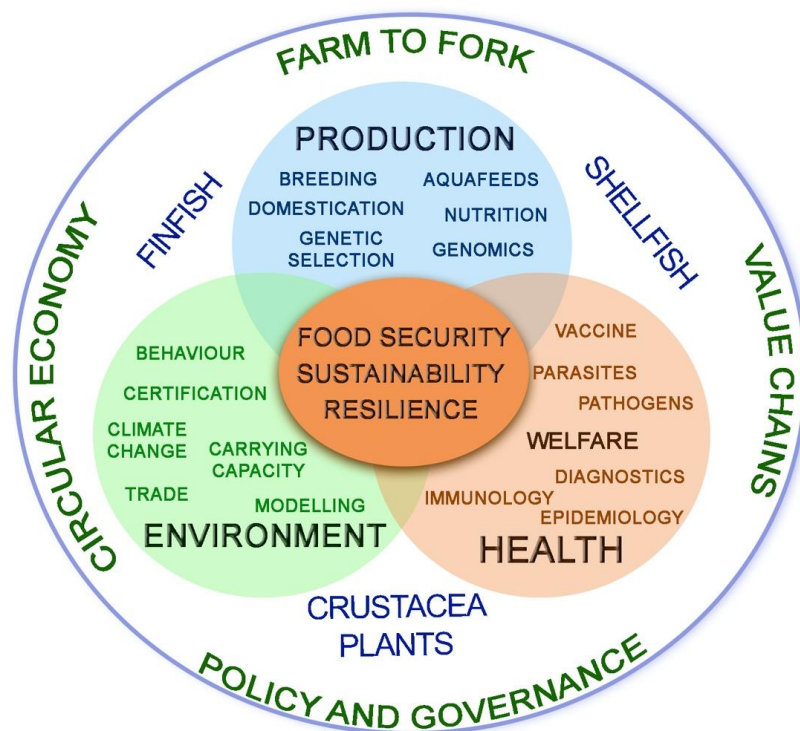
**Figure 2.3A: NATIH Innovation Community Model**



- 2.1.66. Research at the University and other aquaculture research centres, currently focuses on contracts with individual companies with constraints on publication and dissemination of research findings. NATIH will focus on the development of strategic partnerships and expand the publication and dissemination of research to support the aquaculture industry in adopting new working practices and technologies. The approach will enable the University, together with all stakeholders within the aquaculture community including governments, NGOs, charities, industry, the research community, SMEs, entrepreneurs and regulators across the world to develop the innovative solutions, new technologies and services that will drive the next generation of domestic production and export into the global marketplace.

- 2.1.67. The University of Stirling’s Institute of Aquaculture ([IoA](#)) has one the world’s largest concentrations of expertise dedicated to aquaculture leading research on farmed and natural fish stocks, shellfish and aquatic plants. It brings together cross-disciplinary teams and approaches to tackle the diverse range of challenges faced by the world’s fastest growing food production sector. During the 2021 Research Excellence Framework ([REF](#)) period, the IoA secured £19.3M of research funding and engaged in 228 research partnerships across 44 different countries.
- 2.1.68. The unique and diverse mix of passionate and highly skilled people, coupled with a wide range of state-of-the-art facilities will enable the IoA to increase the capacity for working with the diversity of species, life stages, systems, and environments reflecting aquaculture practices.
- 2.1.69. The IoA has an extensive network of collaborators established through research and training programmes and incorporating IoA alumni, spanning academia, industry, government and non-government organisations (NGOs) all over the world. This network supports close links with the world’s leading companies and International organisations working in the sector.
- 2.1.70. Impact is at the centre of everything the IoA does, working closely with stakeholders in industry, practice and policy, to translate fundamental science into sustainable solutions, whilst nurturing and training the next generation of talent for the future of global aquaculture. Appendix S1 (IoA research) highlights the success of the IoA in terms of impact and research investment during the last REF period.
- 2.1.71. NATIH will enhance the interdisciplinary activity that tackles the complex needs of industry and others in the global aquaculture community, catalysing innovation and enterprise activities throughout the sector with a domestic and international reach (summarised in Figure 2.3B).

**Figure 2.3B: Institute of Aquaculture, interdisciplinary working and specialisms**



- 2.1.72. NATIH will facilitate interdisciplinary research by drawing in expertise from across the University's thematic research programmes, including data science, environmental change and management, health and behaviour, global food security, consumer behaviour and policy and regulation.
- 2.1.73. By working with stakeholders in the aquaculture community, world leading research capability driven through NATIH will support the creation of solutions to the challenges that are hindering the sustainable growth ambitions of the global sector including; disease management, environmental sustainability, health and welfare, sustainable feeds, regulatory, planning and financial constraints.

#### **Research, Infrastructure, Skills and Enterprise**

- 2.1.74. Through the improved research and innovation infrastructure, NATIH will respond to the needs of industry and the market demand for **RISE** activities (**R**esearch, **I**nfrastructure, **S**kills and **E**nterprise).
- 2.1.75. **Research** – an expansion of the research capacity and capability will maximise the potential of the concentration of world leading aquaculture specialists at the Institute of Aquaculture. Attracting increased investment in research and development, discovering and applying world class research findings.
- 2.1.76. **Infrastructure** – increased capability and capacity of the infrastructure will expand the existing research and development and contract research portfolio offered by the University and increase the potential for collaborations that could support industry and SMEs within the value chain to adopt and scale solutions identified.
- 2.1.77. **Skills** - NATIH will design and deliver a skills portfolio that supports the national priority areas outlined within the Skills Review for the Aquaculture Sector in Scotland (available [online](#)). The portfolio will create pathways into a range of enhanced opportunities within the aquaculture sector at various entry points including:
- Postgraduate opportunities
  - Masters opportunities
  - Graduate Apprenticeships
  - Industry driven CPD
- 2.1.78. The portfolio offered will suit a variety of learners from those with no prior skill, knowledge or experience, those with degree level qualifications, those already working in aquaculture related organisations (production to value chain) and for those who wish to transition into jobs within the sector from another.
- 2.1.79. It will work with stakeholders in the global aquaculture community to ensure that the sector is equipped with the skills that it needs for the future including the delivery of industry co-produced CPD. To do this, NATIH will work closely with those involved in the national skills system including Forth Valley College, Skills Development Scotland, Sustainable Aquaculture Innovation Centre ([SAIC](#)) and the Scottish Funding Council.
- 2.1.80. The research activity conducted by NATIH will support the economic, environmental and societal ambitions outlined in SEPA's [Finfish Aquaculture Sector Plan](#) supporting the sector to continue to support the global food supply in a way that minimises its environmental impact.

- 2.1.81. The University will connect NATIH into other City Region and Growth Deals that focus on overlapping or synergistic areas of research, enterprise and skills development. Working with partners such as University of Highlands and Islands and the Scottish Association for Marine Science (SAMS), the IoA will ensure that future skills provision delivered through NATIH is complimentary to other skills programmes emerging from aquaculture related investments.
- 2.1.82. The University's role in other Growth deals will ensure that there is synergy with other aquaculture related projects maximising return on investment.
- 2.1.83. The International Marine Science and Environment Centre (IMSE) funded by the Ayrshire Growth Deal ([available online](#)) led by the University will be a Centre of Innovation developed between industry and academia to develop and capture innovation in marine sciences; marine spatial planning; marine technology; and marine education and training and ensure that the Firth of Clyde is recognised as an exemplar in the Blue Economy and marine sustainability.
- 2.1.84. The development of the Machrihanish Innovation Campus (MIC) led by the University of Stirling and part-funded by the Argyll and Bute Rural Growth Deal ([available online](#)) creates an opportunity to maximise gains between the projects. The University of Stirling has set out an [ambition](#) to bring world-leading researchers closer together with partners in industry across Scotland's Growth Deal projects.
- 2.1.85. MIC will also help to establish links with NATIH across the A&B Deal Marine Aquaculture Programme. The MIC project aims to provide large scale marine finfish and multitrophic research and development capability alongside business incubation and scale up facilities, opportunities in this area will be explored with NATIH where appropriate.
- 2.1.86. The IoA is already exploring opportunities to collaborate with the International Seaweed and Shellfish Industry R&D Centre (funded by the Argyll and Bute Rural Growth Deal) and will seek to engage the 'Shellvolution' project (funded through the Islands Growth Deal) to identify opportunities for collaboration and the development of synergistic skills development programmes.
- 2.1.87. At a regional level, NATIH will work alongside other City Region Deal projects to ensure that where skills requirements are shared, for example; the digital skill requirement identified by Scotland's International Environment Centre (SIEC), Digital District and Regional Digital Hubs, that the projects work together to maximise the scope and reach of the range of skills programmes being developed across the City Region Deal.
- 2.1.88. Through the creation of a Skills Pathway Plan (supported by the Stirling & Clackmannanshire CRD Skills and Inclusion Programme) NATIH will support the development of an evidence base that identifies the needs and demographics within the existing regional skills system. The Skills Pathway Plan is currently being reviewed by the CRD partners.
- 2.1.89. Working with regional partners, including the Local Employability Partnerships and Developing the Young Workforce Forth Valley, NATIH will develop targeted approaches to reach target groups identified by the City Region Deal partners due to their economic under-representation within the region.

- 2.1.90. Target groups include women and girls, young people, people with a disability and people living in areas considered to be in the 20% most deprived in Scotland. Regional target groups have been outlined in the CRD Benefits Realisation Plan for Stirling and Clackmannanshire.
- 2.1.91. **Enterprise** - The Business Accelerator (BA) will offer a specialist aquaculture business incubator and support facility delivering a programme of business services. It will ensure that companies, and in particular Micro and SMEs, are able to benefit fully and rapidly from the technologies, opportunities and solutions that are emerging from the NATIH Innovation Community. It will enhance the existing business support landscape offering a range of specialised services for those seeking to transition into and thrive within the blue economy<sup>8</sup>. The NATIH Business Accelerator will work alongside Scottish Enterprise and Business Gateway offering improved access for businesses to specialist knowledge, NATIH facilities including equipment and infrastructure and technical support that cannot be provided by mainstream business support services. Fee structures will vary depending on the size of the business seeking services from the NATIH Business Accelerator.
- 2.1.92. The BA will work with aquaculture related SMEs and entrepreneurs to;
- Start up
  - Improve market traction
  - Scale up
  - Access research, development and innovation funding including Knowledge Transfer Partnerships and Innovation Vouchers.
  - Leverage research and development funding
  - Improve access to academic consultancy support and infrastructure available through NATIH
- 2.1.93. Entrepreneurs and existing businesses will be supported to create new products and technologies that will be needed to support the operational and technological activity of NATIH. Sectoral and bespoke market analyses of domestic and international markets will be developed and provided to SMEs to develop routes to market.
- 2.1.94. By developing a sustainable regional supply chain NATIH aims to maximise its commercial and environmental resilience and drive additional benefits into the region. It will promote and support the adoption of inclusive business models including cooperatives and employee owned businesses. NATIH will embed Fair Work practices and promote these throughout its BA engagements.
- 2.1.95. Led by Scottish Government's [Fair Work First](#) approach, NATIH will also include Fair Work deliverables within procurement in keeping with the University of Stirling's City Region Deal Procurement Strategy (Appendix M8). The procurement strategy will also ensure that social value and community benefits for the region are secured.
- 2.1.96. NATIH will therefore enable the UK to offer a world leading hub of specialist research capability, infrastructure, skills and enterprise support that will cater for both domestic and global market growth delivering significant economic, social and environmental benefits with regional, national and international reach.

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<sup>8</sup> 'The Blue Economy is sustainable use of ocean resources for economic growth, improved livelihoods and jobs, and ocean ecosystem health', The World Bank

## 2.2. Market failure

- 2.2.1. NATIH addresses three areas of market failure; the creation of public goods, imperfect information and externalities.

### **Public goods**

- 2.2.2. There is a reluctance to invest in innovation, new technologies or processes that could easily be adopted by competitors. For example, new approaches successfully tackling pollution and disease would be readily adopted across the industry. This has discouraged the aquaculture industry from investing in R&D with a tendency for firms to collaborate with academic research teams on smaller firm-specific projects rather than industry-wide projects.
- 2.2.3. This has led to a patchwork approach to aquaculture industry engagement. Research facilities across universities tend to focus on specific areas (for example, shellfish or freshwater fish). The research facilities hosted by universities partly reflect the industry's preference to engage on commercially focused shorter term projects.
- 2.2.4. The Green Book defines a public good as “unavoidably available to all” and non-excludable in supply once provided, no matter how widely it is consumed. Research at the IoA, and other aquaculture research centres, focuses on contracts with individual companies with constraints on publication and dissemination of research findings. NATIH will focus on strategic partnerships and expand the publication and dissemination of research to support the aquaculture industry in adopting new working practices and technologies.

### **Imperfect information**

- 2.2.5. For businesses there are uncertainties about the benefits of academic engagement, and potential issues around the uncertainty of any intellectual property generated through such engagement. Investment in R&D carries a degree of risk given the often unpredictable returns, particularly for longer term projects. As a result, many businesses exhibit less than optimal behaviour in investing in R&D.
- 2.2.6. There are significant barriers for smaller businesses engaging with universities. These include the timescales involved in securing benefits, lack of staff to undertake strategic thinking and under-estimation of the benefits of external expertise.
- 2.2.7. There is also an issue of the lack of skills for academics engaging successfully with businesses, particularly smaller businesses. Additionally academic staff may be well placed to help innovate new technologies or approaches but may be less well placed to help apply them with new or growing businesses.

### **Externalities**

- 2.2.8. The aquaculture industry faces significant negative externalities, specifically pollution, organic enrichment and the impact on wild fish and local marine ecosystems. Pollution is a barrier facing the UK's aquaculture industry, with aquaculture farms having difficulty in expanding production or securing new site permits due to environmental concerns.

- 2.2.9. Pollution varies from pesticides and antibiotic pollution, increases in parasitic sea lice population and disease outbreaks affecting wild fish populations. These externalities impact on wild fish populations through disease or spread of sea lice, pollutants harming the local ecosystem, and impact on the quality of the marine environment for other uses, e.g. fishing or recreational purposes.
- 2.2.10. The industry also faces positive externalities through potentially markedly lower carbon associated with a move to seafood from products like beef and dairy. The policy action agenda from COP26 (available [online](#)) highlighted the importance of investment in fishing R&D and innovation to scale up technologies and practices.

### **Addressing market failures**

- 2.2.11. Innovation and the use of new technology will be vital components for the future growth of the aquaculture industry. Increased research and development activity is essential if the aquaculture sector is to remain competitive in the global market, overcome barriers to expansion, and meet the ambitious growth targets for the industry.
- 2.2.12. The IoA, and other aquaculture research centres, focus on research contracts with individual companies and this has drawn investment into smaller scale and specialised research facilities. The NATIH facilities will provide the scope, scale and flexibility needed to cater to the growth in research and innovation for a range of species across the world. This will allow NATIH to grow the strategic partnerships needed to address market failures in research and innovation.

## **2.3. Counterfactual case**

### **Capacity**

- 2.3.1. The lack of additional flexible and future proof environmentally controllable facilities that can cater for both temperate and tropical research would limit the capacity of global research and skills development that could be conducted due to physical limitations and maximised capacity of existing facilities. This could result in a reduction of inward investment, restricting most of the UK activity concentrating mainly on a consolidated salmon aquaculture sector. This would then result in a reduction of the translation of interdisciplinary research into real world applications, novel solutions and technologies both domestically and internationally.
- 2.3.2. With existing facilities either limited or already at capacity, the UK cannot offer a globally specialised hub that can cater both academically and physically at scale for the growth in research and innovation for the range of species across the world and loses out on research and development opportunities that would be necessary to support sustainable growth within global markets. For example, Asia is responsible for around 90% of global farmed seafood including fish and shellfish.

- 2.3.3. NATIH would equip the UK with the capacity coupled with the interdisciplinary specialist expertise to attract research and development opportunities in tropical species of significant importance to the Asian market. This will support inward investment and the ability to export NATIH's capabilities and expertise to these markets. The learning and technology in NATIH has the capability to be applied to food systems around the world. Additionally, the IoA already imports species from around the world and is regulated by the Home Office.
- 2.3.4. Without the proposed disease challenge function, the ability of the University to study bacterial, viral and parasitic disease around the world will remain limited. Whilst research at the University could still take place, it would be significantly reduced in terms of volume and scope with researchers requiring to use facilities in other countries such as Norway who can conduct research of this nature at a scale that the UK cannot.
- 2.3.5. There is therefore a risk that the UK will lose out on domestic and international research, intellectual property, development and innovation investment relating to the study of the biggest challenges to achieving sustainable growth targets for the aquaculture sector<sup>9</sup>.
- 2.3.6. Global investment to maintain the health of farmed seafood to minimise economic loss will therefore go to other countries such as Norway. The lack of research capacity in this area would lead to a lack of inward investment for innovation in disease management which may result in production targets not being met in a sustainable way.

#### **Adoption**

- 2.3.7. The lack of a NATIH dedicated Business Accelerator function would result in a significantly reduced ability for the University to provide the specialised business and enterprise support for those in the aquaculture sector and associated supply chains. Knowledge exchange opportunities, industry partnerships and collaborations that lead to the application of the world leading research at the University would be reduced as there is not sufficient existing capacity to support current demand.
- 2.3.8. The loss of specialist enterprise support that directly connects business into the advancements within NATIH would be lost. This will reduce the potential for R&D investment for the city region.

#### **Skills**

- 2.3.9. Skills provision at the University is research led. Without NATIH the research base in aquaculture technologies and innovations would be more limited in terms of scope, range and volume. The associated skills development programmes would not be able to expand in the way that meets the evolving needs of industry and learners.
- 2.3.10. A skills pathway into aquaculture would not be developed for the region where there is significant opportunity to improve skills outcomes of local people. Regionally excluded individuals would not be targeted or supported as part of the 'business as usual' University activity as it would not be equipped to deliver or manage the required skills portfolio.

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<sup>9</sup> [Solving the \\$6 billion per year global aquaculture disease problem, Cefas, 2017](#)

## 2.4. Strategic and policy context

2.4.1. In addition to the strategies and policies set out above, the alignment of the NATIH project to the following ambitions and strategies is outlined in the following appendices to the business case.

- UN Sustainable Development Goals (*Appendix S2*)
- Build Back Better; Our Plan for Growth, UK Government (*Appendix S3*)
- National Performance Framework, Scottish Government (*Appendix S4*)
- Community Wealth Building, Scottish Government (*Appendix S4*)
- National Strategy for Economic Transformation (*Appendix S4*)
- City Region Deal Outcomes (*Appendix S5*)
- University of Stirling Outcomes (*Appendix S6*)
- Institute of Aquaculture Outcomes (*Appendix S6*)

The project aligns with wider Scottish Government strategic policies:

- Ambition 2030 Strategy and A Good Food Nation (Scottish Food and Drink)
- Scotland Food and Drink Recovery Plan 2020 (supporting opportunities to embrace science and technology innovation)
- Aquaculture Growth to 2030, 2016
- The Bute House Agreement
- Blue Economy Vision, 2022

2.4.2. The draft Strategic Plan for the IoA is appended (*Appendix S7*). The draft strategic plan reflects NATIH's business case journey and including the business case objectives, monitoring and benefits realisation. Examples of the SIEC project's progress towards its objectives are captured in the first annual report (*Appendix M6*).

2.4.3. The NATIH project has already been complemented by supporting aquatic research facilities at the Niall Bromage Freshwater Research Unit ([NBFRU](#)). Salmonids are born in the hatchery at NBRU and grown until they are at the correct stage in the life cycle to then be relocated for use for either freshwater (NATIH) or marine research (NATIH) purposes. NATIH compliments the existing facilities.

2.4.4. NATIH will also support closer working with other organisations engaged in aquaculture research where the University has well established relationships including the University of Aberdeen's International Centre for Aquaculture Research and Development, the University of Highlands and Islands Aquaculture Hub, the University of Hull based National Aquaculture Centre, Dorset & Devon Aquaculture, Collaborative Centre for Sustainable Aquaculture Futures (University of Exeter) and the Centre of Sustainable Aquaculture Research (Swansea University). The project will also facilitate partnership working with regulatory bodies and NGOs (including SEPA, Marine Scotland, Crown Estate and Seafish) that are important players in the applied development of sustainable UK aquaculture.

## 2.5. Project objectives

2.5.1. Three project objectives have been developed for NATIH focussing on three key themes. These objectives have been derived from the rationale and drivers for investment as outlined within the strategic case. The project objectives will tackle existing barriers that must be addressed to unlock the potential of the aquaculture research, development and innovation capability (RDI) at the University. The NATIH project will deliver benefits with regional, national and international reach.

**Table 2.4: Project themes, objectives and benefits**

Theme	Objective	Benefits (15 year cumulative)
Capacity	Increase R&D capacity by providing environmentally controllable, experimental aquatic and challenge facilities.	<p>300% increase in research capacity<sup>10</sup></p> <p>£7 million of additional annual research income after 15 years (based on Research and Infrastructure income from RISE activities).</p> <p>30 research staff (including PhD students, research assistants)</p> <p>360 partnerships<sup>11</sup> with the aquaculture community <i>of which 300 in target markets (salmon, tilapia, pangasius, shrimp, carp and molluscs<sup>12</sup>)</i></p> <p>54 partnerships with Centres of Excellence<sup>13</sup>, Research or Innovation Centres</p> <p>600 research projects to improve the environment, aquatic organism and human health and welfare</p>

<sup>10</sup> Capacity relates to the physical infrastructure and the increased scale of the research facilities that will be delivered through the proposed NATIH option.

<sup>11</sup> Partnerships – refers to formalised relationships derived from funded and commercial arrangements including governments, industry, NGOs, charities, regulators, SMEs, Universities, Research and Innovation Centres and Centres of Excellence.

<sup>12</sup> Target aquatic species (including countries with greatest production levels) – Salmon (Norway and Scotland), Tilapia (China, Asia, Latin America and Africa), Pangasius (Vietnam, India, Bangladesh and Indonesia), Shrimp (China, Thailand and Latin America), Carp (China, India, Bangladesh and Indonesia) and Molluscs (China, Spain, India, Indonesia and Peru)

<sup>13</sup> Centres of Excellence and Innovation Centres within the UK and overseas including: [Centre for Environment Fisheries and Aquaculture Science \(CEFAS\)](#), [The Collaborative Centre for Sustainable Aquaculture Futures \(SAF\)](#), [Sustainable Aquaculture Innovation Centre \(SAIC\)](#), [Scottish Association for Marine Science \(SAMS\)](#)

Theme	Objective	Benefits (15 year cumulative)
		30 case studies on NATIH research impact on the environment, aquatic organism and human health and welfare
Adoption	Support organisations and entrepreneurs to translate and adopt findings of applied research into new markets, products, services or improved business outcomes.	<p>173 organisations supported</p> <p>60 start-ups, entrepreneurs supported</p> <p>60 organisations supported to scale up</p> <p>30 case studies demonstrating the impact of research adoption on business outcomes<sup>14</sup>.</p>
Skills and access	Deliver a NATIH skills portfolio that meets the current and future needs of industry and promotes opportunities for under-represented groups within the city region.	<p>13,869 (total number) people engaged in the NATIH skills portfolio<sup>15</sup> of which;</p> <ul style="list-style-type: none"> <li>- 6,935 women and girls</li> <li>- 2,774 people with a disability</li> </ul> <p>3,600 people accessing industry co-produced CPD</p> <p>2,100 NATIH beneficiaries progressing into employment or higher levels of education or training</p> <p>600 pupils from employability, school, college and university engaging with industry on their journey to employment.</p> <p>300 Overseas learning/employment placements for NATIH learners (UK based)</p> <ul style="list-style-type: none"> <li>- 60 learning/employment placements secured for people who reside in the city region</li> </ul> <p>300 Overseas learning/employment facilitated by NATIH for overseas learners across the innovation community</p>

<sup>14</sup> Business outcomes – case studies will describe the impact of the adoption of research findings on business operations which may include improved productivity, growth, market or product diversification, market traction and exports.

<sup>15</sup> NATIH skills portfolio includes a range of non-accredited and accredited courses with anticipated numbers shown in brackets; PhD (200), Masters (1260), Undergraduate (400) employer demand led co-produced CPD (3600), employability (384), other non-accredited open access (5449), internships and apprenticeships (624) and credit bearing microcredentials (1952)

- 2.5.2. The IoA Strategy, through NATIH, focusses on strengthening the existing world leading research and expertise relating to sustainable aquaculture systems and the associated value chains of important commodity species in global aquaculture. The strategic approach does not focus on target markets by location of production, but by the relevance of the species within domestic and global food systems.
- 2.5.3. The approach adopted by the IoA seeks to maximise financial sustainability and mitigate against the risks that can be brought about by fluctuating political and economic factors in individual countries. Considering the priority species and the location of major producers however it is likely that international partnerships will be developed in countries including India, Vietnam, Indonesia, Thailand, Bangladesh, Chile, Brazil, America, Egypt, China, Spain, Japan, France, Italy and Norway.
- 2.5.4. The NATIH objectives set out above are additional to current IoA activities. The objectives are based on the use of the new infrastructure provide by NATIH . For example, within the themes of adoption and skills and access, the NATIH skills portfolio will consist of new courses and there are currently no current overseas learning and employment opportunities. Within the capacity theme, the IoA's established partnerships within the aquaculture community (around 200) could be taken as the baseline for the objective of establishing a total of 360 partnerships.
- 2.5.5. The Institute of Aquaculture's [committee for Equality, Diversity and Inclusion](#) (EDI) ensures a continuous process to identify opportunities as activities develop to deliver on the University of Stirling's Equalities Outcomes (see below), including NATIH. The IoA's EDI committee builds upon this by encouraging ongoing conversations with staff and students, identifying areas where further improvements are possible, and enacting change towards the University's 5 equality outcomes for 2021-2015 (see below).
- 2.5.6. The IoA's EDI committee meets monthly to discuss division-centred EDI issues, the implementation of EDI interventions, as well as the fulfilment of the Athena Swan Gender Charter. Committee members also act as points of contact and representatives for their staff/student groups.
- 2.5.7. The committee will help to shape NATIH's activities in meeting objectives to secure benefits for underrepresented groups (Table 2.4). Examples of activities are shown in the University's [Gender Action Plan](#) which describes work with [ScienceGrrl](#) (a national organisation supporting women in science), the Stirling chapter runs events, including a Science Fair on campus in collaboration with Forth Valley College. As set out in the Equalities Impact Assessment (EIA) the [widening participation](#) staff support all students with identified barriers to education or employment.

## 2.6. Dependencies and constraints

- 2.6.1. The development and appraisal of options in this business case has been prepared under the following key constraints:
- The University capital plan is restricted in its capacity for further investment;
  - University revenue resources being similarly constrained;
  - A requirement for any option to be capable of becoming self-financing over the longer term to satisfy University governance.
- 2.6.2. The future success of the National Aquaculture and Technology Innovation Hub depends on the following areas:
- Attracting leading researchers to work in a state-of-the-art facility
  - Attracting company partners to co-locate with the Hub
  - Maintaining strong global industry networks including the global alumni
- 2.6.3. The risks of progressing with an investment of the nature proposed are discussed in the Financial Case, Commercial Case and Management Case below. The above analysis reveals that the strategic case for the National Aquaculture and Technology Innovation Hub is clear, with a very strong argument for change leading to an improved aquaculture sector for the UK.

## 2.7. Risk

- 2.7.1. Project risks are set out in the risk register (Appendix M7) including mitigating actions and early warning indicators. At this stage of the project, most risks are reviewed and presented by the design team to the Project Board and issued for review by the University of Stirling City Region Deal Programme Board as detailed in the Management Case.
- 2.7.2. A selection of key project risks is set out in Figure 2.5 showing where mitigation has only partly reduced the overall Risk Score (RS) but with early mitigating actions already put in place. Any additional risks identified will be added to the risk register as the project develops alongside the project's evolving mitigation actions.

**Figure 2.5: Key project risks (and mitigated risk score)**

Risk Ref	Risk description	Mitigation	L	R	RS
NATIH 3.4	The assumptions around revenue expenditure are incorrect and cause unbudgeted costs to be incurred. This could cause additional strain on the University finances turning the overall initiative into a deficit rather than a surplus generating activity.	<p>Effective and robust cost control.</p> <p>Monthly forecast out-turns will provide early indication of any challenges allowing remedial action to be taken quickly.</p>	2	3	6
NATIH 3.1	Delay in the approval of the FBC resulting in the delay to the Implementation Plan for NATIH.	<p>Continue to prioritise the development of FBC details in order to confirm CRD funding available. FBC enables the UoS to draw down required funding.</p> <p>Monitor through NATIH Project Board and UoS Programme Board.</p>	2	3	6
NATIH 4.5	Scottish water restrict the flow rate from the development	<p>Develop an understanding of the proposed flows and discuss with Scottish Water to understand constraints of the public network. Lodge Trade Effluent application early.</p> <p>TE application now lodged.</p> <p>Continued engagement with Scottish Water to ensure appropriate permissions have been sought and secured.</p>	2	2	4

## 2.8. Contingency planning

- 2.8.1. In terms of contingency planning within the context of the delivery of the preferred option, achieving Value for Money and maximising benefits delivered, the NATIH project has evolved in response to rising construction costs and will work flexibly with other CRD projects on the provision of business space.
- 2.8.2. This approach will support the ability to spend as profiled and deliver the benefits and Value for Money as outlined in the Economic Case. Contingency planning relating to operational implementation activities and flexibilities will be kept under review. The University will develop project contingency plans to ensure that the project can spend against the agreed financial profile.

2.8.3. The Risk Register (Appendix M7) outlines operational risks and mitigations relating to financial spend to ensure that it is in accordance with the agreed implementation plan profile.

## 3. Economic Case

### 3.1. Overview

- 3.1.1. The Economic Case considers the most effective option to fully realise the objectives of the National Aquaculture Technology and Innovation Hub (NATIH). A prudent approach was taken in measuring costs, benefits, measuring the social value and ratio of benefits to costs. Only costs and benefits from the NATIH project are considered. Potential benefits accruing from working with other CRD projects are not considered (for example, developing new business space).
- 3.1.2. A Benefits Realisation Plan (BRP) has been appended (Appendix M10) setting out how emerging benefits will be realised and managed. The plan will be reviewed once the RPMO has completed the review of the Deal level BRP. Many of the wider, and likely more significant, impacts will only be fully realised in the long-term.
- 3.1.3. The focus of the Economic Case is therefore on the more easily measured and short to medium-term benefits. This will outline the viability of the NATIH project whilst recognising the longer-term impacts that will build on NATIH's initial investment.

### 3.2. Project options

- 3.2.1. NATIH's objectives are aligned to the Stirling and Clackmannanshire City Region Deal outcomes and objectives. HM Treasury's Green Book describes Critical Success Factors (CSFs) as the attributes that a project must have to achieve its objectives.
- 3.2.2. Given the NATIH project's objectives have already been developed, the Green Book recommends up to seven CSFs are chosen to help assess project options. The alignment between the objectives of NATIH and the City Region Deal objectives and outcomes are appended (Appendix S5).
- 3.2.3. The NATIH project was outlined in the form of a Strategic Outline Case (SOC) when [Heads of Terms](#) were signed for the Stirling and Clackmannanshire City Region Deal. A number of potential projects (including NATIH) were submitted for consideration within the City Region.
- 3.2.4. Development of the SOC included a longlist of potential options considering the capacity and capability of the University of Stirling to deliver the NATIH project, how the project could be financed through the City Region Deal and other sources of funding and investment. A longlist of options helped shape the SOC in establishing the resources required from key partners.

- 3.2.5. A series of stakeholder workshops considered the scope of the NATIH project. This has helped shape the approach of NATIH to help partners better understand the likely capacity and capability challenges in delivering the whole project.
- 3.2.6. The OBC refined and developed several possible viable project options considered following HM Treasury's Green Book guidelines and Critical Success Factors (CSFs). The options included a **do minimum option**, that may just meet business user needs and project objectives, the **preferred way** forward, a **more ambitious** approach (potentially delivering more value, but at higher cost and risk).
- 3.2.7. **Option one: Business as usual** involves the IoA would continue to operate the facilities, at best maintaining the current level research income. This would have a negative effect on the quality and reputation of the aquaculture activity delivered through the University and current leadership position in the sector.
- 3.2.8. **Option two: New aquarium facilities only (do minimum option)** involved the development of the new aquarium facilities and other components included in phase 1 except for the challenge facilities and collaboration space. This option would allow the University to maintain some aspects of the quality and reputation of the aquaculture research activity and current leadership position in the sector.
- 3.2.9. **Option three: NATIH phased approach (preferred option)**, this option delivered NATIH in two phases. Phase 1 of NATIH focused on experimental aquatic facilities, bio-secure challenge facilities, collaboration space and business accelerator facilities. The preferred option will provide flexible aquatic research facilities increasing current capacity by around 300%.
- 3.2.10. **Option four: NATIH both phases concurrently (more ambitious option)**. The more ambitious option involved developing both phases of NATIH concurrently. This would involve developing dedicated business incubation space alongside the facilities (outlined in phase 1).
- 3.2.11. The above options were assessed using the Critical Success Factors (CSF) in the OBC. A more detailed rationale for each assessment is appended along with a summary Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis (Appendix E1). The options were not scored or weighted but ranked in terms of their order of preference in meeting the objectives and CSFs as fully as possible.
- 1<sup>st</sup> Option three: NATIH phase 1 (*preferred option*)
  - 2<sup>nd</sup> Option two: New aquarium only (*do minimum option*)
  - 3<sup>rd</sup> Option four: Both phases (*more ambitious option*)
  - 4<sup>th</sup> Option one: Business as usual (*do nothing option*)

3.2.12. At the start of the FBC stage the preferred (phased) option remained the option best able to meet the project objectives as fully as possible. Option 2 (new aquarium only) was identified as a potential way forward. However, it is likely that this approach would impose additional costs by eroding the University's human capital with the potential loss of staff and research students. These remain vital elements that allow the project to leverage the expertise and industry engagement.

3.2.13. The business as usual option was discounted due to the lack of strategic fit and meeting business needs and the more ambitious option was not considered due to potential affordability. These reasons remain valid for not considering the business as usual and more ambitious options.

### **Single phase approach**

3.2.14. At the start of the FBC the preferred option remained a phased approach, affording the opportunity for the project to consider how the demand for office and industrial space will have changed as hybrid working evolves.

3.2.15. As set out in the Strategic Case the increased costs of delivering the first phase of NATIH inevitably impacted on planning for the second phase. From February 2023 onwards it became clear that the first phase would need to draw on all the available CRD funding. A second phase would have included laboratories and business incubation space.

3.2.16. A new option of a single phase NATIH project was considered with the deliverables shown in the Strategic Case (Table 2.1) prioritised. The University will develop NATIH and its other CRD projects to realise synergies, particularly business incubation space.

3.2.17. The new single phase NATIH project (£18.9m) will deliver:

- Experimental aquatic facilities
- Bio-secure challenge facilities
- The provision of collaboration space
- Business accelerator

3.2.18. The single phase (new preferred) option was reviewed in terms of performance against the project's Critical Success Factors (CSFs) compared with the two phases of the original preferred option. The cost of the single phase project is £18.9m. Based on the cost allocations between the two phases in previous business cases (and the tender response to deliver the first phase of NATIH) the second phase of NATIH would cost around £7.0m giving overall project costs of around £26.0m for the phased (originally preferred) approach.

- 3.2.19. The review (summarised in Figure 3.1A) concluded that the phased approach could be discounted based on potential affordability (Critical Success Factor 4). The University of Stirling has already additional funding and secured additional funding from the Wolfson Foundation. It was considered unlikely that further additional funding from the University of Stirling (and other sources) would be able to address the funding gap to provide all deliverables from both phases.
- 3.2.20. An initial review by the University concluded that value engineering and a more modest second phase would also not be affordable. This confirmed the phased (originally preferred) option should be discounted on the grounds of potential affordability (CSF4).
- 3.2.21. As stated in the Strategic Case, NATIH was acknowledged by Cefas as an investment enhancing the UK' s national capability to provide critical infrastructure. To deliver both phases of the project it is likely that some reduction in the capacity and capability of the core (first phase) project would be needed alongside modest business incubation space in the second phase. This will reduce the project's strategic fit and ability to meet business needs (Critical Success Factor 1) but would still meet the project objective, albeit in a limited way.
- 3.2.22. In terms of potential value for money, capacity and capability and potential achievability the phased (original preferred) option represented a potential way forward. Overall, the review concluded that the new single phase project was best placed to deliver the project objectives and was the preferred option.

**Figure 3.1A: Options summary matrix**

<b>Critical Success Factors</b>	<b>Phased option (original preferred option)</b>	<b>Single phase (new preferred option)</b>
<b>CSF1: Strategic fit &amp; business needs</b>	<b>Meets objectives in a limited way</b>	<b>Preferred way forward</b>
<b>CSF2: Potential value for money</b>	<b>Potential way forward</b>	<b>Preferred way forward</b>
<b>CSF3: Capacity &amp; capability</b>	<b>Potential way forward</b>	<b>Preferred way forward</b>
<b>CSF4: Potential affordability</b>	<b>Discounted</b>	<b>Preferred way forward</b>
<b>CSF5: Potential achievability</b>	<b>Potential way forward</b>	<b>Preferred way forward</b>
<b>Cost (£m)</b>	<b>£26.0</b>	<b>£18.9</b>

### 3.3. Benefits and logic model

#### Benefits (monetised and non-monetised)

- 3.3.1. The summary logic model (Figure 3.1B) lists the inputs (including funding and people resource), activities (including workshops, support provided), outputs (including businesses supported), outcomes (including increased turnover) and impacts (including jobs created).
- 3.3.2. The logic model shows the potential for leveraged private sector investment. The University of Stirling is providing revenue funding and has also secured additional capital investment from the [Wolfson Foundation](#).
- 3.3.3. Some of the impacts shown in the logic model, including improved environmental outcomes, are challenging to quantify and monetise in a meaningful way to inform Cost-Benefit Analysis. A Benefits Realisation Plan (BRP) is outlined in Appendix M10, this sets out a wide range of benefits and how they will be secured.
- 3.3.4. Another challenge is that many of the significant benefits will be realised by organisations working in partnership with NATIH. In this sense most of the significant areas of benefit will be realised indirectly including reduced pollution from the aquaculture industry, expanding sustainable production and supporting markedly lower carbon associated with a move to seafood from products like beef and dairy.
- 3.3.5. NATIH has a key role is to promote itself as a public good to be explored by stakeholders and develop new applications. The benefits explored in the Economic Case represent verified projected revenue associated with NATIH. This is in addition to current research and commercial activities undertaken by the Institute of Aquaculture (IoA) at the University of Stirling.
- 3.3.6. The economic case considers the most effective option to fully realise the objectives of the National Aquaculture Technology and Innovation Hub (NATIH). A prudent approach was taken in measuring costs, benefits, measuring the social value and ratio of benefits to costs. Only costs and benefits from the NATIH project were considered. Further benefits will accrue through synergies with other CRD innovation projects.

**Figure 3.1B: NATOH logic model**

Inputs	Activities	Outputs	Outcomes	Impacts
<p>Stirling and Clackmannanshire City Regional Deal funding.</p> <p>Wolfson Foundation funding (capital)</p> <p>University of Stirling funding (revenue)</p> <p>Research and specialist technical staff time and skills.</p> <p>Leveraged private sector investment (<i>potential</i>)</p>	<p>Centre of Excellence (Collaborative, research, Commissioned research, Access to Infrastructure)</p> <p>Business Accelerator (Consultancy, Business scale up support, Skills Development)</p> <p>Innovation Hub (Challenge Awards Open Innovation Network &amp; collaboration, Scholarships &amp; Calls for Innovation)</p>	<p>Established innovation community to NATIH aims to stimulate, deliver, enable and inspire innovation.</p> <p>Entrepreneurs, businesses and organisations are supported to develop and deliver new products and services.</p> <p>An Inclusive Skills Ecosystem is developed.</p>	<p>Regional and global opportunities in the journey to a net zero economy are maximised, supporting climate change resilience and the management of natural resources.</p> <p>There is a Just Transition for the city region with citizens and communities benefiting from good quality jobs.</p> <p>Innovation and co-production with industry provides the solutions to a more sustainable city region.</p> <p>Individuals and businesses within the city region are equipped with the skills required to thrive in the Green Economy.</p>	<p>Increased economic and inclusive growth, job creation, raised productivity, higher tax revenues, increased business R&amp;D expenditure and improved environmental outcomes.</p>

3.3.7. The logic model considers the proposed inputs (including funding) and the causal path leading from these inputs through to the activities supported by the inputs and the outputs and outcomes generated by the project’s activities. The impacts measure the long-term impacts resulting from the outcomes generated by the project.

## 3.4. Quantified benefits

- 3.4.1. The OBC set out quantified and monetised economic impacts of the outcomes from NATIH. All impacts are shown in 2023 prices, measured in terms of employment and Gross Value Added (GVA). All impacts are discounted using the social time preference rate of 3.5% as set out in HM Treasury's Green Book.
- 3.4.2. Net economic impacts are shown over 15 and 30-year periods. Some of NATIH's impacts will take longer than 15 years to be fully realised. As with all Stirling & Clackmannanshire City Region Deal projects, benefits realisation will be measured and reported on for 15 years. The figures over 30 years provide an alternative view of the likely benefits relative to the project costs.
- 3.4.3. The impacts are based on projected income for Research, Infrastructure, Skills and Enterprise (RISE) activities underpinning the commercial and financial cases. A conservative assumption was taken after 15 years of operation with impacts assumed to remain constant. The quantified benefits were fully described in the Outline Business Case (OBC) and are summarised below:

### **Research, Infrastructure & Enterprise**

- 3.4.4. This benefit relates to NATIH's research services, access to research infrastructure and enterprise services. This includes commercial revenue derived from access to the dedicated NATIH teams and experts, the experimental aquatic facilities and business accelerator facilities.
- 3.4.5. This benefit is based on projected income for research, infrastructure and enterprise activities underpinning the commercial and financial cases. The financial case sets out projected revenue. A conservative assumption was taken after 15 years of operation with impacts assumed to remain constant (£9.5 million GVA per annum).
- 3.4.6. The activities based on research, infrastructure and enterprise were assumed to have characteristics reflecting technical testing and analysis services and research and development services. An average of two industrial sectors was used reflecting the activities described above, the full industry definitions are appended (Appendix E1).

### **Skills and training**

- 3.4.7. This benefit relates to the provision of the skills portfolio and training through NATIH. NATIH will design and deliver education and skills programmes to create pathways into aquaculture related subject areas at a range of educational stages. This benefit is based on projected NATIH income for 'Skills' revenue underpinning the financial case.
- 3.4.8. The NATIH activities based on the skills portfolio and training were assumed to have characteristics reflecting education and training services. The industry definitions used to model the economic impacts are appended (Appendix E1).

### Supply chain and cluster impacts

- 3.4.9. The Stirling city region hosts a wide range of aquaculture businesses and industry organisations. There is potential to develop this further. In particular, the other CRD project, Scotland’s International Environment Centre (SIEC) will host the [Scotland Hydro Nation Chair](#) position working in collaboration with universities, research institutes, innovation centres and businesses across Scotland.
- 3.4.10. Several industry stakeholders were contacted to explore the likely potential for partnership working and the role NATIH could play within the UK’s RISE system. For example, would NATIH compete with similar research hubs and displace existing activity or would it attract new investment to both the city region and the UK,
- 3.4.11. Examples of clusters based around similar research centres are appended (Appendix E1). The examples show a clear pattern of science and research jobs clustered around similar centres with the clustering effects tending to strengthen in response to investment in new facilities. Cluster multipliers ranged from 1.2 to 2.7, meaning that between 20 to 170 additional jobs may be clustered for every 100 jobs directly through NATIH.
- 3.4.12. The cluster effect for the Scottish Association for Marine Science(SAMS) (Dunstaffange) is around 1.3. It is assumed that the NATIH project will initially generate a cluster effect similar to the lower end estimate based on SAMS. The cluster effects are applied only to the research, infrastructure and enterprise activities of NATIH (excluding skills).

### Summary of impacts

- 3.4.13. GVA impacts are discounted using the social time preference rate of 3.5% as set out in HM Treasury’s Green Book. Economic impacts were adjusted to consider only the net additional impacts (shown in Appendix E1) that will arise because of NATIH and disregard activities that may happen even in the absence of the project as set out in the OBC.

**Figure 3.2: Summary of net economic benefits (City Region)**

Benefits	15 years		30 years	
	GVA (£m)	FTE jobs	GVA (£m)	FTE jobs
Research, infra. & ent.	£47.3	47	£111.9	47
Skills & training	£12.8	36	£31.6	36
Cluster & supply chain	£14.2	14	£33.6	14
<b>Total</b>	<b>£74.3</b>	<b>97</b>	<b>£177.1</b>	<b>97</b>

**Figure 3.2: Summary of net economic benefits (Scotland)**

Benefits	15 years		30 years	
	GVA (£m)	FTE jobs	GVA (£m)	FTE jobs
Research, infra. & ent.	£51.9	52	£122.8	52
Skills & training	£12.3	34	£30.3	34
Cluster & supply chain	£15.6	16	£36.8	16
<b>Total</b>	<b>£79.8</b>	<b>102</b>	<b>£189.9</b>	<b>102</b>

**Figure 3.2: Summary of net economic benefits (UK)**

Benefits	15 years		30 years	
	GVA (£m)	FTE jobs	GVA (£m)	FTE jobs
Research, infra. & ent.	£42.8	43	£101.2	43
Skills & training	£9.8	26	£24.3	26
Cluster & supply chain	£11.6	12	£27.3	12
<b>Total</b>	<b>£64.2</b>	<b>81</b>	<b>£152.8</b>	<b>81</b>

### Carbon impacts

- 3.4.14. The latest guidance published by the (Department for Business, Energy & Industrial Strategy (BEIS) states that environmental impacts should be monetised where possible (BEIS, 2021). Monetised impacts should be based on the latest BEIS carbon values (available [online](#)) and used to adjust monetised benefits accordingly.
- 3.4.15. An estimate of the programme’s whole life carbon emissions is set out later in this section. The Scottish Government’s macroeconomic impact model has an environmental extension that makes it possible to estimate greenhouse gas emission effects. The methodology underpinning this extension is also available [online](#). The environmental extension to the impact model is used to produce the high-level carbon assessment of the Scottish Budget.
- 3.4.16. The Scottish Government publishes the underlying direct and indirect (including imports) greenhouse gas effects, detailed by industrial sector. The impacts were used to extend the economic impacts of NATIH to show the total carbon emissions attributed to the impacts in terms of tonnes carbon dioxide equivalent (tCO<sub>2</sub>e) following the same methodology as the Scottish Government’s high level carbon assessment.
- 3.4.17. The carbon impacts used the same industry classifications as the economic impacts. The additional economic activity at a Scotland level was used to estimate the carbon impacts and makes no account for changes in technology or other efficiency improvements.

- 3.4.18. Over 30 years the total carbon impact of the NATIH operations and NATIH clustering effects would be around 22,000 tCO<sub>2</sub>e (direct, indirect and imported). This considers the early years of NATIH, and the time taken to become fully operational. The carbon costs associated with the operation of NATIH would be £2.4 million over 15 years and £6.3 million over 30 years.
- 3.4.19. A similar approach was used to quantify the construction impact based on the capital costs of NATIH (£18.0m). The total carbon impact (direct, indirect and imported carbon) associated with the construction of the NATIH facilities is around 2,600 tCO<sub>2</sub>e with a carbon cost of £0.6 million. The carbon embodied in construction was reduced by 15% to reflect all project elements now repurposing existing infrastructure.
- 3.4.20. If both operation and construction impacts are also considered, then the total carbon impact rises to around 24,000 tCO<sub>2</sub>e over 30 years. However, significant areas of benefit will be realised indirectly including reduced pollution from the aquaculture industry, expanding sustainable production and supporting markedly lower carbon associated with a move to seafood from products like beef and dairy.

#### **Carbon direct impacts and indirect influence**

- 3.4.21. The Cost Benefit Analysis includes the whole lifetime carbon costs associated with NATIH but not the benefits. The Scottish Government's carbon management guidance sets out five project categories to assess city deal projects. These categories are based on a project's potential to either increase or decrease carbon emissions, as follows:
- *Category 1, results in less atmospheric carbon*
  - *Category 2, whole life carbon net zero*
  - *Category 3, capital carbon increase then operationally net zero*
  - *Category 4, capital and operational carbon increase*
  - *Category 5, operational carbon increase*
- 3.4.22. The NATIH project is likely to be category 3 with a carbon capital increase then operationally net zero. The Scottish Government's carbon management guidance also sets out three project influence categories. These categories describe the potential of a project to influence carbon emissions beyond its control boundary.
- *Category A, leads to wider carbon emissions reductions*
  - *Category B, will have a negligible effect on wider carbon emissions*
  - *Category C, leads to an increase in wider carbon emissions*
- 3.4.23. NATIH is likely to fall under Category A. Significant areas of benefit will be realised indirectly including reduced pollution and sustainable production in Scotland, UK and across the world. Figure 3.3 shows tonnes of equivalent carbon per million of output for a selection of food and drink sectors in Scotland.

3.4.24. Scottish agricultural sector has nearly three times the embodied carbon of aquaculture. This difference is masked by significantly variations with agriculture (livestock and crops). If NATIH were to support a modest move within Scotland from beef and dairy to fish, for example, this would make a significant difference to Scotland’s journey to net zero. There is clear potential for NATIH to leverage its international networks to support this move across the UK and beyond, helping to reduce of global carbon emissions.

**Figure 3.3: Tonnes of carbon (equivalent) per £million of output in Scotland**

Sector	Direct carbon	Indirect carbon	Total carbon
Agriculture	1,513.5	554.6	2,068.1
Dairy products, oils & fats processing	85.1	830.2	915.3
Meat processing	48.4	835.4	883.8
Grain milling & starch	90.8	676.1	767.0
<b>Aquaculture</b>	<b>379.0</b>	<b>333.9</b>	<b>712.9</b>
Fish & fruit processing	98.6	554.2	652.7
Bakery & farinaceous	109.0	289.7	398.7
Other food	68.7	299.6	368.3

Source: Scottish Government Carbon Budget (2022-23)

3.4.25. Based on the emissions data shown in Figure 3.3 and the Scottish Government’s latest Input-Output tables it is possible to illustrate the net carbon impacts from a small shift in consumption from agricultural products to aquaculture.

3.4.26. The [Climate Change Committee](#)’s latest progress report ([2022](#)) cited the need to promote a shift to low-carbon diets, including encouraging a 20% shift away from meat and dairy by 2030 (with benefits including the release of agricultural land). A one percent reduction in Scottish agriculture and corresponding one percent rise in Scottish aquaculture would result in a net reduction of 76,000 tCO<sub>2</sub>e each year.

3.4.27. As set out above, both the operation and construction of NATIH are associated with a total carbon impact rises of around 24,000 tCO<sub>2</sub>e over 30 years. If the one percent change in consumption were to arise over 30 years (reaching the full one percent change after 30 years) then the net reduction in carbon would be 1.2 million tCO<sub>2</sub>e over 30 years.

3.4.28. These figures illustrate the comparable scale of carbon impacts resulting from a modest change in consumption patterns. More detailed analysis would adjust carbon impacts to account for cattle rearing being more carbon intensive than other areas of agriculture and consider impacts outside of Scotland. Additionally, the carbon footprint of both agriculture and aquaculture may fall over time reducing the net benefits over 30 years.

3.4.29. More detailed analysis is unlikely to change the overall position of a significant net reduction in carbon from the NATIH project. Based on the above illustrative approach, the net reduction in carbon would be 0.3 million tCO<sub>2</sub>e over 15 years and 1.2 million tCO<sub>2</sub>e over 30 years.

3.4.30. Using the latest BEIS carbon values (and HM Treasury’s discount rate) the value of the carbon saved is £90 million over 15 years and £200 million over 30 years (rounded to the nearest £10 million). Including the illustrative carbon values would raise the Cost Benefit Ratio (Table 3.4 below) for Scotland from 3.5 to 7.6 over 15 years and from 7.1 to 14.9 over 30 years.

**Optimism bias**

3.4.31. HM Treasury’s Green Book suggests that costs, benefits and the time taken to deliver a project should be reviewed for optimism bias and adjusted where appropriate. Adjusting for optimism bias provides a more realistic assessment of initial estimates of costs and benefits.

3.4.32. Initial estimates were set out in the original business case in 2018. More detailed and reliable measures around the costs, benefits and delivery of the project have been developed thus reducing the need for adjusting to account for optimism bias.

3.4.33. Several issues, including impacts resulting from the COVID-19 pandemic, are likely to influence the costs and key benefits of the project. Some consideration may be made based on the latest Scottish Fiscal Commission forecasts which describe future scenarios and set out a range of upside and downside risks. To reflect this uncertainty the value of all benefits was reduced by 3% to adjust for optimism bias (project costs already include an allocation for inflation). This is based on the possible scenarios set out above.

3.4.34. The total benefits, adjusted for optimism bias, are £72.1 million (GVA) across the city region over 15 years. This rises to £171.8 million over 30 years. The Benefit to Cost Ratio (BCR) is highest for Scotland at 3.5 (over 15 years) and lower when considering the UK economy (2.8) reflecting an element of displacement from other UK research centres.

**Figure 3:4 Cost-Benefit Analysis 15 years**

Area	City region	Scotland	UK
Total benefits (-opt. bias)	£72.1	£77.4	£62.3
Project costs	£18.9	£18.9	£18.9
Total costs (incl. carbon)	£21.9	£21.9	£21.9
Net Social Present Value	£50.2	£55.5	£40.4
<b>Benefit to Cost Ratio</b>	<b>3.3</b>	<b>3.5</b>	<b>2.8</b>

**Figure 3:4: Cost-Benefit Analysis 30 years**

Area	City region	Scotland	UK
Total benefits (-opt. bias)	£171.8	£184.2	£148.2
Project costs	£18.9	£18.9	£18.9
Total costs (incl. carbon)	£25.8	£25.8	£25.8
Net Social Present Value	£146.0	£158.4	£122.4
<b>Benefit to Cost Ratio</b>	<b>6.7</b>	<b>7.1</b>	<b>5.7</b>

### 3.5. Sensitivity analysis

#### Sensitivity analysis and cost per job

- 3.5.1. The initial NATIH Outline Business Case (April 2019) also found the Benefit to Cost Ratio (BCR) was highest at a Scotland level. The NATIH BCRs for the City Region and the UK levels were lower driven by leakage and displacement respectively; this echoes the economic impacts set out above.
- 3.5.2. The BCR for NATIH (phases 1 & 2) for Scotland was previously estimated at 3.1 over 15 years. This compares to a current BCR for NATIH of 3.5 over 15 years for Scotland (shown in Figure 3.4 above.). The higher BCR ratio in this updated business case partly reflects prioritisation of the core project elements.
- 3.5.3. The prioritised facilities allow the project to leverage the expertise and industry engagement of the IoA with a higher benefit to cost ratio. The Gross Value Added (GVA) generated by research, infrastructure and enterprise activities account for most of the benefits for all geographies. The benefits associated with the cluster effect are also influenced by research, infrastructure and enterprise impacts (as set out above).
- 3.5.4. If projected revenues from research, infrastructure and enterprise activities were to fall by 25% (with a corresponding fall in the cluster effect) then the BCR for Scotland (over 15 years) would fall from 3.5 to 2.8.
- 3.5.5. If projected revenues from all RISE activities fell by three quarters (with a corresponding fall in the cluster effect) then the 15 year NSPV would become negative at a UK level. However, the NSPV would remain marginally positive for the City Region and Scotland.
- 3.5.6. The cost per job is high at around £190,000 per job for Scotland and higher still at the UK level. This partly reflects the objectives of NATIH to help improve sustainability, environmental outcomes and create relatively high-value employment opportunities.
- 3.5.7. This also reflects the wider benefits and further job creation that will be delivered through synergies with other CRD innovation projects. This includes business incubation space with additional job creation supported by NATIH's activities.

- 3.5.8. Scotland accounted for nearly two thirds (63%) of Britain's 4,000 aquaculture jobs in 2020 (Business Register and Employment Survey). Nearly nine out ten (86%) of Scotland's aquaculture jobs are found in the Highlands and Islands with Stirling (local authority area) the next largest host of aquaculture jobs.
- 3.5.9. The remote and rural location of aquaculture in Scotland is also present in the sector across England with locally significant aquaculture employment in the local authority areas of Cornwall, Wiltshire, Colchester, Somerset West and Taunton, Tunbridge Wells, Cotswold and Test Valley. These communities account for nearly one third of aquaculture in England.
- 3.5.10. Distributional weights could be applied to increase the value of benefits to target areas, including the UK Government's commitment to levelling up economic opportunity across all nations and regions. NATIH has clear potential to both support industry and the economic strategies of both the UK and Scottish Governments. Although not applied to the CBR tables above, distributional would serve to increase the ratio of benefits to cost.
- 3.5.11. A statement supporting the NATIH project was provided by Dr Rachel Hartnell, Head of the Cefas Weymouth Laboratory:
- "This investment enhances the UK national capability to provide critical infrastructure to underpin aquaculture R&D - which alongside Defra's, Centre for Environment, Fisheries and Aquaculture Science (Cefas) aquaria in Dorset will support the scientific and technical work required for sustainable expansion of a biosecure sector both nationally and internationally. Investment in experimental facilities of this kind, when linked to other national centres, maintains and enhances the UK's position as a leader in sustainable aquaculture – a sector which is set to dominate the supply of global seafood by 2050".*
- 3.5.12. NATIH will work alongside Cefas to add to the UK's capabilities by providing an industry and academia hub, working alongside one another to tackle health, welfare and environmental factors that threaten the growth ambitions of aquaculture sectors in Scotland and across the UK. Strategic partnerships are currently being discussed.
- 3.5.13. The UK strategy specifically references an objective to increase freshwater aquaculture, growth cannot be achieved sustainably without research and collaboration to overcome challenges in this space. Cefas does not have the capacity to meet the need of Scotland and the rest of the UK and other Scottish facilities do not have the ability to conduct research at scale which is needed.

## 4. Commercial Case

### 4.1. Commercial Aspects

- 4.1.1. The National Aquaculture Technology and Innovation Hub (NATIH), based within the globally renowned Institute of Aquaculture at the University of Stirling, is well placed to deliver on significant commercial opportunity on a regional, Scottish, UK and global basis. The proposed establishment of extended and future facing facilities (building on the current Institute location) will provide an academic, research, technical and innovation catalyst that will in turn fuel access to a global aquaculture industry that is projected to reach in excess of £225 billion value by 2027.
- 4.1.2. This opportunity for global commercial growth is underpinned by an already significant contribution by the Institute of Aquaculture to the Scottish (and therefore UK) salmon industry. This is through a combination of academic, teaching, research, consulting and business support activities – all of which can be readily expanded through NATIH. This is will in turn develop into a world leading positioning in the broad global focus on Blue Food – one of the leading topics and areas of action to come from COP26.
- 4.1.3. The 5 year strategic outcomes for NATIH are;
- Help create sustainable aquatic food systems around the world informed by world leading research delivering improvements in environmental, human and aquatic organism health and welfare.
  - Drive the discovery, translation and adoption of solutions, new technologies and innovation driven by collaborations with the global aquaculture community.
  - Create a diverse, inclusive skills ecosystem adapting to the needs of the global aquaculture community.
- 4.1.4. The core intent of NATIH as a commercial enterprise is to build on established Institute of Aquaculture revenue, to create new lines of revenue through an invigorated blend of teaching, research, public sector and commercial sector consulting and to play a significant role in enabling emerging Scottish/UK/global businesses to thrive in the wider aquaculture and Blue Food arenas. The operating model involving private and public sector organisations of all sizes will, in a purely commercial sense, combine to drive profitable enterprise directly in line with the ethos of the wider Stirling & Clackmannanshire City Region Deal.
- 4.1.5. As detailed in the Financial Case a viable and self-sustaining commercial model has been demonstrated over a ten-year period. This model is based on the generation of consistently growing revenues from a blend of related activities.
- 4.1.6. These activities have different points to reach full maturity but are based upon RISE (Research, Infrastructure, Skills and Enterprise) activities that are already within the operational heritage of the Institute of Aquaculture as part of the University of Stirling. RISE activities are further detailed in the Strategic Case and outlined within the Financial Case.
- 4.1.7. They have all been aligned to ensure that the project that will:

- Generate joint public/commercial financial gain
  - Play a leading role in building responsible and resilient aquatic food systems that support wellbeing for people and the planet.
  - Apply world leading capabilities in research and education, collaborating with the global aquaculture community through scientific discovery and innovation, thereby transforming practice, informing policy and delivering impact.
  - Deliver demonstrable socio-economic regional impact.
- 4.1.8. The commercial realisation of NATIH is founded on the collaborative working between NATIH and a wide range of partner organisations, in most cases jointly developing and delivering proven research and technology outcomes over defined periods within each financial year. These partner organisations will range in sector, size and purpose with varying challenges and needs within the broad aquaculture and Blue Food space.
- 4.1.9. Appendix C2 outlines the activities that will enable NATIH to significantly develop the current activities within the Institute of Aquaculture, broadening commercial scope and growth based on delivering with customers and partners across a wide range of related areas. Appendix C2 and C3 (services and potential cost models) illustrates the way in which NATIH will drive both outputs and outcomes for those partnerships (regional/Scottish/UK/global) from the identified RISE activities.
- 4.1.10. Partnerships will be underpinned by specifically designed charging models for NATIH services and related outputs. These models will be applied in line with the nature of the commissioning partner, an illustrative example of the NATIH model is appended (Appendix C4).
- 4.1.11. As detailed in the Strategic Case there is compelling evidence of regional/Scottish/UK/global need for NATIH, within a strategic, operational, and commercial framework. From a commercial sense, there are several current strands of Institute of Aquaculture outputs/relationships that offer evidence of the market need, financial opportunity, and socio-economic impact proposed NATIH activities.
- 4.1.12. Further information detailing examples including the nutrition analysis and joint working with leading seafood companies is outlined in Appendix C1.
- 4.1.13. The sustained success of the commercial activities of NATIH, as evidenced in the Financial Case, is founded on the expansion of core activities already undertaken by the Institute of Aquaculture and the expansion of expertise being driven into Blue Food.
- 4.1.14. By taking the current income generated by the Institute of Aquaculture and applying the potential uplift (in the most basic sense of increased physical capacity) that NATIH offers we can evidence the demand for all the identified RISE revenue lines.

- 4.1.15. With well-founded postgraduate teaching, world class research resource, established research funding relationships, established and developing commercial relationships the Institute of Aquaculture achieved an income of £7.3m in 2020/21. NATIH will increase capacity for core activities by 300%, at the same time benefiting from related opportunities through introducing new teaching programmes, attracting world class skills and generating a regional cluster of related ventures.
- 4.1.16. By building on the reputation and achievement of the Institute of Aquaculture, NATIH can deliver additional and wholly separate revenues (shown in Appendix F2). The outline of these services is as follows:

#### **Research**

- 4.1.17. This is a key element of qualified and proven growth, firmly within core Institute of Aquaculture and University of Stirling research capabilities. This is a global engagement and geared towards both traditional grant funding and bespoke project commissions from the private sector.
- 4.1.18. Given the appetite already displayed for NATIH and the proposed related activities, there is a sound case for the growth of Year 1 income of £375,000 to £2.4m in Year 5.

#### **Infrastructure**

- 4.1.19. The deployment and charge for any physical assets expanded through CRD funding. This may be wholly charged, part charged or, on occasion, free to service. It is envisaged that it will form a vital part of service delivery.
- 4.1.20. With a working model as designed and tested for against current Institute of Aquaculture activity we have based a growth of Year 1 income from £37,500 to £1m in Year 5.

#### **Skills**

- 4.1.21. This is underpinned and evidenced through the straightforward expansion of current Institute/University postgraduate and CPD teaching programmes, thereby leveraging the outcomes and innovative outcomes from all NATIH activities. Whilst this experiences a lag of two years (postgraduate) and 4 years (undergraduate) maturation as courses are designed and built, it can be projected programmes that there will be no independent revenue generated in Year 1, but this will grow significantly year on year to £1.5m in Year 5.
- 4.1.22. By driving this level of commercial activity (through dedicated NATIH teams and experts) the wider commercial effect of NATIH will be felt by a 'halo' of regional SMEs and other organisations. In Year 1 partnerships with significant organisations will drive opportunity and gain for a connected group of SMEs, all benefitting from the wider outputs of activity. This halo effect will accelerate year on year, driving the flow of economic success, regional business and SME growth, skills delivery and leading industry practice that is at the heart of NATIH.

## **Enterprise**

- 4.1.23. This is the deployment of senior academic experts and their teams to defined, scoped and fully contracted projects across all sectors. Prior to any work undertaken there will be agreement reached for charging to be based upon defined NATIH rate-cards and service prices. These will be designed against current broader market benchmarks and applied by sector and partner.
- 4.1.24. In line with the current work on related Institute of Aquaculture consulting work we have based a growth of Year 1 income of £112,500 to £3m in Year 5. This is based upon specifically designed rate cards of charge and specifically programmes of recruitment into relevant professional fields.

## **4.2. Evidence drawn from successful projects**

- 4.2.1. Three relevant examples currently underway in Scotland, the Netherlands and Norway offer evidence of success for major partnerships delivering significant commercial, environmental and socio-economic advancement have been reviewed as part of the NATIH business case development process. These are:
- Aqua Spark (Utrecht)
  - Marineholmen (Bergen)
  - Edinburgh Bio Quarter
- 4.2.2. The major lessons learned from these projects, outlined in Appendix C1 are in:
- Founding and Structure – nimble, successful pathways towards goals
  - Heritage and Reputation – building on established expertise, application and investment
  - Funding and Partnerships – forward looking partnerships driving commercial gain
  - Social/Regional Value – the Just Transition of business and wider regional benefit
- 4.2.3. We have purposefully modelled aspects of all three of these areas into our outline structures, combining them to deliver an agile, outcome orientated organisation that delivers results at all levels from the very beginning. The NATIH project is then quickly delivered at scale and in a wholly autonomous way.

## **4.3. Potential alternative funding options**

- 4.3.1. The current commercial plan for NATIH is based on the sustained and self-generated flow of revenues from developed RISE activities.
- 4.3.2. The Commercial Plan for NATIH is to create a standalone and sustained flow of revenues from the first year of operation. This means that any additional external funding will be on the basis of accelerating achievement. This has been based on the success to date of the host Institute of Aquaculture.

- 4.3.3. Appendix C3 highlights the three ways in which NATIH will create revenues (in differing blends) from all projects going forward. It is currently designed to illustrate activities stimulated by NATIH physical facilities but evidences an intention to create commercial outcomes directly in line with the stated services.
- 4.3.4. It is underpinned by the adherence to rate-cards of charging for all levels of services, applied flexibly on the nature of programme and customer.

#### 4.4. Evidence of commercial demand

- 4.4.1. The wider demand and context for the NATIH is evidenced within the strategic case. The commercial demand for outputs is best evidenced by the demand for current Institute of Aquaculture activities, the rapidly rising demand for aquaculture outcomes and the significant emphasis placed by worldwide policy on Blue Food.
- 4.4.2. The IoA works closely with stakeholders in industry, practice and policy, to translate fundamental science into sustainable solutions, whilst nurturing and training the next generation of talent for the future of global aquaculture. Appendix S1 highlights a number of industry-led projects undertaken by the IoA including the commercial outcomes delivered and research investment secured during the last Research Excellence Framework (REF) period.

#### 4.5. Procurement

- 4.5.1. NATIH's procurement strategy is supported by the University of Stirling's [procurement services](#). This is aligned with the overall approach to procurement taken by the University and the [procurement strategy](#). The University of Stirling's procurement strategy ensures that all University procurement activity is conducted consistent with the Scottish Government's support, guidance and priorities for [public sector procurement](#).
- 4.5.2. The intent is to design an ecosystem of supply and demand within the wider City Deal Region, driving economic and social change through the NATIH and its outputs. The procurement strategy for NATIH will ensure that there is strong regional market engagement to encourage existing local suppliers to engage with NATIH opportunities and to proactively assist new suppliers to engage with such opportunities. Support for new suppliers will be offered through the Business Accelerator function with links made to the Supplier Development Programme (available [online](#)).
- 4.5.3. The NATIH will follow supplementary guidance for CRD projects with a focus on the delivery of key inclusive growth and community wealth building deliverables through procurement;
- Supporting Progressive Procurement
  - Creating Opportunities
  - Fair Work; and
  - Sustainability

- 4.5.4. The procurement strategy for the University (as procurement lead) is available [online](#), and all procurement of works and services for the City Region Deal projects will follow the University of Stirling's procurement policies and procedures in line with the provisions of relevant legislation. The procurement strategy & award recommendation reports are appended (Appendix C5) for the "National Aquaculture Technology Innovation Hub Main Contractor" (summary) and "Designer and Installer Pre-Construction Services Agreement" (summary).
- 4.5.5. The University of Stirling's annual procurement report ([2021-2022](#)) states that for every procurement over £4m, the University considers how it can improve the economic, social or environmental wellbeing of its local area through the inclusion of community benefits clauses. Community benefit clauses are also included in procurement valued below £4m where practicable, relevant and proportionate.
- 4.5.6. The annual procurement report confirms procurement of the NATIH project will be covered by community benefit clauses and reported within the University's procurement reporting and to the RPMO.
- 4.5.7. Relevant community benefits considered by the University include (but are not limited to):
- providing work experience opportunities for students and staff;
  - employment and vocational training opportunities;
  - apprenticeships;
  - local subcontractor opportunities available to SMEs, third sector and supported businesses;
  - supply-chain development activity;
  - Industry engagement with local schools;
  - other support initiatives.
- 4.5.8. The NATIH project will need the University of Stirling to consider community benefits similar to those set out above. This will help to address Fair Work principles in the procurement process. The University is experienced in delivering infrastructure works. The 'University of Stirling Procurement Strategy' is shown in Appendix M8. All related procurement activity will be overseen by the University's Head of Procurement.
- 4.5.9. The University's CRD Procurement Strategy was approved in 2021 and is aligned to the delivery of the CRD regional outcomes. The University has developed an action plan that will operationalise the strategy in aspects relating to contract, performance, staff and supplier management. Financial and data management systems have been developed to capture a suite of data sets across the four thematic priority areas below:
- *Theme 1: Creating opportunities and advancing the equality of outcomes*
    - o We will create opportunities for employment, apprenticeships, skills development, and work experience within the city region.
    - o Advance equality of outcomes for those facing disproportionate exclusion from the labour market targeting; young people, women and girls, people with a disability and those living in a community within the city region ranked in the 20% most deprived in Scotland.
  - *Theme 2: Supporting Fair Work*

o We will support the principles of Fair Work through procurement including payment of Real Living Wage, closing the gender pay gap and discouraging the inappropriate use of zero hours contracts.

- *Theme 3: Leading environmental sustainability*

o We will provide leadership to enable the transition to net-zero, improving sustainable business practice and developing environmental resilience within our supply chain.

- *Theme 4: Enabling Community Wealth Building*

o We will develop a resilient regional supply chain by increasing operational spend within the city region and enabling social and community owned enterprises to engage in UoS CRD procurement opportunities.

o We will stimulate innovation within the supply chain to meet our evolving needs engaging with entrepreneurs and working alongside the regional business base.

4.5.10. The Head of Procurement will oversee the development of baseline data sets relating to CRD suppliers reporting findings to the NATIH Project and Programme Boards support decision making relating to procurement in the future. Within this, the Head of Procurement will also oversee the agreement, delivery and reporting of community benefits as part of the contract management process for regulated and non-regulated contracts.

4.5.11. Some examples of anticipated community benefits through NATIH's procurement (to date) have arisen through engagement with the Robertson Group regarding the proposed community benefit strategy submitted as part of the initial tender exercise. The University will advise Robertson of the key local contacts, representatives and groups that should be involved in the co-production of a meaningful regional community benefit offer and will insist on the maximisation of the Community Benefit offer in line with the CRD outcomes. Identified beneficiary groups are:

- Learners (employability, school, college and university level)
- Regional SMEs
- Social enterprises
- Local communities
- Robertson Group supply chain

4.5.12. The University currently has a programme of engagement across the region to ensure the input of:

- Local Employability partnerships (both in Clackmannanshire and Stirling)
- Local Employer Engagement Forum (one body for Clackmannanshire and Stirling)
- Third Sector Interfaces
- Educational establishments
- Local Authorities
- Forth Valley Developing the Young Workforce

- 4.5.13. Within Theme 1 (opportunities) Jobs, apprenticeships and work experience opportunities are currently being agreed between the University and Robertson utilising the CITB [Client Based Approach](#) to developing and implementing an Employment and Skills Strategy on construction projects'. The University will ask Robertson to detail agreed targeting against the 4 CRD groups for each benefit category identified. We anticipate 9 training opportunities will be created through procurement (based on CITB approach).
- 4.5.14. The University will also ask agreed partners to support Robertson to identify opportunities to advance equality of outcomes for the listed groups as part of the coproduction process. The University is due to engage with business interfaces including Local Authorities, Forth Valley Chamber of Commerce, [STEP](#) and [Ceteris](#) re training and capacity building in relation to mental health, health and wellbeing and equality diversity and inclusion.
- 4.5.15. Within Theme 4 (Community Wealth Building) the University is currently engaging with intermediaries that support regional businesses (as noted) to identify opportunities to host Meet the Buyer events, support the work of the [Supplier Development Programme](#) in Clacks and Stirling, provide local training and workshops that will better enable local businesses to engage with the future procurement opportunities relating to NATIH and beyond. We anticipate 38% of procurement will be secured by businesses within the City Region.
- 4.5.16. The University has the agreement of the [Clacks](#) and [Stirling Third Sector Interfaces](#) to support Robertson to engage with regional social enterprises and the [Forth Valley Social Enterprise Network](#) to support them to engage with procurement opportunities relating to NATIH.

## **4.6. Management and delivery of the project**

- 4.6.1. NATIH sits within the programme of University-led projects within the Stirling & Clackmannanshire City Region Deal. This programme is led by a Programme Director and supported by a Programme Management Office containing Programme and Project support staff who, as a team, will ensure the successful establishment of NATIH.
- 4.6.2. This team is integrated with the University's Innovation & Enterprise structure, which oversees the commercialisation of research outputs, business engagement and enterprise support. This ensures resilience and coordination with the team and its operations. An overview of the Innovation & Enterprise structure and how support for engagement with the City Region Deal, and specifically for NATIH, is provided within Appendix M1.
- 4.6.3. In addition, the Programme and Project team also work with colleagues from across the University's academic faculties and with partner organisations in order to optimise engagement and maximise stakeholder input.

## **4.7. Staffing within the University of Stirling (delivery body)**

- 4.7.1. All staff positioned to support the establishment of NATIH bring a wide range of skills, expertise and experience, a summary of which is shown within in Appendix M2.

## 4.8. Contracting arrangements

4.8.1. As the University of Stirling is the Lead Delivery Partner, there are no contracting arrangements to be considered for NATIH.

## 4.9. Risk Management

4.9.1. The University has established procedures for managing risk and the full policy is available on the [University website](#). The University Court and Audit Committee determines the risk appetite of the institution and sets internal control policies in order to provide assurance that these are working correctly.

4.9.2. The three key risks to the Commercial Case can be summarised as follows:

- Delay in the drawdown of CRD funding enabling the development of infrastructure to operationalise NATIH.
- Key personnel recruited and with capacity (where existing) to deliver on current and emerging opportunities.
- Delayed engagement with wider market and region

4.9.3. With NATIH in the early stages of determining suppliers and partners we cannot fully outline specific areas of Risk Transfer in contractual terms. We foresee that the University of Stirling will own most aspects of risk as all operations, infrastructure and services will be based at their locations. This will be developed as the project progresses and all possible transferable risk be explored in individual supplier and operations agreements. Risks to the commercial case are further detailed within the NATIH Risk Register (Appendix M7).

## 4.10. Risk register

4.10.1. The University has established a strategic risk register for its engagement in City Region Deal activity. The Risk Register for NATIH (Appendix M7), outlines operational risks and mitigations relating to financial spend to ensure that it is in accordance with the agreed financial profile.

## 4.11. Contingency plan

4.11.1. Contingency planning relating to operational implementation activities and flexibilities for NATIH has been set out in the Risk Register (Appendix M7). As set out in the management case once the project is implemented, a broader project risk register will be developed, in the same way as it has been for Scotland's International Environment Centre (SIEC).

4.11.2. Within this approach, there is scope for matters to be escalated to Project Board and, if required, on to the University's City Region & Growth Deal Programme Board. Using the same methodology will enable consistency of approach and resilience in the risk management process. This will ensure that Value for Money is delivered by the project and that expenditure is in accordance with the agreed financial profile.

## 5. Financial Case

### 5.1. Overview

- 5.1.1. This Full Business Case (FBC) seeks approval for £17.0 million of City Region Deal (CRD) grant funding to deliver the National Aquaculture Technology and Innovation Hub (NATIH) project. The total capital investment of NATIH amounts to £18.0 million which is funded through CRD capital grant (£17.0 million) together with the Wolfson grant (£1.0 million).
- 5.1.2. In addition to the £18.0 million capital investment, the business accelerator team (detailed in the management case) will help to build commercial income while project assets are developed. Staff costs associated with business accelerator activities will be funded from NATIH's commercial income. In the early years of the project the University of Stirling will underwrite the revenue costs of the business accelerator team.
- 5.1.3. The staff (revenue) costs of the business accelerator team are included in the Statement of Comprehensive Income (SOCl), shown in Appendix F1. HM Treasury's Green Book guidelines suggest the revenue costs (£0.9 million) should be considered as part of the overall cost of delivering NATIH in determining value for money.
- 5.1.4. The overall project costs referred in the strategic, economic and management cases therefore include both capital investment (£18.0 million) and the University's initial revenue contribution (£0.9 million). The total project cost of NATIH (including capital and revenue funding) is £18.9 million.
- 5.1.5. The financial case shows a development which, with this initial investment of the CRD capital and Wolfson grant, will be sustainable, and in turn help to leverage £71.5 million of additional income over the 10-year period (Table 5.3, total income).
- 5.1.6. The assessment and review undertaken by the University indicates that the associated risk profile is affordable, and the project is capable of being self-sustaining over the longer term, if the capital costs are met in full.
- 5.1.7. The University of Stirling considers investments in projects in terms of the impact on both the University's Financial Position and Statement of Consolidated Income (SOCl) which are shown in Appendix F1.
- 5.1.8. The information contained within the Financial Position and SOCl is disaggregated and shown in the tables set out this financial case. Further detailed information is provided in Appendix F2 on the project's annual and monthly capital cashflow, CRD investment and depreciation, projected commercial income and the total project budget cashflow (projected and to date).

## 5.2. Capital Investment

5.2.1. The approach set out in an earlier business case focused on repurposed buildings to accommodate the collaboration space. As more detailed plans have evolved all elements of the NATIH project will now make use of repurposed buildings and facilities to realise cost savings and reduce the carbon cost associated with building materials.

5.2.2. The key components of the NATIH project are shown below.

- **Experimental aquatic facilities** – flexible facilities with temperature-controlled rooms allowing for expanded research on temperate and tropical species. This will increase the capacity of research facilities by around 300%.
- **Bio-secure challenge facilities** – a bio secure level 2 challenge facility to study bacterial, viral and parasitic disease of fish.
- **Collaboration space** – to provide high quality business space for the NATIH team to work and meet stakeholders in the aquaria facility.
- **Business accelerator** – an enterprise programme to make sure businesses (particularly micro and SMEs) benefit fully and rapidly from new technologies, opportunities and solutions<sup>16</sup>.

5.2.3. The capital investment for each component is shown in the table below, together with the CRD delivery costs and how each component is funded.

**Table 5.1 Capital Investment for NATIH (£000s)**

Component	CRD	Wolfson	Total
Experimental aquatic facilities	£10,138	£1,000	£11,138
Bio-secure challenge facilities	£2,314		£2,314
Collaboration space	£2,043		£2,043
Business accelerator	£1,209		£1,209
CRD delivery costs	£1,296		£1,296
<b>Total</b>	<b>£17,000</b>	<b>£1,000</b>	<b>£18,000</b>

<sup>16</sup> As set out earlier, the capital costs associated with the business accelerator exclude staff costs which will be funded through NATIH's commercial income and underwritten by the University of Stirling.

- 5.2.4. The CRD delivery costs are the costs of the team who produce the business cases and are responsible for ensuring that the capital project is delivered. The CRD delivery costs have been included up to and during the period of construction of the asset and are fully funded through the CRD grant.
- 5.2.5. A more detailed breakdown of the costs together with projected cashflow are shown in Appendix F2.
- 5.2.6. It is expected that the establishment of NATIH will create an asset of £18.0 million. The forecasted expenditure of this capital investment is shown in Table 5.2 below:

**Table 5.2 Forecast Capital Expenditure (£000s)**

	Total	2023/24	2024/25	2025/26
Expenditure	£18,000	£4,979	£11,779	£1,242
Cumulative expenditure	£18,000	£4,979	£16,758	£18,000

- 5.2.7. The impact of the capital expenditure and the capital grant funding to the University on both its Financial Position and Statement of Consolidated Income (SOI) are shown in Appendix F1.
- 5.2.8. The University will receive no exemption in respect of Value Added Tax (VAT). Irrecoverable VAT on inputs is included in the costs of such inputs. As such irrecoverable VAT has been factored into the cost of constructing and commissioning of NATIH.
- 5.2.9. All costs are based on 2023 prices (as of July 2023) and are subject to change.

### **5.3. Impact on Income and Surplus**

- 5.3.1. The additional income assumptions have been based on analysis underpinned by business engagement, market understanding and the existing and well proven experience that the University possesses through its normal business activities. The related additional expenditure has been based on a well understood cost structure for the different types of income.
- 5.3.2. The additional costs of running the new facility have been assumed to be included in the non-staff cost element of the various activities.
- 5.3.3. In the period leading up to the completion of the asset, it will be necessary to implement an operating model that underpins the delivery of the stated themes and ensures the sustainable success of the overall project. The business accelerator team will help to build the programme of RISE work while the project assets are being developed.
- 5.3.4. This approach allows NATIH's innovation activities to start as soon as possible, help businesses to address the urgent need to tackle climate change challenges, accelerate

benefits realisation and realise commercial revenues for the NATIH project early on. The anticipated costs have been included which will deliver that model.

- 5.3.5. As set out earlier in this section, the business accelerator costs will be funded from commercial income generated by NATIH’s RISE activities, underwritten initially by the University. Table 5.3 below shows the forecast total income and expenditure over the 10 years of the project from 2024/25 to 2034/35:

**Table 5.3 Total Forecast Income & Operating Expenditure 2024/25 to 2034/35 (£000s)**

	Total
<b>Income</b>	
Research	£22,825
Infrastructure	£7,434
Skills	£13,823
Enterprise	£27,450
<i>Total Income</i>	£71,532
<b>Expenditure</b>	
Staff Costs	£36,274
Other Operating Expenditure	£22,544
Depreciation	£7,236
<i>Total Expenditure</i>	£66,054
<b>Net Contribution to University</b>	£5,479

- 5.3.6. An analysis of the timings of the forecast income and expenditure is shown in Appendix F2.
- 5.3.7. The project as shown in Appendix F2 displays a net cost position for 2024/25 through to 2027/28, before showing a net contribution in 2028/29, which continues to grow year-on-year demonstrating self-sustainability. In overall terms the project leverages £71.5 million of additional income, and a £5.5 million contribution<sup>17</sup>.
- 5.3.8. The leverage of £71.5 million relates to the additional income expected to be generated as a result of the project, with the contribution of £5.5 million being the difference between that additional income (£71.5 million) and the costs (£66.1 million) associated with generating that additional income (shown in Table 5.3 above).
- 5.3.9. There have been a number of key assumptions applied across the income generating RISE activities. These underlying assumptions are described below.

<sup>17</sup> The net contribution in earlier business cases assumed the staff costs associated with the business accelerator team would be funded through the CRD. The net contribution in this FBC is therefore lower reflecting the £0.9 million contribution in the early years of the project from the University of Stirling underwriting the revenue costs of the business accelerator team.

- 5.3.10. *Research* income is shown to increase by £0.4 million in 2025/26, growing by £0.5 million per annum until 2029/30. From 2030/31 onwards income growth is assumed to be 10% per annum. Associated costs increase in line with the growth of income.
- 5.3.11. *Infrastructure* income is modest in 2025/26, growing until 2028/29 when it settles at £1 million. That income is then assumed to remain stable for the remaining period. Associated costs increase in line with the growth of income.
- 5.3.12. *Skills* income is first shown in 2026/27 from where it makes good growth through to 2029/30. From 2030/31 onwards income growth is assumed to be 10% per annum. Costs increase in 2025/26 as investment is required to develop course provision. Thereafter associated costs increase in line with the growth of income.
- 5.3.13. *Enterprise* income is modest in 2025/26, before growing strongly year-on-year until 2029/30. From 2030/31 onwards income growth is assumed to be 10% per annum. Associated costs increase in line with the growth of income.
- 5.3.14. HM Treasury's business case guidance suggests the project should consider whether NATIH will have any net impacts on prices charged by the University of Stirling. We do not anticipate any net effects on prices, running costs or charges arising from the NATIH project and all net effects are reflected in the financial case.
- 5.3.15. As stated above, the NATIH project is expected to leverage £71.5 million in revenue income over 10 years. The project has already leveraged £3.9 million of capital investment from the University and other funders. This includes Scion House at the [Stirling University Innovation Park](#) and supporting aquatic research facilities at the Niall Bromage Freshwater Research Unit ([NBFURU](#)). Together with the £1.0 million capital investment leveraged from the Wolfson Foundation, the NATIH project has leveraged nearly £5 million of capital investment to complement CRD funding.

## 5.4. Impact on the SOCI and Financial Position

- 5.4.1. The financial impact for the University through the Statement of Consolidated Income (SOCI) and the Financial Position is shown in Appendix F1 and encompasses the initial 10 years of the project. The income, costs and contribution are incremental to current University activities.
- 5.4.2. This financial impact is split into two categories, firstly the underlying impact of the new activity generated as a result of the project, and secondly the impact of the CRD and Wolfson grant.
- 5.4.3. Under Financial Reporting Standard 102 – The Financial Reporting Standard applicable in the UK and the Republic of Ireland (FRS 102) rules the CRD and Wolfson grant, even though it relates to the funding of an asset is required to be firstly shown in the SOCI.

- 5.4.4. The CRD grant profile in the SOCI is based on the expenditure profile, although it is recognised that this will ultimately be based on the CRD grant claim profile.
- 5.4.5. Initially this will have a positive impact on the SOCI, but over time, as the asset is brought into use, the annual impact will be negative as the effect of depreciation is taken into account. The impact on the SOCI over the useful life of the asset will be broadly neutral.
- 5.4.6. All costs and revenues are based on 2023 prices and are subject to change.

## 5.5. CRD Grant Funded Investment

- 5.5.1. The CRD grant funded investment in NATIH amounts to £18.0 million, the phasing of the expenditure is shown in Table 5.4. This will be the claim profile if there is sufficient funding, which is dependent on the claim profile of other projects and programmes within the Stirling & Clackmannanshire City Region Deal, otherwise the University will initially cashflow the expenditure.

**Table 5.4 CRD Grant Funded Investment (£000s)**

	Total	2023/24	2024/25	2025/26
Expenditure	£17,000	£4,979	£10,779	£1,242
Cumulative expenditure	£17,000	£4,979	£15,758	£17,000

## 5.6. Financial Risks

- 5.6.1. Financial risks can be divided into three broad categories:
- Robustness of the base costs and income which have been used to underpin the financials.
  - Capital project risks: including the accurate appraisal of costs, time overruns, the ability of the academic, Information Services and Estates teams within the University to deliver the project.
  - Risks for on-going operations: including the demand for services and long-term financial sustainability.
- 5.6.2. It is anticipated that any positive net contribution will be used to underwrite the risks of the overall project.

## 6. Management Case

### 6.1. Project management and governance structures

#### **Roles and responsibilities of the project team**

- 6.1.1. The programme of University-led projects within the Stirling & Clackmannanshire City Region Deal is led by a Programme Director and supported by a City Region & Growth Deal Programme Management Office containing Programme and Project support staff who, as a team, will ensure the successful establishment of the National Aquaculture Technology & Innovation Hub (NATIH).
- 6.1.2. This team is integrated within the University's Innovation & Enterprise structure, which oversees the commercialisation of research outputs, business engagement and enterprise support. This ensures resilience and coordination within the team and its operations. An overview of the Innovation & Enterprise structure and how support for engagement with the City Region Deal, and specifically for NATIH, is provided within Appendix M1 (Innovation & Enterprise).
- 6.1.3. In addition, the Programme and Project team also work with colleagues from across the University's academic faculties and with partner organisations to optimise engagement and maximise stakeholder input.
- 6.1.4. All staff positioned to support the establishment of NATIH bring a wide range of skills, expertise and experience, a summary of which is appended (Appendix M2, project team roles: skills and experience.)

#### **Specialist Advisors**

- 6.1.5. The establishment of NATIH is underpinned through existing structures that bring expert leadership, guidance and support.
- 6.1.6. Overall management of the project is coordinated through the University's Programme Management structures, based within its Innovation & Enterprise operations within the Directorate of Research, Innovation & Business Engagement. Technical guidance is provided by the core academic resource aligned to the project, as well as specialist professional areas within the University such as the Information Services and Estates directorates.
- 6.1.7. Legal support for related contract arrangements is provided through the University's Contract Support function, also based within the Directorate of Research, Innovation & Business Engagement; this team also has ready access to the University's legal advisors, if required. All financial matters are coordinated through the Head of the City Region & Growth Deal Programme who links in with the University's Finance Office and has access to the University's financial advisors, if required.
- 6.1.8. The requirement for specialist advisors will be kept under review.

## **Governance arrangements**

6.1.9. NATIH will operate within the governance structures of the University of Stirling, as well as those established for the wider Deal. The University of Stirling City Region & Growth Deal Programme has the following governance arrangements:

- The University is a legally independent corporate institution founded by Royal Charter in 1967 and is one of only four universities in Scotland recognised by Universities Scotland that are governed by Royal Charters. The key governance forum is the University Court, which has responsibility for the conduct of all the affairs of the University.
- The University Court has delegated authority for the management of the University's City Region & Growth Deal Programme to the University Secretary/Chief Operating Officer, acting through a City Region & Growth Deal Programme Board, the membership for which is executive level. This Board has responsibility for the governance, management and delivery of all the University's City Region & Growth Deal projects and reports to the University Strategy & Policy Group and on to University Court. The remit and composition of the Programme Board is shown in Appendix M3.
- For each University-led project, a Project Board is established and is responsible for project delivery. The Chair of the Project Board oversees developments during the delivery stage of the project, supported by identified leads who represent the interests of those designing, developing, facilitating, procuring and implementing project activities. The Project Board reports to the City Region & Growth Deal Programme Board. The remit and composition of the Project Board is shown within Appendix M4.
- Each project reports through the University's City Region & Growth Deal Programme Management Office to the Deal-level Regional Programme Management Office and then onward into the Deal governance structures.
- Crucially, this governance structure ensures the separation of programme and project governance from delivery.

6.1.10. A structure chart of the governance framework is shown in Appendix M5.

## **Ethics and Integrity**

6.1.11. Ethics and integrity are core to the University of Stirling in terms of its research, its policies and interactions, and in its engagement with local, national and global communities.

6.1.12. The University has an established research ethics review process managed through the work of three ethics review panels; AWERB – Animal Welfare Review Body; NICR – NHS, Invasive or Clinical Research; and GUEP - General University Ethics Panel. Each of the three ethics panels make a biannual report to the overarching University Research Ethics Committee (UREC) which in turn reports to the University Court.

6.1.13. NATIH will adhere to the University's ethics and integrity standards. Any related research will be conducted in accordance with all relevant policies and processes.

6.1.14. The University will also ensure that NATIH engages with all relevant parties, including regulatory bodies, to ensure that protection of the environment is prioritised as part of the establishment of the Hub. Opportunities to reuse or repurpose assets will be considered as a priority. Environmental Impact Assessments will be undertaken as required.

#### **Project management arrangements for operational delivery and future management**

6.1.15. The project will be managed in line with established University project methodology using the best practice guidelines provided through the University's Policy and Planning team.

- Establishment of the technical infrastructure for NATIH will be led by the University of Stirling's Property Management team within the Estates Directorate.
- Contract management for capital projects will be led by the University's Estates Directorate.
- All related procurement activity will be overseen by the University's Procurement Team, within the Finance Directorate.

6.1.16. The operating model will ensure that NATIH will generate outputs, realise revenue and deliver on the forecasted benefits from the investment, both within its delivery phase and in the long-term.

6.1.17. With dedicated resource and embedded links within the University's Innovation & Enterprise structure that provide confidence and resilience wherever possible through consistency with existing processes and structures, the operating model provides a valid structure that will underpin the delivery of NATIH and its activities. Its establishment will be spread across the NATIH project, with immediate support for business engagement and development and enterprise support being fast-tracked in line with the development of the aquaria.

6.1.18. The model proposed recognises the need to support the range of outputs that the Hub will deliver. This includes the establishment of critical, state-of-the-art aquaculture research facilities and the NATIH Business Accelerator. The Business Accelerator will directly benefit the aquaculture industry locally, in Scotland, across the UK and globally. The Business Accelerator will coordinate activities across workstreams to help realise benefits for businesses.

6.1.19. The establishment of NATIH will be overseen by a **Project Manager** to ensure the effective establishment of the technical infrastructure. Ongoing management of the physical asset in the form of the new facilities will be overseen by the lead academics and technicians from the University. The Project Manager role is a full-time resource over a period of two years and will report to the Head of the City Region & Growth Deal Programme.

6.1.20. Initial provision of Business Accelerator services being fast-tracked will focus on engagement with businesses, acting as a key contact and coordination of services provided. We will work directly with businesses to identify their requirement for services such as consultancy, contract research, skills development etc., and, in parallel, will work with the senior academic team and lead technicians to ensure that opportunities are maximised in line with operational capacity.

- 6.1.21. We will support business start-up and scale-up, linking to related activities that are provided by the University's Enterprise Programme. Effective operations will be ensured through efficient administration frameworks and processes.
- 6.1.22. The Business Accelerator posts will be initially funded by the University of Stirling (years 1 and 2). After the first two years of operation, the posts will be funded through NATIH's commercial income. To put this staffing structure in place as quickly as possible, dedicated HR resource will be available.
- 6.1.23. Coordination of outputs and benefits, including oversight of delivery in terms of specific areas such as skills and community wealth benefits will be led by the University's City Region Deal team. The team will also have oversight of NATIH finances, including funding, and ensuring a link into University financial structures and mechanisms. This resource will monitor all projects within the University's programme within the Deal and, as with the Growth Deal Programme Officer, this resource will be shared with Scotland's International Environment Centre (SIEC).

### **Risk management**

- 6.1.24. The University's Risk Management Policy would be applied to NATIH, including all processes in relation to risk exposure and any required mitigating actions. The related procedures will be monitored within both the project and University governance structures. The full policy is available [online](#).
- 6.1.25. Risk management is considered at all stages. For the construction element of the NATIH project, an appropriate risk register has been developed and is overseen by the Project Manager with regular reviews by the Design Team and the NATIH Project Board.
- 6.1.26. Once in implementation, a broader project risk register will be developed, in the same way as it has been for Scotland's International Environment Centre (SIEC). Within this approach, there is scope for matters to be escalated to Project Board and, if required, on to the University's City Region & Growth Deal Programme Board. Using the same methodology will enable consistency of approach and resilience in the risk management process.
- 6.1.27. The Project Manager will assume responsibility for managing risk and will report to the University senior management team and Deal partners as set out in the appended organisation structure.
- 6.1.28. The University Court and Audit Committee determines risk appetite and sets internal control policies to provide assurance that these are working correctly and NATIH will also benefit from this approach.
- 6.1.29. An assessment of operational risk in relation to NATIH, along with the associated mitigation measures, is captured in a Risk Register. This register is maintained and updated as required on an ongoing basis. The Risk Register for NATIH is included within Appendix M7.
- 6.1.30. A contingency plan covering delay to both the establishment of NATIH and the initiation of service delivery will be drawn up, based on the University's Business Continuity strategy. This is evidenced through the University's Safety, Environment, Security and Continuity team (available [online](#)).

- 6.1.31. As a result of contingency planning, the NATIH delivery workplan has increased from 65 weeks to 80 weeks to include a period of testing and refining of the aquatic research facilities. Academic posts supported by NATIH will be filled in advance of the construction work being completed to ensure benefits are realised in the event of a delay in building the facilities.
- 6.1.32. Additionally, The University of Stirling has invested in its other aquaculture research facilities to complement NATIH. The University's other research facilities offers research capacity in some areas in the event of a delay in deployment of the NATIH project. The University are already in discussion with Cefas on the key role NATIH will play in the UK's research infrastructure; to a limited extent NATIH could draw on the capacity of other UK research facilities in some areas in the short-term in the event of a delay in the deployment of the NATIH project.

## **6.2. Benefits Realisation**

- 6.2.1. It is recognised that the delivery and evaluation of the benefits outlined in the Economic Case for NATIH will ensure that value for money has been delivered with the investment from the UK Government.

### **Delivering benefits through procurement**

- 6.2.2. Procurement of works and services for all City Region Deal projects that the University is leading will follow the University's procurement regulations in line with the provisions of relevant legislation.
- 6.2.3. The University is experienced in delivering infrastructure works and required procurement process for works and services. The key procurement activity for NATIH will be linked to the development of the aquaria, specifically, the construction of the new facility.
- 6.2.4. The University's Procurement Strategy and the related Aquaculture Strategy are shown in Appendices M8 and M9 respectively.

### **Delivery, monitoring and evaluation of benefits**

- 6.2.5. A Benefits Realisation Plan (BRP) for NATIH has been set out (Appendix M10) and will be reviewed as the project progresses. This outlines the benefits that will be delivered through the specific outputs and outcomes of NATIH. These map directly on to the benefits and strategic objectives that have been defined for the Stirling & Clackmannanshire City Region Deal overall and demonstrate consistency and coordination. These will be monitored through the Monitoring & Evaluation Framework (MEF) in terms of how and when benefits are delivered.

### **Responsibility for achieving target benefits**

- 6.2.6. The delivery of benefits is central to the success of the NATIH, and resource has been specified within the Operating Model in the form of the Growth Deal Programme Officer to help coordinate, monitor and further develop the impact of NATIH for the region.

## 6.3. Project Monitoring

- 6.3.1. NATIH will submit quarterly progress reports to the Regional Programme Management Office (as requested by the RPMO). An annual report for NATIH will be produced following the format of the SIEC annual report (appended M6). There is value in an early stage annual report as this will allow us to cover project initialisation activities, the first report will be produced at the end of 2023.
- 6.3.2. The project will comply with all CRD-level monitoring and reporting, including any reporting checkpoints for themes or elements within the project. The project team will work with the RPMO to ensure any specific information required in meeting project checkpoints is provided.
- 6.3.3. The project is aligned with the Deal-level objectives in terms of benefits realisation, as outlined in the strategic case. Reporting through the MEF would also align. It should be noted that the Deal-level Benefits Realisation Plan is currently being revised by the RPMO.
- 6.3.4. The CRD strategic outcomes are Inclusive Economic Growth, Higher Value Jobs, Shared Prosperity and an Inclusive Skills Ecosystem. These outcomes are shown in Appendix S5 along with the supporting CRD strategic objectives. The alignment of NATIH's activities are shown with the CRD strategic outcomes and objectives.

## 6.4 Other legal matters

### Relevant legal matters not covered elsewhere

- 6.3.5. Equality Impacts as per Equality Act 2010 equality considerations are central to the activities of NATIH for the project to be able to deliver against its objectives and benefits. An Equality Impact Assessment has been carried out, overseen by the University's Dean for Equality & Diversity, and is included in Appendix M11. The City Region Deal inclusive growth assessment is also appended (Appendix M14).
- 6.3.6. The proposed facilities for NATIH received planning approval in March 2022 (available [online](#)).

## 6.5 Project Schedule

- 6.5.1. The schedule for the establishment of NATIH is outlined within a Gantt Chart for ease of reference. It summarises the key dates for specific elements of the project, including the points at which service delivery will commence, initiating the contribution to the realisation of economic and social benefits.
- 6.5.2. The project plan is shown in Appendix M12 (as of August 2023). The project plan sets out the NATIH plan including RIBA stages, contract finalisation, construction and commissioning.

## 6.6 Sustainability

- 6.6.1 All areas of sustainability are prioritised for NATIH. Details around four specific areas are shown here and considerations around these elements are also included in the related risk management processes.

### **Environmental**

- 6.6.2 Environmental sustainability is at the very core of NATIH. All operations will be managed with this as an absolute priority. From a policy perspective, NATIH will operate in line with the University's published policy on environmental sustainability and this is included in Appendix M13. Environmental Impact Appraisals will be carried out as required, a case study showing how NATIH will reduce water and energy use is appended (Appendix M15).

### **Financial**

- 6.6.3 The structure of, and activities delivered by, NATIH have been designed so that the entity is financially sustainable through a mix of Government investment and revenue income. As the income generated from activities increases, the proportion of Government investment reduces as the business model matures.
- 6.6.4 The total project costs of NATIH amounts to £18.9m which is funded through the CRD grant (£17.0m), the University of Stirling (£0.9m) and the Wolfson Foundation (£1.0m). The financial case shows a development which with this initial investment of the CRD grant, will be sustainable, and in turn help to leverage £71.5m of additional income over the 10 year period.
- 6.6.5 Overall, the assessment and review undertaken by the University indicates that the associated risk profile is affordable, and the project is capable of being self-sustaining over the longer term, assuming the capital costs are met in full.
- 6.6.6 Market failures will be addressed through a variety of measures including supporting start-ups and this will also be monitored through the Monitoring & Evaluation Framework.
- 6.6.7 Further details are included within the Financial Case.

### **Economic**

- 6.6.8 The role that NATIH plays in contributing to economic recovery, following the pandemic, is clear and has driven the approach taken with regard to delivery of outputs in such a way that economic benefits can be realised as quickly as possible.
- 6.6.9 Across the city region the NATIH project will generate an additional £72.1 million (Gross Value Added) during the first 15 years of operation and sustain 97 additional jobs in the city region, contributing to the CRD aim to deliver new jobs across a wide range of sectors.

### **Social**

- 6.6.10 The social impacts of NATIH are detailed within the indicative Benefits Realisation Plan (Appendix M10). The policy drivers ensure that the sustainability of social impact is a priority for NATIH from establishment and throughout all its operations.

## 6.7 Carbon (Energy) Management

- 6.7.1 The University's principal aim in Carbon (Energy) Management is to drive down gas emissions via reductions in energy use and water consumption and to support the delivery of a greener, more sustainable campus environment. The University's key objective is to achieve net zero CO2 emissions by 2040 at the latest<sup>18</sup>.
- 6.7.2 The key activities to achieve the University's objective are shown below.
- Systematically replacing ageing and inefficient campus infrastructure
  - Upgrading the energy efficiency of our buildings through better insulation, cladding and glazing
  - Developing green and cost-effective alternatives to our Combined Heating and Power (CHP) plant (e.g. solar, wind and/or geothermal)
  - Installing air and soil heat pumps, and biomass heating systems across the campus
  - Prioritising sustainability projects in capital expenditure
  - Exploring options for upgrading and repurposing our buildings before new developments are considered (in line with our Campus Master Plan), and ensuring new and refurbished buildings are constructed to the highest environmental standards wherever possible
  - Reducing water consumption by 50% by 2030
  - Exploring smart grid technology and cross-boundary energy options
  - Promoting responsible energy consumption and behaviours via our Green Champions Programme
  - Working with regional partners to find solutions to poor regional transport infrastructure
  - Promoting green travel options
  - Adopting a 'whole systems' approach to support the transition to net zero by 2040
- 6.7.3 These above activities will shape the development and operation of the new NATIH facilities. For example, at this stage in the project NATIH will already seek carbon savings through the repurposing of buildings instead of new developments and improving energy efficiency.
- 6.7.4 The project brief asked for tenders to ensure the project *"is designed, constructed and maintained in a manner which meets the University's net zero carbon aspirations and sustainability requirements."* The preferred bidder ([Robertson](#)) committed to meet the University's aspirations by reducing and monitoring impact through a whole life carbon approach:
- 6.7.5 Robertson's approach to sustainability ensures minimised impact on the environment, focusing on whole life carbon. This ensures that that the contractor will help to make informed design decisions to decarbonise at each project stage. Robertson will monitor impacts (waste, energy, water, transport, biodiversity, and carbon) through BRE's [SmartWaste](#) portal, made available to the University's project team.

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<sup>18</sup> Measured against a 2007/08 baseline

- 6.7.6 Environmental sustainability is an absolute priority for the University of Stirling. The University's Estates Directorate monitors the institution's carbon output and ambitious targets are set regularly to reduce this output on an ongoing basis.
- 6.7.7 The University's in-house Operations and Maintenance team, supported by a blend of external contractors, manage a planned preventative and legislative compliance maintenance regime across campus. In addition, the University has a full time Building Energy Management System Controls Engineer who is continually monitoring energy consumption and building environmental operating conditions to optimise use of energy and therefore carbon reduction.
- 6.7.8 Through this monitoring, appropriate guidance will be in place to ensure that carbon management in relation to the new NATIH facility meets these standards. This guidance will also be embedded within the operations and leadership of NATIH. Additionally, from a governance perspective, the Deputy Director of the Estates Directorate is a full member of the NATIH Project Board (shown in Appendix M4) and will ensure that carbon management remains a priority.

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