

Evaluation of the UK Research Partnership Investment Fund

Evaluation Plan

RAND Europe and Frontier Economics

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Prepared for Research England by Billy Bryan, Tamara Strabel, Emily Hutton, Katie O'Brien, Susan Guthrie, Maria Guijon and Danail Popov



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Executive summary

The UK Research Partnership Investment Fund (UKRPIF) aims to address the need for support and investment at the mid-range scale for higher education (HE) capital projects while promoting collaboration with industry and increasing private-sector investment in higher education providers (HEPs) research. £900 million of UKRPIF funding has been allocated to 53 projects over six funding rounds. A further round, with £100 million of funding, will make awards in 2023 and 2024. The fund's objectives are to:

- a. Enhance the research facilities of HEPs undertaking world-leading research
- b. Encourage strategic partnerships between HEPs and other organisations active in research
- c. Stimulate additional investment in HE research
- d. Strengthen the contribution of the research base to economic growth.

Research England (RE) commissioned RAND Europe and Frontier Economics to conduct a programme-level evaluation assessing the effectiveness of the UKRPIF programme's investment in HEPs and the extent to which it has achieved its objectives: to enhance research facilities, encourage strategic partnerships, stimulate additional investment in HEPs and contribute to economic growth. This evaluation plan is the first of this evaluation's deliverables. It sets out the specific approach to process, impact and economic evaluation of the UKRPIF for implementation between mid-2023 and early 2028. The plan builds on evaluation work from the past five years and covers UKRPIF rounds 1–6.

The introduction of the report first sets out the context within which the evaluation will operate, including the approach taken to develop this deliverable, which included document review, secondary data analysis and a project lead workshop. Chapter 2 presents the literature review on best practices for evaluating research infrastructure, which the evaluation will follow (e.g. using theory-based evaluation to tackle the problem of impact attribution).

Chapter 3 covers process mapping – a description of the 'customer journey' through UKRPIF – which the process evaluation will use to understand to what extent UKRPIF enabled success of its projects via its design (e.g. by using double-match funding). Chapter 4 also includes stakeholder mapping: a tabular analysis of the main UKRPIF stakeholders. Chapter 5 summarises the characteristics of the portfolio of UKRPIF projects (e.g. by geography) as well as a mapping of project objectives at the UKRPIF level.

Chapter 6 includes an updated Theory of Change which details specific impact pathways within which UKRPIF aims to deliver on its objectives. Chapter 7 presents the approach to the process, impact and economic analysis, and the indicator framework, which acts as the blueprint for the evaluation. Finally, Chapter 8 summarises the plan for implementing the evaluation (i.e. when data will be collected).

The next step is to set a baseline for UKRPIF projects in autumn 2023 and to establish annual monitoring.

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Abbreviations

AH	Alternative Hypothesis
AI	Artificial Intelligence
APRL	Advanced Propulsion Research Laboratory
BEIS	Department of Business, Energy and Industrial Strategy
BERD	Business Expenditure on Research and Development
BIS	Department of Business and Industrial Strategy
BP	British Petroleum
BRC	Biomedical Research Centre
CA	Contribution Analysis
CCF	Connecting Capability Fund
CCN	Contractual Commitment Notice
CERN	European Organization for Nuclear Research
CRUK	Cancer Research UK
CY	Calendar Year
DARIAH	Digital Research Infrastructure for the Arts and Humanities
DfENI	Department for the Economy - Northern Ireland
DOI	Digital Object Identifier
DORA	Declaration on Research Assessment
DSIT	Department of Science, Industry and Technology
EDI	Equality, Diversity and Inclusion
ELI	European Light Infrastructure
EOI	Expression of Interest
EPSRC	Engineering and Physical Sciences Research Council
EQ	Evaluation Question
FB	Funded Bids
FTE	Full-Time Equivalent
FY	Financial Year
GBIF	Global Biodiversity Information Facility
GDP	Gross Domestic Product
GEOSS	Group on Earth Observation
GIAA	Government Internal Audit Agency

GSF	Global Science Forum
GVA	Gross Value Added
HE	Higher Education
HEBCI	Higher Education Business
HEFCE	Higher Education Funding Council England
HEFCW	Higher Education Funding Council Wales
HEI	Higher Education Institution
HEP	Higher Education Provider
HEIF	Higher Education Innovation Funding
HERD	Higher Education Research and Development
HESA	Higher Education Statistical Agency
HMT	His Majesty's Treasury
IAAPS	Institute of Advanced Automotive Propulsion Systems
ICGC	International Cancer Genome Consortium
IP	Intellectual Property
ITER	International Thermonuclear Experimental Reactor
ITT	Invitation to Tender
KE	Knowledge Exchange
KEF	Knowledge Exchange Framework
KPI	Key Performance Indicator
LIHE	London Institute for Healthcare Engineering
MCF	Multidisciplinary Characterisation Facility
MIF	Materials Innovation Factory
MRC	Medical Research Council
NAO	National Audit Office
NERC	Natural Environment Research Council
NHS	National Health Service
NIHR	National Institute of Health Research
OECD	Organisation of Economic
ONS	Office of National Statistics
PGR	Postgraduate Research
PGT	Postgraduate Taught
PH	Programme Hypothesis
PT	Process Tracing
QED	Quasi-experimental Design
QR	Quality Related
RAE	Research Assessment Exercise
RCIF	Research Capital Investment Fund
RCT	Randomised Control Trial

RE	Research England
REF	Research Excellence Framework
RI	Research Infrastructure
RO	Research Organisation
ROI	Return on Investment
SFC	Scottish Funding Council
SME	Small/Medium Enterprise
SMS	Scientific Methods Scale
SRO	Senior Responsible Officer
STEM	Science, Technology, Engineering and Mathematics
STFC	Science and Technology Facilities Council
TRAC	Transparent Approach to Costing
TSB	Technology Strategy Board
UAE	United Arab Emirates
UG	Undergraduate
UK	United Kingdom
UKRI	UK Research and Innovation
UKRPIF	UK Research Partnership Investment Fund
USA	United States of America
WCL	World Class Laboratories

1. Introduction

1.1. Context

The UK Research Partnership Investment Fund (UKRPIF) was created to address a need for support and investment at the mid-range scale for Higher Education Provider (HEP) capital projects whilst promoting strategic partnerships between HEPs and other research organisations and increase private sector investment in research. Set up by the Higher Education Funding Council for England (HEFCE), now Research England (RE), in 2012, the fund offers large scale investments of between £10 million and £50 million per project for HEPs, provided they could leverage double that investment in matched funding from non-public sector sources, termed ‘double-match’ funding.

The objectives of the fund are fourfold and remain unchanged since the infancy of the programme. These are as follows:

- a. Enhance the research facilities of HEPs undertaking world-leading research
- b. Encourage strategic partnerships between HEPs and other organisations active in research
- c. Stimulate additional investment in HE research
- d. Strengthen the contribution of the research base to economic growth.

The programme is implemented in rounds, with each round typically¹ operating through a two-stage application process whereby HEPs initially submit an assessed expression of interest application, after which they may be invited to prepare their full proposal for capital funding. Institutions are awarded on the basis that the UKRPIF fund for the development of their research infrastructure can increase their institutional capability to deliver research excellence, contribute to national research and innovation (R&I) ambitions, drive research partnerships and attract further private investments.

RE manages the UKRPIF on behalf of UKRI and the devolved funding bodies. Research and knowledge exchange functions, along with the responsibility for the UKRPIF programme, were transferred from HEFCE to RE on 1 April 2018, which was established as one of the nine councils of UKRI. Currently, the UKRPIF is the largest grant funding scheme by RE, having awarded £900 million of capital funding to 53 research centres and facilities over 6 rounds since 2012, with over three quarters of the projects now being operational, providing a collaborative space for academics, industry partners and SMEs to drive research

¹ Griniece E., A. Reid and J. Angelis (2015). ‘Evaluating and Monitoring Socio-Economic Impact of Investment in Research Infrastructures’. Technopolis Group. Tallinn, Estonia.

excellence. A seventh round of funding was launched in mid-2022, with tranche 1 awarded in April 2023 and tranche 2 funding decisions expected to be awarded in 2024.²

RAND Europe and Frontier Economics have been commissioned by RE to carry out a programme-level evaluation to shed light on the extent to which investment in HEPs through the UKRPIF programme has been effective in achieving the desired objectives to enhance research facilities, encourage strategic partnerships, stimulate additional investment in HEPs and contribute to economic growth. The importance of evaluating the return on investment in research infrastructure is particularly crucial, considering that such facilities are typically funded from public budgets.³ In the case of the UKRPIF, the double-match funding requirement ensures that the public investment in research infrastructure leverages double the amount of investment from private sources. However, progress towards the other key programme objectives is important to capture as well to understand the abundance of R&I impacts as well as the wider societal and economic benefits of this large programme.

1.2. Purpose of the report

This report is the first deliverable of this study. It provides an update based upon the 2019 evaluation framework and sets out the delivery plans for Phases 2 and 3, including a detailed project timeline and risk register.

1.2.1. Structure of the report

The report is structured as follows:

- Chapter 1: Introduction – this chapter summarises the context of this report, its background and how to navigate it.
- Chapter 2: Literature review – analysis of the evaluation literature around research infrastructure.
- Chapter 3: Process mapping – a description of the ‘customer journey’ through UKRPIF.
- Chapter 4: Stakeholder mapping – outlines the different stakeholders related to the UKRPIF programme
- Chapter 5: Portfolio analysis – charts and tables summarising UKRPIF projects.
- Chapter 6: Theory of Change – an updated logic model and narrative of the programme.
- Chapter 7: Evaluation framework and approach – summarises the overall approaches to the process, impact and economic analysis, and the indicator framework.
- Chapter 8: Implementing the evaluation – practicalities on evaluation delivery.

² Griniece E., A. Reid and J. Angelis (2015). ‘Evaluating and Monitoring Socio-Economic Impact of Investment in Research Infrastructures’. Technopolis Group. Tallinn, Estonia.

³ Griniece E., A. Reid and J. Angelis (2015). ‘Evaluating and Monitoring Socio-Economic Impact of Investment in Research Infrastructures’. Technopolis Group. Tallinn, Estonia.

1.3. Overview of methods used

The evaluation team conducted the following activities to inform this report:

- **Review of documentation and data, and scoping interviews:** We reviewed a number of documents, from the UKRPIF business cases, to project applications to previous UKRPIF evaluations. We also analysed UKRPIF portfolio data. Four scoping interviews were conducted with five UKRPIF stakeholders at RE.
- **Literature review:** An updated exploration of the literature around evaluating research infrastructure to ensure we are drawing on best practice for the evaluation design.
- **Portfolio review:** Overview of the nature and composition of the portfolio, to give an overview of the way funding has been invested as well as to support sampling, clustering and aggregation.
- **Stakeholder map:** A tabular typology of the various UKRPIF stakeholders at programme and project level, including a description of their relationship to UKRPIF as well as their relevance to and potential interaction with the evaluation (e.g. project leads as interviewees) to inform what evaluation questions apply to them and to avoid duplication.
- **Project mapping to UKRPIF:** An Excel map identifying how individual projects contribute to UKRPIF-level aims and objectives to later trace results from project to programme level.
- **Regular meetings with the UKRPIF team and a workshop project lead:** A summary note from the workshop is included in Annex A.

2. Literature review

2.1. Summary

The literature on assessing the impacts of investing in R&I infrastructure covering the benefits and challenges associated with different methodology, techniques and approaches is abundant. Previous empirical work devoted to exploring the impacts of research infrastructures has mostly focused on large-scale, internationally significant facilities, with fewer studies looking at mid-size facilities of local or regional importance.⁴ Existing studies on evaluating research infrastructure investments tend to measure a few key observable impacts, such as economic benefits, knowledge spillovers, and spin-offs and local economic effects.⁵ Comprehensive evaluations that are more extensive in their approach are less common, with little attention given to exploring wider societal and economic benefits beyond the more readily observable and easily measurable impacts.⁶ While there have been a few key theoretical contributions in the past decade aiming to address this gap by building coherent, comprehensive methodological models,⁷ there is still scope for further developments in the methodological toolbox of researchers and policymakers to address the unique challenges of evaluating investment in research infrastructures. The time lag in arising scientific return, impact attribution and additionality, retrospective data recall and unintended impacts are some of the commonly noted challenges associated with the evaluation of investment in research infrastructures, to which there are no one-size-fits-all solutions. Evaluating the UKRPIF programme raises further methodological challenges on top of these, due to the outstanding variety in scale, discipline and typology of the research infrastructures encompassed within the 53 projects of the programme.

⁴ Griniece E., A. Reid and J. Angelis (2015). 'Evaluating and Monitoring Socio-Economic Impact of Investment in Research Infrastructures'. Technopolis Group. Tallinn, Estonia.

⁵ Griniece E., A. Reid and J. Angelis (2015). 'Evaluating and Monitoring Socio-Economic Impact of Investment in Research Infrastructures'. Technopolis Group. Tallinn, Estonia.

⁶ Griniece E., A. Reid and J. Angelis (2015). 'Evaluating and Monitoring Socio-Economic Impact of Investment in Research Infrastructures'. Technopolis Group. Tallinn, Estonia.

⁷ See Roschow, R. et al. (2011). 'FenRIAM full guide. Proposal for a Foresight-enriched Research Infrastructure Impact Assessment Methodology'. Comunicare.ro; Griniece E., A. Reid and J. Angelis (2015). 'Evaluating and Monitoring Socio-Economic Impact of Investment in Research Infrastructures'. Technopolis Group. Tallinn, Estonia.

2.2. Introduction

This section provides a brief overview of existing literature on the evaluation of R&I infrastructure investments to inform the approach and methodology suitable for the programme-level evaluation of the UKRPIF programme. After a brief introduction of the national context in which the UKRPIF came about and a note on terminology, the review draws on existing academic and grey literature on R&I infrastructure investment evaluations and brings theoretical and empirical examples of the different methodologies and approaches used in previous evaluations. This literature review focuses on a few key studies that are of particular interest for the UKRPIF evaluation due to their methodological relevancy, while acknowledging that it is by no means a comprehensive, systematic review of the R&I evaluations relevant to this current study. Highlighting the benefits and challenges in the evaluation approach of selected studies allows us to distil learnings and implications most relevant to the evaluation of the UKRPIF programme. Finally, this section also draws on previous monitoring and evaluation (M&E) activities carried out to date for the programme-level understanding on the effectiveness of the UKRPIF programme in realising its objectives, deriving any lessons for the UKRPIF evaluation.

2.3. Understanding the context of UKRPIF and the need for programme level evaluation

2.3.1. Policy background

Why UKRPIF was established

Capital and infrastructure investment is key to underpinning a strong HE sector across the UK. To maintain the UK's competitiveness and attract talented researchers to the UK, and to ensure effective research translation, it is critical to ensure adequate access to high quality research facilities and the latest equipment needed for cutting edge research⁸. At the time that the UKRPIF was established, there were concerns being raised about the way in which these capital investments were being made and the level of investment. The 2010 comprehensive spending review had led to a flat cash settlement for the science budget, and there had been changes made to the funding arrangements. In England, the research funding from the then Higher Education Funding Council for England (HEFCE – the organisation providing core funding to English HEPs under the UK's dual funding system) was ring-fenced, with capital investment outside of that ring-fenced budget. This amounted to a significant cut – over 40% - in capital funding for HEPs.⁹ The devolved bodies (the Scottish Funding Council [SFC], the Higher Education Funding Council for Wales [HEFCW], and the Department for the Economy - Northern Ireland [DfENI]) much like HEFCE, faced similar challenges in balancing the need for capital investment with the constraints of their respective budgets.

At that time, large scale capital investments within the HE sector were made by the Science and Technologies Facilities Council (STFC), and there were also resources for capital investments in business-

⁸ Ulrichsen, T., B. Moore and R. Spires (2012). 'Strengthening the Role of English Higher Education Institutions in the Innovation System: Knowledge Exchange and HEIF Funding'. PACEC Report to HEFCE, April.

⁹ UK Parliament (2013). 'Chapter 2: Key Issues'.

led innovation infrastructure available through the Technology Strategy Board (TSB). However, there were concerns that these capital investments were not always underpinned by a wider strategy, and often there were significant gaps in planning – for example, capital investment was in some cases undermined by a lack of operational resources meaning the potential of large infrastructure investments may not be realised. One important gap identified by a 2013 inquiry by the House of Lords Science and Technology Select Committee¹⁰ was a lack of investment in critical mid-range capital projects, i.e. smaller projects than the scale of investments made by STFC but larger than could be covered within business as usual by HEPs (e.g. within an individual research grant). This had also been previously raised by the 2010 Wakeham review, which had recommended that the Research Councils and funding bodies across the UK should support more regional collaboration and sharing of equipment and resources. More widely, successive parliamentary reports had suggested that the UK's excellent research base had not been capitalised upon, and that the potential to translate this strength into benefits for society and the economy had not been realised.¹¹

The UKRPIF programme launched in 2012 within a climate of declining business investment in research and development (R&D) in the aftermath of the 2008 financial crisis¹². Parliamentary reports from the time highlighted that while the UK was highly regarded internationally for its science and engineering capabilities and for its role in addressing global problems, such as climate change, food, water and energy security, there was a concern that this national strength was not translated into commercial technologies, and, ultimately, to economic growth.¹³ There was recognition that support for the better translation of R&I outputs into commercial applications was needed to stimulate and facilitate national economic gain, as well as for the social and commercial application of these advancements.¹⁴

Changes to the landscape over the lifetime of UKRPIF

The UK research funding landscape is complex, reflecting the devolved nature of the UK's political structure. Some aspects of research funding are centralised, though many aspects remain devolved to the individual nations. This balance between centralised and devolved funding allows for a research funding landscape that is both coordinated and responsive to the specific needs and priorities of each nation.

¹⁰ UK Parliament (2013). 'Chapter 2: Key Issues'.

¹¹ HC (2009). 'Engineering: turning ideas into reality'. House of Commons Innovation, Universities, Science and Skills Select Committee, Fourth Report of 2008-09, HC 50, 27 March; HC (2010) 'The impact of spending cuts on science and scientific research'. House of Commons Science and Technology Select Committee, Sixth report of 2009-10, HC 335, 23 March; HC (2011) 'Technology and Innovation Centres'. House of Commons Science and Technology Select Committee, 2nd Report of 2010-2012, HC 619, 17 February.

¹² Technopolis Group (2019). 'An evaluation framework for the UK Research Partnership and Investment Fund (UKRPIF)'. February, 2019.

¹³ HC (2009). 'Engineering: turning ideas into reality'. House of Commons Innovation, Universities, Science and Skills Select Committee, Fourth Report of 2008-09, HC 50, 27 March.

¹⁴ HC (2010). 'The impact of spending cuts on science and scientific research'. House of Commons Science and Technology Select Committee, Sixth report of 2009-10, HC 335, 23 March.

The central component of the UK research landscape is UK Research and Innovation (UKRI), a body that brings together the seven research councils, Innovate UK, and RE. UKRI is responsible for funding research and innovation across the UK. RE distributes research funding to HEPs in England, and within Scotland, Wales and Northern Ireland, the devolved funding bodies are responsible for distributing research funds in alignment with their respective governments' strategic objectives within the context of wider UK and regional strategies. While each nation has its own funding policies and priorities, the overall goal is to support a strong research base across all four nations.

Over the lifetime of the fund there have been significant changes both in the HE landscape, and in the ways in which capital funding has been organised and administered. A critical, relevant change has been the change in structure and organisation for the body administering the UKRPIF. In 2017, HEFCE was split into two bodies, the Office for Students (OfS), and RE which now administers the fund. RE took on the research-oriented aspects of HEFCE's functions, including running the REF exercise on behalf of all four HE Funding Bodies across the UK, distributing Quality Related (QR) funding to institutions and administering research-oriented funding including, but not limited to, UKRPIF. Responsibility for the educational aspects of HEPs passed to OfS, which includes providing capital funding for education purposes (e.g. facilities for teaching technical subjects, or to support flexible provision and modes of delivery such as e-learning). In 2021-2022, this amounted to £250 million total, £19 million of which was for existing commitments, national facilities and regulatory initiatives and £131 million to HEPs as a mix of formula capital (£7.4 million) and capital bidding exercise (£123.6 million) in investment to HEPs.¹⁵ These resources are distinct from the research-oriented resources that are managed by RE.

Alongside this division of responsibilities, RE was also brought within the umbrella of the newly established UKRI, a cross-disciplinary organisation bringing together the Research Councils as well as Innovate UK (previously TSB) with the intention of improving collaboration, driving efficiency and, particularly, supporting multi and interdisciplinary research.

As part of the wider UK Industrial Strategy, in 2017 the government pledged to increase R&I investments to 2.4% of GDP by 2027, which was estimated to have the potential to unlock as much as £80 billion worth of R&I investments from public and private sources combined within a decade.¹⁶ More recently, the government announced plans to allocate £39.8 billion of the R&I budget for 2022-2025 to drive national ambitions to become a science superpower.¹⁷ Furthermore, in a newly unveiled governmental plan to 'cement the UK's place as a science and technology superpower by 2030', the government has committed to ensure researchers can access high-quality physical and digital infrastructure that attracts further private and public investment, strategic partnerships, talent and cutting-edge discoveries, backed with over £370 million.¹⁸

¹⁵ IFS (n.d.). 'Higher education'; OfS (2021). 'Guide to funding 2021-22'.

¹⁶ Gov.uk (2017). 'Record boost to R&I and new transport fund to help build economy fit for the future'. Governmental press release. 20 November 2017.

¹⁷ Gov.uk (2022). 'Government announces plans for largest ever R&I budget'. Governmental press release. 14 March 2022.

¹⁸ Gov.uk (2023). 'Plan to forge a better Britain through science and technology unveiled'. Governmental press release. 6 March 2023.

Following a peak of capital expenditure across the entire UK universities estate in 2019 of £3.5 billion,¹⁹ investment is expected to fall following significant losses across the sector as a result of the pandemic – estimated by the Institute for Fiscal Studies at between £3 billion and £19 billion.²⁰ According to Universities UK,²¹ this is having significant impacts on plans for capital investment across all devolved nations. In this context – with a diversity of mechanisms for investment in capital projects, but also concerns about funding going forward – there is an increased need to understand how funds such as UKRPIF operate, what they achieve and how they can be improved to ensure they are delivering value for taxpayers’ money.

HEPs also draw on other resources for capital investment including private investment and charity funding as well as wider internal resources, including those coming from student tuition fees. There are different tuition fee policies across the UK nations, further contributing to the diverse landscape for capital investment in the HE sector. Undergraduate students pay £9,250 in England, £1,820 in Scotland (for Scottish and Irish students), £9,000 in Wales, and £4,030 in Northern Ireland. Inflation has put pressure on the tuition income per student. In England, for example, tuition fees have been capped at £9,250 since 2017, this means that by 2025 there will effectively have been a long-term cut to university per student incomes by around a third.²²

It is within this national context that the UKRPIF programme has been delivered, supporting HEPs in the development of state-of-the-art research infrastructure to undertake world-leading research. Research infrastructures are essential in HEPs’ function as education or public service providers, offering external users access to physical and digital resources,²³ further fostering strategic partnerships that contribute to human capital, talent and skills conglomeration.

Wider investments complementary to UKRPIF

Working within the UKRI landscape there are a number of investments that share at least one of the aims of UKRPIF. Not all are based within RE, but one example is that RE co-hosts with Innovate UK the UKRI Strength in Places Fund (SIPF). SIPF funds both revenue and capital investments, including buildings, with the objectives of supporting innovation led relative regional economic growth and enhancing local collaborations. It has a strong emphasis on business innovation and the aim is to develop local economic impact in defined economic geographies. It was funded by the National Productivity Investment Fund, now Strategic Programmes, and has a separate governance structure to RE funded programmes reflecting the programme design/operations. UKRI additionally has a wider Infrastructure Fund, with £481 million being invested into a portfolio of R&I infrastructure projects between 2022 and 2025.²⁴ Funding is allocated across

¹⁹ AUDE (2023). *Higher Education Estates Management Report*.

²⁰ IFS (2020). ‘COVID-19 pandemic puts several universities at risk of insolvency’.

²¹ Universities UK (n.d.). ‘Achieving stability in the higher education sector following COVID-19’.

²² Institute for Policy Research (2022). ‘Universities call for a tuition fee rise – here’s what that would mean for students and taxpayers’.

²³ European Commission (2019). ‘European Research Infrastructures’. European Commission, Directorate-General for Research and Innovation.

²⁴ UK Research and Innovation (n.d.). ‘Infrastructure Fund projects’.

a range of disciplines such as the arts, physics, life and environmental science, social science and medicine. The fund aims to address a breadth of societal issues, from climate change to adolescent mental health.

In addition, Higher Education Innovation Funding (HEIF)²⁵ – which predates UKRPIF, having been first established in 2001 – provides £260 million per year of formula-funding for UK HEPs to support knowledge exchange activities. The Connecting Capability Fund (CCF)²⁶ was established in 2017-18 as the government allocated £100 million funding focused on incentivising universities to collaborate in research commercialisation. The CCF funding aims to connect English HEPs to stimulate effective commercialisation and collaboration with businesses. An initial £15 million was provided as a supplement to the HEIF formula and £85 million supporting competitive project funding as a complement to the core funding mechanism. Both knowledge exchange funds are complementary to UKRPIF in that they support collaboration with industry, but do not provide funds for capital investment.

Other UKRI large scale investments have also endeavoured to promote and enhance cross-sector collaboration, including the Industrial Strategy Challenge Fund, and several Innovate UK funding mechanisms.

From a capital investment perspective, STFC retains responsibility for large scale infrastructure investments such as those on the Harwell Campus, and individual research councils also have discipline specific investments in large centres or other pieces of infrastructure of national importance – for example, NERCs six research centres which are directly supported as part of the council's activities.

At an individual HEP level, capital support is provided by RE through the Research Capital Investment Fund (RCIF), a formula-based funding mechanism which provided £206 million in support in FY2022-23.²⁷ Additional formula allocations have been made in recent years including in FY2020-21, a further £88 million in capital investment was provided through UKRI's World Class Laboratories Fund, administered by RE in collaboration with the devolved administrations, following the publication of the UK's Research and Development Roadmap which placed a significant emphasis on infrastructure investment. Further, in FY2022-23, an additional RCIF allocation of £70.65 million was made to address ongoing uncertainty over access to EU programmes, plus two further supplementary RCIF allocations of £3.87 million and £25 million.²⁸ In the devolved nations, the SFC, the HEFCW, and the DFENI also allocate formula capital to their respective HEPs, through slightly different mechanisms and policies. The devolved funding bodies work alongside RE and UKRI to ensure a unified approach towards capital investment across the UK, considering the specific needs and priorities of institutions in each nation.

More widely, there also other sources of investment that support capital projects. NIHR supports infrastructure investment in health research specifically, with interesting models such as Biomedical Research Centres (BRCs) particularly aiming to drive collaboration between universities and healthcare providers with the intention of promoting research and innovation uptake in healthcare settings.

²⁵ UK Research and Innovation (n.d.). 'Higher Education Innovation Funding'.

²⁶ UK Research and Innovation (n.d.). 'Connecting capability fund'.

²⁷ Research England (2022). 'Research England grant allocations for 2022-23'.

²⁸ Research England (2022). 'Additional QR and Additional RCIF grant allocations 2022 to 2023'; Research England (2022) 'Supplementary QR and supplementary RCIF allocations 2022 to 2023'.

Evolution of UKRPIF aligned to scientific and political priorities

UKRPIF has also evolved over this period, reflecting changes in scientific and political priorities. Most notably, in response to the Net Zero agenda,²⁹ UKRPIF has created a dedicated pilot funding initiative which aims to support capital investments which can reduce the carbon emissions from existing UKRPIF investments. The aim of this £18.9 million investment is to make existing research more environmentally sustainable, and also promote learning and development of good practice regarding sustainable capital projects in the HE sector. Understanding the ways in which UKRPIF has been able to adapt to a changing political and societal landscape (with a range of exogenous shocks over its period of operation, such as the UK's departure from the EU, the Covid-19 pandemic, and more recently increases in energy prices) and maintain its relevance will be an important aspect of the evaluation.

The changes to the political and societal landscape have also been reflected elsewhere in the HE sector. For example, we have seen a significant increase in focus on equality, diversity and inclusion (EDI) in R&I investment,³⁰ and more recently also an increased level of reflection on research culture.³¹ More widely we have seen an increased focus on conducting high quality evaluation to provide both accountability for the investment of taxpayer money, but also in parallel an increasing concern about the level of research bureaucracy,³² and reforms in the way in which research assessment takes place with several standards around this (most notably DORA)³³ gaining international support. Although prior investment should be evaluated on its own terms and in the context of its aims, exploring the extent to which the premise for the establishment of UKRPIF, its aims and its parameters are still relevant in 2022 and for the future will be important to support effective future investment.

Demonstrating the benefits from capital investment

Existing evidence points to significant benefits from capital investment. Prior work by Frontier Economics³⁴ has shown that capital expenditure can offer benefits across teaching, research and knowledge exchange at HEPs. Our work demonstrated that an increase in capital spending of £5m over five years is associated with an increase of c.100 additional FTE students (though this varies by institution type) and an increase of c.£500k in income from contract research and consultancy activities. An additional £3 million in investment in capital of three years was found to be associated with an additional 13 research students in research-intensive universities.

There is also existing evidence from prior reviews that UKRPIF is delivering benefits – though that there may be areas for improvement; a sample of 8 UKRPIF investments were included in a 2016 NAO review of the Department of Business, Energy and Industrial Strategy (BEIS)'s capital investments,³⁵ which though

²⁹ UK Research and Innovation (2023). 'UK research partnership investment fund'.

³⁰ UK Research and Innovation (2023). 'EDI strategy and action plans'.

³¹ UK Research and Innovation (2023). 'Research and innovation culture'.

³² UK Research and Innovation (2023). 'Independent review of research bureaucracy published'.

³³ DORA (n.d.).

³⁴ Frontier (2015). 'A Review of HEFCE Capital Expenditure'.

³⁵ NAO (2016). 'BIS's capital investment in science projects'. Report by the National Audit Office, HC 886 Session 2015-16, 10 March.

critical of BEIS's overall approach to the appraisal and evaluation of science capital projects, was positive about the UKRPIF scheme and the extent to which HEFCE (at the time) has ensured projects were sustainable and would deliver scientific and economic benefits. An interim review of UKRPIF was published in 2018, looking at activities and early outputs based on monitoring data and a series of case studies.³⁶ The review found that over the period 2012-2016, UKRPIF funding accounted for approximately a quarter of capital expenditure by UK HEPs on non-residential buildings. By 2017, the fund was exceeding its aim of double match funding investment, with a total of £1.73 billion in co-investment committed against £681 million in UKRPIF grants. The interim evaluation also concluded that the fund was broadly meeting its other aims, with evidence that research facilities were being enhanced, strategic partnerships had been developed, further funding had been leveraged to support additional research, and positive impacts demonstrated on the research community's ability to contribute to wider innovation and business growth. It was considered too early to demonstrate impacts on job creation and local supply chains, but the evidence in place was sufficient to suggest that this might be a likely outcome over the longer term.

Further work produced in 2019³⁷ set out a theory of change for the fund, structured around its 4 objectives, which provides a more granular picture of the potential intended impacts of the fund. These are diverse, spanning prestige, skills development, research quality, industry investment and collaboration, and economic growth.

Beyond this external work, RE has continued to capture evidence through ongoing monitoring efforts, on the impact of the fund. With 44 projects now complete, benefits have started to be realised,³⁸ including:

- increase in translational research transforming discovery science into healthcare solutions
- standard-setting and thought leadership establishing research centres in the UK as leaders of industry standards
- positive impact on international collaborations including partnerships with universities, industry and charities outside of the UK
- co-location of academic staff with industry representatives and partner employees, fostering knowledge exchange and shared expertise across groups
- positive impact on research outputs such as academic papers, policy white papers, licences and patents
- changes to operating models, including the replacement of dispersed research equipment spread across labs, by single, open-plan laboratories

³⁶ Hall, M. et al. (2018). 'Interim Evaluation of the UK Research Partnership Investment Fund'. Report to Research England by Belmana and the Centre for Enterprise and Economic Development Research, Middlesex University. July 2018.

³⁷ Technopolis Group (2019). 'An evaluation framework for the UK Research Partnership and Investment Fund (UKRPIF)'. February, 2019.

³⁸ UK Research and Innovation (2023). 'UK research partnership investment fund'.

- positive impact on market readiness of research for use by consumers and society with products rolled out, patent applications and revenues from intellectual property
- increase in PhD student numbers and post-doctoral research associates linked to the prevalence of industry sponsorship in UK Research Partnership Investment Fund facilities.

However, evidencing the benefits – and identifying the areas of improvement – for capital investments can be challenging. One of the key challenges is how to address additionality and attribution. The use of equipment and premises supported through capital funding is often assessed through the lens of project-based grant funding making the disentanglement of value added challenging. This is not only because of the blurred lines between the use of equipment and broader project work but also because evaluation metrics development and methodologies are poorly developed to surface the contribution of capital funding. The evaluation approach detailed later in this report was designed with this in mind, tailoring both the metrics used and the approach to the evaluation of capital investment – considering the UKRPIF investment as an enabling platform which drives capability development and investment, and using contribution analysis and process tracing methodologies to unpack and delineate the role and contribution of the capital investment in a complex landscape.

2.3.2. Typology

The terminology in use in the relevant academic literature and policy arena is consistent when it comes to defining research infrastructures, albeit with slight differences when it comes to typifying them. Within the context of this evaluation, the UKRI definition of R&I infrastructure is adopted, referring to physical or digital facilities fundamental for carrying out research activities, including large-scale physical establishments, equipment, knowledge-based resources and tools which underpin daily activities and boost capacity for advancements.³⁹ It is also useful to further differentiate between single-sited and multi-sited, or distributed R&Is, where distributed infrastructure consists of a network of facilities, resources, services in different sites that are managed in a co-ordinated way.⁴⁰ Table 1 demonstrates the typology of R&I infrastructure as understood in this report and provides illustrative examples.

³⁹ UK Research and Innovation (2023). ‘Creating world-class research and innovation infrastructure’.

⁴⁰ Roschow, R. et al. (2011). ‘FenRIAM full guide. Proposal for a Foresight-enriched Research Infrastructure Impact Assessment Methodology’. Comunicare.ro.

Table 1: Typology for R&I infrastructure with examples⁴¹

R&I type	Description	Example
Single-site facility	Distinct research entity or a unified body of equipment at one physical location.	Diamond Light Source Joint European Torus (JET) ISIS Neutron and Muon Source Medical Research Council (MRC) Biomedical NMR Centre
Multi-site or distributed facility	Network of geographically separated facilities that jointly perform or coordinate research functions based on a common scientific theme. This can comprise collections, archives and scientific libraries, among others.	UK National Ion Beam Centre (UKNIBC) Centre for Science at Extreme Conditions (CSEC) Northern Ireland Clinical Research Network (NICRN) National Wind Tunnel Facility Network ELIXIR
Virtual facility	ICT-based systems used for research. This can comprise high-performance communication networks, large datasets and computing facilities, among others.	ARCHER UK national supercomputing service Met Office Unified Model (UM) European Social Survey (ESS) GBIF (Global Biodiversity Information Facility)

Source: RAND Europe.

Investment in R&I infrastructure can broadly be distinguished by public and private, as well as joint public-private endeavours, with the aims and scales of the programmes potentially varying significantly depending on the source of funding.⁴² UKRPIF is publicly funded and is a UKRI scheme managed by RE on behalf of the devolved funding bodies of HEFCW, DfENI and SFC. It also has an important element in drawing in further investment from non-public sources through the double match funding requirement.

2.4. Overview of theoretical and empirical literature on the different approaches to evaluating investments in R&I infrastructure and their implications for the UKRPIF evaluation

2.4.1. Theoretical literature on evaluating investment in R&I infrastructure

In the absence of a well-established tradition of regularly subjecting research infrastructure investments to evaluations, previous empirical studies have relied on a wide variety of approaches and methodologies, including solely quantitative and qualitative methods, as well as mixed-method studies.

In this regard, an important contribution to the theoretical literature is the FenRIAM methodological framework for assessing the socio-economic impacts of research infrastructures developed by Roschow and

⁴¹ This typology and examples are drawing heavily on Griniece and colleagues, as well as on the study by OECD Global Science Forum. See more in Griniece E., A. Reid and J. Angelis (2015). ‘Guide to Evaluating and Monitoring Socio-Economic Impact of Investment in Research Infrastructures’. Technopolis Group. Tallinn, Estonia.; OECD (2014). ‘Report on the Impacts of Large Research Infrastructure on Economic Innovation and on Society: Case Studies at CERN’.

⁴² Imperial College (n.d.). ‘Types of research funding’.

colleagues⁴³ as part of a European Commission funded project. In their typology, they differentiate between single-sited research infrastructure (RIs) versus distributed RIs, and they introduce an understanding of RI lifecycles correlated with the building and use of the facilities: construction phase, operational phase, and fading out in the long run. Their framework aims to provide a common ground for assessing the socio-economic impact of RIs, which is particularly valuable as researchers are often faced with a vast array of methodological tools to choose from when it comes to such evaluations. They provide a coherent, step-by-step guide for making decisions about the research approach best suited to the particular study, complemented with various resources for impact assessment including list of performance indicators and templates for data collection and analysis. The backbone of their framework consists of various modules divided into broad sub-categories with respective lists of performance indicators, recommended data sources, data collection methods, and templates provided for each. Table 2 below demonstrates the various possible impacts of RIs beyond the expected scientific breakthroughs and return on innovation and technology.

⁴³ Roschow, R. et al. (2011). 'FenRIAM full guide. Proposal for a Foresight-enriched Research Infrastructure Impact Assessment Methodology'. Comunicare.ro.

Table 2: Socio-economic impacts of RIs

RI Socio-Economic Impacts: Some Examples	
S+T: Science, Technology & Innovation	<ul style="list-style-type: none"> • New services and opportunities for users and customers • New knowledge and skills (scientific papers) • New methods, techniques, and applications • Mutual learning, knowledge exchange, spill overs • Intellectual Property Rights • New instruments and products • Joint R&D projects with industry • New science and innovation networks • Opportunities for spin-offs and start-ups
JOBS: Work & Population	<ul style="list-style-type: none"> • New directly and indirectly created jobs • Increased economic activity by RI expenditure • Training and skill development (scientists, general staff) • Research training for students • Career opportunities and Life Long Learning • Support of gender balance • Highly-skilled workers for the labour market • Critical mass and synergy effects with other facilities
LIFE: Quality of Life	<ul style="list-style-type: none"> • RI shaping cultural life and lifestyles • Increased cultural diversity affecting attitudes and behaviours • Better socio-cultural skills and language skills • New medical instruments, diagnostics, treatments • Improved community services (health care, education...) • More public awareness of benefits from science • Increased social cohesion
LIFE: Quality of Life	<ul style="list-style-type: none"> • New ecological knowledge, technologies, standards and controls leading to improved sustainability • Better services for energy, water, materials and waste • Impacts on biodiversity of local habitats

Source: Roschow et al. 2011. 'FenRIAM full guide', 20.

A key technique recommended by the FENRIAM framework is to consider the time and spatial specification at the scoping exercise of the impact assessment, ensuring that RIs being compared or examined as part of a project are analysed within the same scope of time horizon and spatial area of impact.

- The **time horizons** within which the impact of RIs is being assessed can significantly influence what performance indicators may be measurable, but can also pose challenges for understanding impact attributability. This is especially relevant in the case of evaluating UKRPIF given that projects are in various phases within their own lifecycle and therefore there might be variations in their measurable impact as well.
- Similarly, the **specification of a spatial scope** is important to be set at the start of the impact assessment, as it has repercussions on the data collection methods, the types of stakeholders holding relevant information, and ultimately the findings. Exploring the socio-economic impact of RIs within a narrow local level may differ significantly from the same analysis on

a regional or country level, especially as the impacts could be diluted when analysing through a larger spatial scope.

The FenRIAM framework is especially valuable as it acknowledges that the impacts of RIs on the region and community in which they operate in can be varied in their nature. Socio-economic impacts may be ‘characterized as short-termed or delayed in time, direct or induced, desired or unexpected, easy to monitor or “below the radar”’.⁴⁴ The authors respect the complexity of the matter and encourage evaluators to carefully tailor the framework to increase its relevancy to the specific context. Through this framework, they offer a comprehensive toolbox and recommendations that can be adapted, moulded and expanded to the needs of the RI impact assessment at hand.

Another key contribution to the conceptual literature on understanding the return on investment in RIs is the impact assessment scheme developed by Technopolis,⁴⁵ which provides a similar practical guidance to the FenRIAM, while acknowledging that each RI is conditioned in its own socio-economic context and therefore there is no ‘one-size-fits all’ approach. In their typology they follow the tradition of previous studies and differentiate between single-site and multi-site facilities, as well as between mobile and virtual facilities. Drawing on the FenRIAM model, they also adopt a lifecycle approach to understanding RIs and differentiate between the construction and operational phase. They use a lifecycle approach to break down the evaluation itself into a construction phase and operational phase. Complete with a logic structure that details the causal relationship between the different inputs and impacts, as well as a list of performance indicators and examples of required data, their model provides a helpful starting point for researchers while leaving room for tailoring the model to specific needs. Their example evaluation logic is particularly useful to draw on as it explores a wide set of impacts, which they categorise under five umbrellas:

1. Economic impact
2. Innovation impact
3. Human resource impact
4. Scientific impact
5. Societal impact.

While this framework offers a well-structured logic model, it is specifically designed for assessing the return on investment in one piece of single, or multi-sited research infrastructure. Evaluating UKRPIF at the programme-level requires a more bespoke approach due to the complexity of assessing the overall impact of a number of individual projects, themselves varying greatly, and include large-scale, highly distributed research infrastructures.

2.4.2. Past empirical work on evaluating investment in R&I infrastructure

Empirical studies assessing the role of RIs and high-quality research equipment in scientific advancements, innovation and socio-economic benefits have mostly focused on the returns on investment in internationally

⁴⁴ Roschow, R. et al. (2011). ‘FenRIAM full guide. Proposal for a Foresight-enriched Research Infrastructure Impact Assessment Methodology’. Comunicare.ro, 20.

⁴⁵ Griniece E., A. Reid and J. Angelis (2015). ‘Evaluating and Monitoring Socio-Economic Impact of Investment in Research Infrastructures’. Technopolis Group. Tallinn, Estonia.

significant large-scale research infrastructures, such as CERN or the Diamond Light Source. In addition, several studies have explored the role of universities in contributing to knowledge exchange and the commercialisation of research outputs, particularly by focusing on capital expenditure in teaching and research facilities at HEPs. This sub-section looks at a few selected empirical studies that are of particular relevance for the UKRPIF evaluation due to their methodological relevancy, while acknowledging that it is not a systematic review and that a plethora of further empirical studies may be relevant to draw on for further breadth and depth on the subject matter.

The role of HEPs as crucial components to strengthen knowledge exchange capabilities have long been recognised, especially as they sit ‘at the intersection of research, education and innovation’.⁴⁶ An econometric investigation of the impacts of capital expenditure in HEPs teaching and research facilities on research and business interaction outcomes by Frontier Economics⁴⁷ found that an increase in capital spending leads to significant positive changes at HEPs, including an increase in student numbers, researchers and income from consultancy and contract research. More general studies assessing the impacts of investment in HEPs have shown that high-quality infrastructure and equipment play an important role in advancing the translational capacity of HEPs from research outputs to societal and economic gain.⁴⁸

Being a renowned particle physics research facility of critical national and international significance, multiple studies have aimed to assess the complex impacts emerging from the investment in CERN. In a study by OECD Global Science Forum (GSF), four qualitative case studies were carried out at CERN to understand the economic and societal impacts of the facility and to derive generalisable lessons for researchers and policymakers on the challenges of measuring the wider impacts of large-scale infrastructure projects.⁴⁹ While the GSF considered using some of the quantitative metrics typical to the methodological toolbox of evaluators when measuring the outcomes of investments in research (including for instance the number of PhDs granted and number of peer-reviewed scientific publications), they eventually refrained from using those due to the continuous increase in such metrics which are naturally expected with resource increases in such institutions. The GSF relied purely on qualitative methods to draw out those less easily observable and measurable outcomes and impacts in a more flexible way, carrying out four case studies, analysing relevant literature, and interviewing key CERN and non-CERN experts and stakeholders. Key to their study was the separation of impact categories into discretionary and non-discretionary impacts, depending on whether the impacts are realised in a quasi-automatic way or through a more directed effort and purposeful resource allocation. The discretionary impact categories include some of the more visible impacts that arise from the construction and operation of the research facility, including purely scientific impacts and direct or indirect economic impacts. The non-discretionary impact categories include innovations that can become external impacts with some level of additional effort.

⁴⁶ Ulrichsen, T., B. Moore and R. Spires (2012). ‘Strengthening the Role of English Higher Education Institutions in the Innovation System: Knowledge Exchange and HEIF Funding’. PACEC Report to HEFCE, April 2012, 1.

⁴⁷ Frontier (2015). ‘A Review of HEFCE Capital Expenditure’.

⁴⁸ Ulrichsen, T., B. Moore and R. Spires (2012). ‘Strengthening the Role of English Higher Education Institutions in the Innovation System: Knowledge Exchange and HEIF Funding’. PACEC Report to HEFCE, April 2012.

⁴⁹ OECD (2014). ‘Report on the Impacts of Large Research Infrastructure on Economic Innovation and on Society: Case Studies at CERN’.

In a later study at CERN, the UK Science and Technology Facilities Council (STFC) commissioned Technopolis to evaluate the breadth of scientific, economic, and social impacts emerging from the national investment in CERN.⁵⁰ Methodologically, the evaluation drew on documentation and data analysis, stakeholder interviews, surveys, bibliometric analysis and a series of case studies. The national benefits derived from CERN are multifaceted and often intertwined, which Technopolis organised under the four broad impact areas of research, innovation, skills, and scientific diplomacy. Within these areas, they developed 12 impact pathways, with a causal chain of input, outcome and impacts within each pathway.

In developing a M&E framework for STFC for future impact assessment purposes, Technopolis suggested improvements to data collection activities and methodological challenges specific to the evaluation of this large-scale research infrastructure. These included:

- Making sure that the gaps in available evidence and data is addressed through a more consistent cataloguing of achievements and additional periodical data collection exercises.
- Improving the overall understanding on the types of impacts that the RI might have.
- STFC to improve its methodological toolbox that can catalyse future evaluation activities through the help of coherent frameworks and schemes to help researchers deciding on a coherent approach. These can be off-the-shelf methodological models, but with room to tailor for specific circumstances and create bespoke evaluation logic based on them.

A socio-economic impact study was undertaken by Technopolis in 2018-2019 to measure the scientific, technological, societal and economic benefits of Diamond through a range of quantitative and qualitative research methods.⁵¹ Established in 2002 and funded jointly by the UK Government and Wellcome, Diamond is a non-profit research organisation that is set out to advance scientific knowledge on global challenges through cutting-edge research, and is a centre for global synchrotron science. The study relied on desk research, surveys, interviews and case studies to assess the impacts of the facility. Their study intended to estimate the cumulative monetised impact of Diamond, while also acknowledging that some of the wider societal impacts are challenging or impossible to do so. Therefore, their approach includes a high degree of quantification across the different impact pathways to monetise the benefits arising from the RI. The metrics they worked with were organised into scientific, technological, societal and economic impacts, with the performance indicators relying on data that could be derived from the RI itself, or otherwise obtained by evaluators through data collection exercises. A key lesson from the research is that the true value of this important national infrastructure cannot be fully uncovered as the benefits arising from the RI will continue to emerge for longer than the scope of the evaluation itself.

⁵⁰ Technopolis Group (2020). 'Evaluation of the Benefits that the UK has derived from CERN'. Main Report, August 2020.

⁵¹ Technopolis Group (2021). 'Socio-economic impacts of Diamond Light Source'. Report by Technopolis Group and Diamond, 4 June 2021.

2.4.3. Typical methodological challenges

The methodological challenges commonly associated with research infrastructure evaluations are further complicated by the nature of the UKRPIF programme, which encompasses 53 research centres and facilities awarded over six separate funding allocation rounds with about £900 million of capital funding, spanning a wide array of sizes, types of infrastructures and disciplinary focus.

Drawing on theoretical and empirical literature, the typical challenges posed by RI investment evaluations include, but are not limited to, the following:

- **Time lag and timepoint variety in arising impacts.** The scientific return of RIs may become realised considerably later than the setting-up of the facility or purchase of advanced equipment. Furthermore, the wider social and economic impacts on the region and community may also emerge late into the operational phase of RIs, or otherwise may emerge at varied timepoints during the lifecycle of the RI. Time lag and timepoint variety necessitate a careful consideration of the initial investment strategy in the RI itself, but also pose a challenge for evaluators. The evaluation approach needs to be developed to cater for time lags and to be able to draw a full picture of the numerous impacts that may arise at various timepoints during the lifecycle of RIs. A potentially helpful way to overcome this challenge is to ensure the consistent cataloguing of achievements of RIs as and when they arise, and that there are no gaps in the available evidence throughout regular data collection activities.
- **Impact isolation and additionality.** The very nature of scientific advancements is that discoveries may be broad and often interlinked, rather than discrete scientific discoveries individually causing measurable societal impacts. Therefore, another key challenge is to isolate the impacts of the RI from the impacts of other contributing factors, or from other establishments that may be closely linked up within its research activities or business partnerships. This latter is of heightened importance in the case of distributed RIs, where various facilities may drive each other to achieve impacts jointly.
- **Data shortages and inconsistent data quality.** Data shortages are a likely challenge throughout the evaluation process, which may be a particularly significant risk in the context of UKRPIF due to the length of the programme and the evaluation activity, as well as the difficulties of capturing data retrospectively. Collecting relevant data early on and keeping any further data collection to a minimum are essential ways of lessening the risks of any gaps or inconsistencies in the available evidence. Data collection activities should always be anticipatory and data duplication should be avoided as much as possible.
- **Assessing displacement.** Some benefits that emerge during the lifecycle of RIs may be at the expense of other activities, which can occur due to a directed effort to achieve certain impacts for instance through resource re-allocation. The extent to which benefits occurred at the expense of other activities may be challenging to assess, especially as some impacts may be intentional and desirable, while others are unwanted, unexpected or indirect.

- **Capturing complex impacts.** While data collection activities are usually helpful to be kept at a minimum, complex outcomes and impacts that are not easily measurable, such as impacts on attitudes and behaviours in the wider community, are just as important, if not more, to capture than readily observable and measurable impacts. Capturing complex outcomes and impacts in metrics that were developed with simplicity, usability and minimal demand in mind, need to be balanced with flexibility and as the merits of understanding complex societal and cultural changes may justify the use of more demanding data collection activities. Relying on qualitative data capture whenever it may be helpful to paint a stronger overall picture of arising impacts can be useful to consider.

The relevance of these challenges is heightened in the case of evaluating the UKRPIF programme due to assessing the impact of a large number of RIs overall instead of focusing on individual impacts arising from any one research facility. The evaluation team considers the above-mentioned challenges carefully and ensure that appropriate preparations are made to overcome or avoid the risks they pose. The use of metrics collection templates with clear guidance will help RIs to anticipate what data is needed to be provided, while leaving room for flexibility to record any additional achievements as and when they arise. Furthermore, RIs will have the freedom to select certain metrics they wish to report on in order to enable capturing of the most relevant data that can showcase the impacts of different RIs uniquely.

2.4.4. Monitoring and evaluation activities to date related to UKRPIF

M&E arrangements within the UKRPIF programme are agreed with HEPs on a project-level at the start of their award. As part of the terms and conditions of their grant, awardees are required to submit quarterly progress reports to account for the developments of their project compared to their plan outlined at the bidding stage, including risks, milestones and the expenditure to date from award and from co-investment sources. The quarterly monitoring returns are complemented with a more detailed annual monitoring report. Finally, all awardees are required to submit a project completion report within 12 months of finishing the construction of any new facilities.

On a programme-level, monitoring and evaluation activities carried out to date to understand the UKRPIF programme in its entirety and the extent to which it is meeting its objectives include three distinct efforts: an independent interim evaluation carried out by Belmana and the Centre for Enterprise and Economic Development Research at Middlesex University in 2017⁵²; a long-term evaluation framework that could be applied to the breadth of UKRPIF-awarded projects across the various rounds developed by Technopolis in 2018⁵³; and a pilot evaluation carried out by RE on a diverse sample of UKRPIF projects to test the viability and suitability of the 2019 evaluation framework in 2019-2020.

⁵² Hall, M. et al. (2018). 'Interim Evaluation of the UK Research Partnership Investment Fund'. Report to Research England by Belmana and the Centre for Enterprise and Economic Development Research, Middlesex University. July 2018.

⁵³ Farla, K. et al. (2019). 'An evaluation framework for the UK Research Partnership and Investment Fund (UKRPIF)'. Technopolis Group. February 2019.

RE ran the pilot exercise with five HEPs (University of Strathclyde, University of Glasgow, Imperial College London, University of Liverpool and Brunel University London). The summaries below are the feedback both from RE and the HEPs from this exercise.

- **Scheduling:** Reporting once a year was considered proportional and useful to prove the value of R&I infrastructure to government stakeholders. Although it is important to determine a baseline, it may be tricky to do so if the award data was many years ago or the data was not consistently recorded. There was concern that the evaluation could feel like an audit and incur a response burden. Retrospective recall, self-reporting bias, contacting past partners for information, impact time lags and reporting continuity were all identified as barriers to accurate monitoring.
- **Metrics:** Projects viewed the socioeconomic ‘pick-and-mix’ (i.e. choosing their most relevant metrics from a list) as a positive feature. Projects also asked that the evaluation apply a consistent approach to data collection and reporting for all data returns (e.g. removing the need to report on some metrics due to project circumstances). The survey is likely to be better for quantitative evaluation data collection, supplemented with qualitative entries alongside numerical reporting for context. Integration with existing data returns to avoid duplication was suggested, as well as reducing some of the detail per output (e.g. number of doctoral students instead of FTE).
- **Proposed solutions:** We will aim to make the monitoring data return as easy to complete as possible (e.g. some pre-filling, consistent format) and will aim to source as much data as possible from other sources (e.g. HESA, Researchfish) to reduce respondent burden. We will clarify the reporting period, for example whether it is the preceding AY, CY or project year, as well as the reporting schedule.

This concludes the M&E literature review chapter. The evaluation will take into account the insights drawn from this review, most notably the teasing out additionality and attribution, particularly from those facilities that are multi-use or have proportionally more match-funding or co-funding both during and after the UKRPIF project. This also ties into issues around timelags. Our contribution analysis approach with process tracing will address these issues head on.

We now turn to the process mapping chapter, where the running of UKRPIF is broken down in detail.

3. Process mapping

This chapter maps out the process behind the UKRPIF capital fund scheme by drawing on the internal documents about the awarding process made available to RAND Europe by RE, as well as on publicly available programme resources. Understanding the funding activities from the call processes, through delivery, project closing and post-award processes is a helpful exercise to envision a well-fitting and suitable independent programme evaluation plan.

While most processes have been well-documented by RE, a continual offering of the funding programme has never been firmly confirmed, therefore the ad-hoc nature of the funding rounds made it potentially difficult to develop a consistent assessment process prior to the launch of the individual calls. Therefore, the processes, while albeit very similar, have slight modifications across the several rounds of funding allocations. This section is intended to paint an overall picture of the process of funding activities, with some of the more substantial differences between the assessment processes of the six rounds being highlighted.

The core funding calls ran in six rounds since 2012, each supporting the development of research infrastructure, including the construction of new facilities, refurbishment of existing ones, or the purchase of research equipment, over the duration of one to two financial years. The first four rounds allocated funds between £10 million and £35 million per individual projects, while the last two rounds offered up to £50 million per project. A fundamental feature of the scheme is the double match funding, which requires HEPs to secure double the amount of their UKRPIF award from non-public investors. The main focus of all six rounds has been to invest in the national higher education research infrastructure, with slight shifts in the wider aims, such as encouraging larger-scale, collaborative projects that are well-aligned with strategic national aspirations and can catalyse local economic growth, or broadening the disciplinary-pool of the funded university projects.

RE on behalf of the devolved funding bodies has also distributed funding to UKRPIF projects through two related funding streams. In July 2020 the government invested additional money in UK World Class Laboratories and as part of this, RE distributed £12 million to 17 eligible existing UKRPIF projects to support the maintenance, refurbishment and improvement of facilities. In 2021 RE on behalf of the devolved nations launched a £19 million Net Zero Pilot competitive funding call with UKRPIF projects to support capital activities which will reduce the carbon emissions of the facilities and make the research processes they support more environmentally sustainable. Overall, nine projects were supported. As a pilot initiative, the funding opportunity aimed to support a range of activity to widen the understanding of best practice in environmental sustainability-focused capital projects. The different UKRPIF funding programmes are summarised in Table 3: Summary of UKRPIF programmes below.

Table 3: Summary of UKRPIF programmes

Programme	Brief description	Value	Duration
UKRPIF (6 Rounds)	<p>The UKRPIF capital funding scheme supports HEPs with the development of their research infrastructure. The objectives of the programme are to enhance research facilities and drive world-leading research, encourage strategic research partnerships, stimulate private investment in research, and strengthen the contribution of research to economic growth.</p> <p>Projects in Round 1-4 have been evaluated by the interim evaluation carried out by Belmana and the Centre for Enterprise and Economic Development Research, Middlesex University in 2018, while the whole of the programme is set out to be evaluated by RAND Europe by 2027.</p>	<p>R1: Overall £100 million fund available, between £10-35 million per individual project. In response to the high-quality bids, the government tripled the support to £300 million, of which £220 have been allocated in R1.</p> <p>R2: Overall £80 million fund available, between £10-35 million per project.</p> <p>R3: At least £100 million available. £10-35 million per project.</p> <p>R4: A least £100 million available. £10-35 million per project.</p> <p>R5: Up to £200 million available to 2020. £10-£50 million per project. Extended eligibility to fund HEPs in partnership with other research organisation funded from the core Science budget. Allows to recognise larger scale projects of strategic national interest and encouraging disciplines that help to address societal challenges.</p> <p>R6: £200 million available. £10-50 million per project. *Exception: 'Exceptionally, projects that do not meet the required lower limit for UKRPIF investment may be considered by the panel, if it can be shown that they meet the objectives of the fund and would extend its reach beyond the balance of sectors and disciplines achieved so far' (information based on R6 bid guidance doc, 6).</p>	<p>R1: Spend between 2012-2015. Funds should be used by March 2015.</p> <p>R2: Spend between 2013-2015. Funds should be used by March 2015.</p> <p>R3: Spend between 2015-2016. Fund should be used by March 2017.</p> <p>R4: Spend between 2016-2017. Funds should be used by March 2017.</p> <p>R5: Spend between 2018-2020. Funds should be used by March 2020.</p> <p>R6: Spend between 2020-2021. Funds should be used by March 2021.</p>

Programme	Brief description	Value	Duration
Net Zero	<p>The UKRPIF: Net Zero 2022-2023 pilot funding scheme was set out to support existing HEPs which previously received UKRPIF funds to enhance the environmental sustainability of their research processes and infrastructures. The fund invites HEPs with previous UKRPIF-supported infrastructures and capital projects to apply, on a competitive basis, for a capital grant in the value of up to £2.5m per UKRPIF facility involved within a single bid, with an overall £18.9 million available as part of the pilot fund (information based on UKRPIF Net Zero bid guidance).</p>	<p>Overall £18.9 million. Up to £2.5 million per project.</p>	<p>Spend during the financial year of April 2022 to March 2023.</p>
World Class Laboratories	<p>The UKRI World Class Laboratories Fund supported the maintenance, refurbishment and improvement of existing research infrastructures in the UK to ensure pioneering research can be undertaken in UK research institutes and that the facilities are supported through the global challenges posed by COVID-19 and climate change. One of the packages offered ongoing support for previous UKRPIF flagship infrastructure investments. Projects that have completed the construction phase and were operational prior to the end of 2018 were eligible for the WCL fund. Funding for the individual institutions were capped at £750,000. The allocated funding was proportional to the original UKRPIF awards and the length of the projects, with £12 million allocated to 17 providers out of the 23 UKRPIF projects that completed their build and were operational at the end of 2018 (information based on WCL Monitoring report, and WCL top up documents).</p>	<p>Overall out of a £300 million investment by government into UK world class laboratories and infrastructure, £12 million was distributed among existing UKRPIF HEPs. Funding was distributed proportionate to their original UKRPIF award, with a cap of £750,000. Awards ranged from £175,000 to £750,000.</p>	<p>Notice of the funding came in Autumn 2020, funding was allocated for FY2020-21 and had to be spent by the end of March 2021. Projects had the option to decline the funding if they did not think they would be able to spend it by the deadline – none did.</p> <p>Projects completed a short monitoring return on the use of the funding.</p>

Source: RAND Europe.

3.1. Call, selection and awarding processes

Call processes

Invitation to apply for the funds are shared on established communication channels, including the RE website (formerly HEFCE), as well as on various relevant news feeds.⁵⁴ The exact websites that the calls are published on are not stated in any materials related to call documentation. While applicants have always been invited to contact the RE team by email with any queries about the application process, webinars or workshops for applicants were first introduced for the Net Zero Fund.

The application process typically runs in two stages, except for Round 2 in 2013-2015, which operated through a one-stage application process. Furthermore, Round 5 has had a slightly different call process than the other rounds of funding allocations, which is further explained in Text box 1 below. Submissions in all rounds were requested in email.

In the **first stage**, eligible HEPs wishing to apply need to submit their expression of interest (EOI) using the EOI template shared along the bid guidance, as well as a letter of intent from the co-investor as early evidence for commitment and a letter of approval from the head of the lead institution.⁵⁵ The EOI template follows a structure that aligns with the criteria used by the assessment panel to judge which institutions to invite for the second stage of the application. This includes providing a brief outline and rationale of the project that demonstrates contribution to the four UKRPIF programme objectives and gives an estimate of its total capital costs as well as arrangements to meet the additional costs; the amount of funding applied for that is within the range set by RE; evidence of the indicative amount and nature of co-investment funding along with a letter of interest from the co-investor; evidence of research excellence; and an indicative plan for the delivery of the facilities. The timeframe given for institutions to submit their EOIs after the launch of the calls varied in the six rounds, with the later rounds being open to applicants for slightly longer than the first few rounds. This depends on the spend timeframes RE is given by government and how long RE have to run the call set up and award phase before the projects have to spend the money. After a careful assessment by RE officers and the assessment panel, successful applicants are then invited to proceed to the second stage to submit their full bids, while unsuccessful applicants are sent feedback. In their approval letter, successful applicants might be asked to get in touch with RE with regards to discussing arising issues or clarification questions prior to the submission of their full bid. The approval letter also informs institutions of the number of successful EOIs and the total amount of funding they are applying for.

In the **second stage**, HEPs need to develop their proposal further to demonstrate clear project objectives for the use of the research facilities, linked to outputs and outcomes. The full bid guidance is developed by RE during the first assessment stage in order to incorporate relevant feedback and clarifications for the second round. This is then shared with successful institutions along with their invitation to submit the full bid. Templates are provided by RE to use in the proposal, including: a proposal cover; a breakdown of

⁵⁴ According to information from the Round 4 UKRPIF Process presentation prepared by HEFCE and shared with RAND Europe.

⁵⁵ A confirmation letter from the head of the institution that leads the bid has been a requirement in all rounds. A letter of intent from co-investor(s) became a requirement from Round 2.

information about building works and equipment purchases to illustrate value for money; and a table to give details about finances, including capital funding and expenditure year-by-year and operating income and expenditure year-by-year. In the proposal, institutions need to provide details on the nature and terms of conditions regarding the co-investment they secured, as well as clear evidence and explanation on how the funding would contribute to driving world-leading research. There is a greater emphasis on risk considerations at this stage, with each proposal required to show that they considered potential risks associated with the project, including risks to the financial commitment of co-investors. Other criteria taken into account when assessing the full proposals include value for money; sustainability considerations (both in terms of the environmental sustainability of the research facilities as well as the sustainability of project management over time through sufficient staffing and resources); and details of arrangements for monitoring and evaluation purposes. The latter is only loosely described in the bid guidelines, with little explanation given as to what parameters should be monitored with what frequency by applicants. The absence of detailed instructions on monitoring requirements at the bid stage may have been due to the lack of clarity on the commitment of RE to further rounds of funding, which might have posed potential difficulties in planning the monitoring and evaluation activities project-wide in advance. The bid guidance documents do mention, however, that RE intends to evaluate the outcomes from the investment in research facilities and they expect awarded HEPs to readily provide information to the research organisation carrying out the evaluation when it comes to it.

Text box 1: Round 5 processes

RE (then HEFCE) published the call for initial submissions for Round 5 of UKRPIF in December 2015. Compared to previous rounds, a few changes have been made to the assessment criteria and allocation process in order to reflect wider factors taken into account when allocating up to £200 million funding made available by Department for Business, Innovation and Skills (BIS) for 2018-19 to 2019-20.

The existing criteria have been expanded to recognise the need to identify emerging areas of research excellence and consider proposals with a great potential to leverage local collaboration and economic growth. Furthermore, Round 5 encouraged larger, more strategic and collaborative bids that support evolving partnerships, as well as bids which are of sizable, ambitious projects and align well with strategic national interest and seek to address societal challenges. This has helped to widen the disciplinary pool of applicants to include more social science related proposals.

To accommodate bids of this scale and ambition, the upper funding limit for bids have been increased from the previous £35 million to £50 million, and a longer application timescale have been introduced to allow HEPs to develop good quality proposals.

While the application process remained largely the same as in the previous rounds, the assessment panel considered bids in two tranches to cater for bids which were in an earlier stage of development and needed slightly more time to refine their proposals. In practice, this meant that successful EOIs have been invited to submit their full bids to either Tranche 1 or Tranche 2:

- Tranche 1: The panel considered bids that are at a more advanced stage of development.
- Tranche 2: The panel considered bids where the expressions of interest have indicated that they were at an earlier stage of development, or where the panel believed this to be the case. The panel may also have invited bids that required further development in Tranche 1 to resubmit to Tranche 2.

The bid guidance clearly explained the reason behind considering bids in two tranches and stated that HEFCE retained at least half of the available funding for the second tranche of bidding.

The assessment of Round 5 bids followed the same process as in the previous rounds, with slight alterations to include feedback from additional internal and external experts and stakeholders. This included feedback from HEFCE Assurance, Finance and Estates teams to assess the strength of bids in terms of finance and estates management, as well as comments from Regional Consultants on how the bids fit with the institution's strategy and anticipated developments. Key strategic external stakeholders were also requested to contribute to assessment input, including the Research Councils to comment on the bids relevant to their areas of expertise, as well as the Department of Health and Innovate UK.

Source: Based on UKRPIF Round 5 bid guidance documents and panel meeting minutes.

Selection processes

The assessment process of bids at the two stages are essentially the same. Firstly, EOIs go through an initial review by RE officers who conduct basic eligibility checks and comment on how far the proposals met the criteria to progress to stage two. RE officers will consider the evidence for research excellence and may refer

to data sets such as Research Excellence framework (REF) results. Comments may also be provided from an assurance officer on the extent to which proposed projects may need to access additional borrowing, and about any observations on financial sustainability. The criteria at this initial review includes overall credibility of the project and its total cost; amount of funding applied for is between the available range; indicative amount of co-investment; evidence of scale and track record of research excellence; and indicative delivery plan. Similar criteria are sought by the relevant funding bodies for bids in Wales, Scotland and Northern Ireland. For Round 6 the bids were shared with the UKRI research councils that were most relevant to the bids research discipline and focus. The councils were asked to consider and comment of factors including the scale and track record of research excellence, the credibility and feasibility of the proposal, the additionality, and strategic alignment. This information is compiled and shared with the panel to support their review.

Each EOI is assigned to two assessment panel members to review the bid against the assessment criteria. The assessment panel then receives all bids and commence with the discussion of each bid in detail with the information from RE officers taken into account and the panel leads for each EOIs leading the discussion on each bid. The panel agrees on overall scores for each of the criteria for each bid on a scale of 1 to 5. The criteria at this stage that EOIs are scored and ranked against includes: evidence of how the UKRPIF will lead to developments that build on the research excellence of the institution, including the extent to which a project will support the development of researchers for the future; evidence of commitment from co-investors and summary of the terms and conditions of the contribution; and value for money. While these three core assessment criteria have remained unchanged in the six rounds of the funding allocation, Rounds 1-3 applied a weighting of 2:1:2 against them (research excellence: strength of co-investment: value for money), and Rounds 4-6 an equal weighting to all three criteria.

Once the scores are completed and ranking is done, the panel agrees on which ones to reject, then goes through the remaining ones again so they are positioned relatively correctly compared to each other, potentially adjusting the scores of certain criteria. The final considerations are made with the wider factors in mind, including strategic national context and sector or subject spread. Recommendations are then made to the Chief Executive of RE, who is also the UKRPIF Senior Responsible Office about which bids to accept or decline, as well as about institutions identified by the panel that should be asked to provide any further information to strengthen their bid. The assessment panel may also recommend reducing the funding allocations for individual bids. The Chief Executive is given delegated authority to consider the panel recommendations and approve or reject them.

The assessment of full bids at stage two follows the same process, with an initial review by RE officers who might seek advice from subject and industry experts as well. The assessment panel then receives all the bids, which are assigned to panel members for an in-depth consideration based on topical knowledge or expertise, where possible. The panel then makes final recommendations to the Board for rounds 1-5, and the RE Executive Chair for round 6+.

Awarding processes

Following Executive Chair approval, applicants are notified of the decision of their application in email, with all institutions receiving feedback on their bids. Successful applicants are sent an award letter by RE in

which they confirm the amount of funding allocated to the project, outline the terms and conditions such as amount of co-investment achieved within the stated timescale, and provide a template for the contractual commitment notice (CCN) which needs to be returned before commencing payment of the capital grant. RE conducts additional general and project specific due diligence checks on the projects prior to award. A copy of the finalised co-investment agreements needs to be submitted as well with the confirmation of approval. RE will typically make a public announcement of outcomes with a UKRI news piece and potentially with sector press. A public announcement by the Secretary of State or Minister for Universities and Science (or previous equivalents) could occasionally follow.

3.2. Delivery and post-award processes

Delivery and project monitoring processes

Successful applicants are informed of the terms and conditions of their funding allocation in their approval letter. This includes that any significant alteration to the project matter that is likely to affect the original outcomes, risks or timescale must be promptly reported to the respective funding body, who reserve the right to suspend, terminate or reclaim the funding if the intended outcomes are unlikely to be achieved.

Regular monitoring and evaluation arrangements are agreed at the outset each project based on the plans outlined by their lead institutions in their bids. This means that institutions are largely responsible for the ongoing monitoring of their projects progress and then reporting back to the relevant funding body and RE at set intervals. The award letters from RE, and where applicable the relevant funding body, do state, however, that projects will be monitored on the progress of capital development and the achievement of the co-investments stated in bids on an annual basis, and that they reserve the right to audit progress on any UKRPIF funded project at any time during the project's lifecycle. Furthermore, the award letters also state that an evaluation of project funded under UKRPIF is expected to be commissioned by RE in the future, to which end institutions should be ready to provide information or discuss their project with whoever carries out the evaluation. RE, HEFCW, SFC and DfE NI also reserve the right to make any project outputs, including the final project completion reports, available to disseminate for the benefit of the sector or to use for policy development.

Awarded projects are monitored on a quarterly basis following a brief monitoring report template that asks HEPs to account for the developments of their project compared to their plan outlined at the bidding stage, including any changes to the risks and any new milestones achieved. It also asks about the financial development of projects, including UKRPIF and co-investment funding that have been drawn to date. The quarterly monitoring is complemented with an annual monitoring process, whereby HEPs need to return a slightly more detailed form compared to their quarterly monitoring forms. Awardees are also required to submit a project completion report within 12 months of finishing construction on any new research facilities. The process and returns are well documented by RE and have been made available to RAND Europe upon request.

Close-out and post-award processes

The funding is conditional on receiving a satisfactory final project completion report, which sets out how far the project has met its objectives, milestones, deadlines and the details of spending against the original

financial plans. This needs to be received by RE or the relevant nations funding body within 12 months after project completion, along with an assurance statement. In the case of a missing or inadequate final report, RE reserves the right to conduct an audit of the project and recover audit costs, a proportion of the grant or reclaim the funding altogether if it is believed has been misused.

The full UKRPIF process is summarised in the Figure 1 below.

Figure 1: UKRPIF Process mapping



Source: R4 UKRPIF Process ppt prepared by RE (then HEFCE).

4. Stakeholder mapping

Complementing the process mapping exercise, a stakeholder mapping exercise was conducted to better understand the different stakeholders related to the UKRPIF programme, as well as their relation to and interaction with each other and with the programme as a whole. This will inform the approach taken in the evaluation framework and will be essential to identify sources of information for any data collection activity undertaken as part of the evaluation.

Table 4 presents the findings of the stakeholder mapping exercise, demonstrating the main groups and subgroups of the programme, their roles and relations to each other, and some of the identified indicators associated with them. This information draws on programme level documentation about the business strategy and governance of the fund made available to the evaluation team by RE, as well as on the stakeholders understood in previous evaluation exercises.⁵⁶ It is important to note that different documents identified different stakeholders or grouped them slightly differently, which can impact the approach taken when implementing an evaluation framework due to how the relation of stakeholder groups to the outputs, outcomes and indicators are captured. The evaluation framework outlined in our report relies on the below stakeholder map.

The beneficiaries of the programme are the UK HEPs who are allocated capital funding in any of the UKRPIF rounds and they are the main drivers behind the theory of change, especially in realising the direct outputs and contributing to the outcomes. As part of the agreement of the funding allocation, they are responsible for the monitoring arrangements of their project and need to provide quarterly returns to RE, SFC, HEFCW or DfE NI as applicable, to take account of the development of their project and its financial status. There are a number of possible indicators linked to them which will form an essential part of the evaluation activities.

The unique feature of the programme is the double match funding, which makes co-investors a key group to understand, both in terms of their perceptions about the overall programme objectives, the reasons behind their financial commitment to projects, and their ways of engaging with their supported HEPs. While the use of the UKRPIF funds is limited to capital investments, the co-investments could either be made toward capital or recurrent costs and could be in-kind or cash in nature. The exact split between different kinds of co-investments made towards project per round or on the programme-level can be useful indicators.

⁵⁶ Hall, M. et al. (2018). 'Interim Evaluation of the UK Research Partnership Investment Fund'. Report to Research England by Belmana and the Centre for Enterprise and Economic Development Research, Middlesex University. July 2018.

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Other important stakeholder groups are the different bodies within RE responsible for strategic and operational governance of the programme, as well as the businesses or charities who directly or indirectly are impacted by the UKRPIF-funded projects, particularly by co-investment, strategic partnership, or project spin-offs. The final stakeholder group identified is RAND Europe as the organisation responsible for carrying out the full programme evaluation, commissioned by RE.

Table 4: Key stakeholders and their role in the evaluation

Identification		Role in the evaluation framework	Possible linked indicators
Group	Subgroup		
Beneficiaries	<ul style="list-style-type: none"> • UK HEPs • PhD students • KE professionals 	<ul style="list-style-type: none"> • UKRPIF-awarded HEPs are the main drivers behind the ToC, especially on the output and outcome level. • Awarded HEPs need to provide an up-to-date list of key contacts for up to 10 years beyond the lifecycle of their project. • Awarded HEPs need to complete periodic monitoring returns as evidence of the development and successful delivery of their project as agreed in the terms and conditions of their funding allocation. • Awarded HEPs need to submit project completion reports within 12 months of finishing the construction of their research facility. • Awarded HEPs are expected to provide data and be open to discussions about their project with RE and the programme evaluators. 	<ul style="list-style-type: none"> • Number of new academic staff • Number of new PhDs • Number of new publications • Number of new major research achievements
Co-investors	<ul style="list-style-type: none"> • Industry partners • Charitable organisations • Philanthropic donors 	<ul style="list-style-type: none"> • Awarded HEPs are required to secure double match funding from non-public resources, either in the form of capital investment or re-current investment contributions. • Co-investment contributions are to be agreed upon at the project start and the letter of agreements from co-investor(s) need to be provided to RE. • Co-investment profile is regularly monitored by RE on a project and programme level, including the amount and nature (e.g. cash or in-kind; capital or recurrent). 	<ul style="list-style-type: none"> • Amount of investment contributed to individual projects • Net additional investment contributed by co-investors • Number of co-investors per individual projects • Number of co-investors contributing to the whole of the programme • Split between capital co-investment contributions and recurrent co-investment per funding rounds and on overall programme level • Number of new industry collaborators per project

Identification		Role in the evaluation framework	Possible linked indicators
Group	Subgroup		
Research England (previously HEFCE), on behalf of UKRI and the devolved funding bodies (HEFCW, SFC and DfENI)	<ul style="list-style-type: none"> • UKRPIF SRO • RE Council • UKRPIF Programme Board (which includes representation from SFC, HEFCW, DfENI) • RE Chief Operating Officer and Operations Team • RE Executive Board • UKRPIF Team and Research Directors • UKRPIF Assessment Panel • UKRPIF Risk Panel 	<ul style="list-style-type: none"> • Maintains overall programme responsibility, including strategic and operational governance, day-to-day delivery, monitoring of live projects, reviewing of payments, assessment of bids and management of risks. • Involved in periodic collecting of project-level monitoring data from awarded HEPs. • Commissions independent programme evaluation and coordinates with evaluators, including providing programme documentation. • Monitors the programme as a whole and assesses whether programme objectives are being met. 	<ul style="list-style-type: none"> • Net additional income attributable to UKRPIF • Spread of funded projects by discipline
Major partners and collaborators with HEPs	<ul style="list-style-type: none"> • Academic or industry collaborators with HEPs • Including partners who are not co-investors but principal partners (e.g. NHS Trust) 	<ul style="list-style-type: none"> • Interviewees 	<ul style="list-style-type: none"> • Number of collaborators • Number and types of outputs arising from collaborations
Key businesses, organisations and charities	<ul style="list-style-type: none"> • External project partners • Organisations supported by UKRPIF project spin-offs • Users of the facility and research developed as a result of UKRPIF 	<ul style="list-style-type: none"> • The programme leads to HEPs maintaining and creating new strategic partnerships. 	<ul style="list-style-type: none"> • Number of strategic staff maintained • Number of new strategic partnerships • Number of co-located staff
Wider stakeholders	<ul style="list-style-type: none"> • DSIT, HMT, NAO, GIAA and other central government departments • Local and regional governance (councils, etc) 	<ul style="list-style-type: none"> • Interviewees 	<ul style="list-style-type: none"> • External views on UKRPIF

Source: RAND Europe.

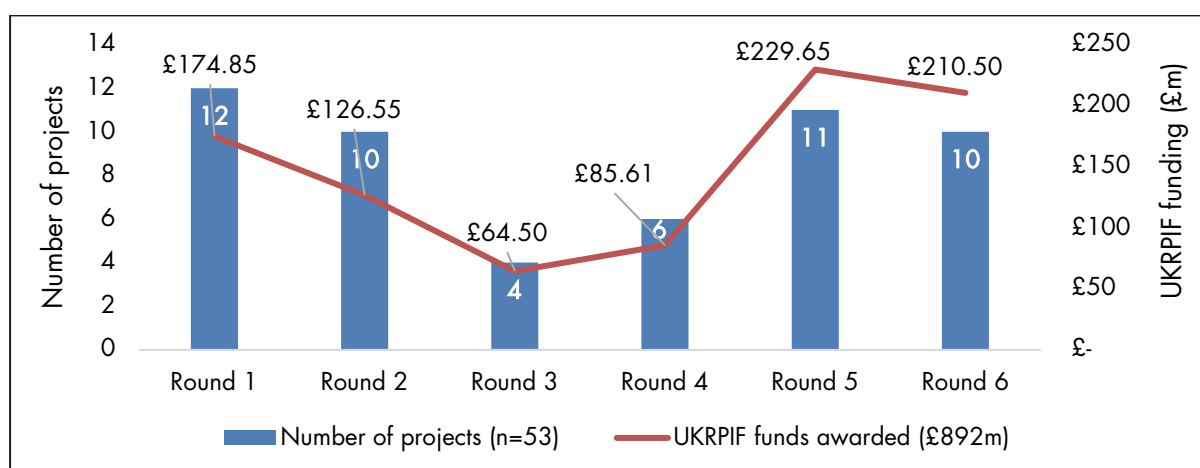
5. Portfolio analysis

This chapter presents a portfolio analysis of UKRPIF awards. It provides a high level picture of the projects' characteristics, the funding allocated, co-invested and partnerships. It is split into two sub-sections: **secondary data review**, using summarising UKRPIF metadata to characterise the portfolio; and **project mapping**, which maps the objectives of the projects to UKRPIF objectives. These tasks inform the development of indicators, begins to set a baseline and feeds into sampling for Phases 2 and 3.

5.1. Secondary data review

There were 53 UKRPIF projects across the first 6 rounds, with 44 at practical completion. UKRPIF funding totalled £892 million, with the most funding awarded in Rounds 5 and 6 and the least in Round 3 (£230 million, £210 million, and £65 million respectively), although this round did have the least number of projects (Figure 2). The average UKRPIF project value was highest in Round 6 and lowest in round 2 (£21 million and £13 million respectively). The higher average awards in Rounds 5 and 6 correspond with the increase in the upper award threshold for those rounds from £35 million to £50 million.

Figure 2: Number of projects and total UKRPIF funding per round



Source: RAND analysis of UKRPIF data (accurate as of 21/06/2022).

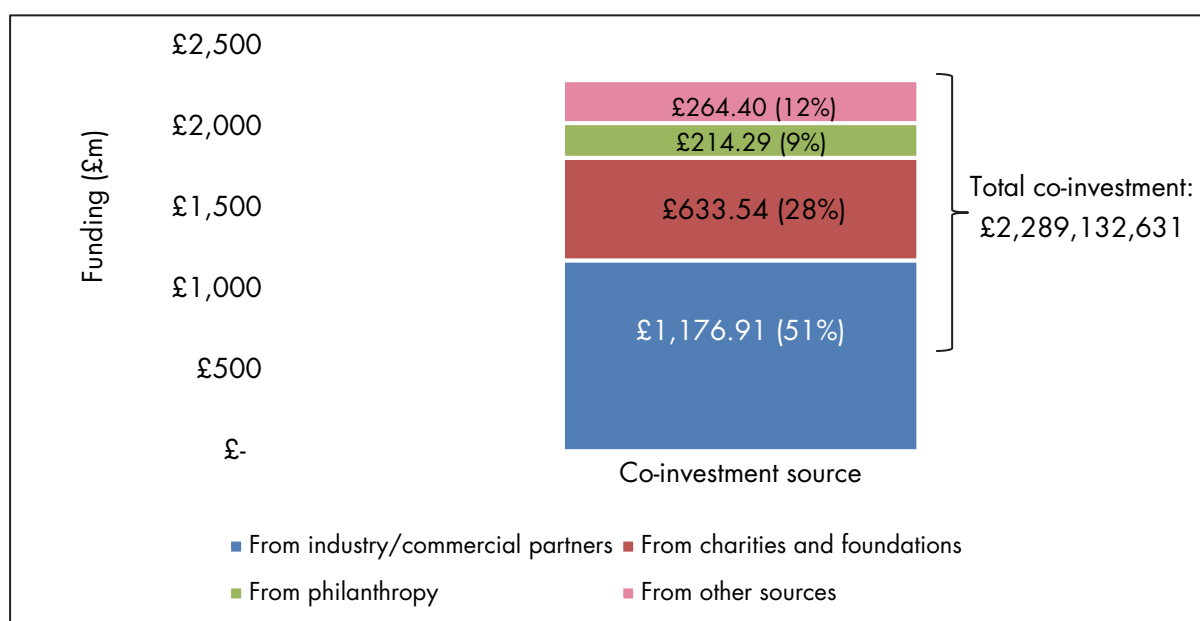
Table 5: Average project value per round

	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	Overall
Average project value	£14.57m	£12.66m	£16.13m	£14.27m	£20.88m	£21.05	£16.82m

Source: RAND analysis of UKRPIF data (accurate as of 21/06/2022).

Industry/commercial partners were the highest source of co-investment, making up over 50% of funding (51%), followed by charities and foundations (28%); philanthropy was the lowest source of co-investment (9%) (Figure 3).

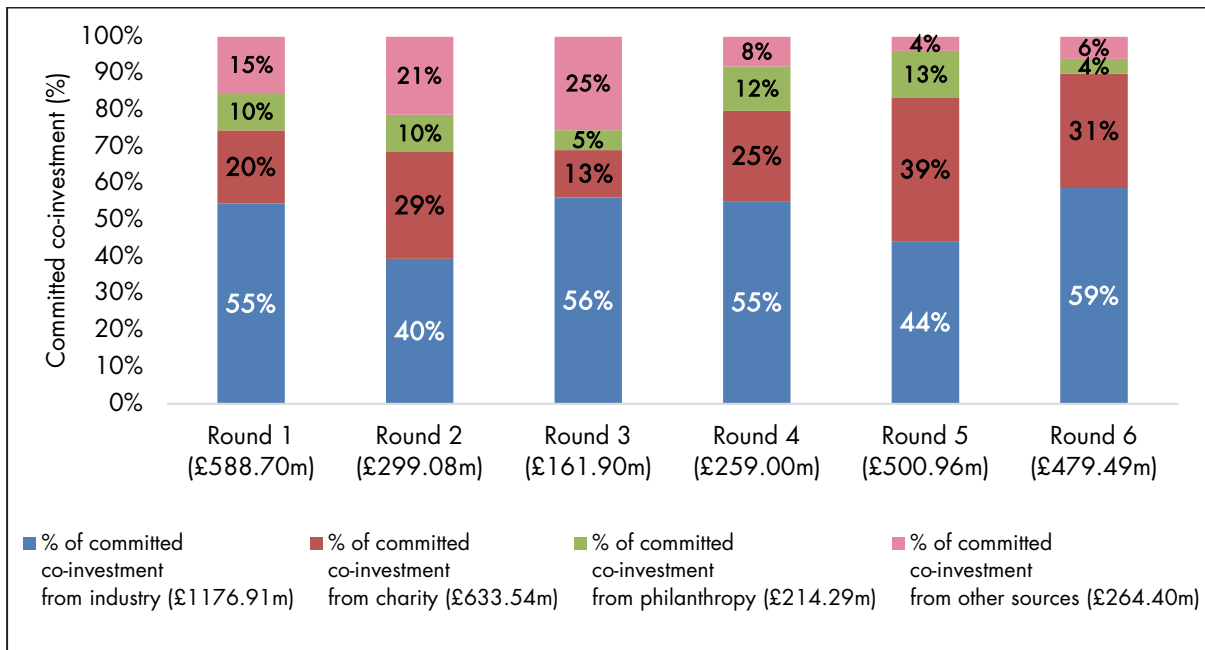
Figure 3: Co-investment sources



Source: RAND analysis of UKRPIF data (accurate as of 21/06/2022).

The proportion of co-investment types was inconsistent across rounds, though industry co-investment was always the largest single source of co-investment (Figure 4). Co-investment from charities was the second largest sources in all rounds bar round 3 where co-investment from other sources reached a high of 25% of total co-investment. In most cases, the ‘other’ source is not identified in the portfolio data, in other cases the sources are typically private entities (e.g. Manchester Round 3 - Mubadala Development Company), followed by public funding sources (e.g. Cambridge Round 3 - National Institutes of Health).

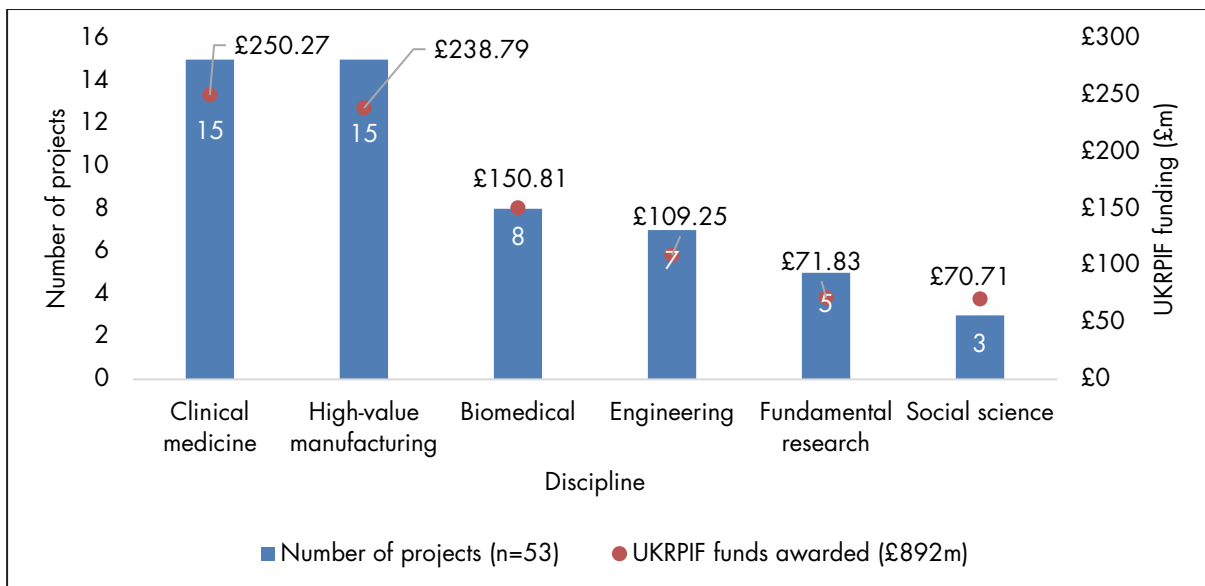
Figure 4: Committed co-investment by funding round



Source: RAND analysis of UKRPIF data (accurate as of 21/06/2022).

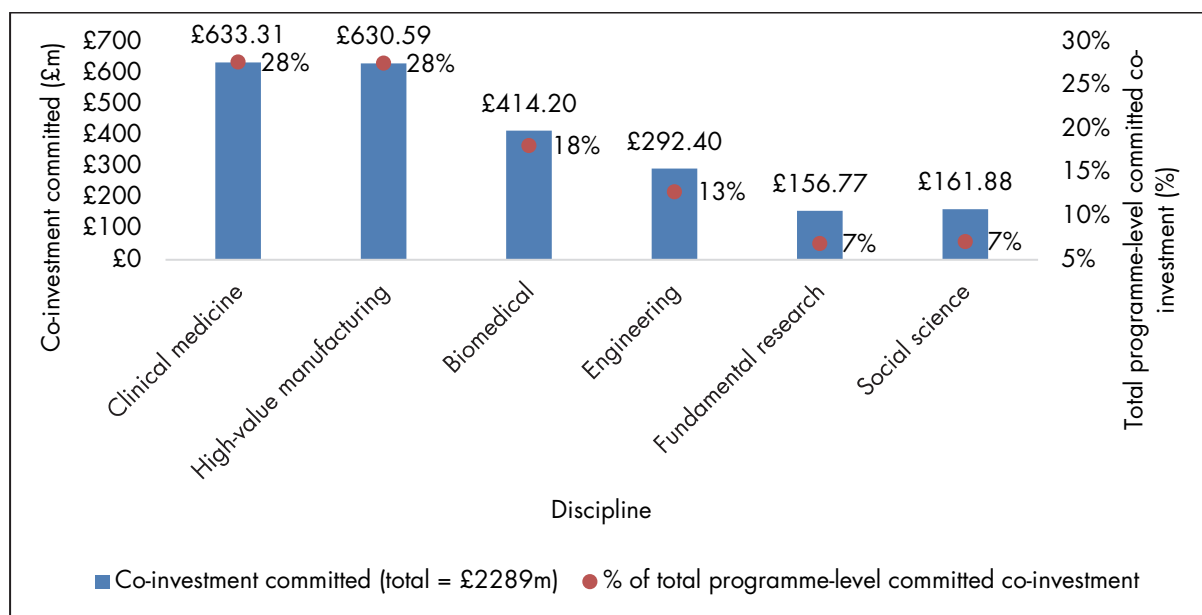
Clinical medicine and high-value manufacturing were the disciplinary groups with the highest number of UKRPIF projects, awarded UKRPIF funds (combined, 55% of the total funds) and co-investment committed; social science and fundamental research had the lowest number of UKRPIF projects, UKRPIF funds awarded (8% of the total funds each) and co-investment committed (Figure 5, Figure 6). It is worth noting that many projects will have, or will in the future, comprise activities that cross disciplinary boundaries rather than the single designation they receive in this data.

Figure 5: Number of UKRPIF projects per disciplinary group and UKRPIF awarded



Source: RAND analysis of UKRPIF data (accurate as of 21/06/2022). Note: Disciplinary groups were derived from the Belmana Report groupings.

Figure 6: Co-investment committed by discipline



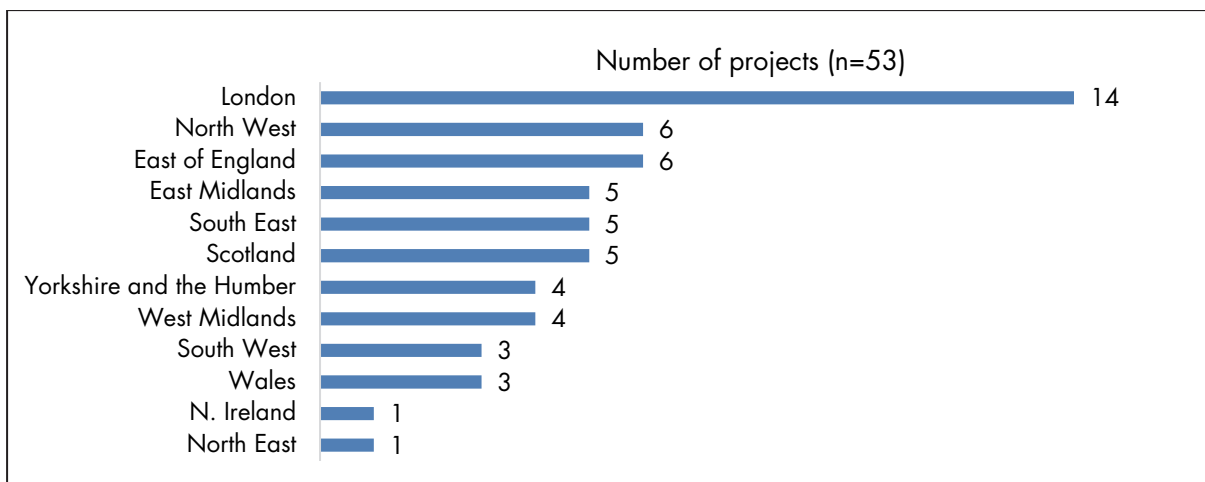
Source: RAND analysis of UKRPIF data (accurate as of 21/06/2022).

The ‘Golden Triangle’ regions, including London, the East and the South East of England, received over half of the UKRPIF funding (£447,445,189, Table 7). England received more UKRPIF investment than all of the devolved nations (85.6%, £763,308,455 vs 14.4%, £128,354,500, Table 7).

Table 6: Number of successful HEP bids and total bids received in each region

Region	Number of eligible HEPs in the region	Number of HEPs in the region that have submitted a bid for UKRPIF	Number of EOIs submitted by HEPs in each region	Number of successful bids submitted by HEPs in each region	Application rate for each region (number of bids/number of eligible HEPs)	(%) of successful bids for each region
East Midlands	9	3	11	3	1.2	27
East of England	9	5	22	7	2.4	32
London	38	10	39	15	1.0	38
Northern Ireland	3	1	1	1	0.2	100
North East	5	2	6	0	1.2	0
North West	14	6	17	6	1.2	35
Scotland	18	5	16	5	0.9	31
South East	17	4	20	4	1.2	20
South West	14	4	8	3	0.6	38
Wales	8	2	4	3	0.5	75
West Midlands	11	5	16	4	1.5	25
Yorkshire and the Humber	11	3	13	2	1.2	15

Figure 7: Number of projects by region



Source: RAND analysis of UKRPIF data (accurate as of 21/06/2022).

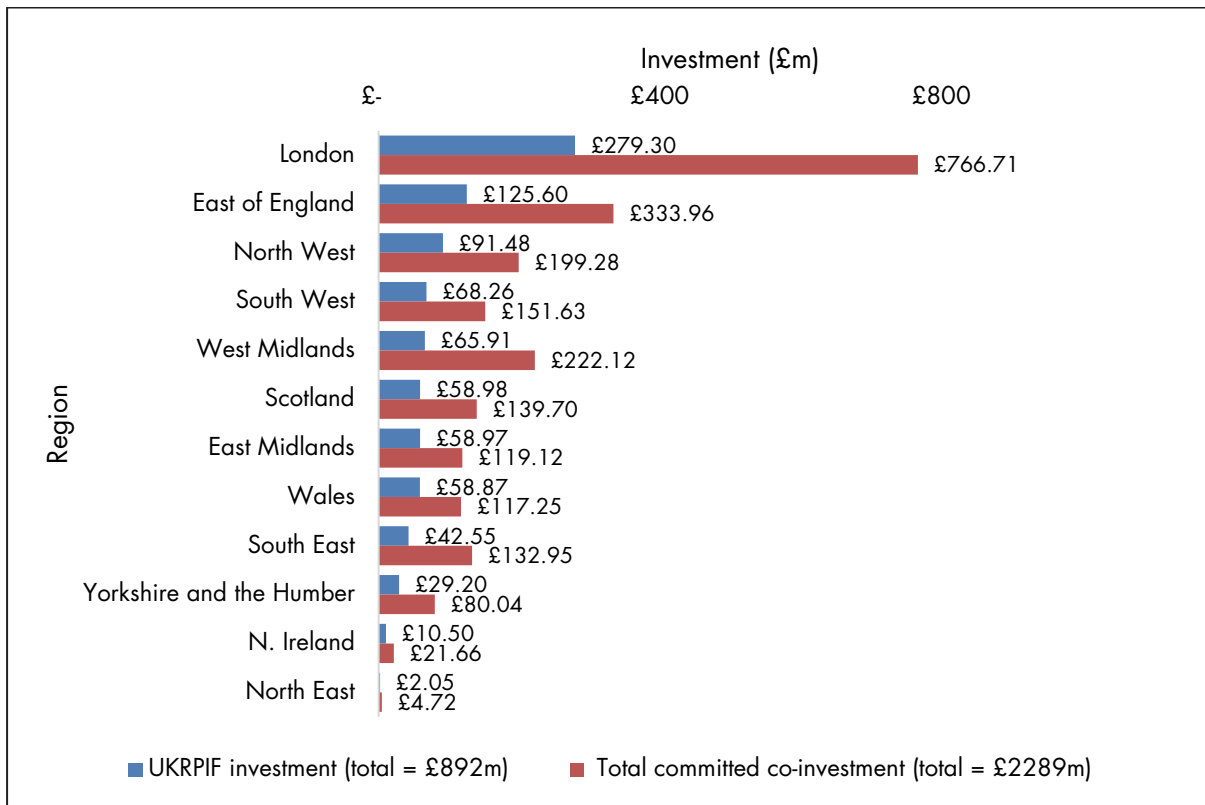
Table 7: UKRPIF investment by region

Region	UKRPIF investment/ funding (£)	UKRPIF funding awarded (%)
North		
North East	£2,050,000	0.2%
North West	£91,483,810	10.3%
Yorkshire and the Humber	£29,200,456	3.3%
Midlands		
East Midlands	£58,965,000	6.6%
West Midlands	£65,905,000	7.4%
The 'Golden triangle'		
East of England	£125,604,500	14.1%
London	£279,295,689	31.3%
South East	£42,545,000	4.8%
Other		
South West	£68,259,000	7.7%
Devolved nations		
Scotland	£58,982,500	6.6%
Wales	£58,870,000	6.6%
Northern Ireland	£10,502,000	1.2%

Source: RAND analysis of UKRPIF data (accurate as of 21/06/2022).

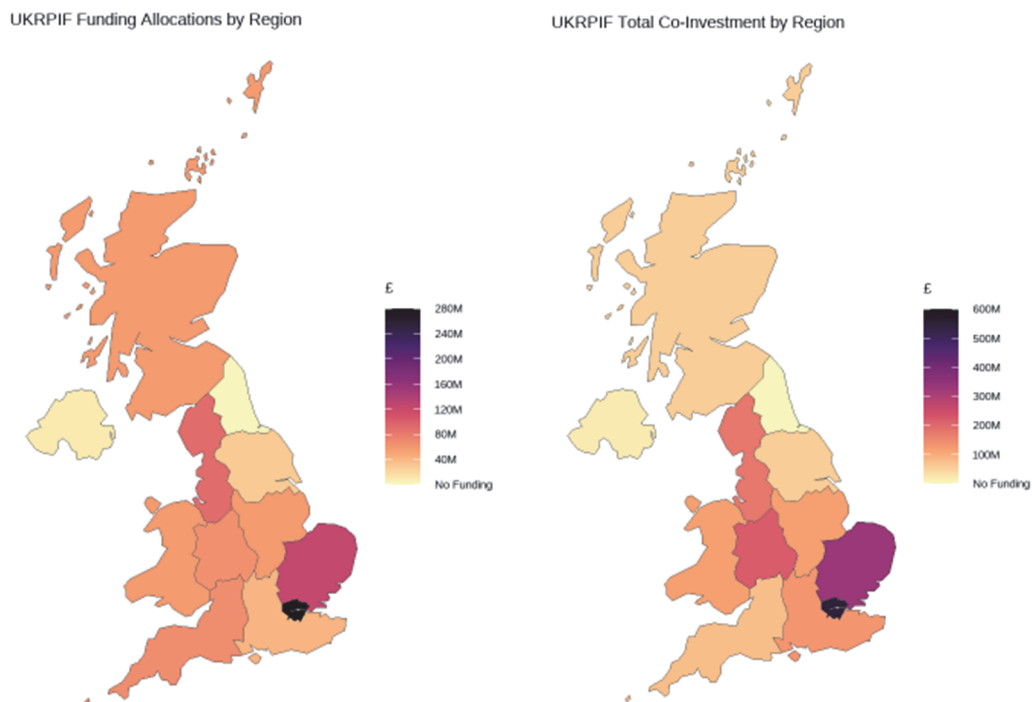
The co-investment figures per region and devolved nation largely mirror the proportions described above (Figure 8, Figure 9). Projects in the West Midlands (3.37 times UKRPIF funds) and the South East (3.12 times UKRPIF funds) did differ here, attracting a higher proportion of co-investment compared to their overall UKRPIF funding proportion. Wales, East Midlands and Northern Ireland had the lowest multipliers (around 2 times UKRPIF funds were co-investments).

Figure 8: Investment by region



Source: RAND analysis of UKRPIF data (accurate as of 21/06/2022).

Figure 9: UKRPIF funding and co-investment by region – heat map

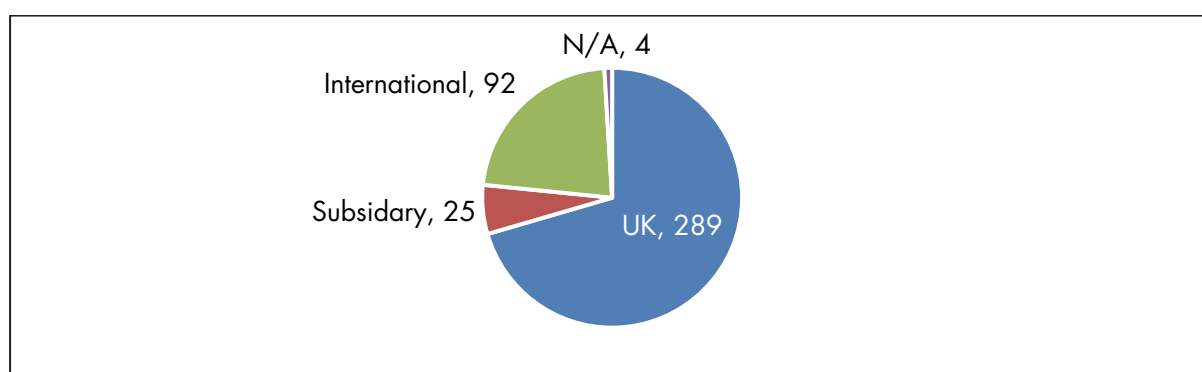


Source: RAND analysis of UKRPIF data (accurate as of 21/06/2022).

A minority of HEPs received more than one UKRPIF funded project (13 versus 20 receiving only one UKRPIF project). This included the University of Cambridge (5), the University of Manchester (5), King’s College London (4), University College London (4) and Brunel University London (3).

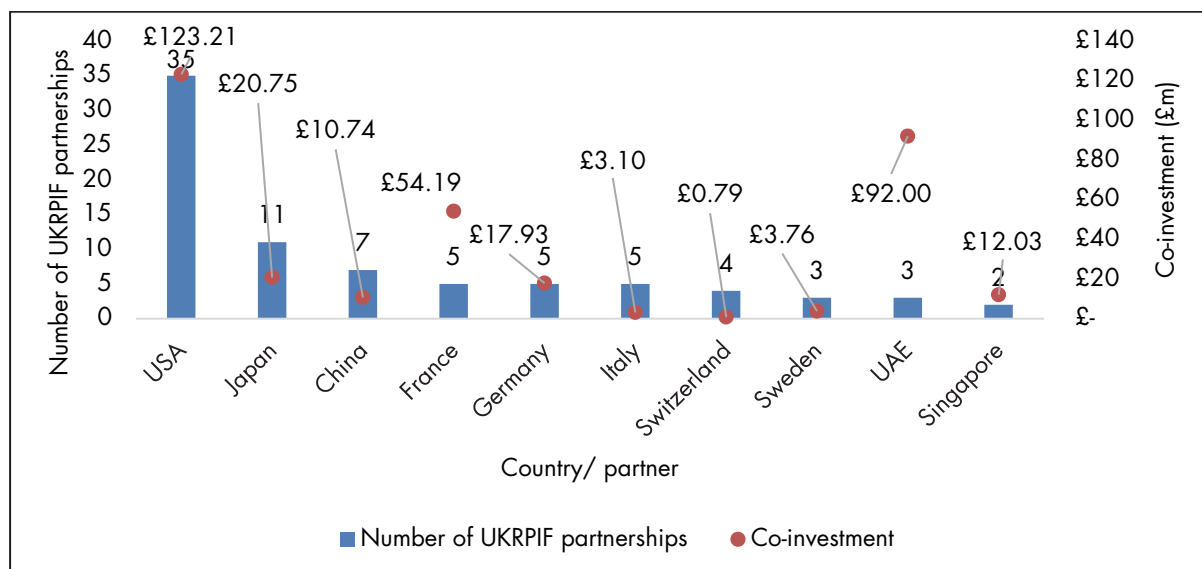
The majority of project partners were UK organisations, with around a quarter being internationally based or were subsidiaries of international companies in the UK (Figure 10). Of the international partners, the most by far were from the USA, followed by Japan and China (Figure 11). The level of co-investment largely reflected the number of partnerships, with the notable exceptions of partners from France, the UAE and Singapore who contributed more on average than other partners, particularly the UAE who co-invested £92 million across three projects (average of £30.6 million per project), far more than others and only £30 million behind the USA with 35 projects (average of £3.52 million per project).

Figure 10: Locations of partners



Source: RAND analysis of UKRPIF data (accurate as of 21/06/2022). Note: ‘Subsidiary’ indicates a UK branch of an international company.

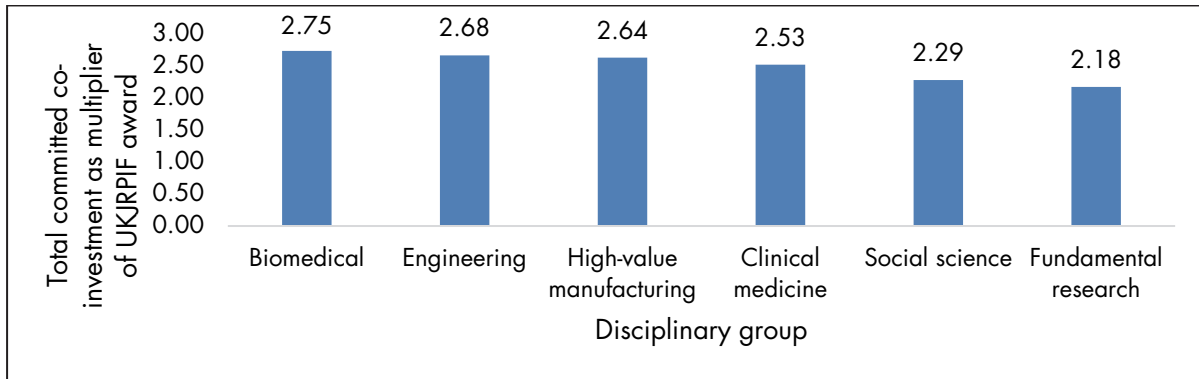
Figure 11: Top 10 countries by number of partnerships



Source: RAND analysis of UKRPIF data (accurate as of 21/06/2022).

All projects were able to attract at least twice the amount of UKRPIF funding from co-investment, as is a key condition of receiving UKRPIF funding (Figure 12). The biomedical and engineering disciplines were able to secure the highest multiplier of co-investment compared to their UKRPIF funding, with social science and fundamental research securing the lowest of the disciplines (Figure 12).

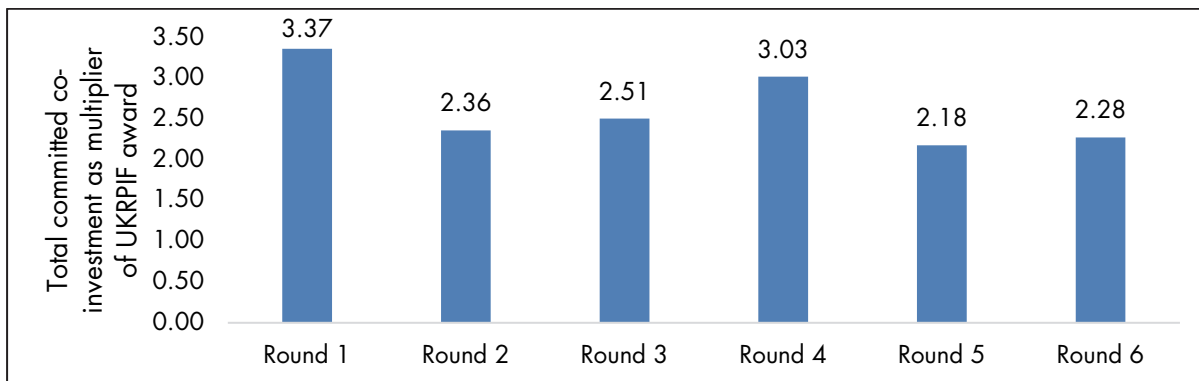
Figure 12: Total committed co-investment as multiplier of UKRPIF award by disciplinary group



Source: RAND analysis of UKRPIF data (accurate as of 21/06/2022). Note: Disciplinary groups were derived from the Belmana report groupings.

Per Round, co-investment as a multiplier of UKRPIF award was highest for Rounds 1 and 4, and lowest for the most recent rounds, though none were below 2 times the UKRPIF award (Figure 13).

Figure 13: Total committed co-investment as multiplier of UKRPIF award by Round

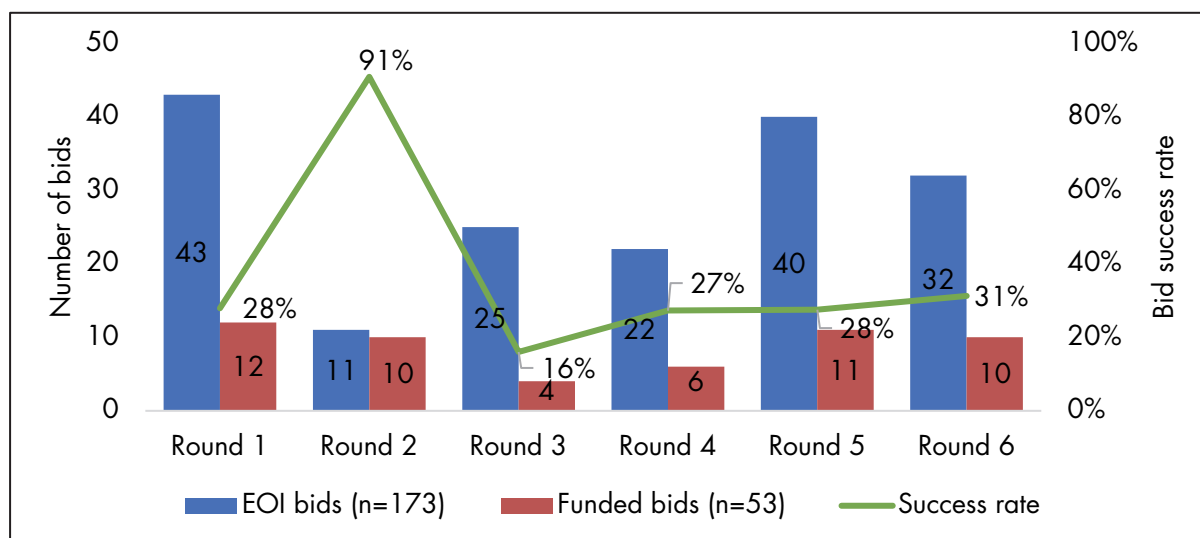


Source: RAND analysis of UKRPIF data (accurate as of 21/06/2022).

The most EOIs and funded bids (FBs) were received in Round 1 and Round 5. Round 2 was a one stage process which had the highest bid success rate, however, this can be attributed to circumstantial funding rearrangements.⁵⁷ Rounds 3 and 4 had the lowest bid success rate (Figure 14). The average bid amount fluctuated between £13.7 and £14.8 million from Rounds 1-4, then increased sharply in Rounds 5 and 6 to almost £18 million (Table 8).

⁵⁷ Round 2 had the highest bid success this is in part due to the notice of further funding for UKRPIF rounds 1 and 2, the rounds were launched in quick succession and round 2 was a one-stage process. A project funded in round 1 also did not proceed and this money was reallocated to round 2.

Figure 14: Number of EOI bids, UKRPIF funding and success rate per round



Source: RAND analysis of UKRPIF data (accurate as of 21/06/2022).

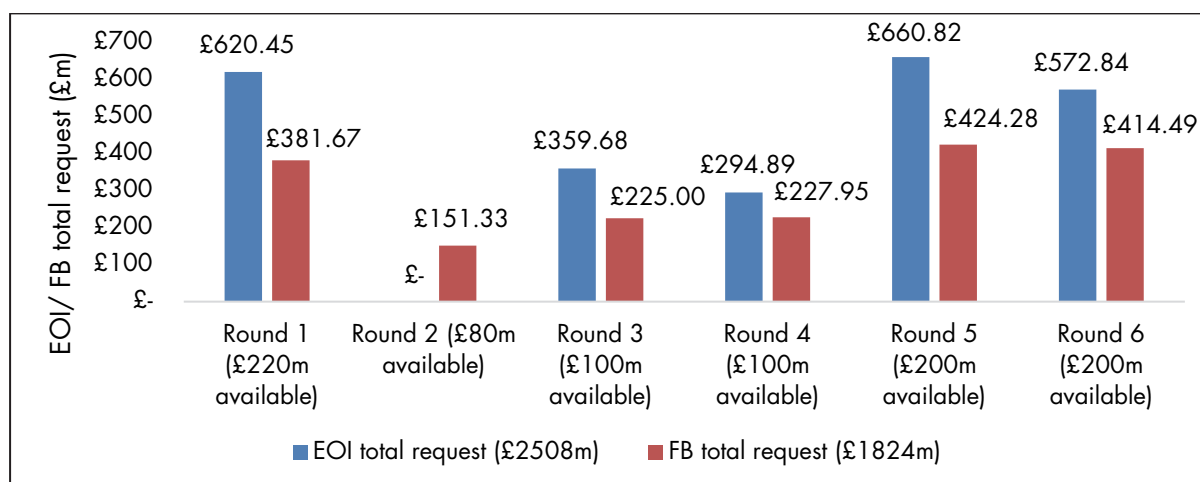
Table 8: Average bid value per round

	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6
Average bid value (£)	£14.43m	£13.76m	£14.82m	£13.89m	£16.84m	£17.90m

Source: RAND analysis of UKRPIF data (accurate as of 21/06/2022).

EOI total requests were highest in Rounds 1 and 5, where the funding available is the highest. Conversely, EOI total requests were at their lowest in Round 3 and Round 4. FB total requests were highest in Round 5 and round 6, and at their lowest in Round 4 (Figure 15).

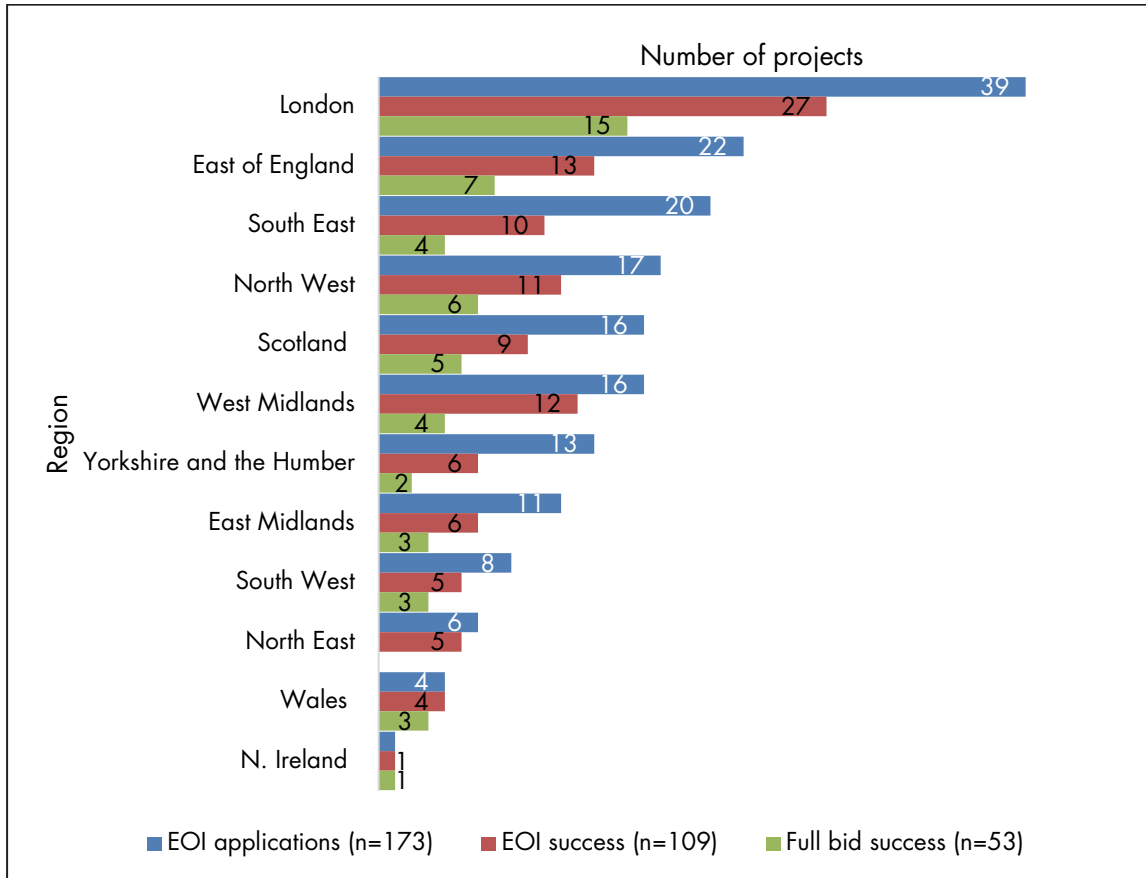
Figure 15: EOI and FB total request by round



Source: RAND analysis of UKRPIF data (accurate as of 21/06/2022). Note: no EOI stage for Round 2.

Broadly, HEPs across regions tended to receive around a third of successful bids compared to the number of EOI applications (Figure 16). However, this trend is not the case for the North East (0% full bid success from EOI), Wales (75%) and Ireland (100%).

Figure 16: Number of EOI applications, EOI success and full bid success by region



Source: RAND analysis of UKRPIF data (accurate as of 21/06/2022).

5.2. Project Mapping

Project mapping was conducted to understand the scope of the portfolio and to assess how the different parts of the portfolio map to the evaluation framework. To conduct the project mapping, a data extraction template was created that detailed the high level and sub level UKRPIF objectives against each of the successfully UKRPIF funded projects across the six rounds. For each project, the respective full bid pack documentation was used to fill out the extraction template, with key word searches and the objective sections being used to identify the key information. Subsequent to this, level of alignment was established between the projects and objectives and a summary of overall coverage at objective and sub-objective level was calculated (Table 9).

Overall coverage of the UKRPIF objectives is high, with all projects (except one in one instance) aiming to address all UKRPIF objectives. However, although there is slightly less coverage at the sub-objective level per project, this remains high on average (79%). The most sub-level coverage is received for economic growth (96%), with nearly all projects aiming to have an impact on in jobs, spin outs, GDP, research

capacity (96%), improved quality of research (94%), and strategic partnerships, which are mentioned in the objectives of all projects. However, fewer projects targeted producing graduates with relevant skills (60%) or stimulating additional investment through research grants (43%) and beyond UKRPIF (42%).

Examples of how projects targeted sub-objectives in their applications is illustrated in Table 10.

Table 9: Overall coverage at sub-objective level

High level UKRPIF objective	Sub-objective	Number of projects covering sub-objective	% of total UKRPIF projects
Objective 1: Enhance the research facilities of HEIs undertaking world leading research	Improved Quality of Research	50	94%
	Graduates with Relevant Skills	32	60%
	Research Capacity (number of researchers, availability of facilities)	51	96%
Objective 2: Encourage Strategic Partnerships Between HEIs and other organisations	Co-location (shared facility, jointly owned)	43	81%
	Strategic Partnerships	53	100%
Objective 3: Stimulate Additional Investment in Higher Education Research	Investment by Partners	52	98%
	Income from Research Grants (grant capture, leveraging, named funds)	23	43%
	Sustainability (plans beyond UKRPIF)	22	42%
Objective 4: Strengthen Contribution of Research to Economic Growth	Economic Growth (industry, jobs, spin outs, GDP)	51	96%

Source: RAND analysis of UKRPIF data.

Table 10: Example of sub objectives from project bids

High level UKRPIF objective	Sub-objective	Example from project bids
Objective 1: Enhance the research facilities of HEIs undertaking world leading research	Improved Quality of Research	R1 - Materials Innovation Factory (MIF) - University of Liverpool: <i>"This new hub will increase the quality, breadth, and competitive pace of fundamental and applied research in key areas of materials, chemistry, and bioscience, thus building a UK international lead in applications related to energy, personal care, materials, chemicals, and pharmaceuticals."</i>
	Graduates with Relevant Skills	R4 - Research Foundation in Compound Semiconductor Technology - Cardiff University: <i>"The aim will be to train students and</i>

High level UKRPIF objective	Sub-objective	Example from project bids
		<i>postdoctoral level workers in advanced device concepts and industrial level nano-device fabrication. These skills are crucial for embryonic high-tech industries and established companies alike."</i>
	Research Capacity (number of researchers, availability of facilities)	R5 - Institute of Advanced Automotive Propulsion Systems (IAAPS) – University of Bath: <i>"IAAPS will create a threefold increase in capacity, enabling universities and partners to produce additional research outputs."</i>
Objective 2: Encourage Strategic Partnerships Between HEIs and other organisations	Co-location (shared facility, jointly owned)	R2 - Cancer Centre - Research and Innovation Hub - King's College London: <i>"Co-locating research and clinical teams in this new Centre... the Hub will allow teams to be on one unified site, with shared facilities for informal interaction."</i>
	Strategic Partnerships	R4 - Chemistry of Health - University of Cambridge: <i>"The CoH building will provide space for new research collaborations that will exploit Cambridge's data-rich environment, which includes the European Bioinformatics Institute, the Cambridge Crystallographic Data Centre, the Royal Society of Chemistry, the NHS clinical data at Addenbrooke's, CRUK genomics, the Institute of Metabolic Science and the Sanger Institute."</i>
Objective 3: Stimulate Additional Investment in Higher Education Research	Investment by Partners	R6 - London Institute for Healthcare Engineering (LIHE) - King's College London: <i>"Co-investment is provided by Siemens Healthineers, Medtronic, NVIDIA, IBM, 10 SMEs and the Wellcome."</i>
	Income from Research Grants (grant capture, leveraging, named funds)	R1 - Manchester Cancer Research Centre - University of Manchester: <i>"We hold major programme grants from CR-UK and Breakthrough Breast Cancer."</i>
	Sustainability (plans beyond UKRPIF)	R3 - Advanced Propulsion Research Laboratory (APRL) - Warwick University: <i>"JLR is providing recurrent funding of £28.5M over the initial 15 years to support operational costs."</i>
Objective 4: Strengthen Contribution of Research to Economic Growth	Economic Growth (industry, jobs, spin outs, GDP)	R2 – Multidisciplinary Characterisation Facility (MCF) – University of Manchester: <i>"The initial investment of \$100 million (£60 million) by BP will create over 200 new industrial, academic and research jobs providing a unique platform for the invention of new materials solutions in the UK."</i>

Source: RAND analysis of UKRPIF data.

This concludes the chapter on portfolio analysis. Now the processes, stakeholders and projects have been mapped, we turn to the UKRPIF Theory of Change where we begin to modify the evaluation approach based upon the intelligence gathered in these preceding activities.

6. Theory of change

6.1. Overview

This chapter sets out the Theory of Change (ToC) for UKRPIF at the programme level. This consists of a visual presentation, or logic model, which presents the ToC in one image, and a wider narrative ToC that explores the intervention logic in more detail. The ToC (both the logic model and narrative together) is intended to provide an articulation of the rationale for and intended outcomes and impacts of UKRPIF, as well as capturing the underlying assumptions.

This is the second iteration of the ToC. The first was developed as part of the 2019 evaluation framework by Technopolis. Key updates are discussed later in this section, though no fundamental changes were made. The current version was updated based on the following inputs:

- Review of programme documentation, including business cases and proposals.
- Review of Technopolis' Evaluation Framework Study.
- Scoping interviews with key UKRPIF stakeholders from RE.

This section is structured as follows:

- We illustrate how the relevant inputs and activities are intended to translate into outputs and near- and medium-term outcomes, as well as the assumptions that are inherent in these expectations.
- We set out a logic chain, setting out the main programme inputs and activities, as well as the intended outputs and outcomes of the programme.
- We set out a narrative description explaining how the intended impacts and intermediate outcomes are expected to arise from the programme's inputs activities and outputs. This includes a discussion of potential risks and assumptions across this pathway to impact, and the external factors that will influence and affect the pathway.

6.2. Visualisation of the Theory of Change

The ToC is intended to serve several purposes. First, it provides a key input and guiding framework for our theory-based evaluation approach. As such, the evaluation plan that follows in the next Chapter builds on the ToC. Secondly, it aims to articulate a shared understanding of the aims of the programme and how it

is anticipated these will be achieved. Not all aspects of the ToC will apply to all projects, but all the projects should be able to see their expected pathways and impact reflected across parts of the ToC.

The ToC takes a 'logic model' approach, capturing the inputs, activities, outputs, outcomes and impacts of the programme sequentially from left to right. The ToC is intended to be read from left to right, but this is not intended to imply a simple linear progression between these aspects – indeed there will be many non-linearities and feedback loops within the operation of the programme, beyond the pathways stemming from the four original objectives of UKRPIF.

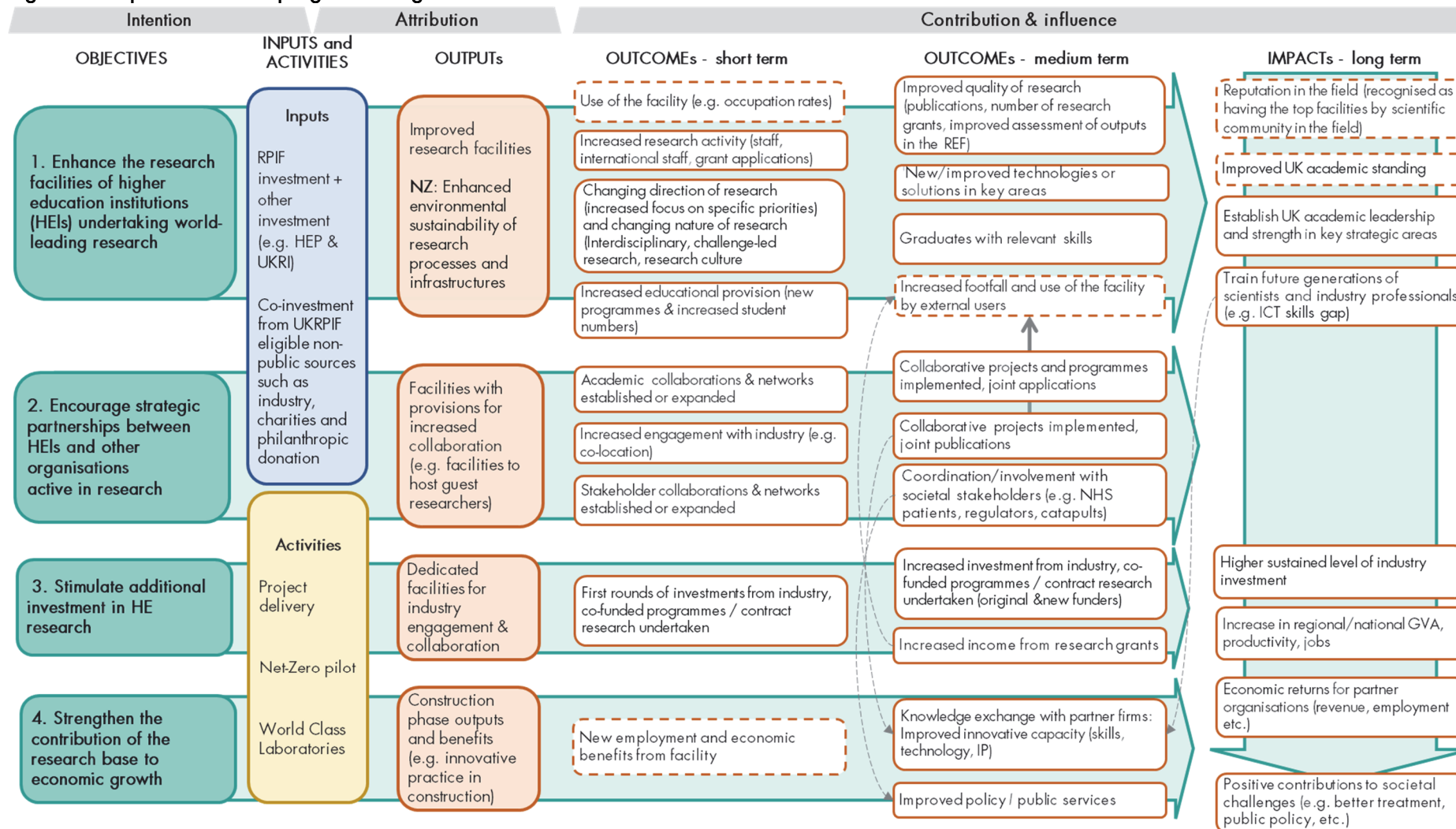
As identified in the 2019 framework, there are four broad time windows that represent when the results of the UKRPIF are expected to occur per project. We note here that each project timeline will be different, as will its results, but this provides a broad guide for the evaluation:

- **The building phase** covers 'activities' and 'outputs', which should coincide with the completion of the infrastructure, and is expected to yield outputs 2-5 years post-award.
- **The short-term** (4-6 years post-award) which relates to short term outcomes.
- **The medium-term effects** (7-8 years post-award) is a mix of medium-term outcomes and some early impacts.
- **The longer-term objectives** (9+ years post-award) are linked with programme impacts.

We have made two main adjustments to the 2019 version of the ToC:

- First, we have made two visual changes to improve the readability of the ToC. We have simplified the links from the objectives to outcomes and within impacts with block arrows. This was done as the possible connections between those factors are higher than those that can be reasonably included in the visualisation without risking poor readability ('arrow soup'). We have added three bars along the top of the ToC: the 'intention' block denotes the programme rationale and inputs. The 'attribution' block contains activities and outputs, which should be within the control of the programme (we can be reasonably sure they caused the results). The 'contribution' block contains all outcomes and impacts. UKRPIF alone is unlikely to achieve macro-level results (e.g. UK's economic growth), but it can contribute to them.
- Second, we have reflected 'activities' alongside inputs. This simply reflects the work the projects do to deliver on their objectives up to and after infrastructure completion. It also reflects the Net-Zero and WCL elements of UKRPIF which were implemented after 2019. An additional output has been added to reflect the objectives of the Net-Zero programme ('Enhanced environmental sustainability of research processes and infrastructures'). The objectives of the WCL funding were largely the same as the wording around the outcomes related to the first objective and are thus considered addressed by the existing outcomes around improved facilities, albeit with a focus on their maintenance and refurbishment.

Figure 17: Updated UKRPIF programme logic model



Source: RAND Europe. Adapted from Technopolis (2019) UKRPIF Evaluation Framework Report.

The specific descriptions of each input, activity, output, outcome and impact remain the same as outlined in the 2019 framework, with any changes already outlined above. Inputs (funding, people) and activities (project selection and delivery) are those elements most in control of the programme in that they would not have come about without its existence (i.e. in the realm of attribution). Outputs may occur as part of project delivery (e.g. improved facilities) with some occurring shortly after. Outcomes are those which follow on directly from outputs but require programme participants to continue their work and realise the intended benefits at the project level (e.g. attract additional investment, maintain networks), though the programme can only claim to have made a contribution towards those results. Longer term outcomes and impacts are much more difficult to determine the contribution the programme has made to them, such as increases in regional GVA.

The only substantive content addition we have made is in regard to **activities**, which would typically include: securing planning permission, appointment of personnel to manage the build, finalisation of investment terms with co-investors, completion and sign off of design, tendering, commencement of works, final checks up to practical completion, installing research equipment, additional staffing and monitoring of project deliverables.

It is also worth recognising the potential the benefits realised in preparing a UKRPIF bid - the impact even before award of reaching out and brokering new partnerships and relationships for the bid, the increased strategic thinking of the relevant research groups, increased interdisciplinary working. This will be particularly explored with unsuccessful applicants, as to what extent the bidding process itself helped them to secure funds and co-investment later on.

6.3. Impact Pathways

6.3.1. Key causal pathways

We have identified ten causal pathways in the logic chain (i.e. *x causes y because of z*). Much of these were developed from strategic UKRPIF documents, including the 2012 and 2015 business cases, as well as the logic described within the ToC itself. We specifically note here that the below statements do not cover every potential impact pathway, just the most strategically significant (i.e. relating to the four objectives).

Inputs/Activities to outputs:

- UKRPIF funding and within-sector co-investment *leads to* improved research facilities *because* UKRPIF was designed to allow for high-quality and sufficiently funded projects with robust strategic business cases built on research excellence, demonstrating strong, sustainable collaborations (with double match funding) and contribution to economic growth, and overall value for money.
- UKRPIF funding *leads to* facilities with provisions for increased collaboration *because* UKRPIF encouraged collaborative bids between HEPs and ROs which build on collective research strengths and addressed the market failure of coordination between R&I actors by providing a joint venture based on R&I collaboration.

- Non-public co-investment e.g. industry co-investment, and charitable funding and philanthropic donations *leads to* dedicated facilities for industry engagement and collaboration *because* UKRPIF's double match funding ensures that all parties have 'skin-in-the-game' with cross-sector collaboration designed-into the infrastructure's functions.

Outputs to short- and medium-term outcomes:

- Improved research facilities *lead to* improved quality of research *because* world-class research is more likely to take place in state-of-the-art facilities, itself increasing capability and stemming from the quality requirements set out for projects by UKRPIF.
- Facilities with provisions for increased collaboration *lead to* the implementation of collaborative projects and programmes *because* advances in scientific understanding and technological breakthroughs occur in physical (and virtual) environments that enable the interaction and engagement of different disciplines, and people from different disciplines to interact and engage with people from different backgrounds and sectors, strengthening collaborations and subsequent joint efforts.
- Dedicated facilities for industry engagement and collaboration *lead to* increased investment from industry *because* large-scale, successful partnerships generate their own momentum (critical mass) and attract additional funding over time, and the challenge of information asymmetry and competition are reduced as the initial fixed cost and risk exposure lessens for industry partners (i.e. the initial sunk expense of building the facilities is shared and the completed facility is ready for subsequent R&I to commence, leading to new investment).

Outcomes to impacts:

- Improved quality of research *leads to* established UK academic leadership and strengths in key strategic growth areas *because* UKRPIF projects contributed to the training of researchers (capability and capacity building), new/improved solutions in strategic areas, that UKRPIF specifically helped steer, and established reputations for world class facilities.
- Increased investment from industry and successful collaborative projects with industry *leads to* a higher sustained level of industry investment *because* increasing the total volume of collaborative R&I will cause businesses to invest to a greater extent in riskier and potentially higher-value R&I and cause academics to increase the share of use-oriented research.
- Subsequent collaborative R&I projects, contracts and cross-sector knowledge exchange spillovers *lead to* increases in regional/national GVA, productivity and jobs *because* UKRPIF anchors investment in R&I in the UK and through these R&I collaborations and the research and high level skills generated strengthens the contribution of the research base to economic growth, through supporting key industry sectors which contribute to the UK economy.
- Cumulative results from world class research, challenge focused R&I efforts and increased interactions with societal stakeholders (e.g. NHS patients, regulators, catapults) *lead to* proportionately high positive contributions to societal challenges *because* a larger volume of world-class research carried out in conjunction with the private and third sectors will generate a

proportionately larger volume of social and economic impact than one would expect from the same funds invested through separate strands of conventional research grants and proprietary R&I, and public funding is needed to ensure that investment is at the socially optimal level as without it there might be underinvestment in science capital.

6.4. Key Assumptions

Assumptions were initially identified in the 2019 Evaluation Framework (per each of the four objectives). See below.

Text box 2: Key assumptions per each of the four programme objectives

Enhance research facilities at leading UK HEIs:

- World-class research is more likely to take place in state-of-the-art facilities, with equipment and even buildings needing to be upgraded continuously to remain close to the technological frontier. This is not restricted to STEM subjects, with for example the social sciences becoming ever more reliant upon a digital and globally connected infrastructure of computational facilities, open access data centres and linked social surveys.
- Advances in scientific understanding and technological breakthroughs increasingly occur in physical (and virtual) environments that cause disciplines to interact and engage with people from different backgrounds and sectors.

Create strategic partnerships with other organisations:

- Academic research groups do not own the full spectrum of knowledge and techniques required to frame research questions and pursue them to their logical conclusion, and research programmes may be more readily progressed through collaboration with other organisations in the private, public and third sectors. This may include leading technology businesses, hospitals, research charities or other universities in the UK or overseas.
- Strategic partnerships can strengthen the research itself while also providing enhanced access to the pathways through which knowledge produced may undergo further development, commercialisation and wider exploitation.

Stimulate additional investment in higher education research:

- The public-private partnership model has the potential to leverage public funds, and thereby expand the total volume of strategic applied research being pursued in UK universities.
- Large-scale, successful partnerships will generate their own momentum (critical mass) and attract additional funding over time, further expanding the individual centre's research capacity and helping to secure its long-term sustainability in order to maximise its impact potential.

Strengthen the contribution of public research to economic growth:

- Increasing the total volume of collaborative R&D will cause businesses to invest to a greater extent in riskier and potentially higher-value R&D and cause academics to increase the share of use-oriented research.
- A larger volume of world-class research carried out in conjunction with the private and third sectors will generate a proportionately larger volume of social and economic impact than one would expect from the same funds invested through separate strands of conventional research grants and proprietary R&D.

Source: Technopolis (2019) UKRPIF evaluation framework.

In addition, we have identified the following cross-cutting assumptions:

- **Translation of research outputs into usable technology relevant to real-world applications.**
- **Projects demonstrate a viable business case** which offers an attractive return on private investment, both as part of initial double match funding and for follow-on funding post-award.

- **Favourable timing for infrastructure completion** at the end of the programme due to a healthy business environment, continued research area relevance and end-user responsiveness.
- **The networks and collaborations created and strengthened through the projects are capitalised** upon post-project to invest and engage in using the facilities and further R&I, commercialisation and advocacy for R&I solutions and policies. These networks span SMEs, policymakers, regulators, investors, in the UK and internationally.

6.5. External influences

Related to these assumptions, there are several external influences that have been identified which might affect the outputs, outcomes and impacts brought about in full or in part by UKRPIF.

- **Development of comparable or superior facilities** (e.g. industry, other UK / non-UK government programmes). Market forces, external shocks or technological breakthroughs may encourage others to develop facilities with similar objectives to UKRPIF projects. This can help with the uptake of solutions from the projects via crowding in. It may also help in R&I development if knowledge from external developers is shared and built upon by the UKRPIF projects and vice-versa.
- External shocks such as the **COVID-19 pandemic** may have affected the intended timelines of projects, requiring extensions due to project teams not being able to attend physical sites or by reduced productivity (due to sickness, people leaving the workforce). Investments from partners may also fall through if their activities were particularly exposed to external shocks like the pandemic. In other cases, facilities focusing on tackling challenges brought up by COVID-19 (e.g. vaccine manufacturing) may receive additional investment to fast-track solutions. Economic, political and social shocks such as Brexit and the war in Ukraine will also have effects on materials supply chains, personnel and international collaboration opportunities, to be explored in the evaluation.
- **Other public investments in research infrastructure**, from UKRI (mainly STFC, the Engineering and Physical Sciences Research Council (EPSRC) and Innovate UK) and international funder activities i.e. investments, technology developments and policy decisions made outside the UK. These could multiply the benefits of UKRPIF, assuming there is no duplication or prohibitive competition.

Risks

In addition to the assumptions embedded within the ToC described above, there are a range of general risks to the successful delivery of UKRPIF. This section summarises these wider risks, to highlight potential unintended consequences and alternative ToCs.

- Investing in R&I involves substantial risk, not least because of the timelag between investment, R&I results and potential commercialisation. Compounded with any delays, external partners may find their original investment to have taken too long to bear fruit, and could decide to withdraw or decline to provide any additional investment.

- As identified in the 2019 framework, there are risks and benefits to the funding model: ‘There is a risk that the industrial investment in UKRPIF is being paid for by a **lowering of investment** in intramural research. The programme’s theory of change assumes increasing Business enterprise research and development (BERD), however, even if overall levels of BERD remain broadly constant there may be some gain to the overall economic system resulting from businesses supporting riskier and more fundamental research.’

7. Evaluation framework and approach

This chapter summarises the overarching approaches to the process, impact and economic evaluations.

7.1. Overarching evaluation approach

The evaluation will use a mixed methods approach, tailored to capture evidence against the evaluation questions (EQs) and ToC and to assess the contribution of UKRPIF to its aims. The matrix below shows how the EQs map to the methods.

Table 11: Evaluation and study matrix

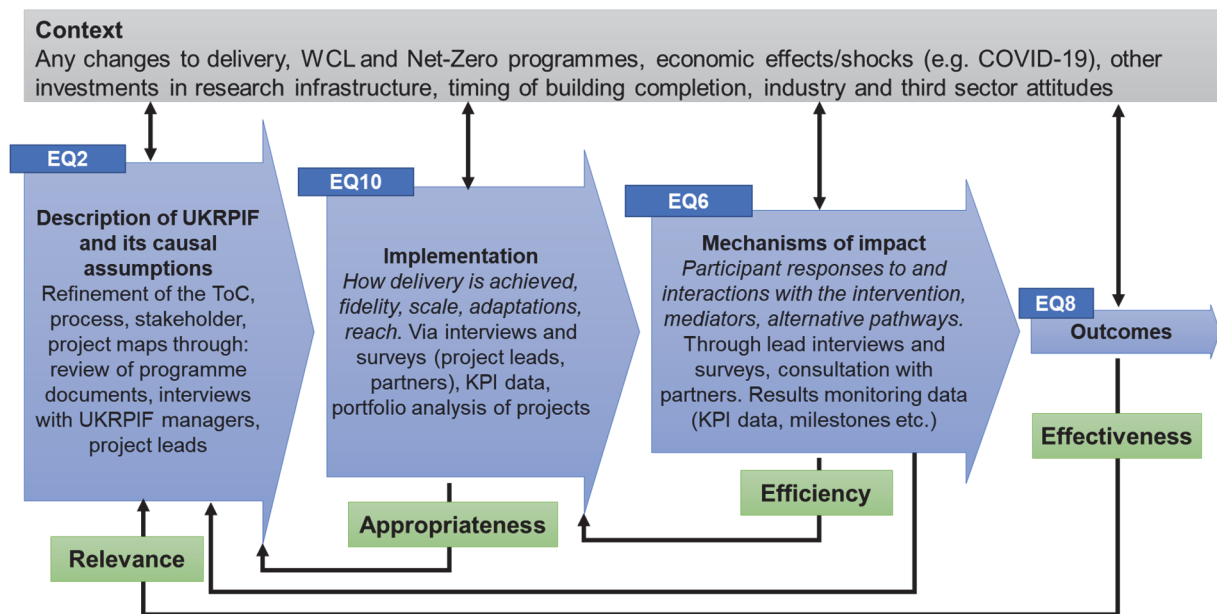
Evaluation questions (EQs - from the ITT - simplified)		Process eval	Impact eval	Economic eval	Interviews	Case studies	Secondary data	Survey
1. Programme objectives	EQ1. To what extent is the programme achieving its original objectives? If it is not, why not?		xxx	xx	xxx	xxx	xx	xxx
	EQ2. To what extent do the programme objectives remain appropriate and relevant?	xxx	xxx		xxx			xxx
2. Impact and socio-economic evaluation	EQ3. What are the research impacts and benefits of the programme?		xxx		xxx	xxx	xxx	x
	EQ4. What are the socio-economic impacts and benefits of the programme?		xxx		xxx	xxx	xx	xx
	EQ5. What is the impact of the UKRPIF on the higher education (HE) sector?		xxx	xx	xxx	xx	xxx	xx
	EQ6. How have the anticipated impacts of the UKRPIF evolved?	xxx	xxx		xxx	x	xxx	xxx
	EQ7. What might have been expected to happen without the UKRPIF investment? (Counterfactual)		xxx	xxx	xxx	xxx	xxx	xx
3. Funding model	EQ8. How effective is the UKRPIF funding model?	xxx	xxx	xxx	xxx	x	xx	xxx
	EQ9. What is the value for money of the UKRPIF?		x	xxx	xx	x	x	x
	EQ10. How has the programme evolved since its launch in 2012?	xxx	xxx		xxx			xxx
4 Disbenefits – EQ11. Have there been any disbenefits of the UKRPIF investment		x	xx	xxx	xxx	xxx		xxx

Note: **xxx** – high level of alignment, **xx** – medium alignment, **x** – some alignment. Source: RAND Europe.

7.2. Process evaluation

The process evaluation will follow best practice MRC process evaluation guidance focusing on how strengths and weaknesses in design, implementation, and contextual factors affect delivery (Figure 18). This considers **relevance** (did UKRPIF’s aims meet target groups’ needs), **appropriateness** (was the funding model appropriate to achieve aims), **effectiveness** (were intended results were achieved), and **efficiency** (to what extent was delivery was to time and budget). This approach will aim to understand what worked well and not so well to inform future UKRPIF rounds. Process related questions based on the below framework and EQs 2, 6, 8 and 10 will be woven into all aspects of primary data collection and document review in all phases, and reported within each deliverable to provide an ongoing assessment of UKRPIF delivery.

Figure 18: Process evaluation framework



Source: RAND Europe.

7.3. Impact evaluation

The UKRPIF evaluation must demonstrate that outputs and outcomes exceed what would have happened in the absence of the investment. There are challenges in addressing attribution for infrastructure investments of this type since many of the outcomes will also be dependent on other resources and investment to support the use of this infrastructure. One way of addressing these challenges is to use a counterfactual control group by tracking quantitative outcomes for unsuccessful applicants or other infrastructure investments. However, given the diversity of UKRPIF both in terms of field and context, control groups per project would be required to do this in a robust quantitative manner. It is unlikely appropriately matched comparators exist to do this effectively, and produce meaningful statistical comparisons, nor would robust data be available to robustly compare them across all the intended aims of the fund.

We will use theory-based methods where the contributions of the programme are traced through reconstructing and tracing the causal pathways from UKRPIF inputs to intended outputs and early

outcomes and produce rigorous accounts of the additionality of UKRPIF. The HMT Magenta Book advises utilising theory-based approaches to assess the contribution of complex of interventions to observed results. In line with this, assessments of the contribution made by UKRPIF to the results will be based on a pragmatic theory-based approach using contribution analysis (CA) and process tracing (PT).

Beyond this, we will look to develop appropriate comparators for different outcomes –quantitative or qualitative as appropriate. For example, we may develop a matched set of comparable businesses using the Business Structure Database, if appropriate, to look at GVA impacts on engaged companies, whereas for analysis of student outcomes we would look at comparable HEP outcomes. We will conduct 2-4 light touch case studies focusing on unsuccessful applicants to explore qualitatively what was achieved without UKRPIF support.

Our review of the available information indicates that the most likely counterfactual group would either be unsuccessful applicants or non-participant research infrastructure developers. Following Magenta Book guidance, it is unlikely that an experimental approach can be used as we are unable to assign participants at random given the nature of grant funding, nor would the groups be large enough to be statistically identical. Turning to quasi-experimental designs (QED), the options are heavily dependent on what information is available on participants. A regression discontinuity design requires significantly more participants than a Randomised Control Trial (RCT) and as such is not feasible here. Propensity score matching would require data on all applicants at the point of application to ‘match’ treated grantees to their counterfactuals which we assume would exist in this case (dependent on assessment data). This method would again require comparable outcome data for the counterfactual group, which is not collected by UKRPIF and would be difficult to obtain (i.e. unsuccessful applicants going back 11 years).

The above discussion will be continued with UKRPIF programme managers and finalised in Phase 2a.

7.3.1. Contribution analysis and process tracing approach

CA is a six-stage process for assessing causal claims. CA seeks to explore attribution by assessing the contribution of the programme to observed results and outcomes and develop pathways through which ultimate impacts can be plausibly achieved (or not) following on from these initial results. As is the case for most R&I programmes, ultimate impacts can take some time to emerge, and CA offers a means to capture progress towards them at a relatively early stage. It provides a guiding framework for testing programme hypotheses (PH – these are the contribution claims set out in section 6.3.1) and establishing a well-reasoned case to explain the relative contribution made by UKRPIF, over and above alternative hypotheses (AH). The assessment of contribution is qualitative in nature (e.g. necessary evidence identified, but not sufficient to discard AH), but will be informed by both quantitative and qualitative evidence from all methods discussed.

Our six-step approach will first be applied as a ‘CA of direct influence’, assessing as many of the outputs and outcomes that can be traced back to UKRPIF interventions as possible, data will be presented in this in the interim report. The following annual rounds of data collection for the final evaluation will allow us to iterate this analysis and also extend our consideration of contributions through to the medium-term outcomes and impacts:

1. Set out the attribution problem to be addressed (Phase 1)
2. Develop contribution claims and risks (Phase 1)

3. Gather the existing evidence on the theory of change (Phase 2a)
4. Assemble and assess the contribution story, and challenges to it (Phase 2a)
5. Seek out feedback (Phase 2a)
6. Revise and strengthen the contribution story (Phase 2a, 2b, 3).

Process Tracing (PT) is used within our CA framework as a means of testing the hypotheses against the evidence collected in the evaluation. PT is a qualitative method for assessing causal inference using four tests to determine the necessity and sufficiency of evidence to prove/disprove a hypothesis:

- **Hoop test** – basic test that can be used to eliminate certain hypotheses e.g. before understanding the impact of a certain facility, that facility must have been completed, if it has not, the test fails and the hypothesis eliminated.
- **Straw-in-the-wind** - supports a particular hypothesis but does not rule it in or out, usually a single piece of qualitative evidence with little to no triangulating evidence (e.g. one interview).
- **Smoking gun** - can be used to confirm a hypothesis. This is usually multiple pieces of triangulated evidence pointing towards the same result, but it does not disprove other hypotheses, despite being strong evidence.
- **Double decisive** - This confirms one hypothesis and eliminates all others. This might be a combination of an industry investor claiming that they decided to invest in expanding a UKRPIF funded-facility solely because of the government de-risking the initial opportunity, and multiple other sources prove the investment exists and that other accounts confirm that claim. These tests are the most difficult to prove, even with hypothetical examples.

Developing a PT framework provides transparency as to which criteria will be used to judge whether programme theories are true or not, and how conclusions will be drawn. We have chosen PT over outcome harvesting as both CA and PT are grounded in generative causality and look to assess confidence about impact (as suggested by Befani and Mayne).⁵⁸ PT is more appropriate here where the likely outcomes are largely known (i.e. not unpredictable) and is more economical (tracking back is more time consuming). However, we will actively look for alternative pathways to impact and track back where the path is unclear. PT tests are also sufficiently robust and flexible to capture the wide range of impacts the fund seeks to achieve, from increasing skills and infrastructure and encouraging strategic partnerships to stimulating economic growth. We will use two tests for assessing the strength of the supporting evidence: Convergent Triangulation (strength) and Authoritative Source (credibility).⁵⁹ Considering whether, and why, key findings are ‘Triangulated’ and whether a given test finding is based upon an ‘Authoritative source’ helps us make judgements on the ‘strength of evidence’ for or against each hypothesis. In addition, we will triangulate findings against the baseline assessment. This will help us to identify any change that has

⁵⁸ Befani, B., and Mayne, J. (2014). ‘Process tracing and contribution analysis: A combined approach to generative causal inference for impact evaluation.’ *IDS bulletin*, 45(6), 17-36.

⁵⁹ Delahais, T., and J. Toulemonde (2017). ‘Making rigorous causal claims in a real-life context: Has research contributed to sustainable forest management?’ *Evaluation*, 23(4), 370–388.

occurred, with the CA&PT methodology then allowing us to establish whether that change can be attributed to UKRPIF investment.

Below, we give a practical example of how a PT test would look using the UKRPIF ToC (Table 12).

Table 12: Example Process Tracing test

Result in ToC	Medium term outcome: Improved quality of research
Contribution claim (Programme Hypothesis)	Improved research facilities <i>leads to</i> improved quality of research <i>because</i> world-class research is more likely to take place in state-of-the-art facilities, itself stemming from the quality requirements set out for projects by UKRPIF.
Evidence we expect to observe if true	Highly cited publications, projects show noteworthy research achievements, confirmed with bibliometrics, interviews and surveys say achievements would not have happened without facilities funded by UKRPIF.
Evidence sources	Bibliometrics, triangulated interviews, surveys, project closure reports
Process tracing test	Smoking gun (provides strong, unique support for the hypothesis)
Rationale	Strongly strengthens the hypothesis if observed. Self-reported attribution of quality to UKRPIF facilities is compelling evidence in support of the PH, but does not entirely rule out other contributing factors (e.g. the research may have been as high quality without facility, or another would have been used)
Result – strength	Passed, failed or inconclusive / evidence strength assessment

Source: RAND Europe.

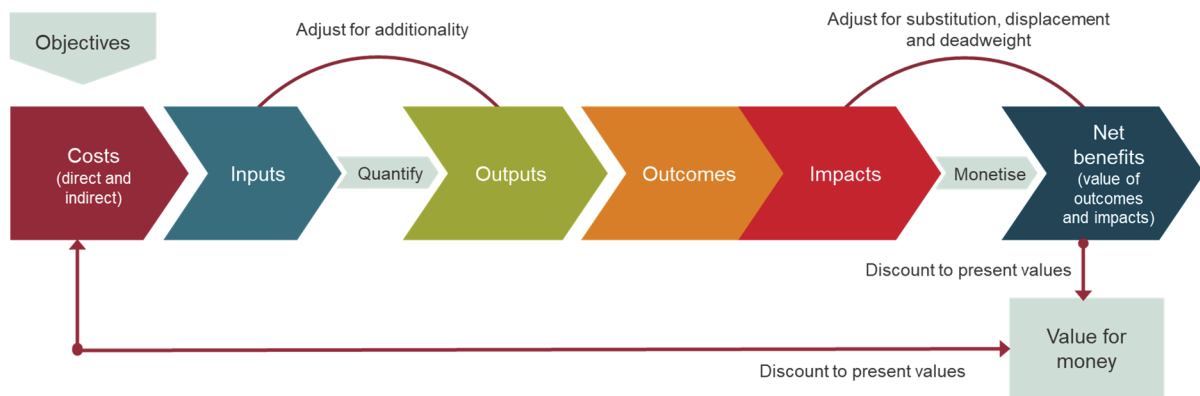
A full PT framework will be developed in Phase 2a.

7.4. Economic evaluation

This subsection sets out the key issues to be addressed in the economic evaluation and a high-level description of our methodology, which builds on the approach submitted in the proposal. It expands our understanding of the evaluation dimensions, metrics and sources based on our review of UKRPIF documentation, the 2019 framework and the data collection tools applied in the 2019/2020 pilot.

The aim of the economic evaluation is to establish whether the aggregate monetary value of the outputs, outcomes and impacts delivered by UKRPIF are greater than its costs, in line with best practice principles.⁶⁰ As shown in Figure 19 below, this will require us to robustly quantify and monetise costs and benefits, with relevant time discounting applied and within a framework that identifies the causal links between UKRPIF funding and the key outcomes and impacts.

Figure 19: Summary of UKRPIF logic overlaid with economic analysis approach



Source: Frontier Economics.

At a high level, our approach involves combining the evaluation evidence that will be gathered during this evaluation with existing monitoring data and other secondary data sources to estimate the aggregate value of the programme. Cost data will be gathered from Research England (i.e. value of awards, operating expenses – administrative costs, engagement costs incurred by third parties). Benefits data will draw on quantitative and qualitative evidence to provide a holistic assessment of UKRPIF.

We will calculate the net benefits of UKRPIF. This requires accounting for the additionality of the funding and adjusting for substitution, displacement and deadweight effects. In line with Green Book principles, our calculation of the net benefits will focus on attempts to estimate the productivity-enhancing benefits associated with UKRPIF rather than benefits associated with the construction of facilities which could displace activity elsewhere, or job creation which would be assumed to displace other jobs at a national level. This suggests a focus on the wider economic benefits that the research infrastructure enables which could be linked to productivity improvements and, therefore, to drivers of socio-economic growth.

A preliminary list of potential benefits (at all geographical levels) based on our review of the documentation shared by UKRPIF programme managers is presented below:

- Additional research capacity and quality (e.g. additional academic and non-academic jobs with wages/productivity higher the average, volume and quality of research).

⁶⁰ The latest version of the Green Book (2022) and supplementary guidance is available.

- Increased R&I funding leveraged by partners and non-partners (including VC by spin-offs, start-ups or incubated SME) in UK HERD (including from overseas).
- Number of newly created and active businesses supported (spin-outs, start-ups, SMEs).
- Increased funding leveraged by supported spin-outs, start-ups and incubated SMEs (e.g. venture capital) from different sources (including from overseas).
- Improved sales, income from intellectual property, contract research income, and/or consultancy income associated with new research outputs (e.g., new technologies, therapies, processes, services).
- Other benefits relative to specific projects (e.g. QALY, healthcare cost savings, carbon emissions, etc.).

Table 13 presents a description of preliminary benefits, their link with the updated UKRPIF ToC, proposed metrics and sources, and a first assessment of their availability based on data and documentation provided by the fund and secondary data sources. These benefits will be reviewed to make sure they align with the revised evaluation framework and data collection and analysis tools that will be developed after Phase 1. There will be a trade-off between the extent these benefits can be standardised to allow for aggregation of net returns and the flexibility needed to account for the diverse projects UKRPIF has supported. When possible, projects will be clustered through collective outcomes and impacts based on discipline, sector, size and scope.

Outcomes and impacts are expected to materialise over a number of years (see ToC chapter (Chapter 6) for timings) and will vary depending on the operation start date. It is important to consider the full lifetime of economic costs and benefits to provide a complete assessment of UKRPIF outcomes and impacts. We will apply standard discount factors and present costs and benefits on a ‘net social present value’ value. We will also explore options to ‘forecast’ future benefits given that any future evaluation will only provide partial evidence of realised impact.

Table 13: Economic evaluation – Preliminary metrics and data sources

UKRPIF objective	Dimension	ToC level	Metric	Source
Enhance the research facilities of HEPs undertaking world-leading research	Improve quality of research	Outcome	Number of additional highly cited publications	<ul style="list-style-type: none"> • Dimensions AI • Researchfish (will give a list of publications with which to assess citations) • Research Excellence Framework (providing an alternative measure of quality)

UKRPIF objective	Dimension	ToC level	Metric	Source
				<ul style="list-style-type: none"> • Reporting Metrics Template (evaluation evidence)
Enhance the research facilities of HEPs undertaking world-leading research	Increase number of PhD/research students	Outcome	Number of additional PhD/research degrees awarded	<ul style="list-style-type: none"> • HESA • Reporting Metrics Template (evaluation evidence)
Enhance the research facilities of HEPs undertaking world-leading research	Expand research capacity	Outcome	Number of additional academic and non-academic staff members	<ul style="list-style-type: none"> • HESA • Reporting Metrics Template (evaluation evidence) • UKRPIF impact data survey
Encourage strategic partnerships between HEPs and other organisations (public, private, third sector)	Increase colocation between university researchers and external partners	Outcome	Number of additional staff from external partner organisations co-located	<ul style="list-style-type: none"> • HESA/HE-BCI Survey • Reporting Metrics Template (evaluation evidence)
Encourage strategic partnerships between HEPs and other organisations (public, private, third sector)	Strategic research partnerships formation	Outcome	Number of additional strategic partnerships by type (academic, private, charity/non-profit, hospital, other) and status (active)	<ul style="list-style-type: none"> • HESA/HE-BCI Survey • Reporting Metrics Template (evaluation evidence)
Stimulate additional investment in UK HERD	Increase in R&I funding leveraged in UK HERD by partners	Outcome	Additional funding leverage by strategic partners (e.g. research contracts) by source	<ul style="list-style-type: none"> • HESA/HE-BCI Survey • Reporting Metrics Template (evaluation evidence)
Stimulate additional investment in UK HERD	Increase income from competitive research fundings	Outcome	Additional competitive research funding secured (e.g. awards, grants) by source	<ul style="list-style-type: none"> • HESA/HE-BCI • Researchfish • Reporting Metrics Template (evaluation evidence)

UKRPIF objective	Dimension	ToC level	Metric	Source
Strengthen contribution of research to economic growth	Increased financial sustainability	Impact	<ul style="list-style-type: none"> • Additional annual capital investment by type (capital, life extending, replacement, disposal) • Annual additional research income linked to facility 	<ul style="list-style-type: none"> • HESA/HE-BCI • Reporting Metrics Template (evaluation evidence)
Strengthen contribution of research to economic growth	Increase in innovation activity	Impact	Number of new/improved products/services, processes or practices	<ul style="list-style-type: none"> • HESA/HE-BCI • Reporting Metrics Template (evaluation evidence)
Strengthen contribution of research to economic growth	Increase in innovation activity	Impact	Number of additional patent/licences filed and granted (intellectual discovery) by type (software and non-software)	<ul style="list-style-type: none"> • HESA • Reporting Metrics Template (evaluation evidence) • UKRPIF impact data survey
Strengthen contribution of research to economic growth	Increase in innovation activity	Impact	Number of newly and active organisations/businesses supported (spin-offs and/or start-ups, SMEs, other commercial businesses)	<ul style="list-style-type: none"> • Reporting Metrics Template (evaluation evidence)
Strengthen contribution of research to economic growth	Increase in innovation activity	Impact	Annual turnover from newly and active organisations/businesses supported	<ul style="list-style-type: none"> • Reporting Metrics Template (evaluation evidence)
Strengthen contribution of research to economic growth	Increase in innovation activity	Impact	Additional funding raised by organisations/business supported (e.g. venture capital, seed funding)	<ul style="list-style-type: none"> • HESA • UKRPIF impact data survey
Strengthen contribution of research to economic growth	Drive socio-economic growth	Impact	Number of jobs created by organisations/business supported	<ul style="list-style-type: none"> • ABS • Reporting Metrics Template (evaluation evidence)

The impact evaluation will inform the quantification of the outputs, outcomes and impacts of the fund. Any changes in performance will be subject to external comparators where feasible. We will establish the extent to which the benefits we observe are over and above what would be expected under a business-as-usual scenario. We will explore several counterfactual options (as set out in the impact evaluation

methodology) including self-reported counterfactuals but also constructing a control group of HEPs which would be used to compare with those in receipt of UKRPIF funding (those unsuccessful at EoI stage).

Table 14 presents our preliminary approach to monetise the benefits associated with the outcomes and impact of UKRPIF. This builds on the approach submitted in our proposal and includes a first assessment of the secondary sources available. Not all benefits of the fund will be monetisable so we will be clear on which benefits are included in the VfM assessment. In cases where monetisation is not possible, we will use ‘what if’ scenarios to assess the scale of benefits needed to justify public funding and assess the credibility of those assumptions. Additional evidence from the qualitative research and surveys will support best estimates of key non-monetised benefits as well as spillover effects and adjustments to account for substitution, displacement, deadweight and crowding out/in. For example, partners might have operations in other countries so gains in productivity might be shared across different locations.

Table 14: Economic evaluation – Preliminary approach and sources for monetary estimates

ToC level	Dimension	Metric	Monetary estimate	Source
Outcome	Improve quality of research	Number of highly cited publications	Value of research / rates of return	• Existent evidence
Outcome	Increase number of research PhD/research students	Number of additional PhD/research degrees awarded	Wage rate premium	• ASHE (ONS) jobs.ac.uk • TRAC
Outcome	Expand research capacity	Size of academic and non-academic staff (jobs created)	Wage rate premium	• ASHE (ONS) jobs.ac.uk • TRAC
Outcome	Increase in R&I funding leveraged in UK HERD by partners	Additional R&I funding leverage by strategic partners	• Productivity gains • Rates of return	• Existent evidence
Impact	Increase in innovation activity	Number of new/improved products/services, processes or practices	• Additional sales/income (consultancy income, others) • Productivity gains	• HESA/HE-BCI • Existent evidence
Impact	Increase in innovation activity	Number of additional patent/licenses filed and granted	• Additional IP sales/income • Productivity gains	• HESA/HE-BCI • Existent evidence
Impact	Increase in innovation activity	Number of newly and active organisations/businesses supported (spin-offs and/or start-ups, SME's, other commercial businesses)	Additional revenues / Productivity gains	• HESA/HE-BCI • Existent evidence
Impact	Drive socio-economic growth	Additional jobs created by supported businesses	Wage rate premium	• ASHE (ONS)

ToC level	Dimension	Metric	Monetary estimate	Source
Impact	Drive socio-economic growth	Additional GVA	GVA ratios derived from sectoral GVA	• ABS aggregates (ONS)

Reflecting uncertainties, we will develop scenarios around key values and parameters to test the sensitivity of any VfM estimates to particular assumptions made. We will provide an Excel-based model alongside the report to support the calculations.

Based on our approach set out above, we have planned for the following activities as part of our economic evaluation in 2026/27:

- **Desk review of economic returns of research infrastructure** in line with the evaluation framework and the evaluation questions set out by Research England. We will focus on the links between outcomes and productivity gains. Evidence of the strength and direction of links between UKRPIF funding and economic benefits, as well as key factors according to which impacts may vary (e.g. size/ranking HEP, discipline, type of investment, degree of coordination, etc). We will use the Maryland Scientific Methods Scale (SMS) to assess the methodological validity of the evidence which is widely used within government. The output will be a summary of robust estimates from existent evidence that will be used in the VfM analysis.
- **Review of appropriate methodologies to monetise outcomes and impacts** to ensure that can be appropriately translated into net returns. This should align with the impact evaluation methodology, addressing the issues already identified by Research England and project leads (e.g. diversity, additionality, attribution, time-lags, counterfactual, etc.). The output will be a summary of the most up-to-date and robust methodologies that can provide reliable and unbiased estimated of the key economic benefits. Factors to control for:
 - Other funding received from UKRI with similar objectives.
 - Desire to innovate through research – more likely to seek funding.
 - Existing research capacity – more likely to receive funding from other sources.
 - Intensity – some universities have applied to more than one project.
 - Non-linear benefits – universities might face setbacks due to external events.
 - Time profiles – varied and uncertain time lags between operation start date and materialisation of impacts.
 - Median and mean effects – significant impact from small number of big wins (HEI with better research reputation).
- **Development of the VfM framework and model.** Inputs are likely to be divided into two types: a common set of variables that describe the outcomes and impacts of UKRPIF funding, and a set of pre-entered parameters that reflect the best available evidence about the economic returns of research infrastructure in similar settings. The outputs of the VfM model will be (1) measure of

outcomes/impacts, (2) measure of costs, and (3) measure of benefit, which in turn will provide cost-benefit metrics (ROI). These outputs will capture both direct effects as well as wider indirect costs and benefits, and will be adjusted to account to spillovers and substitution, deadweight and displacement. The VfM will also include a transparent and documented set of principles and assumptions used to translate inputs into outputs (i.e. multipliers, aggregating benefits over time, discount factor, etc.).

7.5. Indicator framework

The table below summarises the evaluation indicators (Table 15). This framework operates at the programme level rather than the project level and is distinct from the annual data collection from projects, which do feature within this framework as data sources.

Table 15: Evaluation indicator framework

Evaluation question	Sub-evaluation question	Indicator	Data source
EQ1. To what extent is the programme achieving its original objectives? If it is not, why not?	To what extent, and how, has the UKRPIF enhanced the facilities of HEPs?	<ul style="list-style-type: none"> • Qualitative assessment of facility enhancement, attributed to UKRPIF funding. 	<ul style="list-style-type: none"> • Project reporting • Survey • Interviews (project leads)
	How has the UKRPIF increased the capability and capacity for world-class research at HEPs?	<ul style="list-style-type: none"> • (project reporting) Number of outputs, number of research doctoral degrees awarded, number of staff – all attributed to UKRPIF • Assessment of type / quality of skills developed because of UKRPIF facility (e.g. upskilling, career progression) attributed to UKRPIF 	<ul style="list-style-type: none"> • Project reporting • Survey • Interviews (project leads) • TRAC data
	How do the facilities and their reputation compare now internationally? To what extent has the UKRPIF advanced the UK’s global position to attract research and development?	<ul style="list-style-type: none"> • Qualitative assessment of the extent to which projects were able to attract skilled people (e.g. skill level, career stage) attributed to UKRPIF • Qualitative self-assessments from projects on reputational gains, compared to baseline attributed to UKRPIF 	<ul style="list-style-type: none"> • Project reporting • Survey • Interviews (project leads)
	To what extent and how has UKRPIF encouraged strategic partnerships between HEPs and other research active organisations? (Local/regional, national, international). What is the strength of the partnerships?	<ul style="list-style-type: none"> • (project reporting) Number of strategic partnerships, broken down by categories e.g. long-term, contract, whole company, single researchers 	<ul style="list-style-type: none"> • Project reporting
	To what extent, and how, has the UKRPIF stimulated additional investment in higher education research? (Local/regional, national, international)	<ul style="list-style-type: none"> • (project reporting) Total volume of R&I funding leveraged, total volume of competitive research funding secured 	<ul style="list-style-type: none"> • Project reporting
	How much, and what types of additional investment has the UKRPIF attracted?		
	To what extent, and how, does the UKRPIF catalyse ongoing or self-sustaining investment momentum beyond completion of the facility?		

Evaluation question	Sub-evaluation question	Indicator	Data source
	To what extent are the investments and facilities sustainable e.g. are HEPs able to maintain and upgrade their facilities?	<ul style="list-style-type: none"> Qualitative self-reported assessment of physical sustainability of facilities in terms of maintenance and improvement. Relevance to WCL funds. 	<ul style="list-style-type: none"> Survey Interviews (project leads)
	To what extent are the facilities funded able to adapt to new developments and stay up to date? If they are not, how could this be improved through the programme structure?	<ul style="list-style-type: none"> Qualitative self-reported assessment of adaptability of facilities. Relevance to WCL funds. 	<ul style="list-style-type: none"> Survey Interviews (project leads)
	To what extent, and how, has the programme strengthened the contribution of research to economic growth (local/regional, national and international)?	<ul style="list-style-type: none"> (project reporting) Number of organisations/businesses supported Economic analysis (Phase 3) – see Table 13 	<ul style="list-style-type: none"> Project reporting Economic analysis HEBCI
	How much value (£) has the UKRPIF contributed or catalysed?		
	Has performance against the objectives been equal across England and the devolved nations?	<ul style="list-style-type: none"> Aggregation of project level reporting, qualitative assessments of progress, strategy and outcome statements, impact case studies – comparisons across countries in terms of achievement and reported opportunities and challenges 	<ul style="list-style-type: none"> Project reporting Survey Interviews (all)
	Is there a difference in the opportunities and challenges in different nations?		
EQ2. To what extent do the programme objectives remain appropriate and relevant?	Considering the changed research and wider financial landscape alongside findings from this evaluation (including the types of projects funded and the impacts, and the extent to which these have changed and evolved), to what extent do the programme objectives remain appropriate and relevant?	<ul style="list-style-type: none"> Qualitative assessment of appropriateness and relevance over time since baseline 	<ul style="list-style-type: none"> Literature review Interviews (all)
EQ3. What are the research impacts and benefits of the programme?	What are the impacts of UKRPIF on research at provider, national and global levels?	<ul style="list-style-type: none"> (project reporting) Number of outputs – all attributed to UKRPIF Aggregated qualitative assessment of impact from project level reporting, impact case studies, strategy and outcome statements REF impact case study * ratings – those attributed to UKRPIF 	<ul style="list-style-type: none"> Project reporting Survey Interviews (all) REF 2021 case studies

Evaluation question	Sub-evaluation question	Indicator	Data source
EQ4. What are the socio-economic impacts and benefits of the programme?	What impact has UKRPIF had on knowledge exchange between HEPs and the wider world?	<ul style="list-style-type: none"> • (project reporting) Number of strategic partnerships • Number and type of co-authorships on publications emerging from the programme • Quality of knowledge exchange enabled by UKRPIF 	<ul style="list-style-type: none"> • Project reporting • Bibliometric analysis • Interviews (leads and partners) • HEBCI • KEF results
	Considering indicators of socio-economic impact, what socio-economic impact and benefits has UKRPIF delivered?	<ul style="list-style-type: none"> • (project reporting) All socioeconomic indicators • Economic analysis (Phase 3) – see Table 13 	<ul style="list-style-type: none"> • Project reporting • Economic analysis
	To what extent, and how, has the UKRPIF contributed to government strategy and priorities – and responded to changes in government strategy and priorities?	<ul style="list-style-type: none"> • Qualitative evidence of use of programme outputs by policymakers (e.g. citation of UKRPIF funded outputs in policy documents, attributed to facilities) • Qualitative assessment of UKRPIF projects’ adaptability to government strategies and priorities 	<ul style="list-style-type: none"> • Survey • Interviews (all)
EQ5. What is the impact of the UKRPIF on the higher education (HE) sector?	To what extent has this programme influenced the research infrastructure strategy of HEPs?	<ul style="list-style-type: none"> • Qualitative assessment of UKRPIF projects’ influence on HEPs’ infrastructure strategies 	<ul style="list-style-type: none"> • Survey • Interviews (leads)
	Has this approach to funding changed the capacity, type and discipline of activity and research dominant and funded in the UK?	<ul style="list-style-type: none"> • Qualitative assessment of UKRPIF projects’ influence on HEPs’ approach to R&I • Qualitative assessment of UKRPIF influence on research infrastructure funding in the UK 	<ul style="list-style-type: none"> • Survey • Interviews (all)
	To what extent does the programme meet the needs of the HE sector?	<ul style="list-style-type: none"> • Qualitative assessment of to what extent the programme meets the needs of the UK HE sector 	<ul style="list-style-type: none"> • Survey • Interviews (all)
EQ6. How have the anticipated impacts of the UKRPIF evolved?	How do the projects and their anticipated impacts at the bidding stage compare to the actual impacts at i. completion ii. following operation?	<ul style="list-style-type: none"> • % of planned impacts met compared to proposal at completion and thereon via Strategy and outcome statements, disaggregated by types of provider, types of projects and discipline 	<ul style="list-style-type: none"> • Project reporting • Survey • Interviews (leads)
	Are there any observable trends between types of provider, types of projects and discipline?		
EQ7. What might have been expected to happen without the	What might have happened to the research activity and capacity at the funded HEPs and in UK more widely in the absence of the UKRPIF funding?	<ul style="list-style-type: none"> • Self-reported counterfactual scenario assessment of capacity, likelihood of facility being built, partnerships and co-investment 	<ul style="list-style-type: none"> • Survey • Interviews (leads)

Evaluation question	Sub-evaluation question	Indicator	Data source
UKRPIF investment? (Counterfactual)	To what extent would the universities have delivered these facilities in the absence of UKRPIF?	existing and other impacts being achieved, all without UKRPIF funds	
	To what extent would partnerships and co-investment have been established and the bidding stage and subsequently without UKRPIF?		
	What have universities been able to do that they might not have been able to without this funding?		
	Link to the UKRPIF objectives, to what extent would these have been achieved without the investment compared to with?		
EQ8. How effective is the UKRPIF funding model?	To what extent have the requirements maximised the impact of the programme?	<ul style="list-style-type: none"> • Qualitative assessment of to what extent the eligibility and funding model are attributed to project impacts, opportunities and barriers 	<ul style="list-style-type: none"> • Survey • Interviews (leads) • Case studies
	To what extent might the requirements of the UKRPIF have constrained, been inflexible, or acted as barrier to research and impact? (e.g. does UKRPIF make a step change in UK research, does it support novel and high risk research areas, is it suitable for all types of provider, discipline and size of excellent research consortia?)		
	To what extent are the funding thresholds appropriate?	<ul style="list-style-type: none"> • Qualitative assessment of the appropriateness of the funding thresholds 	<ul style="list-style-type: none"> • Interviews (leads and non-participating HEPs)
	How does the level of demand for this funding and the success rate reflect on the programme? What assurances or concerns does this suggest for the design of the programme or wider HE infrastructure funding?	<ul style="list-style-type: none"> • External views of the competitiveness of the programme, the demand for it and qualitative comparisons to other funding sources 	<ul style="list-style-type: none"> • Literature review • Interviews (external stakeholders)
	Have the features of UKRPIF caused any unintended consequences?	<ul style="list-style-type: none"> • Qualitative assessment of unintended consequences and potential improvements to UKRPIF 	<ul style="list-style-type: none"> • Survey • Interviews (leads) • Case studies
What could be improved? Are there any additional requirements or funding tools that could be applied here to enhance the success and impact?			

Evaluation question	Sub-evaluation question	Indicator	Data source
	Projects may experience delays, require substantial changes from their bid, or be discontinued. To what extent and how are these occurrences and their infrequency/ frequency linked to the funding model?	<ul style="list-style-type: none"> • Qualitative assessment of effects of the funding model on project delivery/performance 	<ul style="list-style-type: none"> • Interviews (leads and partners)
	How is UKRPIF perceived among its stakeholders?	<ul style="list-style-type: none"> • Levels of satisfaction with scheme processes, relevance and effectiveness 	<ul style="list-style-type: none"> • Survey • Interviews (all) • Case studies
EQ9. What is the value for money of the UKRPIF?	What is the overall value of the programme?	<ul style="list-style-type: none"> • Economic analysis (Phase 3) – see Table 13 and Table 14 	<ul style="list-style-type: none"> • Economic analysis
	What is the return on investment and how does this compare to similar and different funding programmes and approaches?		
	How much additional public and private R&I investment has the UKRPIF contributed towards the 2.4% R&I investment target of GDP by 2027?		
	Linking to the objectives, has the programme delivered value for money in view of these?		
	Considering the investment and delivery costs against the impact and outcomes does the UKRPIF represent value for money?		
EQ10. How has the programme evolved since its launch in 2012?	To what extent have the nature and type of project funded changed, by, for example: Type of provider funded; Discipline and interdisciplinarity; Type of research: Basic/applied/experimental; Number of Partners; Type of Co-investment; Standalone facility or part of a wider development; Multi-provider collaborations; and any other observable trends?	<ul style="list-style-type: none"> • Portfolio level statistics of UKRPIF projects over time 	<ul style="list-style-type: none"> • Portfolio analysis (see Chapter 5)
EQ11. Have there been any disbenefits of the UKRPIF investment	What are the estimates for deadweight, displacement, leakages and negative spill overs?	<ul style="list-style-type: none"> • Economic analysis (Phase 3) – see Table 13 • Qualitative assessment of deadweight, displacement, leakages and negative spill overs 	<ul style="list-style-type: none"> • Economic analysis • Interviews (all)

Source: RAND Europe.

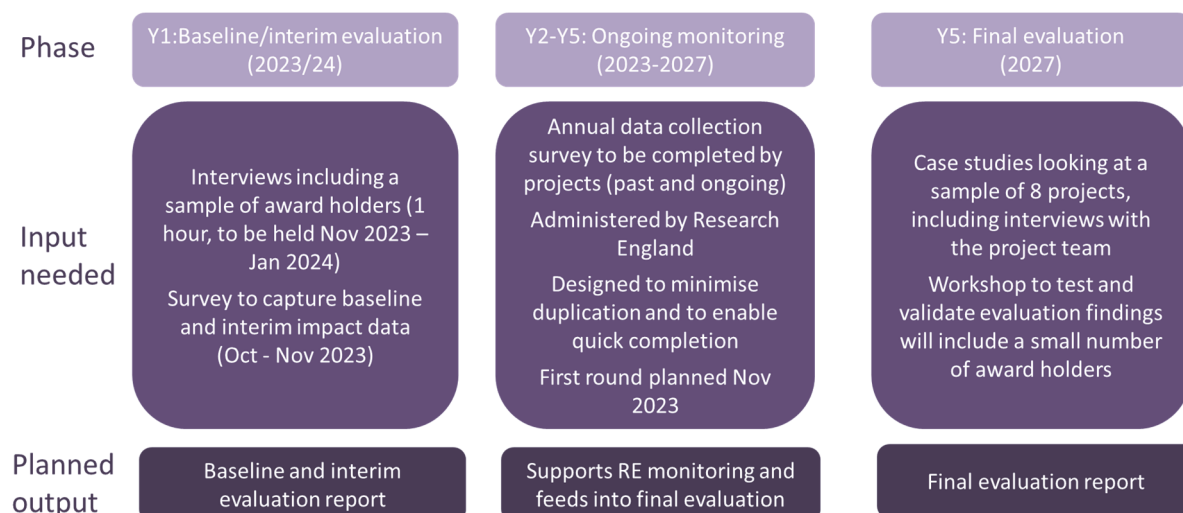
8. Implementing the evaluation

This chapter presents the practicalities of the evaluation process. It is a product of the work conducted as part of Phase 1, including review of the 2019 framework, and plans from the proposal (as far as those plans remain relevant and robust).

8.1. Overall structure and timing of the evaluation

The evaluation will be implemented in three phases (Figure 20). The baseline (Phase 2a) will follow the end of this inception phase, collecting a dataset with which to compare subsequent project results. There will be a period of ongoing monitoring up to 2026 based upon tools developed in the previous phase, followed by a final data collection and synthesis in 2027. A detailed Gantt of the evaluation is included on the next page (Figure 21).

Figure 20: Summary of the evaluation timings



Source: RAND Europe.

8.2. Phase 2a: Baseline and interim evaluation

8.2.1. Overview

The baseline report will involve the evaluation team and Research England working together to build a robust view of metrics for each project at their baseline position i.e. at the point of award. This will include all projects in Rounds 1-6, with the potential to include Round 7 depending on when they are awarded (expected November 2023). This phase will also include an interim evaluation based upon primary and secondary data collection.

8.2.2. Documentation and secondary data analysis

We have indexed and sorted all the documents and data sources provided as part of Phase 1 of this evaluation, having reviewed many of these already. For the baselining, we will develop a bespoke extraction template designed to pick out baseline metrics from the sources. Sources will include all the programme documentation and data already collected, including completion reports, which will provide useful progress data. As well as internal data, this will also include analysis of relevant secondary datasets. We anticipate drawing on a range of sources to address the different aims and hence different data needs of the fund. These will likely include Dimensions data (which we assume can be made available via UKRIs existing license) on investment and publications, HESA data on investment, staffing and wider engagement (e.g. HEBCI survey), plus analysis of Researchfish data (via GtR) and REF 2021 impact case studies to broaden our review of socioeconomic impact. Where feasible we will identify appropriate comparator groups to ensure these analyses are contextualised, and we will also identify baseline measures of performance drawing on the publicly available datasets and those shared by Research England, supplemented by survey data.

8.2.3. Survey

The survey will be primarily quantitative in nature, aiming to collect information against key evaluation metrics at baseline and at the interim evaluation stage from all UKRPIF awards. Metrics to be included would include measures related to student numbers and outcomes, collaborations, investment and research and wider outputs. Burden will be minimised by ensuring publicly available data and evidence collected through other means are used where possible, with the survey only being used to collect additional information not available through other sources. We will also include a limited set of process questions in the survey (primarily Likert scales) to assess award holders' experiences and satisfaction with their engagement with UKRPIF. We anticipate surveying the total population of funded projects (more will be awarded in subsequent rounds), including leads and, if possible, partners.

8.2.4. Interviews

Interviews are the primary means of collecting the rich qualitative data needed to robustly assess UKRPIF's EQs and claims in the ToC. Interviews will be semi-structured with clearly defined topic guides, to include impact and process questions. Where there is a need for quantitative indicator data the guides may include a limited number of closed, scale and multiple-choice questions conclusions. Interviews will be conducted online and bespoke per group to reduce the burden on consultees' time. We anticipate conducting 30

interviews in Phase 2a and 40 in Phase 3, covering award holders, unsuccessful applicants, funding and programme management (RE, devolved funding bodies, UKRI) and wider stakeholders – notably business/third sector partners and institutional leadership.

We will develop a framework of questions to probe economic aspects explored in the economic assessment later:

- (Deadweight / attribution) To what extent did the benefits occur solely because of the activities conducted under UKRPIF, as a proportion? Why?
- (Leakage) How have the impacts benefited those outside of the target beneficiary group?
- (Substitution) Did your university pivot to work under UKRPIF from another activity?
- (Displacement) Have jobs in other adjacent sectors been lost to working in developing facilities?
- (Multiplier effects) Has UKRPIF created jobs outside of the target sectors?

This analysis will be presented with the caveat that it is only a qualitative assessment, and that it informs a future economic analysis rather than replaces it. Interview data will be entered into a framework to code and analyse the data. The codes will be used to track evidence against pathways in the ToC, or alternative pathways. This will allow us to systematically ‘test’ the ToC using interview data.

Table 16 shows the proposed sample structure for phases 2a&3, NB: some people may fall into several groups. Phase 2b is not listed as interviews will not be conducted during the annual data collection.

Table 16: Description of interview sample – TBA with Research England

Group	Description	P2a	P3
UKRPIF programme management	Colleagues at Research England. Focus on process related questions around call design, monitoring and delivery, strategy and relationship building. Five interviewees were consulted in Phase 1, subsequent interviewees would include those from devolved administrations and from UKRI as appropriate.	5	5
Direct beneficiaries of grants	Project leads (one per project) will be interviewed for a comprehensive and robust account of processes and impact (they will be interviewed about all steps through the ToC, and relevant barriers and enablers). Some organisations have led multiple projects, we will look to avoid duplication with group interviews. Sampling will be based on proportionally (as far as possible) covering the rounds, project size, discipline, geography and other project characteristics. These interviews will also act as follow-ups to the survey and will explore emerging themes (e.g. if a difference in response to questions is observed between smaller and larger institutions, we would prioritise HEP size in our sampling).	15	20
Other beneficiaries	Partners will be consulted about the impact of the programme on their organisations and their experiences of programme processes. A selection of different types of partners and stakeholders (e.g. business/third sector partners and institutional leadership) will be sought to garner a range of contextual views.	5	10
Unsuccessful applicants	A sample of high scoring unsuccessful applicants to learn about their experiences of programme processes and what happened to their projects in the absence of funding to inform evidence on alternative impact pathways. Risk: this is usually a hard to reach group, hence the	5	5

Group	Description	P2a	P3
	sample size, we will offer short interviews offering the opportunity to reflect.		
		Total	30
			40

8.2.5. Planning, analysis and deliverables

A finalised **annual data collection plan** will also be produced based on our analysis of existing sources and our experiences of data collection in this phase of the evaluation, building on those data collected through the survey. We aim to keep this relatively low burden but to ensure that sufficient evidence is captured to ensure a robust evaluation, working in collaboration with Research England. The plan outlined in the next sub-section will provide the basis for this.

The **baseline and interim findings** will be presented in one report (March 2024), presenting findings first for the baseline assessment at the project level before providing an interim view of programme level findings. The baseline data will be collated largely as described in the 2019 framework report with modifications based on this updated evaluation plan (e.g. adapted metrics). The interim findings will be synthesised according to our CA&PT framework using the approach described in the previous chapter.

All reports in this evaluation will be agreed prior with RE in terms of format and length. They will be written and presented in line with the principles of HMT’s Green and Magenta books, and Government Social Research ethics guidelines. They will be presented in formats suitable for different audiences, with short summaries for non-specialists and fuller discussions and detailed technical annexes for practitioners. The formal presentations to Research England at the end of each phase will include delivery of full slide packs which can be repurposed and presented to wider stakeholders. Our in-house design and communications team will also work closely with Research England to produce an infographic at this interim stage, summarising the key achievements of the Fund in a format that can be used for presentations and in social media communications with stakeholders such as HMT, UKRI and the devolved funding bodies.

8.3. Phase 2b: Annual data collection

8.3.1. Overview

The data collection in Phase 2b will largely be led by Research England using templates and guidance developed as part of Phase 2a. UKRPIF lead institutions will be required to report in three different ways:

- **Annual data returns for a set of performance dimensions:** From the project completion date for a period of up to 10 years (see Table 18).
- **Strategy and outcome statements:** A qualitative reflection on how the objectives in the original bid are being resourced and delivered: how the institution is creating the environment in which they will achieve and/or exceed these objectives; what they have achieved under each core performance dimension.
- **Impact case studies relating to the social or economic achievements of the project:** A qualitative reflection on the evidenced socio-economic achievements of the project.

Projects will report based on completion date rather than project award date. The standard reporting schedule for projects will be as follows:

- Baseline data for their award year.
- Data for their completion year - the cumulative change since the award year.
- Data for the launch year of the evaluation - the cumulative change since the completion year.
- Yearly reporting from there forwards to the point of 10 years post completion (i.e. completed construction, installation and is supporting research).

The following sub-sections summarise the approach to each of the three monitoring activities.

8.3.2. Periodic reporting metrics

Projects will be required to report on common metrics, based on the ToC, with a supporting narrative to add context to their answers. Templates developed and used for the pilot will be refined in Phase 2a but will remain in Excel format.

Contextual and results level data will be collected as part of these reporting metrics. Quantitative data collected will be considered within the context of the provider and project, the following data will be collected for each project (prepopulated where possible).

Table 17: Contextual quantitative metrics

Metric	Example data
Size of provider by staff numbers	(UG+PGT), (PGR), (Staff all), (Research Staff), (Research and Teaching Staff). Available from HESA.
Size of project facility by occupancy	Categories as above, typical anticipated occupancy.
Cost	(Total university income), (Total research income), (Total cost of facility), (RE UKRPIF Investment). Available from HESA.
Type of provider	(KE category, or tariff category)
Type of project undertaken	(New building or Re-fit), (Standalone project or part of wider campus/city project)
Research discipline(s) of project	Using Research England categories

Source: RAND Europe, adapted from the evaluation pilot feedback document.

The table on the next page details the ‘results’ metrics that will be requested of projects as part of the annual data collection (Table 18). The guidance and tool to collect this will be developed as part of Phase 2a, ready to be deployed in Phase 2b by Research England. The tools from the 2019 framework will be used as a basis for this.

Table 18: Overview of reporting metrics

Objective	Performance dimensions	Metric – final description TBA	Domain
1. Enhance research facilities at leading UK HEPs	1. Improved quality of research	Number of outputs – Up to three distinct outputs with details on date, type, title, author, DOI, publisher. Projects will be asked to include in their narrative a review of the three research outputs attributable to their UKRPIF project that demonstrate impact, research advancement and quality.	Research activity
	2. Graduates with relevant skills	Number of research doctoral degrees awarded - express as a % of total FTE with guidance to attribute FTE if position is partly attributed to facility, or part supervised by academic. A qualitative narrative will be available to allow HEPs to reflect on, for example, the lagging nature of this metric in their context.	
	3. Research capacity	Number of staff (FTE) - the detail collected will be reduced to the total FTE employed in each category at the time of report, we will not collect unit of assessment or type of contract, but align with accepted forms of reporting FTEs (HESA definitions). HEPs may provide additional information in the narrative as required including the prevalence of permanent/fixed contracts (rather than requiring this in quantitative form).	
2. Create strategic partnerships with other organisations	4. Strategic partnerships formation	Number of strategic partnerships - Number of partners by year, type of partner (academic, private, charity, hospital, other). Distinguished as pre-dating UKRPIF, UKRPIF signatories and new partnerships. Guidance will be made clear as to the definitions of types of partners and a qualitative narrative can be supplied to contextualise the relative importance of partners.	Sustained development
	5. Co-location	Number of staff co-located – staff, staff's organisation type, degree of engagement. There will be a mechanism for reporting interdisciplinary group co-location (from within HEP). A qualitative statement would collect co-location on projects with more fluid interactions beyond FTE (e.g. steering groups; recurring focus groups; desk allocation utilised by more than one staff member)	
3. Stimulate additional	6. Investment by partners	Total volume of R&I funding leveraged (partners only) - Funding amount by AY, funding source by type, including domestic/overseas partners, how long funding is committed for. This should be recorded as co-investment commitments per year.	Additional activity

Objective	Performance dimensions	Metric – final description TBA	Domain
investment in higher education research		Definition of 'partner' will be clarified. Accompanying narrative will allow HEPs to detail what the funds were used for.	
	7. Increased income from research grants	Total volume of competitive research funding secured (excluding partners) - Funding amount, funding source by type, including domestic/overseas funders, how long funding is committed for. All HESA funding categories will be included (e.g. BEIS research councils, UK central government etc). This should be recorded as co-investment commitments per year. Definition of 'partner' will be clarified. Accompanying narrative will allow HEPs to detail what the funds were used for.	
4. Strengthen the contribution of public research to economic growth	8. Socio-economic growth measurables	2 mandatory: Research outcomes taken up by relevant stakeholder Number of organisations / businesses supported 3 optional: Number of organisations/businesses supported (e.g. spin-offs, start-ups and SMEs) Number of employees of supported organisations/businesses whilst benefitting from UKRPIF project facilities Employment costs of supported organisations/businesses whilst benefitting from UKRPIF project facilities (£ '000s) Estimated profits of supported organisations/businesses whilst benefitting from UKRPIF project facilities (£ '000s)	Return on investment
9. Equality, Diversity, Inclusivity – qualitative entry to detail any specific actions undertaken to improve equality, diversity and inclusion in the facilities. EDI will be clearly defined within the context of R&I and of research infrastructure as far as possible. These actions will be specific to the UKRPIF facility rather than HEP level actions (though descriptions of how they specifically relate to the UKRPIF project will be relevant).			
10. Sustainability – qualitative entry to summarise any specific measures to ensure the facilities were designed, built, maintained and operated with environmental sustainability in mind, contributing to any Net-Zero goals of the HEP or more broadly. These actions will need to be linked specifically to the UKRPIF project facility, rather than HEP wide measures, where possible.			

Source: RAND Europe, adapted from the 2019 framework, pilot evaluation and workshop feedback.

8.3.3. Strategy and outcome statements, and case studies

The strategy and outcome statements and case studies will follow the approach suggested in the 2019 evaluation framework report.

The **strategy and outcome statements** will provide a self-reported assessment of project progress (e.g. partly met, met, exceeded expectations), reflect changes in strategy and likely outcomes.

The **impact case studies** will ask projects to demonstrate economic, wider social, health, environmental, and/or public policy or service impacts. The case study template developed in the 2019 framework was purposefully aligned with the REF case study template. We will work on a case by case basis as to whether a REF case study can be submitted either as retrospective evidence (REF 2021 cases) or for REF 2029. Projects will be asked to deliver an equivalent number of cases dependent on their award date, aiming for one case study every two years.

Templates for the strategy and outcome statements and case studies will be finalised in Phase 2a, ready for implementation in Phase 2b.

8.3.4. Plans for engagement with Research England

We assume that this workstream will largely be led by the in-house team at RE who will conduct the annual data collection process, and that the engagement of the evaluation team between completion of Stage 2a in October 2023 and commencement of the final evaluation in September 2026 will be relatively small. However, we have planned for the following activities:

- **Quarterly meetings with the RE team** to maintain contact and discuss any changes in the Fund or other notable activities to ensure we are up to date with progress.
- **Support to Research England in the review of annual data returns.** Although RE will lead on this process we have planned in sufficient time to discuss, provide support, and consider the implications of the annual data returns. We anticipate this will consist of a workshop discussion session with RE team once the returns come in, and then 2-3 calls to discuss progress or any issues arising as Research England further review and analyse the data.
- **Review of data collection process.** We also anticipate holding an annual meeting with RE to reflect on the data collection process and any lessons learned and, if needed, making minor refinements and improvements to the data collection template and process.

Beyond this ongoing engagement we are happy and able to take the lead on this annual data collection process subject to additional resources being made available.

8.4. Phase 3: Final evaluation

8.4.1. Overview

The final phase of the evaluation will cover all projects funded up to this point, providing a final assessment of process, impact and value for money.

8.4.2. Secondary data analysis

A key source of evidence for the final impact evaluation will be the annual data collection process, which will be designed to minimise the need for further consultation. With this in mind, we do not anticipate conducting an additional iteration of the survey as this would be duplicative, though this is dependent on any data gaps identified at the beginning of phase 3. This data analysis task would also include the analysis of wider secondary data sets identified as part of Phase 2a, updating these analyses to take into account the additional dataset that become available over the intervening period. This later analysis will allow us to assess whether any changes observed at the interim phase have been sustained, and whether any new benefits (or disbenefits) have emerged over time.

Much of the data collected in the intervening years will be organised ready for synthesis in Phase 3. There is one annual data collection due in 2027 which may need to be slightly earlier if the data are to be included in the final analysis (e.g. August instead of September 2027).

8.4.3. Case studies

Case studies will allow for more in-depth exploration of a sample of projects/a cross-cutting issue across several projects. They will draw on document review, secondary data and interviews. We will use deliberative sampling to reflect the range of contexts and experiences of delivery, drawing on the information from annual data collection as well as our analysis of the portfolio included in this report. We take a realist approach to case studies, allowing an exploratory examination of the evidence in context and the potential to explore unexpected outcomes and disbenefits as well as the expected routes to impact. This will allow us to unearth novel impact mechanisms and stress test pathways set out in the ToC. We will expand on the typology for case studies in Phase 2a, creating a detailed sample frame and template. As well as award-based case studies, we will explore alternative pathways to impact via several vignettes of unsuccessful applicants to illustrate if and how those outside the programme go on to develop their facilities by other means (or not). We do not intend for this to be a formal counterfactual analysis, rather another view on processes and to explore alternative paths. We anticipate conducting a total of eight case studies focusing on UKRPIF awards, plus 2-4 vignettes of unsuccessful applicants.

8.4.4. Interviews

We will conduct a programme of interviews with a similar range of stakeholders engaged in Phase 2a, with an extra ten to contribute additional evidence for case studies (Table 16). The majority of these will inform the case studies, but we also set aside 5-10 interviews to be conducted with key wider stakeholders including those involved in programme delivery on the funder side and any other stakeholder groups not adequately captured by the selected case studies.

8.4.5. Workshop, analysis and deliverables

Evidence from the preceding sources will be analysed using our CA and PT framework (steps 5 and 6 – gather further evidence and finalise contribution stories) to develop a set of emerging findings which would be explored and validated at a **workshop** with key stakeholders to be agreed with the client but likely to include those involved in Fund delivery and oversight alongside a sample of award holders. The aim of the half day

workshop (in person or virtually depending on preference and context) would be to explore, test and validate the emerging findings, and identify lessons learned and observation to inform future investments.

Alongside this, the **economic assessment** approach outlined in the previous chapter will be performed. The findings from the impact and economic evaluations will be brought together in the **final report** which will offer an assessment of the programme against the evaluation questions specified, as well as wider observations and lessons learned which may be of relevance to future investment.

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Annex A. Project leads workshop - summary

UK Research Partnership Investment Fund (UKRPIF) Evaluation

Project Leads Workshop

20th April 2023, 12:30-15:00 (via Teams)

Introduction and purpose

This workshop was part of a wider evaluation across all UKRPIF activities to assess the delivery of the programme and provide evidence of its outcomes and impacts. This study was commissioned to RAND Europe, with partners Frontier Economics, and runs from September 2022 to January 2028. The work involves an impact and economic evaluation, informed by a baseline data collection exercise in autumn 2023, then annual data collection thereafter.

The purpose of this workshop was to introduce the evaluation to project leads. The aims were twofold:

- **To explore the achievements of UKRPIF projects.**
- **To introduce the evaluation framework and data collection plan** to outline what data we propose to collect and get feedback from project leads.

We addressed these aims via three activities:

Activity 1: Impact stories

- ➔ **Gave project leads the opportunity to introduce their project(s) and hear about others’.**
- There were representatives from a wide variety of UKRPIF-funded projects, both in terms of the disciplinary backgrounds, year of being awarded, the project lifecycle phase they are currently in, and Net Zero awardees.
- Some attendees participated in the interim evaluation run by Belmana and Middlesex University.

Activity 2: Feedback on the monitoring plan

- ➔ **Discussed the feasibility of the monitoring plan, any opportunities or anticipated challenges.**
- **Qualitative element of the evaluation is welcomed:** The concern over capturing some of the more nuanced or unintended complex impacts through quantitative metrics was raised. Qualitative reporting is therefore a good addition to paint a better overall picture of project impacts, especially to capture impacts that are less easily measured through quantitative metrics.

- **Challenge of baseline data:** The baseline data refers to data collected from the year of receiving the award. More clarity is needed around the timepoints that data will be collected in the lifecycle of projects, and what that means for projects awarded in the different rounds.
- **Concern about the relevance of metrics not being static over the project lifecycle:** Shifting focus of projects since their award date, shifting focus of partners and co-investors, more developed technology than at the time of being awarded, increasingly digital approaches, lots of involvement of projects over time might mean that the relevance of the metrics to measure impacts may change. Flexibility is needed to be able to record the type of data that will demonstrate impact.
- **Challenge of isolating the impacts and attribute purely to UKRPIF:** Receiving the funding has acted as a catalyst in many ways, leading to new partnerships, new public and private funding, therefore the impacts are difficult to be attributed to any one of the factors. Challenge of teasing out impacts in the case of multi-site/use/access facilities.
- **Challenge of time lag in realising impacts:** Measurable impacts may be years after the operational phase of the project and continue for years after the evaluation. Poses challenges for assessing full picture. Possibility of reporting on anticipated impacts.
- **Project leads should be notified of metric collection date well in advance:** Need to be mindful of the timepoints when data is collected. Lots of advance notice (2-5 months) to allow time for reaching out to partners to supply data. Avoid end of financial year, end of academic year, middle of the summer, when collating data might be difficult from partners.
- **Seeing metrics reporting template well in advance:** Importance of knowing what data is needed well in advance of metrics collection. Thorough instruction and description for each type of data is needed. Thorough guidance on what is needed on EDI as well.
- **Best use of already available data:** The evaluators are keen to make sure to collate data that is already available from various sources (e.g. Researchfish) and avoid data burden and unnecessary duplication. There might be some overlap with REF and impact case studies.
- **Flexibility is key over being dogmatic about data collection:** The diversity of the size, scope and discipline of the projects requires some level of flexibility with the timepoints of data collection as well as what data is collected.
- **Will the reports be published:** Yes, they will, there is also some material online, e.g. an interim evaluation in 2015/16.

Activity 3: Feedback on the reporting metrics

➔ **Discussed the feasibility and applicability of the metrics and data sources.**

- **Concern about the ability to capture the range of impacts:** Issue of impact additionality and impact isolation. Changes in project focus over time poses challenges to understand impact on the long run. Triangulation of quantitative and qualitative data.
- **Challenge of consistency and flexibility in data collection approach:** Allowing for the diversity of projects to report on their performance that is the most helpful for them. Difficulty of being able to paint a complete picture and account for all the success stories and outcomes arising from a project.

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- **Concern about data availability and retrospective data collection:** Some projects may find it burdensome to pull together data retrospectively, especially those who have not participated in the interim evaluation.
- **Being able to pick some of the metrics is welcomed:** Ability to pick and select which metrics to report allows for flexibility.

Attendees:

- RAND Europe evaluation team
- Frontier Economics evaluation team
- Research England representatives
- Representatives from HEFCW, SFC and Department for the Economy Northern Ireland
- Project leads from UKRPIF-awarded projects.

We thank all the attendees for their attendance and keen participation.