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Sêr Cymru II

Inception Evaluation

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Sêr Cymru II. Inception Evaluation

FINAL VERSION

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Views expressed in this report are those of the researcher and not necessarily those of the Welsh Government

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Glossary of Acronyms

Acronym/ Key word	Definition
BEIS	The Department for Business, Enterprise and Industrial Strategy. A Department of the UK Government
CCTs	Cross-cutting Themes
CIE	Counterfactual Impact Evaluation
CTDDC	Cardiff Translational Drug Discovery Centre
DiD	Difference in Difference
EIA	Equality Impact Assessment
ERDF	European Regional Development Fund
ESNR	The Economy, Science and Natural Resources Group. A Department of the Welsh Government
ESPRC	Engineering and Physical Sciences Research Council
EU	European Union
EW	East Wales
GVA	Gross Value Added
HE-BCIS	Higher Education Business and Community Interaction Survey
HEFCE	Higher Education Funding Council for England
HEFCW	Higher Education Funding Council for Wales
HEI	Higher Education Institution
HEIF	Higher Education Innovation Fund
HESA	Higher Education Statistics Agency
ICT	Information, Communications and Technology
IP	Intellectual Property
MSCA COFUND	The Marie Skłodowska-Curie Actions COFUND scheme, part of the EU Horizon 2020 programme
N ₂ O	Nitrous Oxide
NISCHR	National Institute for Social Care and Health Research
NPIF	National Productivity Investment Fund
NRN	National Research Network
PhD	A Doctorate of Philosophy
R&D	Research and Development
RA	Research Assistant
RC	Research Council
RCT	Randomised Control Trial
RCUK	Research Council UK
RDA	Regression Discontinuity Analysis
REF	Research Excellence Framework
RRI	Responsible Research and Innovation Oversight Group
SME	Small and Medium sized Enterprises
SMS	Maryland Scientific Methods Scale
STEMM	Science, Technology, Engineering, Mathematics and Medicine

ToC	Theory of Change
UK	United Kingdom
WEFO	Welsh European Funding Office
WHEELLO	Wales Higher Education European Liaison Officers
WWV	West Wales and the Valleys

Summary of Key Findings

Design, rationale and theory of change

A key finding of this inception stage evaluation is that there is a very clear, detailed policy framework underpinning Sêr Cymru II. The evaluation also found that the objectives of Sêr Cymru II are well-aligned with Welsh Government policy, particularly the Welsh Government's national science strategy (Science for Wales) and the grand challenge areas¹ it identifies. A further key finding of the evaluation is that non-devolved UK Government policies, despite being of less direct relevance to Wales, could nevertheless have an impact, for example by increasing competition for excellent researchers, upon the programme's performance and the achievement of key outcomes.

The evaluation found that there is scope for Sêr Cymru II to demonstrate how it can better reflect and contribute towards the objectives of the Well-being of Future Generations (Wales) Act. A key focus in this respect needs to be the collection of appropriate monitoring evidence to inform relevant indicators that monitor progress in implementing the Act.

In elucidating the policy logic, the evaluation found that, in addition to the ERDF output and result indicators, there are a number of softer or intermediate outcomes that the Sêr Cymru II operations could reasonably be expected to realise. These include:

- the perceived attractiveness of host institutions to students and other academics
- enhanced experiences for students, and
- the ability of Wales' universities to sustain funded research posts after ERDF funding has expired.

The evaluation also identified a number of external forces which could have a bearing on the implementation as well as the effects and impacts of the Sêr Cymru II operations. These include EU transition (which will have a direct bearing on available funding but may also restrict universities from attracting foreign talent to work in Wales) and increased competition from other UK countries and the rest of the world to recruit excellent researchers (which may make it more challenging for Wales to attract prestigious researchers and secure STEMM research funding).

¹ Science for Wales and the grand challenge areas are explained in paragraph 1.2

The theory of change for Sêr Cymru II is based on a number of key assumptions, which were revealed through the exercise in elucidating the policy logic. The assumptions include:

- investing in additional STEMM research fellows will be an efficient and effective method of increasing Wales' share of Research Council funding.
- increasing the number of researchers in Wales will contribute to addressing the existing, collective shortfall across STEMM-related disciplines, that there will be an adequate level of interest and demand from appropriate candidates in the funded fellow opportunities created, that the fellows will generate additional research positions, and that some will wish to continue working in Wales after Sêr Cymru funding comes to an end.
- that the publication and dissemination activities of Sêr Cymru II-funded researchers will be of excellent academic standard so as to gain international recognition.
- interest in Rising Star positions will come about as a result of contacts, networks and relationships between prospective candidates and researchers already employed in Wales HEIs.
- that the operations will have a positive effect on business performance, including enhanced productivity through increased innovation, and that will happen as a result of private enterprises (including SMEs) wanting to engage with those departments hosting Sêr Cymru II research fellows and the research being of interest and benefit to them.
- that students will benefit through the operations, by being taught by Sêr Cymru-funded researchers and through attending HEIs at which an increased volume of world-class research is taking place.

A key finding of this evaluation was that while match funding for approved fellows was ring-fenced by participating universities, future uncertainties over university funding resulted in uncertainty about whether further fellowships could be applied for. This was highlighted as a key risk in terms of the on-going sustainability of the programme and levels of STEMM research being undertaken in Wales' universities in the future.

A further key finding was that there is widespread support amongst stakeholders around the need for Sêr Cymru II to build a critical mass in Wales' scientific research base.

When interviewed, stakeholders expressed support for the way in which Sêr Cymru II had been designed and argued that there was clear logic in the assumptions made and the way that it aims to address the identified challenges. Stakeholders took the view that having had COFUND and ERDF operations approved and aligned was a major achievement which has resulted in securing kudos for Wales amongst European colleagues.

The evaluation found that there had not been a formal review of Sêr Cymru I and there was a perception amongst stakeholders that there was very limited transfer of knowledge and learning gained from the delivery of Sêr Cymru I. This was largely due to personnel changes in key posts, but this was not thought to have had a detrimental impact upon the delivery of Sêr Cymru II given the different emphasis of the successor programme on a wider group of early career researchers.

Stakeholders took the view that it is appropriate for Sêr Cymru II to be targeted at STEMM subjects and focused upon targeting early and mid-career research opportunities, as this enables a more incremental approach to be adopted. Stakeholders observed that all categories of fellowships on offer via Sêr Cymru II had been relevant and appropriate. Upon its launch, Sêr Cymru II offered Research Fellow, Re-capturing Talent and Rising Star positions. There has been relatively little success in recruiting to Recapturing Talent positions. Due to the submission of some very high quality applications from potential research chairs, the Welsh Government incorporated a small number of prestigious research chair positions. The evaluation found that stakeholders judged this change to have been wholly appropriate.

Implementation

The evaluation found that prior to submitting applications to the Welsh Government, universities in Wales play a key role in advertising, developing, scrutinising and prioritising Sêr Cymru II proposals. It also found a direct link between the promotional efforts deployed by universities and the levels of interest generated amongst potential fellows. The most effective promotional route deployed by universities was via existing academic staff, who recognised the opportunity to build upon existing research strengths.

This early-stage involvement from universities was found to have resulted in high quality submissions for Sêr Cymru II ERDF funding and a high approval rate. However, a key finding was that this has been a resource-intensive process for central university support

staff and not directly supported by ERDF funding. In response, the Welsh Government awarded participating universities 'one-off' payments in recognition of the development and on-going support to Sêr Cymru II funded researchers not directly covered by the grant awards.

A further key finding of this inception stage evaluation was that the Sêr Cymru II application processes are considered by stakeholders to be rigorous and robust from an academic point of view and there is a clear focus on ensuring research excellence. This has resulted in an appropriate portfolio of fellowships having been commissioned that provides good coverage across three of the original grand challenge areas.

In terms of securing peer reviewers to comment on research proposals, stakeholders highlighted the strengths of this process as being the pragmatic approach adopted by the independent evaluation panel and the opportunities for applicants to respond to reviewer comments. The main weaknesses were identified as being the lack of consistency in terms of the number of reviewers in place and scoring of proposals.

The evaluation also found that the Programme Beneficiary Board was considered by stakeholders to be well attended and working effectively.

The evaluation found that the Head of Research Programme Development, who leads the Sêr Cymru II delivery team within the Welsh Government, is very highly regarded by stakeholders. The role was considered to be instrumental in the design and implementation of the programme. However, some identified that the programme may be over-dependent on this role, particularly given that the post-holder is a secondee to the Welsh Government. This was highlighted as a key risk area.

A key finding of the evaluation was that there is scope for some improvement in relation to speeding up the issuing of grant approval letters to universities. Welsh Government officials are aware of this issue and have taken appropriate remedial action in this respect. Universities would also value clearer, more consistent and faster technical guidance, specifically around the implementation of ERDF funding and ensuring compliance with WEFO's requirements.

Appropriate monitoring arrangements put in place by the Welsh Government, are on the whole appropriate (paragraphs 5.79 to 5.84 detail the arrangements that are in place) though universities point out that funded fellows are likely to need support with on-going monitoring activity which will place further pressure on already stretched central

resources. A small number of suggested practical additions could be made to the monitoring framework to report on:

- training or professional development activities undertaken by funded fellows
- activities or outcomes relating to the CCTs, and
- activity and outcomes relating to the teaching time utilised.

It was not possible as part of this inception stage evaluation to gather a detailed overview of the support landscape which is in place for individual early career researchers at their host universities. However, it is clear that different universities approach this in different ways and offer different types of pastoral support. The evaluation highlighted the importance that stakeholders attached to the work of funded fellows in conducting outreach activities to promote their work and careers in research, particularly with young people. To achieve this, it was suggested that the Welsh Government should support fellows with specific training and by facilitating links and networks with organisations who promote science with young people.

The evaluation found that the programme could do more to engage with businesses and industry by ensuring that funded research is aligned with, and can be applied to address the needs of businesses. One way of progressing this agenda is to explore practical opportunities for researchers to spend time within commercial settings.

Progress to date has been positive in relation to appointing Research Fellows - the target number of Research Fellows in West Wales and the Valleys has been met and solid progress has been made against the equivalent target in East Wales. To date, a total of 31 fellowships have been awarded across two funding rounds. The vast majority of fellowships, 28 in all, have been awarded to Cardiff and Swansea Universities. In terms of the grand challenge areas covered, 12 fellowships relate to low carbon, energy and the environment, 11 fellowships relate to life sciences and health, 6 relate to advanced engineering and materials and one relates to ICT and the digital economy. The final fellowship relates to all of the grand challenge areas.

In terms of fellowship types, 26 have been Research Fellowships, one Recapturing Talent, three Rising Stars and one chair position. The evaluation found that interest and demand in Recapturing Talent fellowships has been more limited to date, due to difficulties in identifying and targeting this cohort. The evaluation identified this is a key risk for the remaining delivery of the programme.

The evaluation did not reveal any major differences in how the West Wales and the Valleys and East Wales operations could be implemented in order to meet their objectives.

The Baseline Position

This inception stage evaluation has involved a detailed examination of data and information to provide a clearer picture of the baseline position for the Sêr Cymru II ERDF operations.

The key findings of this work in terms of the current position are that:

- HEIs in Wales secured £204.6m research income across all disciplines during 2015/16 which represents 3.5 per cent of the UK total share of £5,890m
- Wales requires an additional £89.9m in total research funding per annum across all disciplines to secure a 5 per cent national share of UK research funding (which would equate to Wales' population share). This shortfall has increased from £59m in 2012/13
- In terms of income per researcher, current research income is £36,900 per researcher in Wales compared with £43,000 across the UK. To address this deficit, an additional £6,500 of research income would be required per researcher based in Wales (but this would only bring Wales up to 4 per cent of national research income share)
- The main source of research income in Wales is research councils followed by UK government
- STEMM-related research income accounts for 88 per cent of research income in Wales (during 2015/16), which is the same proportion as the UK average. Medicine, Dentistry and Health group makes up the largest share of research income in Wales, at 43 per cent
- Amounting to £179m in absolute terms STEMM-related research income in Wales accounts for 3.5% of the UK's proportion and would require an additional £80 million annually to reach a 5 per cent share
- Analysis of STEMM research staff numbers shows that since 2012/13, the gap has widened between Wales and the rest of the UK. To achieve STEMM research staff numbers at 5 per cent of the UK total, Wales required 630 FTE

staff in 2102/13. This shortfall had increased to 1,070 by 2015/16. While the UK researcher-base grew in this time period, Wales saw a reduction of 0.3 per cent

- Spatially, East Wales' Universities secured £117m in research income in 2015/16 driven mainly by Cardiff University. This compares to £87m in Universities in West Wales and the Valleys.

Cross-cutting Themes and the Welsh Language

The evaluation found that the CCTs have been adequately considered in the design and development of Sêr Cymru II and the actions proposed in terms of implementing CCT activity via the ERDF funded operation are reasonable and logical.

A key finding of this inception stage evaluation is that equal opportunities will be the main cross-cutting theme to which Sêr Cymru II will be able to contribute. In this context, funded fellows will need to be supported and encouraged to conduct outreach activities to promote their work in a way that encourages girls and women to pursue STEMM careers. It is also reasonable to expect that Sêr Cymru II operations should make a positive contribution to a more gender-balanced research workforce in Wales. However, the lack of interest to date in the Recapturing Talent fellowships is a concern in this respect and needs to be a key consideration for the delivery team.

The evaluation also found that the ERDF operations can reasonably be expected to contribute to the cross-cutting theme of environmental sustainability (not least by funding research that adds value in this area). Similarly, there are a small number of opportunities for the operations to make a positive contribution to the cross-cutting theme of tackling poverty and social exclusion.

The evaluation reports that the STEMM research landscape in Wales includes some Welsh-medium research activity and that this has increased of late, largely due to the stimulus and funding provided via the Coleg Cymraeg Cenedlaethol. Overall, the evaluation found that the extent to which the Sêr Cymru II operations can be expected to positively contribute to the Welsh language is limited. However, there are a number of practical ways (e.g. by encouraging and supporting funded researchers to learn Welsh and maximising the opportunities to disseminate information in Welsh) that the operations can help make some progress in this respect.

Evaluating Impact – Methodological Considerations

This inception evaluation has explored potential approaches to undertaking counterfactual impact evaluation (CIE) of the Sêr Cymru II operations. Recognising the limitations of available data and methodological considerations, there is limited scope to undertake more rigorous counterfactual impact evaluation approaches.

A plausible approach would be to undertake a comparative benchmarking exercise at the level of individual universities and STEMM subjects. Such an approach would match participating universities in Wales with comparators across the UK based on the following criteria:

- STEMM research income (data source: HESA 2015/16).
- Number of STEMM researchers (data source: HESA 2015/16).
- STEMM research strengths by available subject breakdown (data source: HESA 2015/16).
- Trends in STEMM research income (data source: HESA 2012/13 and 2015/16).

All universities in the UK can be ranked on these indicators. Comparators can then be identified around each of Wales' universities by a defined threshold, allowing for more than one match for each HEI in Wales. This should allow for a sizeable control group to be created and observed.

Chapter 8 of this report sets out the detail of how this comparative benchmarking exercise might be taken forward from a methodological perspective and combined with other qualitative evidence gathered through various methods. Whilst these methods in combination will be able to provide a valuable assessment of the nature of the impacts which arise, they will be less robust (than counterfactual impact evaluation methods) in terms of the attribution of the change to Sêr Cymru.

The complementary programme of qualitative research combines fieldwork with:

- funded researchers (and potentially unsuccessful applicants)
- businesses participating in Sêr Cymru II funded research
- various stakeholders.

Recommendations

In terms of Sêr Cymru II delivery the evaluation recommends that:

- the Sêr Cymru II Business Plans better reflect how the intervention can make a contribution to the Wellbeing of Future Generations Wales Act with a particular focus on capturing monitoring data as evidence of how this is achieved against a number of appropriate indicators
- the Welsh Government addresses the current risk of Sêr Cymru II being over-dependent upon one individual who currently fulfils the role of Head of Research Programme Development as a secondee
- clearer, more consistent and faster technical guidance, specifically around the implementation of ERDF funding and ensuring compliance with requirements, be issued to universities in receipt of funding
- funded fellows report upon training or professional development activities, CCT activities and outcomes and teaching time utilised as part of the reporting template. We further recommend that the Welsh Government includes more closed or option-based responses within the report template to facilitate analysis of outputs and impacts.
- alternative and innovative marketing and communication approaches should be piloted in order to reach a broader cohort of individuals who may be interesting in the Recapturing Talent fellowship opportunities
- the target set for Recapturing Talent fellowships should be reviewed in light of the success or otherwise of such alternative marketing approaches and if deemed appropriate, be reduced to a more realistic and achievable number
- the Welsh Government should support fellows with outreach related training and by facilitating links and networks with organisations who promote science with young people, and should encourage fellows to learn Welsh and disseminate their findings through the medium of Welsh
- greater effort is made to engage businesses to improve the focus on meeting the needs of industry. Some Sêr Cymru II fellows (and their researchers) could, for example spend time in businesses (via placements or formalised arrangements) to strengthen and deepen their understanding of how STEMM research can be applied in commercial settings.

In light of the limited evidence available at the inception evaluation stage the evaluation further recommends that the mid-term evaluation considers and reviews:

- the support landscape which is in place for individual early career researchers at their host institutions
- the extent of opportunities for interdisciplinary research and how these can be encouraged across the portfolio of approved fellowships and research projects
- how third sector organisations can be encouraged to participate in Sêr Cymru II funded research activity
- evidence that the assumptions within the policy logic, as set out on page 9, are credible and the anticipated benefits emerge.

In terms of the impact evaluation methodology the evaluation recommends that:

- a comparative benchmarking exercise at the level of HEIs and STEMM subjects should be undertaken which would involve matching participating HEIs in Wales with comparators across the UK
- participating HEIs in Wales should be consulted as part of the mid-term evaluation to better understand the research context at each institution and clarify any implication this may have upon Sêr Cymru II
- the Welsh Government should explore the possibility of gaining access to Scopus² as it would allow additional data to be made available for the purposes of evaluating Sêr Cymru II. The availability of Scopus research outputs would:
 - allow further CIE analysis to be undertaken around research outcomes, researchers and research groups as well as HEIs
 - enable the construction of research group comparators which would include the possibility of surveying non Sêr Cymru II supported researchers
- monitoring data should be made available in an anonymised and quantifiable format for analysis purposes.

² Scopus is the largest database on abstracts and citations of peer-reviewed literature. It is run by Elsevier.

1. Introduction

- 1.1 OB3 and Regeneris were appointed by the Welsh Government to undertake an evaluation of the European Regional Development Fund (ERDF) components of the Sêr Cymru II programme.

About Sêr Cymru II

- 1.2 The Sêr Cymru II programme was established to develop research excellence in the grand challenge areas of life sciences and health, advanced engineering and materials and low carbon, energy and environment which form the cornerstone of Wales' Smart Specialisation strategy³. A stimulus paper by the Leadership Foundation for Higher Education found that there was a deficit of 600 researchers in Wales involved in STEMM-related disciplines with the largest subject deficits being in clinical medicine, biosciences, physics, electrical and computer engineering, mechanical engineering and maths⁴. Sêr Cymru II is intended to build on the work of a predecessor programme (Sêr Cymru I) which committed £50m to bring prestigious research chairs to Wales' universities. Sêr Cymru I, which was non-EU funded, invested in the recruitment of four internationally renowned academics and supported the development of three National Research Networks (NRNs) in each of the grand challenge areas.
- 1.3 Sêr Cymru II aims to further strengthen Wales' research performance by targeting investment, attracting world-class research talent and, in the case of the non-ERDF-funded elements, supporting infrastructure. While building on the work of Sêr Cymru I which focused on recruitment of research chairs, Sêr Cymru II is different in that it aims to attract research-excellent scientists in the early or middle stages of their career, and those currently on a career break into research posts in Wales.
- 1.4 In November 2015, the Welsh European Funding Office (WEFO) approved two Sêr Cymru II operations under Priority Axis 1, Specific Objective 1.1 of the West

³ Smart Specialisation Strategies are a key part of the European Commission's approach to Cohesion Policy for 2014-2020. They are national or regional innovation strategies that are integrated, place-based economic transformation agendas. Source: European Commission. Smart Specialisation factsheet. March 2014.

⁴ The Case for Growing STEMM Research Capacity in Wales. Stimulus Paper. Page 2. Halligan, W and Bright L. Leadership Foundation for Higher Education. London. May 2015

Wales and Valleys (WWV) and East Wales (EW) ERDF Operational Programmes⁵. Sêr Cymru II is investing in:

- Rising Star Fellowships designed to attract the very best in up and coming research talent.
- Research Fellowships designed to attract stellar candidates.
- Recapturing Talent Fellowships designed to attract stellar researchers that want to return to work following a career break.

1.5 In addition, the operation is also supporting a number of research chairs. This was not initially a feature of the operation but since the launch of Sêr Cymru II, there has been sufficient demand from senior academic researchers for the programme to support a small number of strategically important research chair positions. A number of stakeholders noted that they expect these applicants to bring with them a productive research programme and the ability to build a team of research excellence.

1.6 The total cost of the WWV operation is £20.5m including an ERDF contribution of £14.6m and the total cost of the EW operation is £18.4m including an ERDF contribution of £8m. Match funding is provided by the Welsh Government, the Higher Education Funding Council for Wales (HEFCW) and participating Universities. The Welsh Government (including ESNR⁶, HCRW⁷ and HEFCW) will contribute almost £8 million (£3.5m ESNR, £0.4m Health and Care Research Wales and £3.8m HEFCW)⁸.

1.7 In addition, the Sêr Cymru II programme contains a £17m COFUND scheme which was announced by the then Welsh Government Minister for Economy, Science and Transport in September 2015. This is funded via the Marie Skłodowska-Curie Actions COFUND scheme, which is part of the EU Horizon 2020 programme, and aims to bring 90 new research fellows from across Europe to grow Wales' scientific research base. COFUND applicants cannot have lived in the UK for more than 12 months during the three years prior to an

⁵ Welsh Government (2014), 'Priority Axis 1: Research and Innovation. Specific Objective 1.1: Increase competitive and private research funding', *2014-2020 ERDF West Wales and the Valleys Operational Programme and East Wales Operational Programme*.

⁶ The Welsh Government Department for Economy, Science and Natural Resources.

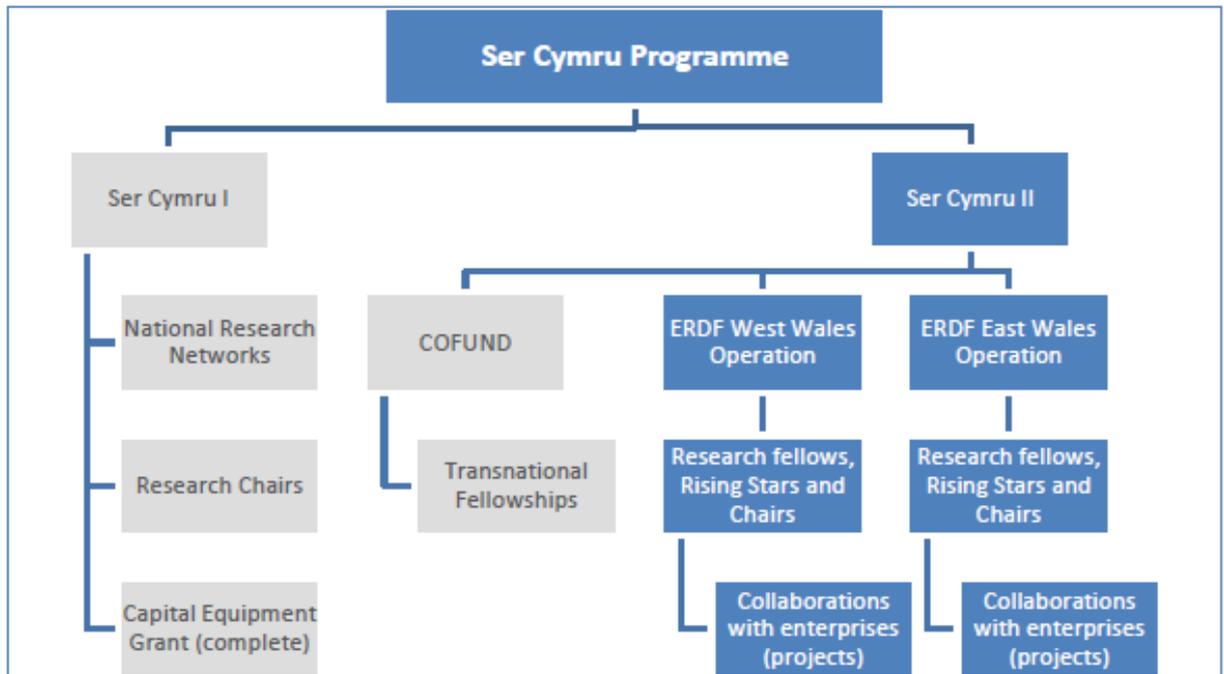
⁷ Health and Care Research Wales.

⁸ Welsh Government (2015) *Sêr Cymru II West Wales and the Valleys ERDF Business Plan*. Version 4. Page 84.

application being submitted. The COFUND element is being delivered in parallel with the ERDF operations but is not being evaluated as part of this study.

- 1.8 Figure 1.1 provides an overview of the various components of the Sêr Cymru Programme. Darker boxes indicate the elements which are ERDF funded and therefore the subject of the evaluation.

Figure 1.1: Overview of Sêr Cymru Programme



Source: Welsh Government

Evaluation aim and objectives

- 1.9 The evaluation specification set out that Sêr Cymru II will be evaluated in three stages:
- An inception stage.
 - A mid-term stage.
 - A final impact stage.
- 1.10 The work being undertaken by OB3 and Regeneris relates to stages one and two. It is the Welsh Government's intention to commission the summative, final stage impact evaluation in due course.

1.11 The overall aim of the evaluation as set out in the research specification is to:
‘Understand with clarity and detail the way that Sêr Cymru II is implemented, its interdependencies and its impacts, particularly, its effectiveness in causing the outcomes and impacts for which the operations were designed, to be realised’.

1.12 The specific objectives for this inception evaluation stage are to:

- Set out a detailed logic model to articulate the theory of change underpinning Sêr Cymru II.
- Clearly set a baseline position for excellent research capacity in Wales in East Wales and West Wales and the Valleys.
- Assess the fit of the operations against the Welsh Government’s strategic objectives to promote the Welsh language and safeguarding the wellbeing of future generations and the cross-cutting themes (of equal opportunities and gender mainstreaming, sustainable development and tackling poverty and social exclusion).
- To develop an appropriate methodology to assess the progress of the operations in meeting the aims and objectives set out in the business plan and the outcomes and impacts identified in the theory of change and logic model.
- Clarify the data that needs to be collected to enable evaluation of the progress, outputs, outcomes and impacts of the operations.
- To identify and suggest ways in which adjustments might be made to the Sêr Cymru II operations to improve their fit with objectives.

2. Inception Evaluation Methodology

2.1 The methodology for this inception stage evaluation has involved the following three stages:

Stage 1 – Study Commencement

2.2 The study commencement stage involved meeting with Welsh Government officials in January 2017 to agree the approach to the evaluation. The detailed methodological approach was outlined in an evaluation work plan. It also involved preparing a brief background note which was used by the Chief Scientific Adviser for Wales at a Sêr Cymru celebration event in February 2017. The briefing note set out the aim and objectives of the evaluation, the broad method being adopted and encouraged key stakeholders to participate.

Stage 2 – Scoping

2.3 A detailed scoping phase was undertaken which involved:

- Meeting with Welsh Government and HEFCW officials in Cardiff in January 2017 to discuss and agree the specific data requirements for the study. A detailed note of the session was produced.
- The preparation of semi-structured discussion guides, used as aide memoirs to conduct stakeholder interviews. The discussion guides were approved by the evaluation steering group and are included in Annex 5.
- Conducting scoping interviews with six key stakeholders involved with the design, approval and implementation of Sêr Cymru II. The stakeholders included the Chief Scientific Adviser for Wales, Welsh Government, WEFO and HEFCW officials, a member of the Sêr Cymru II Programme Beneficiary Board, the Chair of the Sêr Cymru II Independent Evaluation Panel and the Chief Executive of the Learned Society of Wales. The list of stakeholders interviewed was discussed and agreed with the evaluation steering group.
- A detailed analysis of relevant literature encompassing⁹:
 - Devolved Welsh Government and non-devolved UK Government policy and strategy documents.

⁹ A full list of documents reviewed is provided in the bibliography.

- Programme- (ERDF) and operation-specific documents (the Sêr Cymru II ERDF Business Plans).
- Monitoring information including databases and monitoring reports.
- The preparation of a set of inter-related theory of change-based logic models for Sêr Cymru II. An over-arching logic model was prepared along with a distinct logic model for each of the fellowship types.
- The preparation of a detailed baseline position drawing on various evidence sources. This involved:
 - Reviewing the range of potential sources and indicators that could be used for the baseline assessment. This long list of sources was filtered down to those shortlisted for analysis, by considering their relevance, granularity, timeliness and accessibility.
 - Drawing on published data from the Higher Education Statistics Agency (HESA) measures of research capacity, including research income by HEI, the number of staff on research and research and teaching contracts. HEFCW provided a further detailed breakdown of this data by source of research income and discipline. The data used has been made available from 2012/13 academic year up to 2015/16 (the latest academic year for which data is available).
 - Analysing HESA data for academic years between 2010/11 and 2014/15 on interactions with third parties through its Higher Education Business and Community Interaction Survey (HE-BCIS). This was used to analyse contract research income, research contracts, consultancy contracts and intellectual property outcomes at HEIs in Wales compared to the UK.
 - Drawing (where possible) on literature and analysis in published sources (e.g. Elsevier).
 - Benchmarking Wales' position and performance against the UK.
- Reviewing programme monitoring arrangements. This involved analysing the reporting templates developed by the Sêr Cymru II delivery team.

Stage 3 – Stakeholder Consultation

2.4 Stage 3 involved conducting telephone, Skype and face to face interviews with 32 stakeholders. Views were sought in relation to:

- The design and rationale.
- The baseline position.
- The implementation model.
- Delivery and performance to date.
- Impact, attribution and potential approaches to counterfactual evaluation.

The list of stakeholders to invite for interview was provided by the Welsh Government. A full list of organisations who contributed to the evaluation is provided in Annex 4.

A small number of stakeholders (eight) were invited to interview, but unsuccessfully. In one case, the respondent felt that they would not have more to add to other's contributions, in another, a suitable time could not be found. A further respondent was leaving his position and successfully nominated a colleague. The remaining five did not respond to repeated emails and an attempt to call. Nevertheless, Welsh Government officials, pro-vice chancellors, WEFO and HEFCW officials, the Programme Beneficiary Board, the Independent Evaluation Panel and the Learned Society of Wales were all felt to have been sufficiently represented amongst interviewees.

Stage 4 – Project Management and Reporting

2.5 Stage 4 involved communicating progress with Welsh Government officials throughout the inception stage work programme (via e-mail and telephone) and included a progress meeting in March 2017. Stage 4 also included the preparation of this Inception Stage Evaluation report.

3. Policy Context

3.1 This chapter considers the policy context which provides the strategic background, initially to the design and implementation of Sêr Cymru I and then more recently to the Sêr Cymru II operations. The chapter draws on the review of documents undertaken as part of the Scoping Phase (Stage 2 of the methodology).

Welsh Government Policies

Programme for Government (2011-2016)

3.2 The Welsh Government's Programme for Government (2011-2016)¹⁰ set out the high level outcomes of 'healthy people living productive lives in a more prosperous and innovative economy'.

3.3 As part of a series of key actions intended to support the economy and business, the Programme for Government committed to 'collaboration between our universities and with the best universities outside Wales' in the context of science and engineering and to ensure that 'the scientific knowledge and expertise of our world-leading academic groups' are 'made available to support innovation and job creation in companies in Wales'¹¹.

3.4 In the context of a wider set of commitments to improve education in Wales, the Programme for Government also identified the need to generate a 'percentage change in income for Welsh Higher Education institutions coming from Research Councils'¹².

Science for Wales

3.5 In 2012, the Welsh Government published its strategic agenda for science and innovation in Wales¹³. This is a significant policy document that set the strategic context for the Sêr Cymru concept.

3.6 Science for Wales set the goal of building 'a strong and dynamic science base that supports the economic and national development of Wales'¹⁴.

¹⁰ Welsh Government (2011), *Programme for Government*, Cardiff

¹¹ Ibid. Page 3.

¹² Ibid. Page 14.

¹³ Welsh Government (2012), *Science for Wales. A strategic agenda for science and innovation in Wales*, Cardiff. <http://gov.wales/docs/det/publications/120306scienceen.pdf>

¹⁴ Ibid. Page 7.

3.7 Specifically, it set out aims of:

- Increasing Wales' share of Research Council funding from 3.3 per cent in 2009/10 to 5 per cent. Wales' percentage of the UK population is 4.7 per cent¹⁵.
- For the proportion of research achieving 3* and 4* quality and impact levels in Wales' universities to reach the highest UK level (55 per cent achieved by England in the 2008 Research Excellence Framework (REF)¹⁶.

3.8 The strategy also set out a series of principles including:

- Judging research and researchers by the REF standards of 'excellence' and ensuring that high quality, front rank research success is broadcast and celebrated.
- Making a long-term commitment to science and innovation projects.
- Stronger co-ordination of resources and priorities across government, academia, industry, EU structural and research programmes to allow more focused delivery and raise impact.
- Re-structuring universities to increase impact and scale, whilst promoting excellent existing research and recognising and appreciating the value of key national science related assets.
- Actively looking to collaborate with the best elsewhere, wherever that may be.
- Tracking and pursuing UK and European opportunities to attract institutions, facilities, science and innovation capability and investment into Wales¹⁷.

3.9 The strategy presented an analysis of the current [i.e. in 2012] situation in relation to science in Wales. Key issues of note included that:

- Wales' universities tend to submit proposals to Research Councils that are not particularly high spending and the profile of research interests in Wales

¹⁵ Source: Office for National Statistics, Population growth for UK countries mid-2016 <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/bulletins/annualmidyearpopulationestimates/latest#population-of-england-reaches-55-million> accessed 17 July 2017

¹⁶ Ibid. Page 7.

¹⁷ Ibid. Page 8.

tends not to be aligned with the topics for which Councils are making larger grants (such as the Engineering and Physical Sciences Research Council ESPRC).

- Businesses in Wales generally invest less on average in research and development (R&D) than businesses in the UK as a whole. They also access proportionally lower levels of funding from the EU Framework Programme than the whole UK.
- An insufficient number of high quality research proposals are being developed and submitted by Wales' universities with a preponderance of individual, small applications compared with funders' expectations for larger, more ambitious and challenging proposals, often requiring multi-institutional co-operation¹⁸.

3.10 Science for Wales (2012) emphasised the importance of 'excellence' as a criterion for judging the quality of research and that 'Wales must rely on objective, factual evidence to judge excellence, or impact – always relative to the best in the UK and beyond'¹⁹. It made the point that excellence is an 'attractor' and can draw in people, investments and facilities, especially if associated with a 'star' scientist. It also emphasised the need to focus on REF and the annual World University Rankings which broadly measure reputation.

3.11 In developing the strategy, the Science Advisory Council for Wales helped to identify three priority research themes (referred to as the grand challenge areas) where Wales' scientific research is strong and aligned with three of the Welsh Government's priority sectors, namely life sciences, energy and environment and advanced materials and manufacturing. Thus, the three so-called 'grand challenge' areas set out in the strategy are:

- Life sciences and health.
- Low carbon, energy and environment.
- Advanced engineering and materials.

¹⁸ Ibid. Pages 9 and 10.

¹⁹ Ibid. Page 10.

- 3.12 The grand challenges areas are underpinned by four cross-cutting themes, which are:
- STEM outreach.
 - E-infrastructure²⁰.
 - Intellectual Property (IP) exploitation.
 - Fundamental ('blue skies') research²¹.
- 3.13 The strategy identified that UK Research Council committees, boards and councils provide the leadership to create and design new funding opportunities and ideas. It set the ambition of Wales becoming 'far more involved in these, to help in shaping research calls and not to act just as customers'. At the time the strategy was written in 2012, of 89 seats available across UK Research Councils, representatives from Wales only occupied two. 'Increasing this to four or five will be part of the challenge in building the capacity for more world-class academics in Wales who can be supported to engage with such activities'²².
- 3.14 Science for Wales identified that success in research terms requires leaders, experienced in coordinating team members from differing institutions and subject fields, who can integrate scientists from different backgrounds. This is relevant in the sense that it outlines the need for on-going support beyond simply the recruitment of high calibre researchers.
- 3.15 Turning specifically to the policy context that led to the establishment of Sêr Cymru, Science for Wales outlined that the Welsh Government 'wants more focused action, using existing and new resources to develop and raise the impact of the science base, as well as further raising its quality in a sustainable way'²³. The strategy pointed out that other countries have developed a range of institutional models and programmes. For instance:

²⁰ e-Infrastructure refers to a combination and interworking of digitally-based technology (hardware and software), resources (data, services, digital libraries), communications (protocols, access rights and networks), and the people and organisational structures needed to support modern, internationally leading collaborative research.

²¹ Ibid. Page 12.

²² Ibid. Page 16.

²³ Ibid. Page 20.

- The German Government supports a number of Max Planck²⁴ and Fraunhofer Institutes²⁵.
- Science Foundation Ireland has invested substantially in world-leading researchers and their teams and evidence suggests such arrangements are proving highly successful.
- An approach to research pooling has been applied successfully in Scotland where scientists take a discipline- based, cross-institutional view of research applications with the Scottish science community being regarded as ‘a single entity’²⁶.

3.16 In order to realise this aspiration, Science for Wales outlined the Welsh Government’s intention to work with universities, their representative organisations and HEFCW to provide funding for new academic ‘stars’ (‘Sêr’) with supporting teams and equipment and to couple this with a new programme of pooling activity across Wales’ university departments – National Research Networks (NRNs)²⁷.

3.17 The aim of this work would be to improve the capability of the research community in selected disciplines ‘so it can cooperate on proposals and projects and be more successful than to date’. The strategy made clear that this approach intended to build on experience in Wales while adopting ‘appropriate elements’ from Science Foundation Ireland and the Scottish research-pooling concept.

3.18 To lead the NRNs the strategy set the aim of recruiting ‘high impact’ network directors. The proposed NRNs would include existing staff who are ‘demonstrably excellent’ and would also encompass the new ‘stars’ and their associated new fellowships and lectureships. The role of the director of each NRN with their team of well-connected experts would be to make Wales’

²⁴ Max Planck was a German theoretical physicist whose discovery of energy quanta won him the Nobel Prize in Physics in 1918. The Max Planck Society operates a number of research institutions in Germany and abroad focused on life sciences, natural sciences and the social and human sciences.

²⁵ The Fraunhofer-Gesellschaft is an organisation for applied research in Europe. Its research activities are conducted by 69 institutes and research units at locations throughout Germany. Affiliated international research centres and representative offices provide contact with regions of greatest importance to present and future scientific progress and economic development.

²⁶ Ibid. Page 20.

²⁷ Ibid. Page 21.

universities ‘more powerful and better connected with UK and European collaborators and funding bodies’²⁸.

3.19 The strategy set out the ambition of ‘demonstrating to the wider world our determination to succeed in science and maximise its impact in driving economic growth’²⁹.

3.20 Science for Wales set out a series of specific actions that the Welsh Government would undertake both in the short term (one year) and medium term (five years). These are summarised in Table 3.1.

Table 3.1: Summary of one and five year actions outlined in Science for Wales

One year actions	Five year actions
<p>Launch the first Sêr Cymru programme, establishing the NRNs in the grand challenge areas and actively seek to attract ‘stars’ to Wales.</p> <p>Consider support requirements for the four underpinning activities.</p> <p>Facilitate greater synergy between EU structural funds and research programmes in Wales’ universities and industry, and improve technical and peer review of WEFO-funded research proposals.</p> <p>Set up new arrangements to work more closely with the HE sector in improving research effectiveness and encourage deeper and broader engagement with UK Research Councils.</p> <p>Commission a detailed study to establish the factors which determine our [i.e. Wales’] performance in winning competitive research funding, including analysis of the scale and quality of proposals, success rates, funding outcomes and the influence of EU structural funding.</p>	<p>Work to improve the effectiveness of interaction with funding agencies, raise the level of ambition, extend networks to create more powerful proposals that are aligned with funding opportunities, and promote greater expertise and professional development in grant applications.</p> <p>Influence higher education researchers to increase the level of funding won from competitive research sources (chiefly from the UK Research Councils) to achieve UK funding that exceeds our population fraction of 4.9 per cent.</p> <p>Promote more effective research collaboration and use mergers between departments to form stronger research entities of sufficient size, reputation and excellence to attract both ‘star’ researchers and able junior scientists. We will encourage the development of ‘critical mass’ in relevant areas and in research involving a number of traditional or newly emerged disciplines in order to meet strategic needs.</p>

Source: Science for Wales, Welsh Government

²⁸ Ibid. Page 21.

²⁹ Ibid. Page 22.

Innovation Wales

- 3.21 In 2014, the Welsh Government published *Innovation Wales*³⁰ which recognised that Wales is a small country that ‘cannot be good at everything’. As such, the strategy outlined the need to ‘recognise where our strengths are and exploit them more’³¹.
- 3.22 In this context, the Welsh Government adopted the Smart Specialisation³² methodology, which ‘seeks to be more inclusive in the future development of strategy and delivery, involving vital stakeholders in a region such as businesses and universities’³³.
- 3.23 *Innovation Wales* considered the inter-relationship between research and innovation. It outlined that levels of R&D in Wales are ‘nowhere near as high as we would like’ and we ‘do not win a large enough share of available competitive funding’. It cited *Sêr Cymru* as an important foundation in fostering collaboration between institutions and building critical mass in our academic research effort. It also identified the need for research levels within business to increase, linking this with the need to ‘try to attract research-intensive companies to Wales, help those already here to research more and support the start-up of new, research active businesses’³⁴.
- 3.24 In the context of the grand challenge areas set out in *Science for Wales*, *Innovation Wales* set the focus on targeting investments in these areas to ‘build a culture of continuous innovation, adding value to existing capability within Wales and realising the economic potential which innovation can deliver’³⁵. It also added a fourth grand challenge area to the three listed in *Science for Wales*, namely ICT and the digital economy³⁶.

³⁰ Welsh Government (2014) *Innovation Wales*, Cardiff.

³¹ Ibid. Page 7.

³² The Smart specialisation’ approach combines industrial, educational and innovation policies to suggest that countries or regions identify and select a limited number of priority areas for knowledge-based investments, focusing on their strengths and comparative advantages. Source: OECD.

³³ Welsh Government (2014), *Innovation Wales*, Cardiff, Page 7.

³⁴ Ibid. Page 11.

³⁵ Ibid. Page 14.

³⁶ Ibid. Page 13.

The Diamond Review

3.25 In 2013, a review was announced of higher education in Wales. This became known as the Diamond Review, and was published in 2016. At the heart of the review are proposals on the system of student support, moving towards a mix of grants and loans to cover maintenance. The review does, however, make recommendations with respect to research funding, and one of the guiding principles of the review was that ‘the funding system should take into account the UK-wide and international dimensions of research activity and collaborations and the need for universities in Wales to be competitive and successful in those environments’.

3.26 In particular, the Diamond review recommended that:

- Welsh Government funding be made available for programmes to support postgraduate researchers via three-year scholarships for 150 research students each year.
- Quality-related research funding be maintained at least in real terms over the next five years.

3.27 The Welsh Government accepted these recommendations in principle, and commented that the dual funding mechanism ‘is also crucial to help redress the short fall in STEMM researchers in Wales through university support for programmes such as Sêr Cymru’³⁷.

The Hazelkorn Review

3.28 Published in 2016, the Hazelkorn Review³⁸ examined the post-compulsory education system in Wales, taking in initiatives at 6th form, FE and HE, work-based learning and adult and community education. The review was wide-ranging, with a number of the recommendations relevant to research capacity, including:

³⁷ Welsh Government (2016) Welsh Government response to the recommendations from the Review of Student Support and Higher Education Funding in Wales ‘The Diamond Review’, Cardiff.

³⁸ Hazelcorn, E. (2016) Towards 2030. A framework for building a world-class post-compulsory education system for Wales, Cardiff

- Strengthening ‘collaboration and build critical mass across education and research in order to underpin and boost coherence and critical mass, quality and competitiveness’.
- ‘Putting in place the necessary support mechanisms and career pathways to ensure a continuing pipeline of research talent, at masters and doctoral level, necessary to both attract and retain talent in Wales, and drive innovation’.

3.29 It also noted that the governance of research, while not within the scope of the review, needed ‘an urgent, targeted evaluation of research capacity and capability than was possible in this review’.

Public Good and a Prosperous Wales – Building a reformed PCET system

3.30 The Welsh Government sets out its response to the recommendations offered by the Hazelkorn Review in the ‘Public Good and a Prosperous Wales’³⁹ White Paper consultation document. The Welsh Government accepts Professor Hazelkorn’s recommendations and proposes to establish a new strategic authority, the Tertiary Education and Research Commission for Wales, to provide ‘oversight, strategic direction and leadership for the post-compulsory education and training sector’.⁴⁰ This new Commission would be expected to co-ordinate ‘research and postgraduate research capacity funding in a more strategic and dynamic way’⁴¹.

3.31 The White Paper also sets out the Welsh Governments’ intention to legislate so as to provide for a committee of the Commission (to be known as Research and Innovation Wales) which would oversee and co-ordinate Welsh Government research and innovation expenditure.

*The Reid Review*⁴²

3.32 In response to Hazelkorn’s recommendation, which called for a review of research and innovation strategy, Professor Graeme Reid was asked by Welsh Ministers to identify research and innovation strengths in Wales and to outline

³⁹ Welsh Government (2017) Consultation Document. Public Good and a Prosperous Wales – Building a reformed PCET system, Cardiff.

⁴⁰ Ibid., p. 11

⁴¹ Ibid., p.11

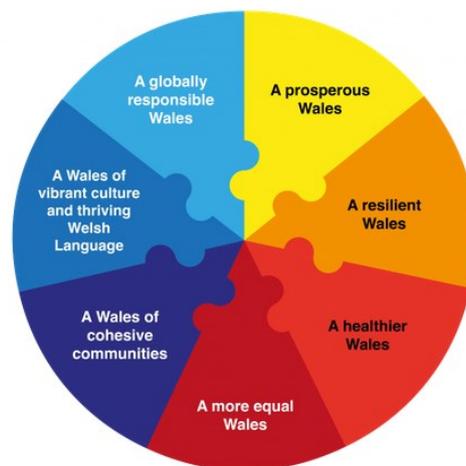
⁴² <http://www.uniswales.ac.uk/the-reid-review-summary-of-documents-and-weblinks/>

how these assets could be used more effectively by business, communities and the Government. The review is due to report at the end of 2017 and offer recommendations on the future development of research and innovation strategy for Wales and guiding principles to inform future investment and funding decisions by the Welsh Government.

Well-being of Future Generations (Wales) Act

3.33 The Well-being of Future Generations (Wales) Act became law in Wales on 29 April 2015 with the aim of improving the social, economic, environmental and cultural well-being of Wales. The Act intends to strengthen existing governance arrangements for improving the well-being of Wales, ensuring that present needs are met without compromising the ability of future generations to meet their own needs. In particular, the Act identifies seven well-being goals for Wales, set out at Figure 3.1.

Figure 3.1: The Seven Well-being goals of the Future Generations (Wales) Act



Source: Welsh Government

3.34 Given the broad ranging nature of the Act, it could be argued that Sêr Cymru II might contribute to greater or lesser degrees to each of the well-being goals. However, the goal of a prosperous Wales seems the most relevant opportunity. In this context, the Act sets out the ambition of ‘an innovative, productive and low carbon society which recognises the limits of the global environment and therefore uses resources efficiently and proportionately (including acting on climate change); and which develops a skilled and well-educated population in an economy which generates wealth and provides employment opportunities,

allowing people to take advantage of the wealth generated through securing decent work⁴³.

3.35 The Act also introduces national indicators that will measure the difference being made to the well-being of Wales. These indicators are intended to be used by the Welsh Government as the basis of its annual reporting (via the Annual Well-being Report), to update progress being made in Wales in achieving the seven well-being goals.

3.36 The Welsh Government proposed a series of 46 indicators⁴⁴. While none of the indicators in the Act relate specifically to research or science, some are of indirect relevance to Sêr Cymru II. These provide an opportunity for Sêr Cymru II to demonstrate how its activities and the outcomes it is generating contribute to the Act. In particular:

- Indicator 11 relates to the percentage of businesses which are innovation-active.
- Indicator 14 relates to the ecological footprint of Wales.
- Indicator 21 relates to the percentage of people in employment.
- Indicator 41 relates to the emissions of greenhouse gases within Wales.
- Indicator 42 relates to the emissions of greenhouse gases attributed to the consumption of global goods and service in Wales⁴⁵.

3.37 A small number of the stakeholders consulted as part of the inception evaluation were mindful that the Sêr Cymru II Business Plans did not reflect the details outlined in the Act

3.38 It should be possible however for the Welsh Government to analyse monitoring data and evaluation evidence in a way that makes it possible to maximise the opportunity to demonstrate how Sêr Cymru II is contributing to the indicators for the Act.

⁴³ Welsh Government (2015) *Well-being of Future Generations (Wales) Act 2015. The Essentials*. Welsh Government. Cardiff. 2nd Edition, May 2015. Page 6.

⁴⁴ Welsh Government (2016) *How to measure a nation's progress? National indicators for Wales as required by section 10(1) of the Well-being of Future Generations (Wales) Act 2015*. Welsh Government. Cardiff.

⁴⁵ Ibid. Pages 2 and 3.

Taking Wales Forward

- 3.39 The objectives of Sêr Cymru II are consistent with the commitment set out in Taking Wales Forward, the Welsh Government's Programme for Government (2016-2021)⁴⁶. A key theme in Taking Wales Forward is supporting businesses to create prosperity. This includes a commitment to 'drive forward inward investment, innovation and the creation of new jobs'⁴⁷.
- 3.40 The document also indicates a coherent fit between Sêr Cymru II and the Programme of Government given that Taking Wales Forward sets out the need to 'better utilise our existing relationships with Wales' universities to help sell Wales to the world following the Brexit vote and work with the sector to ensure protection for students and important research grants'⁴⁸.

UK Government Policies

- 3.41 In addition to the devolved policy context, it is also worth noting some key developments at UK level which may have an indirect effect on the implementation of Sêr Cymru II.

Supply-side interventions and university expansion

- 3.42 The UK-wide approach to developing research capacity within higher education should be seen in the context of a wider supply-side approach to skills and employment policy, which has prevailed since the 1980s.⁴⁹ This has stressed the need to increase the skills of the labour force in general in order to drive international competitiveness.
- 3.43 This focus on human capital development has been accompanied by significant expansion in the university sector generally. The 2000s in particular saw steady increases in the number of higher education students and hence strong funding settlements for the sector, supported by the Science and Innovation Framework 2004-2014.⁵⁰ This has, in turn, enabled an expansion in the number of academics, including the number of researchers.

⁴⁶ Welsh Government (2016) *Taking Wales Forward*. Welsh Government. Cardiff

⁴⁷ Ibid. Page 4.

⁴⁸ Ibid. Page 11.

⁴⁹ See, for example, Ball, S.J. (2008). *The Education Debate*. Policy Press, Bristol

⁵⁰ HM Treasury (2006) *The Science and Innovation Framework 2001-2014*. [online]. Available at: http://webarchive.nationalarchives.gov.uk/+http://www.hm-treasury.gov.uk/spending_sr04_science.htm [Accessed April 2017].

The Roberts Review

3.44 Alongside this general expansion, specific efforts have been made in the past decade or so to increase UK research capacity via specific funding mechanisms. In 2002 the Roberts Review - SET for Success - on the supply of people with science, technology, engineering and mathematics skills was published. Sir Gareth Roberts championed 'the need to develop policy and practice in relation to the growing number of staff employed exclusively or predominantly to carry out research'.⁵¹ Set for Success recommended that:

- HEIs take responsibility for ensuring clear career paths for post-doctoral researchers, and that all HEFCE and Research Council researching funding is made conditional on this.
- Research Councils significantly increase salaries awarded to science and engineering postdoctoral researchers that they fund.
- Government provide funds for establishing a significant number of academic fellowships, to be administered by the Research Councils.

3.45 This led specifically to what became known as Roberts Funding, whereby a portion of Government investment in science through the UK Research Councils went to funding research staff and postgraduate researchers. This allocation amounted to tens of millions of pounds per annum and needed to support the recommendations made by the Roberts Review on career development.

The Concordat and other changes

3.46 Since the Roberts Review, a number of changes have taken place in the higher education landscape. These include:

- The implementation of a framework for modernising the pay structures in universities in 2004.
- The introduction of full economic costing⁵² from 2005.
- A three-year national pay settlement from 2006 to address relative decline in pay levels in the sector.

⁵¹ Roberts, G. (1998). *Research Careers Initiative Report*. London.

⁵² Whereby all universities are required to estimate the full cost of their research projects using a method developed by HEFCE.

3.47 Notably, Research Councils UK developed a Concordat to Support the Career Development of Researchers, in 2008. This sets out ‘the expectations and responsibilities of researchers, their managers, employers and funders’.⁵³ It is designed to improve the employment and support for researchers and research careers in UK higher education, with the intended benefits being to sustain research excellence, to increase attractiveness of the UK for talented researchers and to improve research output. Its principles for employers include:⁵⁴

- Recruitment and selection: Recognition of the importance of recruiting, selecting and retaining researchers with the highest potential to achieve excellence in research.
- Recognition and value: Researchers are recognised and valued by their employing organisation as an essential part of their organisation’s human resources and a key component of their overall strategy to develop and deliver world-class research.
- Support and career development: researchers are equipped and supported to be adaptable and flexible in an increasingly diverse, mobile, global research environment.
- The importance of researchers’ personal and career development, and lifelong learning, is clearly recognised and promoted at all stages of their career.

3.48 All of Wales’ universities have signed the Concordat.

The Higher Education White Paper

3.49 In May 2016, the UK Government published a White Paper on Higher Education, and the HE Bill received Royal assent in April 2017. This has signalled far-reaching reforms across a range of domains, with the central driver being enhanced competition and choice for students. Amongst the many proposed reforms include the creation of a single research and innovation funding body, UK Research and Innovation. This responds to the findings of a

⁵³ Research Councils UK (2008) *Concordat to Support the Career Development of Researchers*. [online]. Available at: <http://www.rcuk.ac.uk/research/efficiency/concordats/>. [Accessed April 2017].

⁵⁴ Ibid. Page 31.

review by Sir Paul Nurse, which recommended the creation of a single body to bring together the 7 research councils. The rationale is to enable inter- and multi-disciplinary research to be effectively taken forward. Innovate UK will be integrated into this body but retain its distinctive funding streams. This body will be responsible for distributing over £6bn per annum in research funding. In response to this, the Welsh Government is currently consulting on the creation of a committee called Research and Innovation Wales (RIW), the purpose of which would be “to oversee and coordinate Welsh Government research and innovation expenditure provided to the Commission with the aim of creating a more dynamic and responsive-to-need research, innovation and knowledge translation environment in Wales.”⁵⁵

Industrial Strategy

3.50 The UK Government issued a Green Paper on its Industrial Strategy in January 2017. Noting that the UK lags behind other advanced economies in its expenditure on research and development, the Paper suggests a number of interventions that are being considered for addressing this and enhancing the UK’s competitive position. The most relevant in the context of Sêr Cymru II are:

- Building the pipeline for talent in a growing economy: the strategy notes that funding programmes for PhDs and post-doctoral researchers are heavily over-subscribed, so efforts will be made to ‘substantially increase the number of PhDs and research fellowships in STEM subjects (science, technology, engineering and maths).’⁵⁶
- Ensure that the UK attracts top international talent. The strategy notes the evidence that the presence of academic ‘stars’ serves to pull in other researchers and private businesses, and that other countries are active in attracting leading academics who can anchor strong departments. The UK may consider similar actions.

⁵⁵ Public Good and a Prosperous Wales – Building a reformed PCET System. Welsh Government Consultation Document, issued 20th June 2017 WG31891

⁵⁶ HM Government (2017) *Green Paper. Building our Industrial Strategy*, London

3.51 *The National Productivity Investment Fund (NPIF)* The 2016 Autumn Statement⁵⁷ committed the UK Government to £23 billion of additional high-value investment, aimed at increasing the UK's productivity performance. Following this, and picking up on the themes within the industrial strategy, significant investments were announced over the coming four years in research capacity.. The investment package includes £250 million up to 2021 to 'build the pipeline of high-skilled research talent necessary for a growing and innovative economy', which includes:

- £90 million towards an additional 1,000 PhD places. These are intended to be in areas aligned to the Industrial Strategy. 85 per cent will be in STEM disciplines.
- £160 million to support new fellowships for early and mid-career researchers, again in areas aligned to the Industrial Strategy.
- £100 million, through the Rutherford Fund⁵⁸, to attract the brightest minds to the UK. This includes:
 - £50 million of NPIF funding for fellowship programmes to attract global talent
 - £50 million from existing international funds to support fellowships from emerging "research powerhouses" including India, China, Brazil and Mexico.

3.52 This has potential implications for Sêr Cymru II given that significant additional research funding will be going into English universities in order to attract and retain researchers there. It may increase competition with English universities for researchers. Further, if English schemes are successful in attracting additional research talent to English universities, they may serve to worsen Wales' relative research capacity position by reducing Wales' proportional share of the total UK researcher base.

⁵⁷ <https://www.gov.uk/government/publications/autumn-statement-2016-documents/autumn-statement-2016#productivity-1>

⁵⁸ <https://www.gov.uk/government/news/100-million-rutherford-fund-to-attract-best-researchers-to-the-uk>

EU secession

- 3.53 The UK's vote to leave the European Union has important consequences for the UK higher education sector. At the time of writing, the UK Government was about to commence negotiations on the terms of its exit. Whilst HM Treasury has provided a full lifetime guarantee for all ESIF projects approved before the UK leaves the EU, the wider implications of exiting the EU are uncertain and will not be known until the outcome of these negotiations. At present there is uncertainty over the UK's continued participation in EU-wide research programmes such as Horizon 2020, along with the UK's immigration policy with respect to highly skilled researchers from the EU and beyond. There have already been reports of UK-based researchers being excluded from bids or EU research projects due to this uncertainty⁵⁹.
- 3.54 It is, of course, possible that as part of the negotiation the UK will decide to make contributions into these programmes in order to continue to participate in them, and that a liberal immigration policy will be adopted with respect to research talent. The Industrial Strategy Green Paper states that, 'As the UK prepares to leave the EU we remain committed to maintaining and building on our strengths in R&D to continue attracting world-class people, skills and foreign investment'.⁶⁰
- 3.55 However, the current uncertainty may have some bearing in the short term on the performance of the Sêr Cymru II programme, for example, if the uncertainty makes it more difficult to attract researchers from EU countries and/or EU research funding to Wales.

Synopsis: Policy Context

- 3.56 The review of relevant Welsh Government policy documents shows that there was and continues to be a very clear, detailed and supportive devolved policy framework in place for the development and implementation of both Sêr Cymru I and Sêr Cymru II. The review also shows that the objectives of Sêr Cymru II are well-aligned with Welsh Government policy although there is scope for the

⁵⁹ Institute of Physics blog (2016) *UK researchers excluded from European research network due to Brexit*. [online]. Available at: <http://www.iopblog.org/researchers-begin-to-feel-brex-it-impact/>. [Accessed April 2017].

⁶⁰ HM Government (2017) *Green Paper. Building our Industrial Strategy*. London

programme to demonstrate how it can better reflect the objectives of the Future Generations Wales Act.

- 3.57 UK Government policies are, as would be expected, of less direct relevance to Wales given that they focus on policy choices that only apply in England. However, some of the UK Government's recent policy responses (such as the NPIF) could result in external forces (outside of the immediate control of those operating Sêr Cymru II) that may have an effect on performance and the achievement of key outcomes such as increasing competition to recruit excellent scientific researchers. These issues are reflected in the theory of change based logic models outlined in Chapter 5 of this report.

4. Baseline Position

- 4.1 This chapter considers the existing levels of research capacity in Wales' higher education institutions (HEIs). The chapter starts by explaining the range of potential baseline indicators considered, and the basis for taking some of these forward for detailed analysis. An analysis of Wales' performance on these shortlisted indicators is then set out.
- 4.2 As an operational definition, by *research capacity* we principally refer to the human resources (i.e. research staff) and financial resources (i.e. research income)⁶¹ required to undertake research activities. The outputs of these research activities are then measured in terms of numbers of publications and citations, as well as collaborations with third parties.
- 4.3 The analysis benchmarks Wales' position and performance against the UK (especially with reference to the 5 per cent share target) as well as internationally, where the data allows.
- 4.4 The 5 per cent share target is based on Wales as a proportion of UK population as features in publications that examine the research capacity in Wales, as well as the Business Plans for Sêr Cymru II. For comparison, we have undertaken illustrative analysis of Wales as a share of the national UK economy based on Gross Value Added (GVA). This shows that Wales accounts for 3 per cent of the UK share of total GVA in 2015 (ONS, 2016). Therefore, it may be worth noting that while Wales might perform below the 5 per cent UK share on some of the research capacity indicators examined in this section, its performance when benchmarked against the size of its economy is better.

Indicators considered

- 4.5 In scoping the baseline assessment for the evaluation, a range of possible data sources to help us understand the comparative research capacity and performance of Wales were considered. The usefulness of these data sources for the baseline position and subsequent evaluation was assessed in terms of their:

⁶¹ Research income can be considered as both an input and an output in the context of this evaluation.

- Relevance – the extent to which they capture aspects of Wales’ position and performance that are of direct relevance to the rationale and objectives for Sêr Cymru II.
- Granularity – the extent to which they can be meaningfully broken down in sufficient detail, for example, in order to enable an understanding of STEMM-specific performance.
- Timeliness – whether the data are produced with sufficient regularity to be useful for a future assessment of the impact of Sêr Cymru II.
- Accessibility – whether it is feasible to access the data, given time and cost constraints for the evaluation.

HESA data

4.6 The Higher Education Statistics Agency (HESA) publishes detailed data at the institution level on the number of academic staff engaged in research and the income that they are securing, by source. This is available annually through HEFCW and is broken down by discipline. It was a key source in the analysis by Halligan and Bright (2015). It is therefore a very useful source for the baseline and evaluation, in giving a timely understanding of comparative research capacity secured for Wales.

4.7 HESA also publishes data on interactions with third parties through its Higher Education Business and Community Interaction Survey (HE-BCIS). This contains a range of variables including income from collaborative research and consultancy, and outputs from this activity including spin-outs and IP generation. This is also available by institution and on an annual basis through HEFCW, but cannot be broken down by discipline. We conclude that this is also a useful source for the baseline, although it should be borne in mind that there is a time lag between the recruitment of researchers and any achievement of the outputs contained here.

Scopus

4.8 Other key data on research outputs (publications and citations) is available through commercial data providers. For example, Elsevier runs Scopus, the largest database on abstracts and citations of peer-reviewed literature. The company has carried out two sets of analysis on Wales’ comparative

performance using this bibliometric data (for 2011 and 2014), which were used in the Halligan and Bright report. The data contains very useful analysis of publications and citations by subject area, with international benchmarks.

- 4.9 We have investigated access to the Scopus data, and we found that whilst it contains some very useful and timely indicators of past research output, it is not easily accessible for the purposes of the evaluation. Individual universities are able to access Scopus but it is unlikely that we will be able to make use of this data for the evaluation without violating their terms of access.
- 4.10 Currently there are no firm plans to update the Elsevier report which uses Scopus to for an analysis of publications and citations in Wales' HEIs. We therefore cover the key messages from the published report⁶² on Wales' comparative research performance here, but note that unless partners are planning to fund an update to the report or facilitate access to the Scopus database, it will not be possible to use the data for subsequent evaluation purposes. As was the case for the indicators on interactions, the time lag between researchers being in post and the achievement of these outputs should be borne in mind.

Research Fish

- 4.11 Another potential source of data on Research Impact is Research Fish. This is a commercial provider that draws on information inputted by researchers themselves on the outputs, outcomes and impact of their research. It covers data on publications, citations, collaborations, and IP generation. However, it only covers main research council awards, and those research awards where researchers have input data into Research Fish, meaning that there are some gaps in its coverage. We investigated accessing this data for the baseline assessment and evaluation: the product is primarily aimed at direct funders of research (e.g. Research Councils) and individual institutions, and is costly to obtain. Given these issues with accessibility and coverage, we have not included this source in the baseline.

⁶² Elsevier (2016) *International Comparative Performance of the Welsh Research Base 2010-2014*.

Research Excellence Framework

- 4.12 The Research Excellence Framework (REF) was introduced in 2014 as the successor to the Research Assessment Exercise and the key mechanism for assessing the impact of publicly funded research. The results are used to inform the allocation of quality-related (QR) research funding by government. The REF contains a range of measures of research impact, principally focussed around an overall quality profile for the submitted research, with 4* being the highest rating and corresponding to 'quality that is world leading in terms of originality, significance and rigour'.
- 4.13 The latest REF for 2014 pertained to submissions made in 2013. The next REF will take place in 2021 and will incorporate the findings of a recent review of the REF by Lord Stern.⁶³ Given these changes, there will not be direct comparability between the 2014 and 2021 REF outputs. Another point to note is that the REF is based only on a subset of all research publications. Submissions are chosen by HEIs and focus on areas of research strengths, so results are not necessarily representative of the research landscape as a whole. Therefore, whilst the 2014 REF exercise provides useful insights into Wales baseline research capacity in 2013, set out at Annex 1, the 2021 REF data will be of limited use for the purpose of evaluating the impact of Sêr Cymru II.
- 4.14 Annex 1 sets out details of the relevant data sources, their characteristics and application, in tabular format.

Research income

- 4.15 The latest data on research income is available from HESA for the 2015/16 academic year. This data shows that HEIs in Wales secured £204.6m research income - in all disciplines - out of the total £5,890m secured by all HEIs across the UK. This is equivalent to 3.5 per cent of the UK share, which is one and a half percentage points below the target of 5 per cent based on Wales' population share. This implies that, in order to meet its target of 5 per cent of the UK total, Wales' institutions would need to secure additional £89.9m of research funding per year.

⁶³ Lord Stern (2016) Building on Success and Learning from Experience: an Independent Review of the Research Excellence Framework

4.16 The £89.9m of additional annual research income required to reach the 5 per cent (at 2015/16 levels) is based on the assumption that the UK total remains unchanged – this implies that in order to increase its share, Wales would need to do so at the expense of other UK regions⁶⁴. However, if Wales were to secure additional research income which is entirely additional to the UK, it would require £94.4m to achieve a 5 per cent UK share.⁶⁵

4.17 Figure 4.1 sets out an analysis of how much additional research income would be required, to achieve a 5 per cent share from each of the current income sources. It clearly demonstrates that Wales falls short on all but two income sources in securing its 5 per cent share of national research income:

- The areas in which Wales outperforms its target 5 per cent share are UK central government income sources (6 per cent) and UK other sources⁶⁶ (6 per cent).
- In absolute terms, the gap in research funding from research councils and UK-based charities is the largest, with an additional £27m and £28m required respectively from each source to bring Wales up to the 5 per cent national share.

4.18 Alongside considering Wales' share of the UK total and comparing this to its population share, another way of benchmarking Wales' institutions' performance is by looking at income on a per researcher basis. This shows that in 2015/16, the research income was equivalent to £36,900 per researcher⁶⁷ in Wales, 15 per cent lower than the comparative figure of £43,400 across the UK⁶⁸.

4.19 This means that to make up this gap, an additional £6,500 of research income would be required per researcher in Wales. In total, this would be equivalent to

⁶⁴ This is calculated by establishing what 5 percent of the UK's research income share amounts to and subtracting Wales' equivalent from the 5 per cent UK share to identify the additional income or researchers required.

⁶⁵ This approach results in a larger amount required to make up the gap. This is due to the fact that the UK total would rise as well as the Wales total if income secured is additional to the UK. The approach to calculating this is to establish what a 5 per cent share of the UK's research income amounts to, subtracting Wales' equivalent from the 5 percent UK share and scaling up by dividing by 0.95 to arrive at the additional income/researchers required for Wales to make up 5 per cent of the UK share.

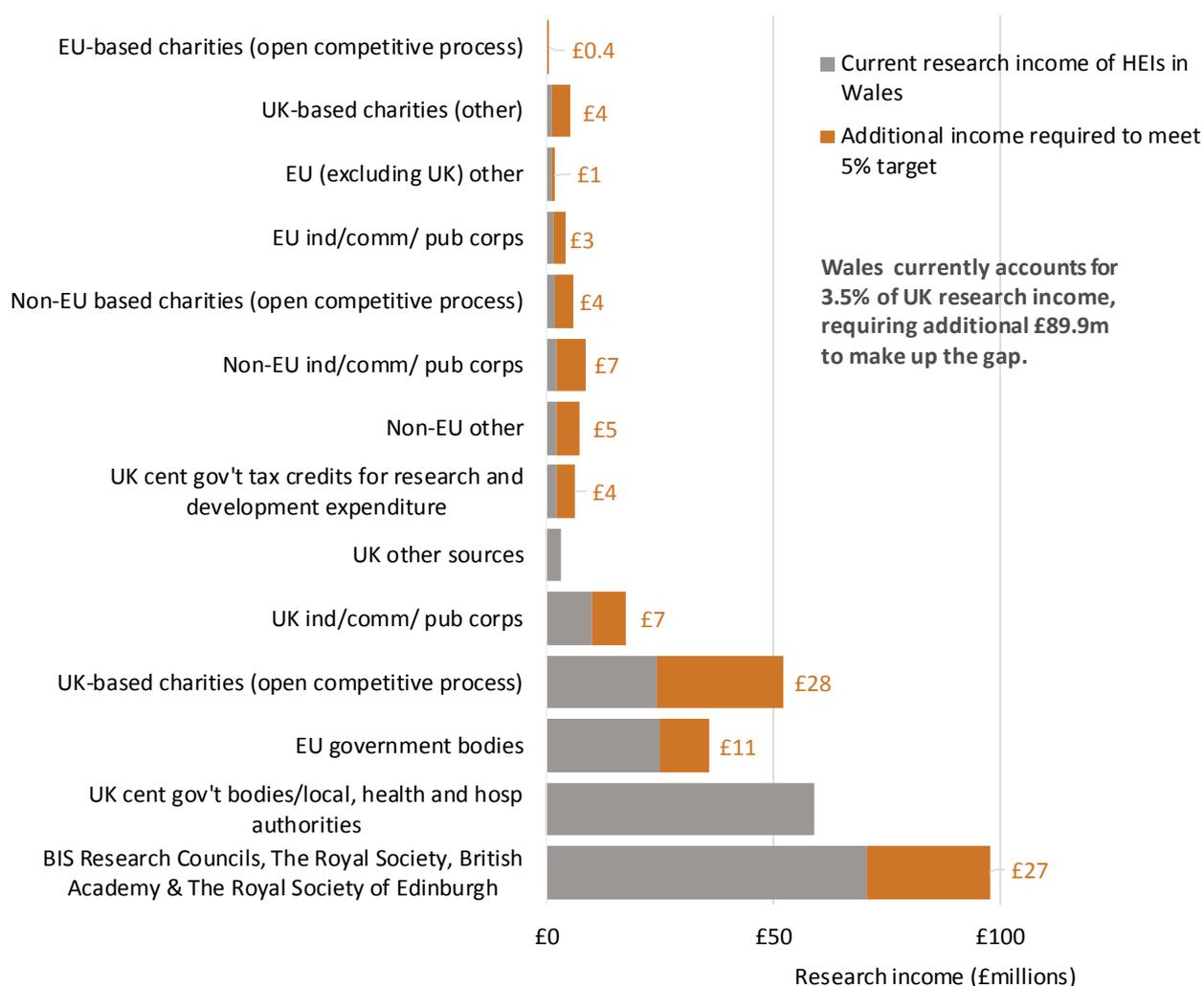
⁶⁶ Other sources are defined as all remaining UK sources of research income. This can include income from HEIs where the HEI is the original contractor.

⁶⁷ Academics on research contracts, and research and teaching contracts.

⁶⁸ The income per researcher is calculated as a ratio of total research income in Wales (£204.6m) to total staff on research, and research and teaching contracts in Wales (5,540). The equivalent calculation is replicated for the UK.

£36m of additional research income provided the number of academics stayed the same (i.e. 5,540 researchers). It should be noted that even if this was achieved, it would still fall short of the amount required to bring Wales up to a 5 per cent national income share. The implication is that Wales' under-performance in generating research income is a result both of the performance of its existing researchers and of a deficit in the actual number of researchers. As an illustration, increasing the number of researchers in Wales to make up the 5 per cent UK share, but keeping income per researcher constant, would only bring Wales up to 4 per cent of national research income share.

Figure 4.1: Additional research income by source required to meet 5 per cent UK share



Source: HESA Finances 2015/16

Table 4.1 Research income by source, 2015/16

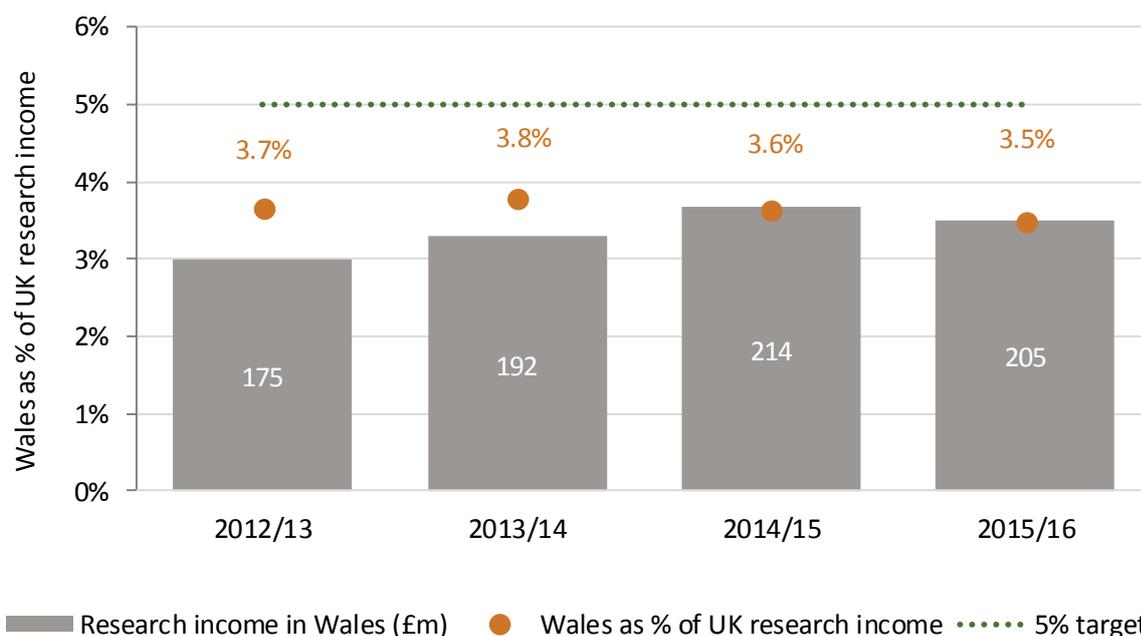
Research income source	Research income of HEIs in Wales (£m)	Research income of HEIs in the UK (£m)	Wales as a share of UK research income (per cent)
BIS Research Councils, The Royal Society, British Academy & The Royal Society of Edinburgh	£70.8	£1,958.2	3.6%
UK cent gov't bodies/local, health and hosp authorities	£59.1	£967.7	6.1%
EU government bodies	£25.0	£715.0	3.5%
UK-based charities (open competitive process)	£24.4	£1,043.4	2.3%
UK ind/comm/ pub corps	£10.1	£349.1	2.9%
UK other sources	£3.3	£57.1	5.7%
UK cent gov't tax credits for research and development expenditure	£2.1	£126.4	1.6%
Non-EU other	£2.1	£146.4	1.4%
Non-EU ind/comm/ pub corps	£2.0	£173.6	1.2%
Non-EU based charities (open competitive process)	£1.8	£118.4	1.5%
EU ind/comm/ pub corps	£1.5	£80.9	1.9%
EU (excluding UK) other	£1.2	£35.3	3.5%
UK-based charities (other)	£1.1	£105.1	1.0%
EU-based charities (open competitive process)	£0.1	£9.4	1.0%
Total	£204.6	£5,886.0	3.5%

Source: HESA Finances 2015/16

Research income trends

- 4.20 Trends over the last four academic years show that Wales' HEIs experienced growth in research income between 2012/13 and 2014/15, but a fall of 4 per cent in 2015/16. This compares to a much smaller reduction in UK-wide research income of only 0.4 per cent between 2014/15 and 2015/16. Overall, since 2012/13 research income secured across all UK HEIs has increased more than in Wales, representing a 23 per cent increase compared to 17 per cent increase across HEIs in Wales.
- 4.21 Correspondingly, over the last four years Wales maintained just under a 4 per cent share of national research income until recently, dropping to 3.5 per cent in 2015/16 (see Figure 4.2).

Figure 4.2: Research income of HEIs in Wales, 2012/13-2015/16



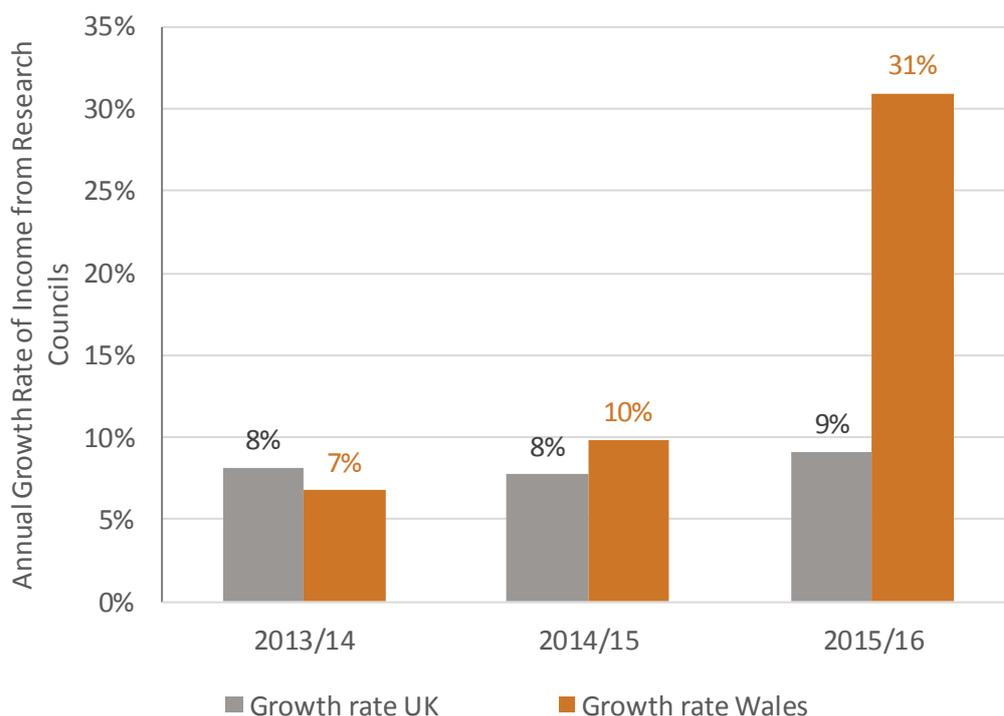
Source: HESA Finances 2012/13-2015/16

4.22 As shown earlier, the largest share of research income secured in Wales is accounted for by research councils (35 per cent). This is similar to the average for all UK HEIs of 33 per cent. Figure 4.3 shows the growth rates in research income among Wales' and UK HEIs. Wales' institutions are capturing an increasingly larger share of income from research councils, and in 2015/16 this income increased by almost a third compared to the previous year.

4.23 This represents a substantive increase, especially when compared to the national increase of 9 per cent between 2014/15 and 2015/16. Breakdown by type of research council provides insight into what drove the change:

- The largest increase in absolute terms was in income secured from the Engineering and Physical Sciences Research Council (EPSRC), representing an additional £6.75m compared to the year before (a 45 per cent increase).
- This is closely followed by an increase of £6.70m secured from the Medical Research Council (MRC) (an increase of 65 per cent).

Figure 4.3: Change in Income from Research Councils, 2012/13-2015/16



HESA Finances 2012/13-2015/16

4.24 The second largest source of research income in Wales in 2015/16 is UK government sources⁶⁹ (29 per cent). Wales has maintained a 6 per cent share of the UK equivalent for the last four years, despite a £2.5m fall in Wales in 2015/16 compared to the previous year.

4.25 The Wales share of income from EU government bodies has reduced from 6 per cent of the UK level in 2012/13 to 3 per cent in 2015/16. EU funding is the third largest source of research funding for Wales (accounting for 14 per cent of the total), so although it is reducing its national share of this source, this represents a risk for Wales' HEIs.

STEMM Research Income and Trends

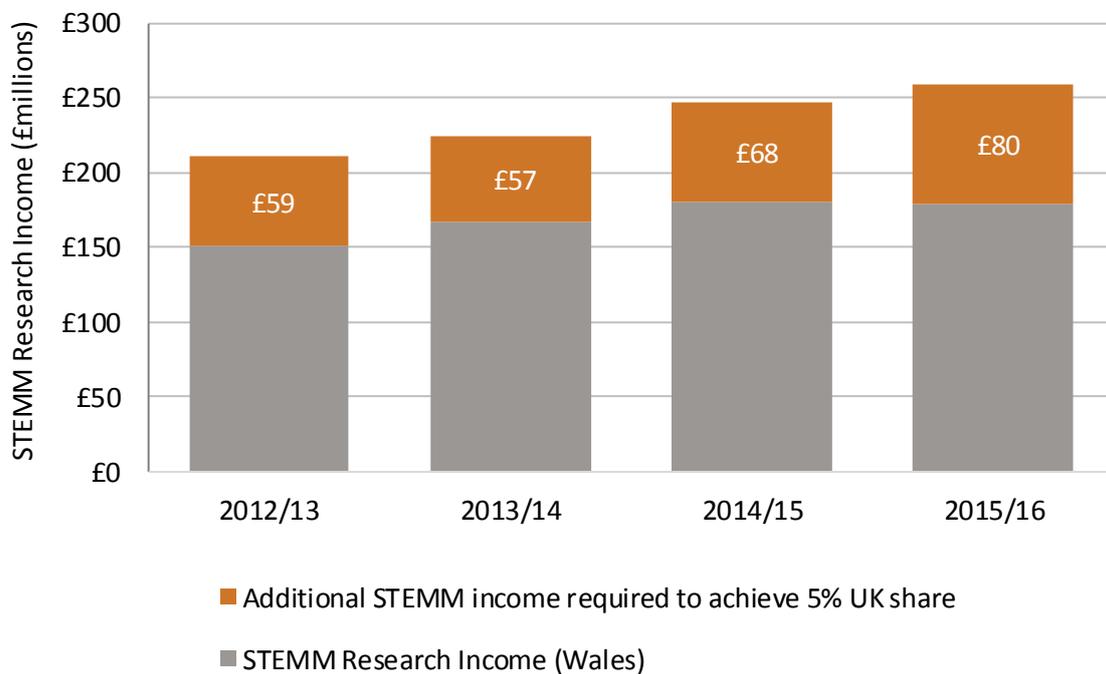
4.26 STEMM-related research income is the main focus of Sêr Cymru II. This analysis shows that in 2015/16, 88 per cent of research income in Wales was STEMM-related, which is the same proportion as the UK average.

⁶⁹ UK Government Sources includes significant amounts of non-competitive EU Structural funds. These capacity building funds are currently listed under UK Government/ Local Authorities category, and not EU or EU Commission funds for the HESA data submission, primarily because such pre-allocated funding is not regarded as competitive and is administered on the basis of below average performance of GDP.

4.27 Wales' STEM research income in 2015/16 accounted for 3.5 per cent of the UK equivalent, amounting to £179m in absolute terms. This implies that an additional £80m of STEM-specific research income would be required per year for Wales to meet its target 5 per cent share, assuming the UK total remained unchanged.

Since 2012/13, Wales has maintained a relatively stable share in STEM income. However, in absolute terms the gap has been widening, changing from £59m in 2012/13 to £80m in 2015/16.

Figure 4.4: STEM research income in Wales, 2012/13-2015/16

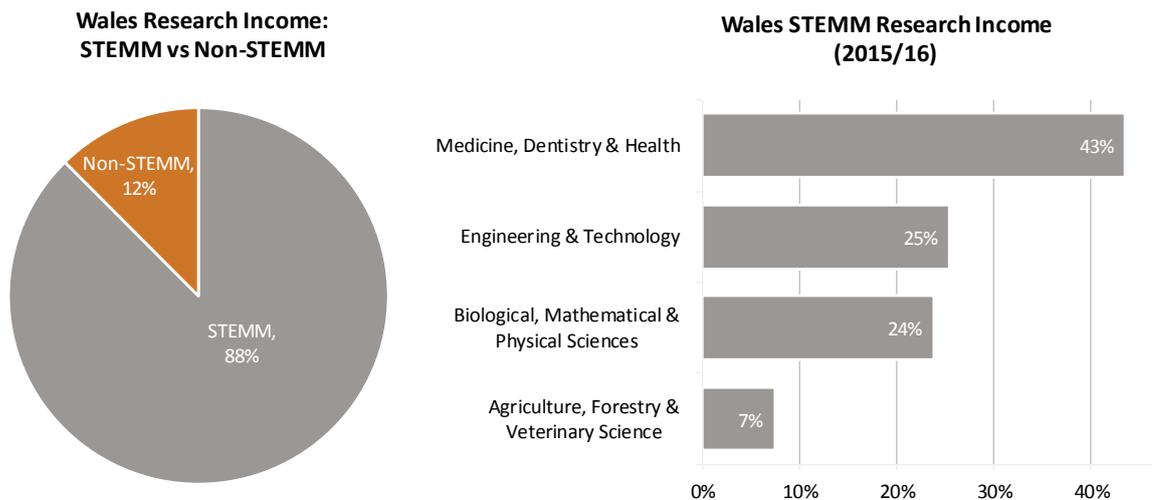


Source: HESA Finances 2015/16

Research income by subject

4.28 Figure 4.5 shows how, out of the four broad STEM subject groups, the Medicine, Dentistry and Health group makes up the largest share of research income in Wales, accounting for 43 per cent.

Figure 4.5: STEMM research income in Wales, 2012/13-2015/16

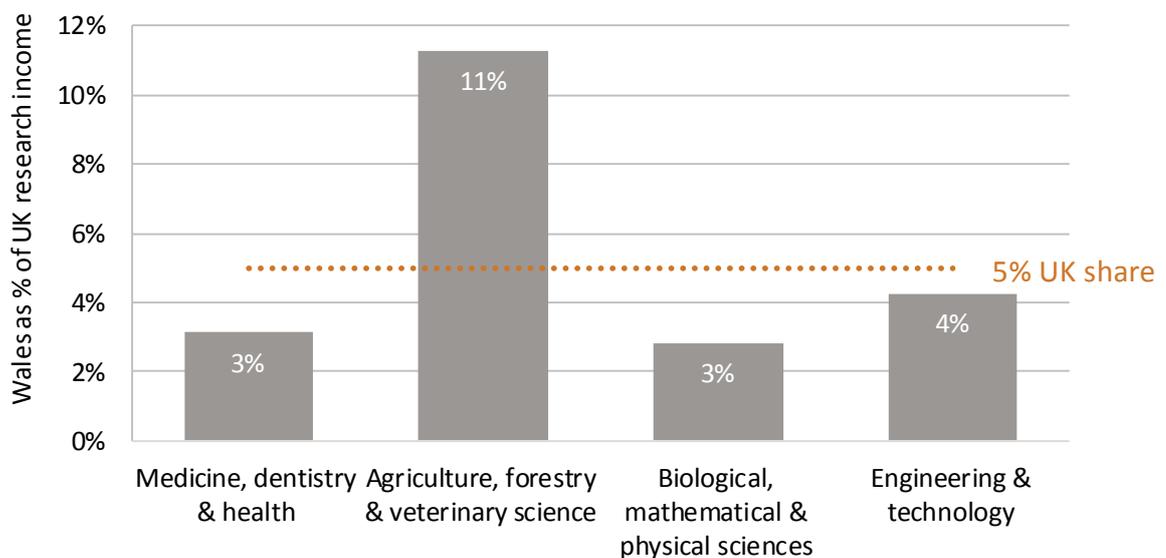


Source: HESA Finances 2015/16

4.29 Figure 4.6 illustrates how Wales’ HEIs have a concentration of agriculture-related research activities. Despite accounting for only 7 per cent of research income in Wales, this is an area where Wales’ HEIs exceed the 5 per cent UK share target – i.e. Wales’ HEIs account for 11 per cent of Agriculture, Forestry and Veterinary Science research income in the UK.

4.30 The remaining three STEMM subject areas are below the 5 per cent target for UK share, consistently accounting for 3 per cent of the UK share in Medicine and Biological Sciences, and 4 per cent in Engineering and Technology between 2012/13 and 2015/16.

Figure 4.6: Wales Research Income by subject as a percentage of UK

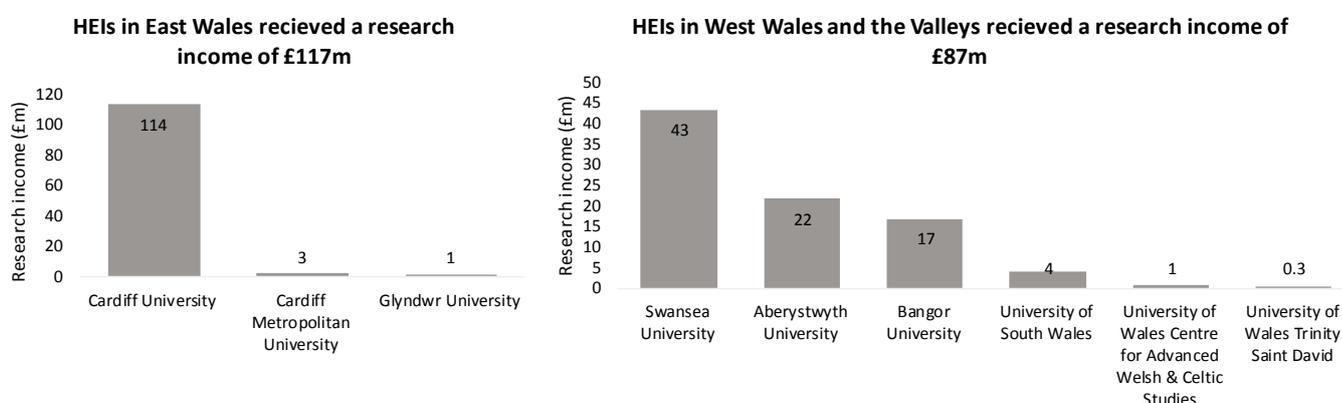


Source: HESA Finances 2015/16

Composition and Trends by institution

- 4.31 Research income in Wales is concentrated in a handful of HEIs. In East Wales, Cardiff University accounts for 97 per cent of research income in the region, and the University accounts for 56 per cent of research income across the whole of Wales.
- 4.32 In West Wales and the Valleys, research income is more evenly distributed between HEIs, with Swansea, Aberystwyth and Bangor Universities accounting for 94 per cent of research income between them.

Figure 4.7: Research income by institution, East Wales and West Wales and the Valleys, 2015/16



Source: HESA Finances 2015/16

- 4.33 Trends over the last four years show that East Wales as a whole increased its research income by 27 per cent between 2012/13 and 2015/16, primarily driven by Cardiff University. West Wales and the Valleys only saw an increase of 6 per cent in comparison.

Table 4.2: Research income by HEI, 2012/13 and 2015/16

Numbers and percentages	Research income 2015/16 (£m)	Change since 2012/13	
		Absolute (£m)	Per cent
Cardiff University	114	25.0	29%
Cardiff Metropolitan University	3	0.3	12%
Wrexham Glyndŵr University	1	-1.0	-49%
Total East Wales	117	25.0	27%
Swansea University	43	6.0	17%
Aberystwyth University	22	3.0	18%
Bangor University	17	-3.0	-17%
University of South Wales	4	-1.0	-26%
University of Wales Centre for Advanced Welsh & Celtic Studies	1	-	-
University of Wales Trinity Saint David	0	0.0	-2%
Total West Wales and the Valleys	87	5.0	6%

Source: HESA Finances 2012/13 - 2015/16

4.34 The HEIs individually have different mixtures of STEMM and non-STEMM activities, reflected in research income by subject. For instance:

- Cardiff University is the main representative of STEMM in East Wales. In terms of subject areas, it accounts for much of the research income in medicine and related activities (79 per cent of Wales' total) and biological, mathematical and physical sciences.
- In West Wales and the Valleys research income is more spread between HEIs. There are some clear subject specialisms at Swansea (engineering and technology, as well as medicine, dentistry and health), Aberystwyth (agriculture-related areas and biological, mathematical and physical sciences), and Bangor (biological, mathematical and physical sciences).

Table 4.3: Research income by HEI and subject area, 2015/16 (£millions)

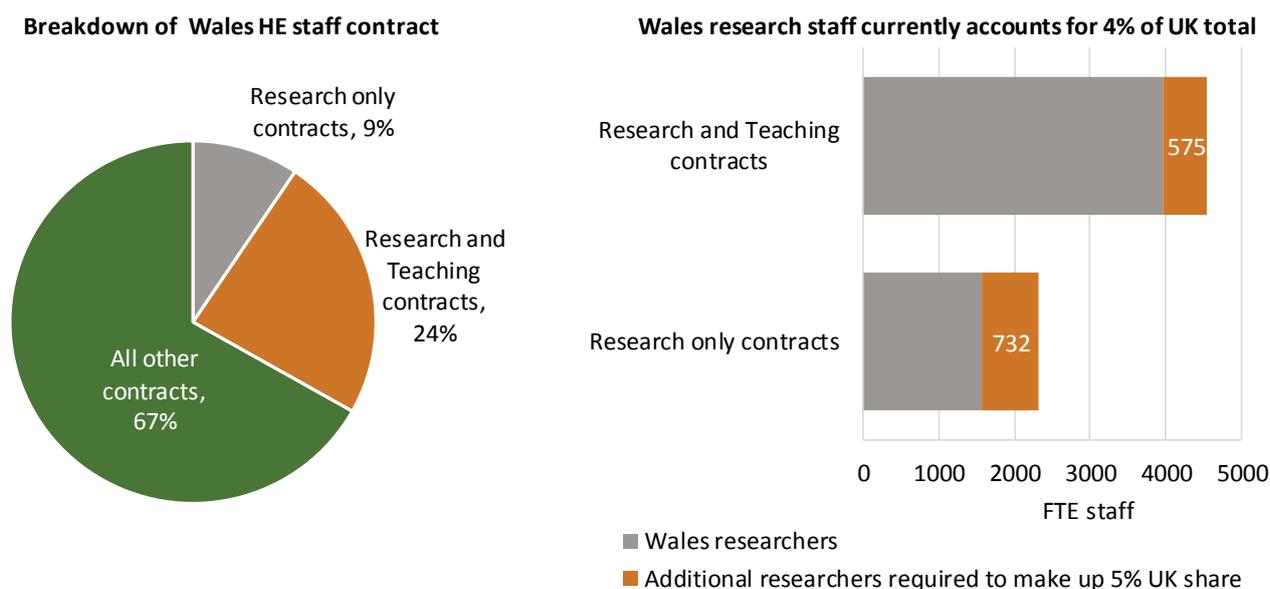
Numbers and percentages	Medicine, dentistry & health	Agriculture, forestry & veterinary science	Biological, mathematical & physical sciences	Engineering & technology	Total STEMM	STEMM as % of Wales total
Cardiff University	61.7	0.0	25.5	13.6	100.8	56%
Cardiff Metropolitan University	0.0	0.9	0.3	0.0	1.3	1%
Wrexham Glyndŵr University	0.1	0.0	0.0	0.8	0.9	1%
Total East Wales	61.9	0.9	25.8	14.5	103.1	58%
Swansea University	10.5	0.0	2.5	26.8	39.8	22%
Aberystwyth University	0.0	10.4	7.2	0.7	18.4	10%
Bangor University	4.6	1.9	6.8	0.7	14.0	8%
University of South Wales	0.9	0.0	0.3	2.7	4.0	2%
University of Wales Trinity Saint David	0.0	0.0	0.0	0.0	0.0	0%
Total West Wales and the Valleys	16.1	12.3	16.8	31.0	76.2	42%
Total Wales	77.9	13.3	42.6	45.5	179.2	100%

Source: HESA Finances 2015/16

Research Staff

- 4.35 In 2015/16 there were 1,575 staff on research-only contracts, and 3,965 staff on research and teaching contracts, across HEIs in Wales (see Figure 4.8). Together, this accounts for 4 per cent of the UK's research staff (135,640 FTEs). An additional 1,240 FTE researchers would be required (across all disciplines) for Wales to represent a 5 per cent UK share.

Figure 4.8: STEMM Research Staff in Wales, 2015/16

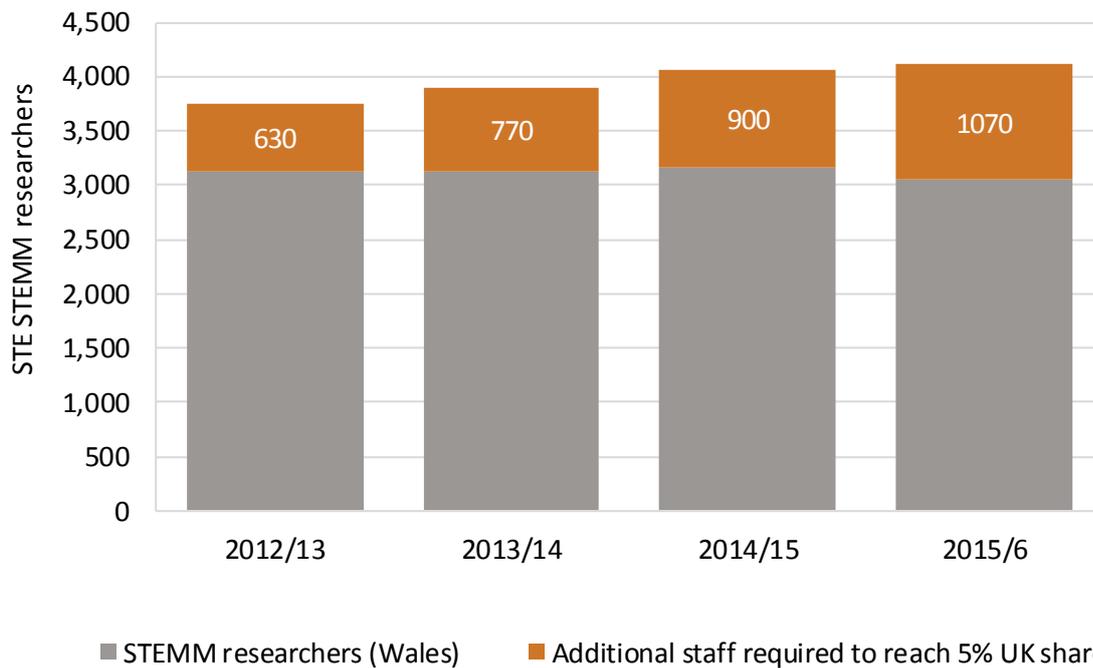


Source: HESA Staff 2015/16

- 4.36 Of the total research staff (research only, and research and teaching), there are 3,045 STEMM researchers in Wales – also 4 per cent of UK share. Figure 4.9 illustrates how the gap in STEMM disciplines has grown and, in 2015/16 would require 1,070 additional researchers to reach a share equivalent to 5 per cent of the UK figure (82,295).
- 4.37 This is a stark increase in the requirement since the Halligan and Bright report⁷⁰ estimated 630 FTE researchers would be required based on 2012/13 HESA data. The gap between Wales and the rest of the UK has widened: while across the UK the number of STEMM researchers grew by 10 per cent between 2012/13 and 2015/16, in Wales it fell by 3 per cent.

⁷⁰ Halligan, P. and Bright, L. (2015) *The Case for Growing STEMM Research Capacity in Wales*, The Learned Society, Cardiff

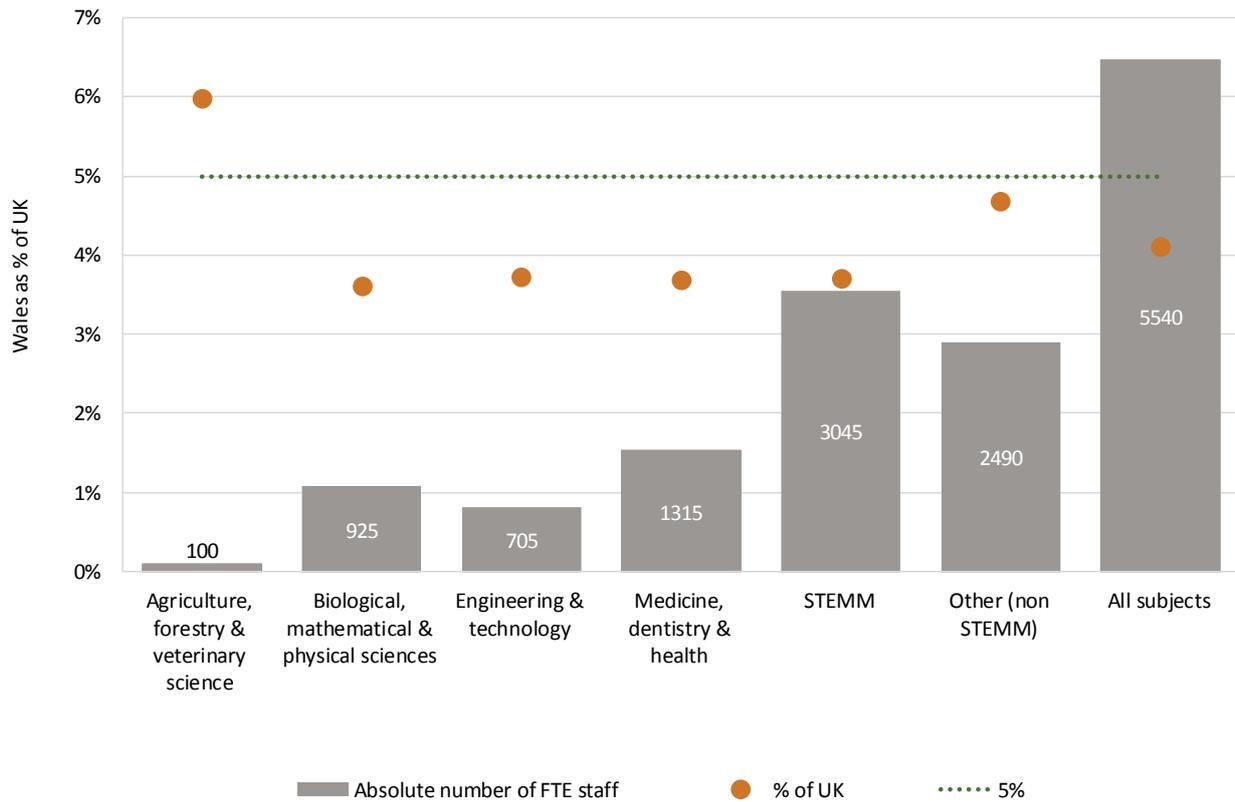
Figure 4.9: STEMM Research Staff in Wales, 2012/13 – 2015/16



Source: HESA Staff 2012/13-2015/16

- 4.38 In 2015/16, STEMM researchers accounted for 55 per cent of all researchers in Wales compared to 61 per cent across the UK. The largest subject area in staff terms in Wales is medicine, dentistry and health, representing just under a quarter of all staff (24 per cent).
- 4.39 There is one area where Wales makes up a comparatively larger share of UK researchers, which is agriculture, forestry and veterinary science (6 per cent) In absolute terms this represents around 100 FTE staff. Across all other areas, Wales’ share is below the 5 per cent benchmark (see Figure 4.10).

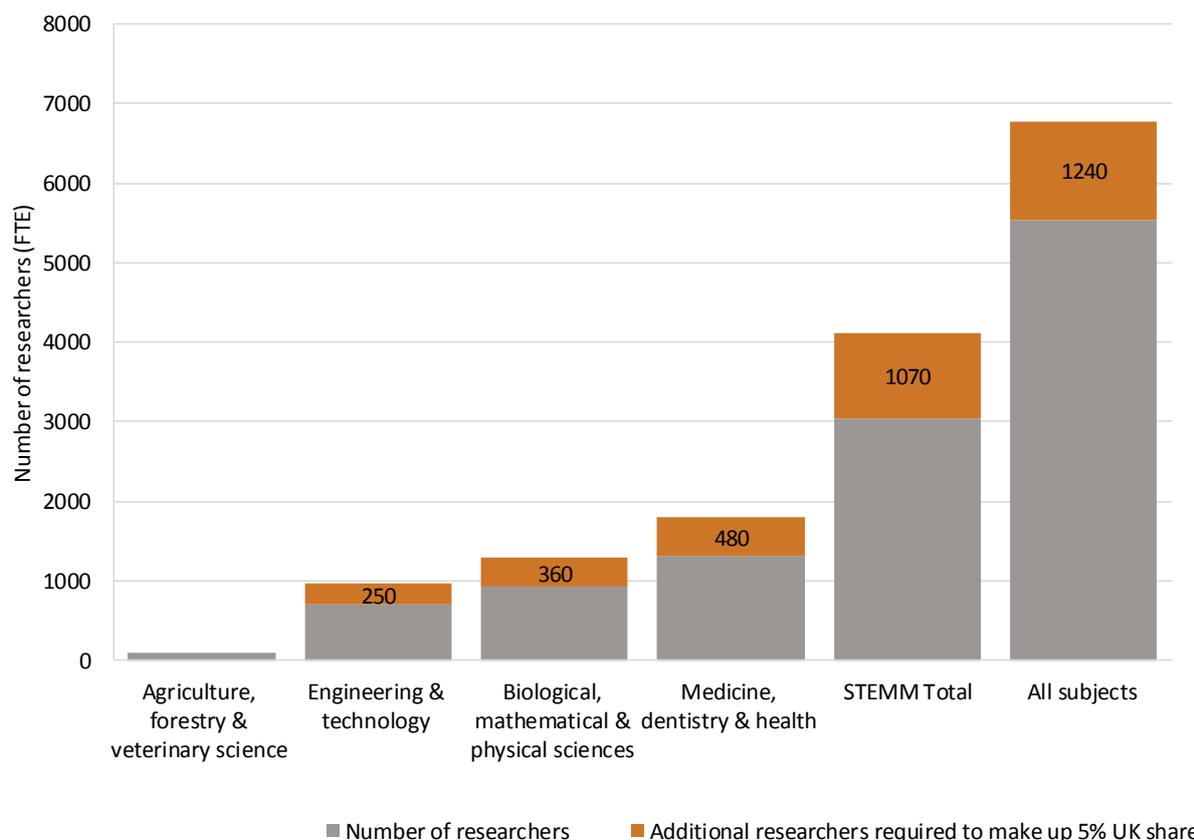
Figure 4.10: Research Staff by Subject Area, 2015/16



Source: HESA Staff 2015/16

4.40 The gap analysis shows differences between subject areas, which is presented in Figure 4.11. The largest gap in absolute terms is in medicine, dentistry and health, where around 480 more staff would be needed to make up the gap. This is followed by biological sciences (360) and engineering and technology (250).

Figure 4.11: Additional research staff by subject required to meet 5 per cent UK share, 2015/16



Source: HESA Staff 2015/16

Research output and quality

4.41 It is also useful to consider measures of research output, or the outcomes that result from the research inputs and activities. As outlined in the data overview, the sources of information on research outputs are restricted, but there are a number of publications which can be drawn on, which consider how Wales performs.

Publications and Citations

4.42 The reports by Elsevier (2016; 2013) prepared for HEFCW and BEIS contain useful information on publications and citations relevant to Sêr Cymru II. The 2016 report for HEFCW focuses on the performance of Wales' research base in particular between 2010 and 2014. The report for BEIS precedes this, examining the UK research base between 2008 and 2012.

4.43 In 2012, UK researchers published 139,700 articles, of which Wales accounted for 4.4 per cent. Wales' share has remained broadly consistent between 2008

and 2012. Citations show a very similar performance in 2012, with Wales accounting for 4.3 per cent of UK's share.

- 4.44 The report for HEFCW provides more up to date measures, and benchmarks Wales compared to the UK as well as internationally⁷¹. The findings from this report highlight a strong performance in Wales relative to the UK as well as international comparators:
- The report estimates that Wales ranked 5th out of 17 countries in 2015 based on publications per year per researcher, ahead of the UK (9th) and the EU average (15th).
 - Wales performs even better when considering citations per researcher, ranking 4th compared to an overall UK rank of 9.

Research impact

- 4.45 The REF 2014 assesses the quality of submitted research outputs across UK universities. The results show that more than three quarters of submissions by Wales' HEIs have been assessed as world leading or internationally excellent, which is in line with the UK average.
- 4.46 Moreover, results found that more than half of Wales' submissions were classed as world-leading in terms of impact on life beyond academia.
- 4.47 Wales' highest performing subject areas include Psychology and Neuroscience, Allied Health Professions, General Engineering, and Geography/Environmental Studies and Archaeology, followed by other non-STEMM disciplines.

Interactions between HE providers and businesses

- 4.48 As noted earlier, alongside measures of research capacity, there is also useful data on collaboration achieved by researchers in post. This provides a good indication of the extent to which researchers in Wales' HEIs are engaged in collaborative research and commercialisation activities with the private and public sectors, linking to one of the intended outcomes of Sêr Cymru II.

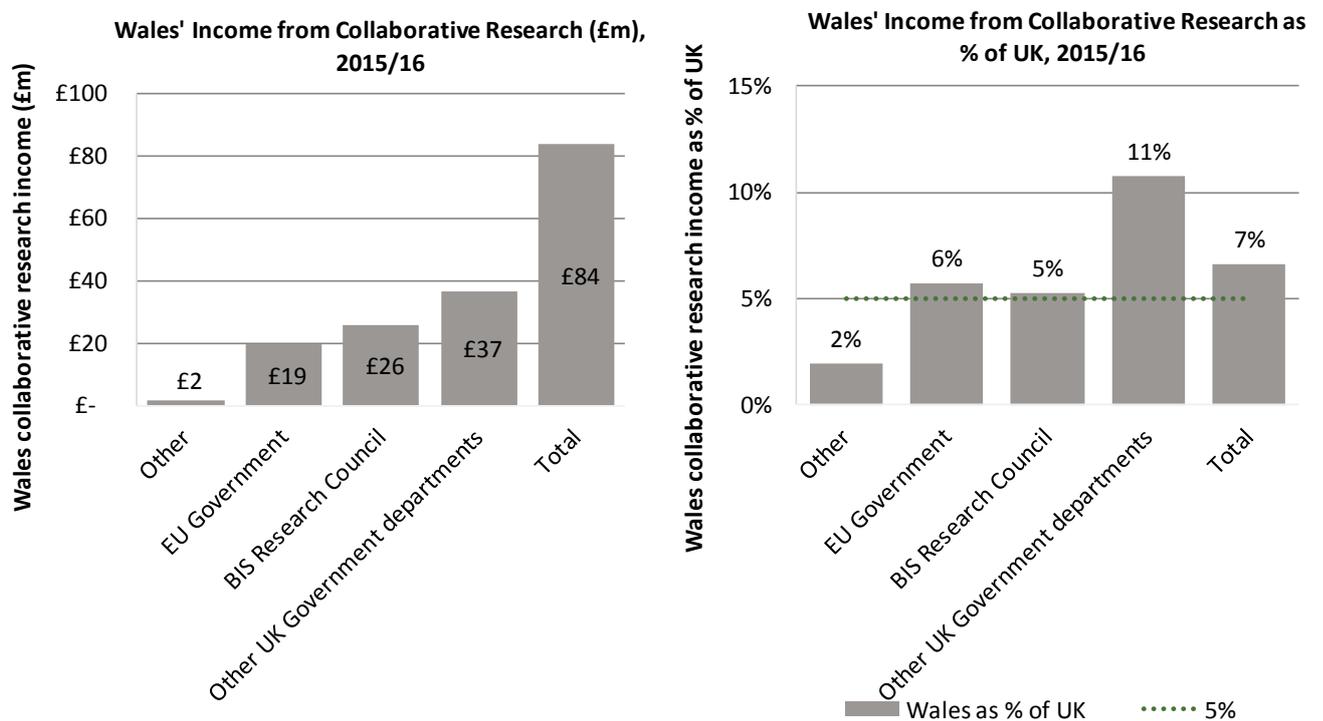
Collaborative Research

⁷¹ Comparators include: three other UK countries (Scotland, England and Northern Ireland) and the UK as a whole; European and international countries of similar size and population (Belgium, Denmark, Finland, Ireland, Norway and New Zealand); and other major research nations (USA) as well as international benchmarks (World, EU and OECD countries).

4.49 Data on collaborative research⁷² activities and income is provided by the Higher Education business and Community Interaction Survey (HE-BCIS), which at the time of writing is available up to 2014/15.

4.50 The latest data in Figure 4.12 shows that Wales performs well on the measure of income from collaborative research involving public and private funding. It accounts for almost 7 per cent of the UK total on average, and exceeds this share for some sources of income.

Figure 4.12: Income from collaborative research involving public and private funding, Wales 2014/15

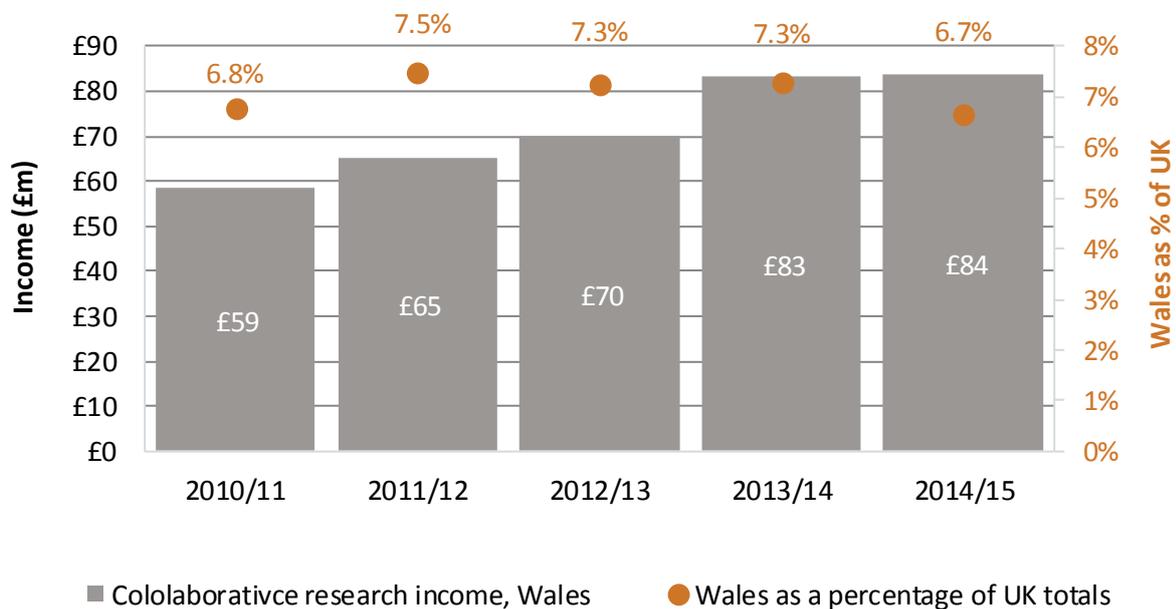


Source: HEBCIS 2014/15

4.51 This performance exceeding 5 per cent UK share has been consistent over the past five years. Although Wales has been increasing its collaborative research income in absolute terms, the 2014/15 proportion of the UK total is actually the lowest out of the five years (6.7 per cent).

⁷² Collaborative research includes research projects with public funding from at least one public body, and a material contribution from at least one external non-academic collaborator (Source: HESA Definitions).

Figure 4.13: Collaborative research income involving public and private funding, Wales



Source: HEBCIS 2014/15

- 4.52 Breakdown by Wales’ regions and institutions highlights the dominance of Cardiff University, which stands out as generating the largest amount of collaborative research income. As a result, East Wales accounts for almost 60 per cent of Wales’ share, increasing by a quarter since 2010/11.
- 4.53 In West Wales and the Valleys, Aberystwyth and Bangor Universities are leading in this area, with £8m and £7m respectively. Although the area accounts for a smaller share of Wales’ collaborative research income, it has increased by more than a third since 2010/11, driven by Aberystwyth University almost doubling its income.

Table 4.4: Collaborative research income by area and HEI in Wales

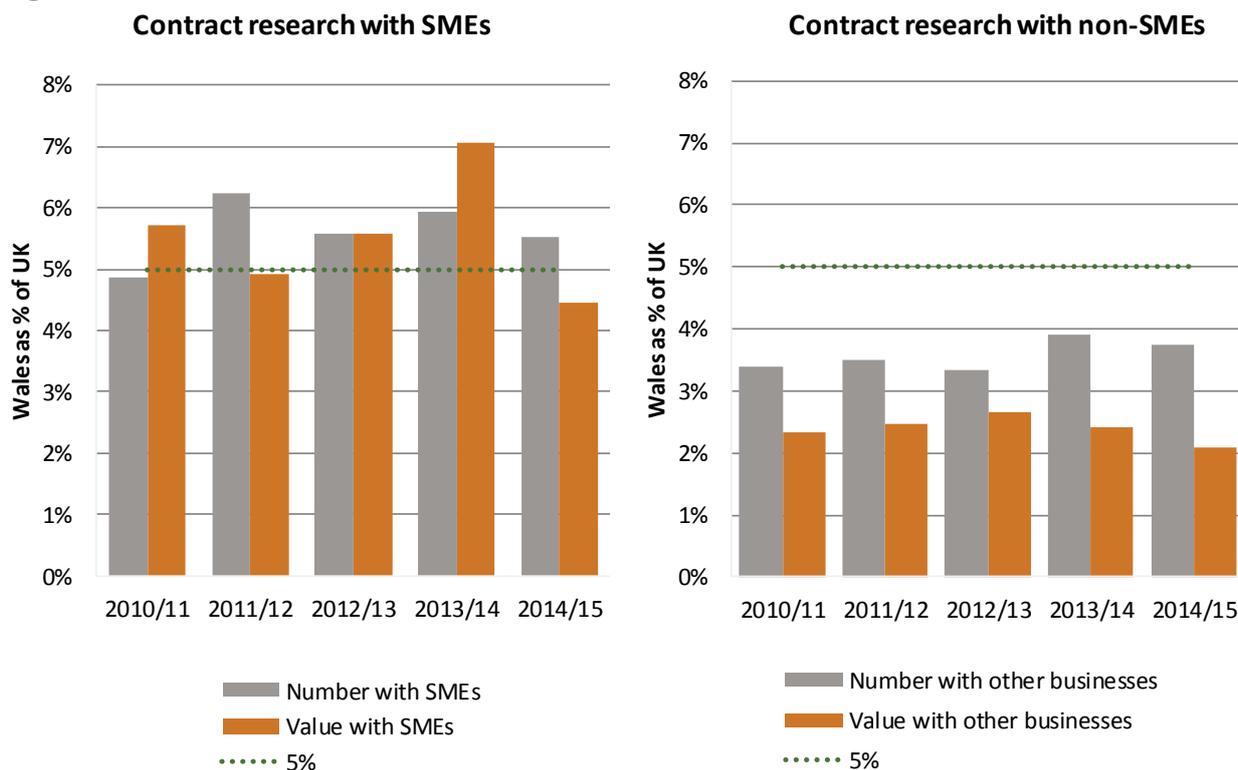
Numbers and percentages	Collaborative Research income 2014/15 (£millions)	Change since 2010/11	
		Absolute (£millions)	Per cent
Cardiff University	£18.9	£2.61	16%
Cardiff Metropolitan University	£3.3	£2.14	191%
Wrexham Glyndŵr University	£1.3	£0.00	0%
Total East Wales	£23.50	£4.75	25%
Aberystwyth University	£7.7	£3.62	88%
Bangor University	£6.9	£0.79	13%
University of South Wales	£1.4	-£0.06	-4%
University of Wales Trinity Saint David	£0.1	-£0.21	-68%
Total West Wales and the Valleys	£16.1	£4.14	34%

Source: HEB CIS 2010/11 – 2014/15

- 4.54 In 2014/15, HEIs in Wales had 546 contracts for research⁷³ with commercial organisations, which amounted to £11.3m in research income.
- 4.55 This constitutes 6 per cent of the total number of SME research contracts across the UK, however, the value of these contracts is only 4 per cent of the UK total. This suggests that contracts secured by institutions in Wales are, on average, of lower value than those across the UK as a whole. Analysis suggests that the average value of an SME research contract in Wales was £15,400 compared to £19,100 across the UK, i.e. almost 20 per cent below the national average.
- 4.56 Analysis over time suggests the recent performance on SME contracts represents a fall – up to 2014/15, Wales was around the 5 per cent mark or exceeding it in both, number of contracts and their value (see Figure 4.14).
- 4.57 With non-SMEs, however, Wales has consistently held around 3-4 per cent national share of contracts and 2 per cent of value.

⁷³ Contract research includes contract numbers and income identifiable by the HE provider as meeting the specific research needs of external partners, excluding any already returned in collaborative research involving public funding and excluding basic research council grants (Source: HESA Definitions).

Figure 4.14: Contract research with SMEs and non-SMEs, Wales



Source: HEBCIS 2010/11 – 2014/15

4.58 The number of consultancy contracts⁷⁴ with businesses at HEIs in Wales in 2014/15 constitute only 2 per cent of the UK share, equivalent to 1,064 contracts in Wales out of a UK total of 70,808 contracts. Of these in Wales, 669 were with SMEs (just 1 per cent of UK share of 61,670) and 395 with other businesses (4 per cent of UK share of 9,138). The value of consultancy contracts amounted to over £4.5m in 2014/15:

- The average value of SME contracts among HEIs in Wales was £3,700 – more than three times the UK average (£1,200). Despite this, Wales only captures around 3 per cent of the UK value.
- However, the average value with non-SME businesses was only £5,700 which is less than half the UK average of £12,000. Wales captures 2 per cent of the UK non-SME consultancy contracts.

⁷⁴ Consultancy includes contract numbers and income associated with advice and work crucially dependent on a high degree of intellectual input from the HE provider to the client (commercial or non-commercial) without the creation of new knowledge. Consultancy may be carried out either by academic staff or by members of staff who are not on academic contracts, such as senior university managers or administrative/support staff. (Source: HESA Definitions).

4.59 So overall, Wales' HEIs are underperforming in both volume and value of consultancy services provided to businesses, with no significant variation over time.

Table 4.5: Consultancy contracts with SMEs and non-SME businesses, 2014/15

	Number of contracts		Value of contracts	
	with SMEs	with non-SMEs	with SMEs (£m)	with non-SMEs (£m)
Cardiff University	254	93	£1.28	£0.36
Cardiff Metropolitan University	214	16	£0.52	£0.09
Wrexham Glyndŵr University	2	1	£0.02	£0.00
Total East Wales	470	110	£1.82	£0.45
Bangor University	17	8	£0.26	£0.13
Swansea University	41	230	£0.20	£0.98
University of South Wales	65	42	£0.19	£0.46
Aberystwyth University	3	3	£0.01	£0.02
University of Wales Trinity Saint David	73	2	£0.01	0
Total West Wales and the Valleys	199	285	£0.67	£1.60
Total Wales	669	395	£2.49	£2.04

Source: HEBCIS 2014/15

4.60 Analysis on an institutional level shows East Wales is leading in SME consultancy contracts, with 470 contracts with a combined value of £1.82m. Cardiff University and Cardiff Metropolitan both have a sizeable share of these contracts, however, Cardiff University has a much higher value associated with these.

4.61 West Wales and the Valleys, on the other hand, leads on consultancy with non-SME businesses. This is driven by Swansea University having 230 contracts in place with a combined value of just under £1m.

Stakeholder Views – Collaboration with Commercial and Third Sector Organisations

4.62 Stakeholders from the private sector felt that a key way in which Sêr Cymru II could do more to engage with businesses and industry was to ensure that research is, as far as possible 'rooted in industry challenges' and 'targeted at industry needs'.

4.63 At a practical level, this meant Sêr Cymru II fellows investing more time in exploring and identifying key areas of alignment between their academic research and its application (not least in terms of commercialisable outcomes) to

businesses. In this context, one private sector stakeholder (that had participated extensively in Sêr Cymru I) felt that a 'better balance is needed'.

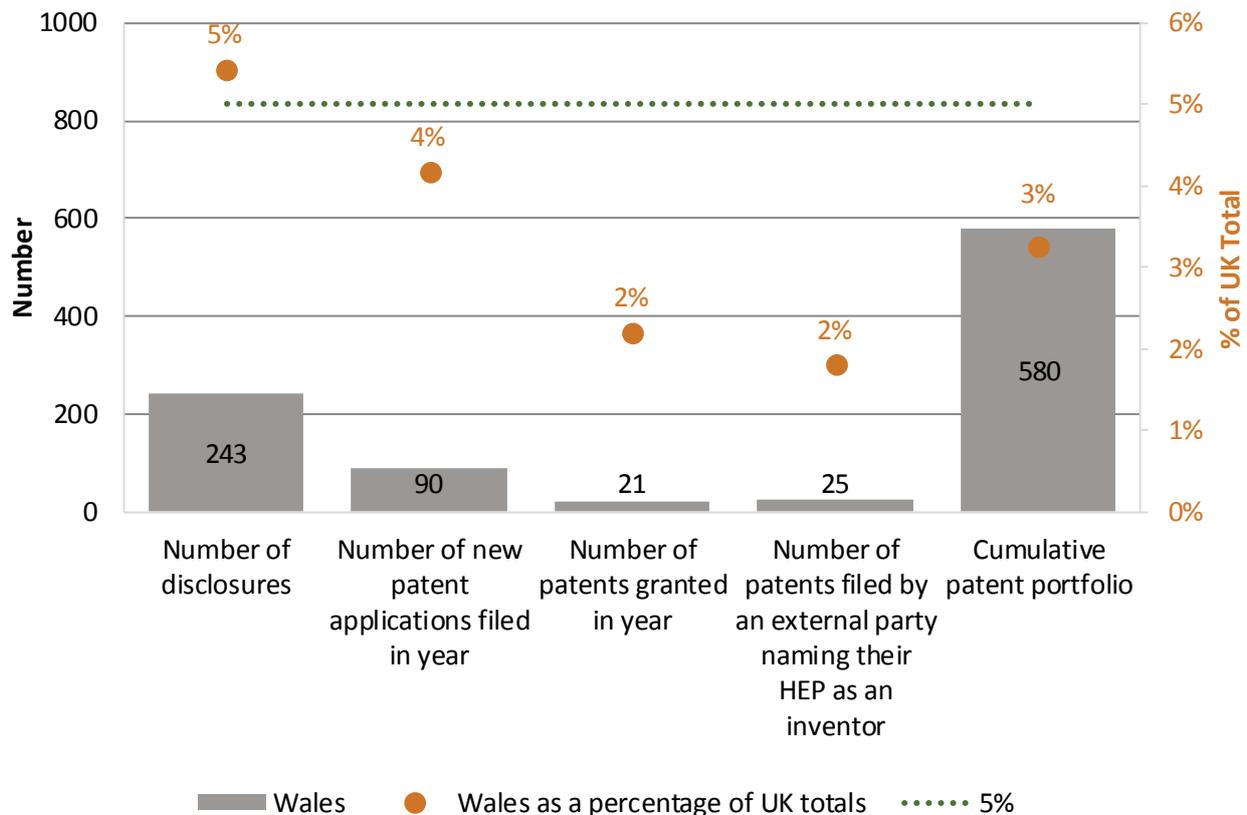
- 4.64 A further practical suggestion related to Sêr Cymru II fellows and PhD Students working alongside them on their research projects, spending time in businesses (potentially through formalised arrangements or placements) to strengthen and deepen their understanding of how research can be applied in commercial settings.

Intellectual Property

- 4.65 HE-BCIS collects a range of intellectual property (IP) indicators to measure 'the value added by the HEI when interacting with a range of external partners'.⁷⁵ These indicators provide a helpful indication of how research activities at HEIs translate into products and ideas en route to commercialisation.
- 4.66 Below is an overview of performance of HEIs in Wales in disclosures and patents.
- In 2014/15 Wales' HEIs had a total of 243 disclosures (i.e. public sharing of an invention), which is just over 5 per cent of the UK total. This is a decrease on previous years, as Wales was previously capturing almost 8 per cent in 2012/13 and 6 per cent in 2013/14.
 - Other measures of patents show a relatively weaker performance. The total number of live and active patents at HEIs in Wales (i.e. cumulative patent portfolio) includes 600 individual patents, however, this represents only 3 per cent of the UK total with no significant variation over time.

⁷⁵ HESA Definitions

Figure 4.15: Disclosures and Patents filed by or on behalf of the HEI in Wales, 2014/15



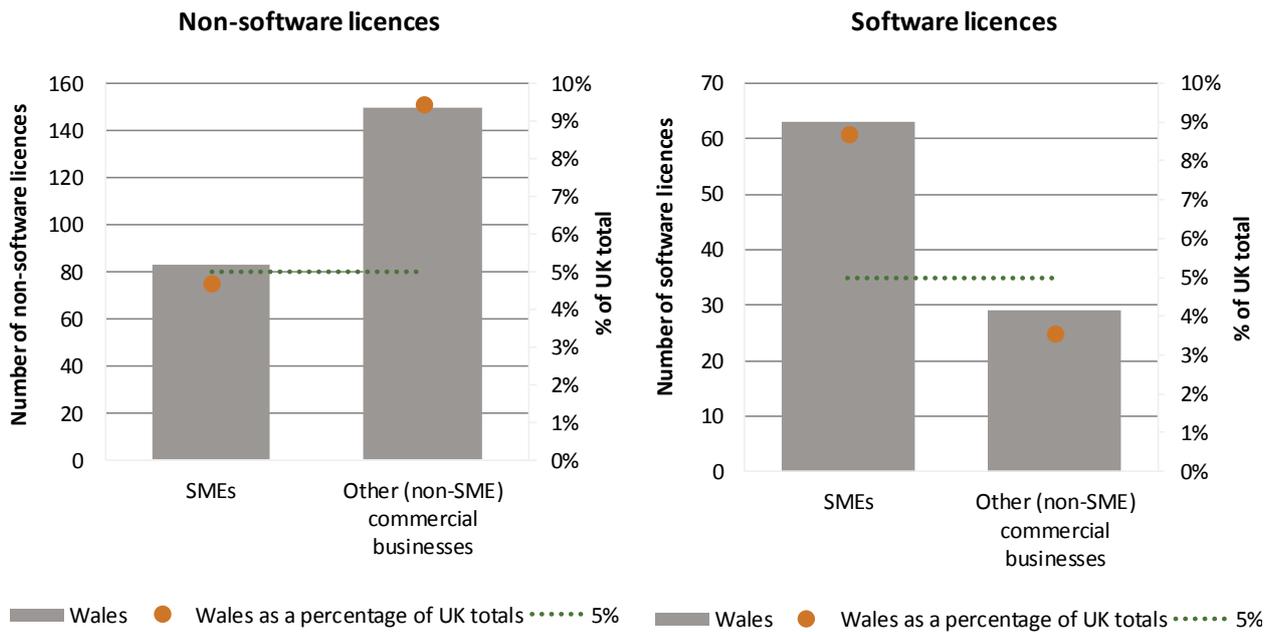
Source: HE-BCIS 2014/15

4.67 Wales’ HEIs perform well on the software and non-software licences⁷⁶ indicator:

- Non-software: 80 have been granted with SMEs (5 per cent of UK total). A further 150 were granted with commercial organisations, representing a 9 per cent UK share. Around half of licences at Wales’ HEIs are generating income (129 licences), which is only 3 per cent of the national share.
- Software: 63 licences had been granted with SMEs (9 per cent UK share) and 29 with other businesses (4 per cent). A notable point is that more than 24,000 licences with non-commercial organisations had been granted at Bangor University in 2014/15, which on its own makes up almost three quarters of the UK total.

⁷⁶ Licences include the number of all active licences granted from licence agreements, assignments, exercised option agreements, licences to spin-outs and income-generating Material Transfer Agreements (MTAs). Software licences govern the use or redistribution of software.

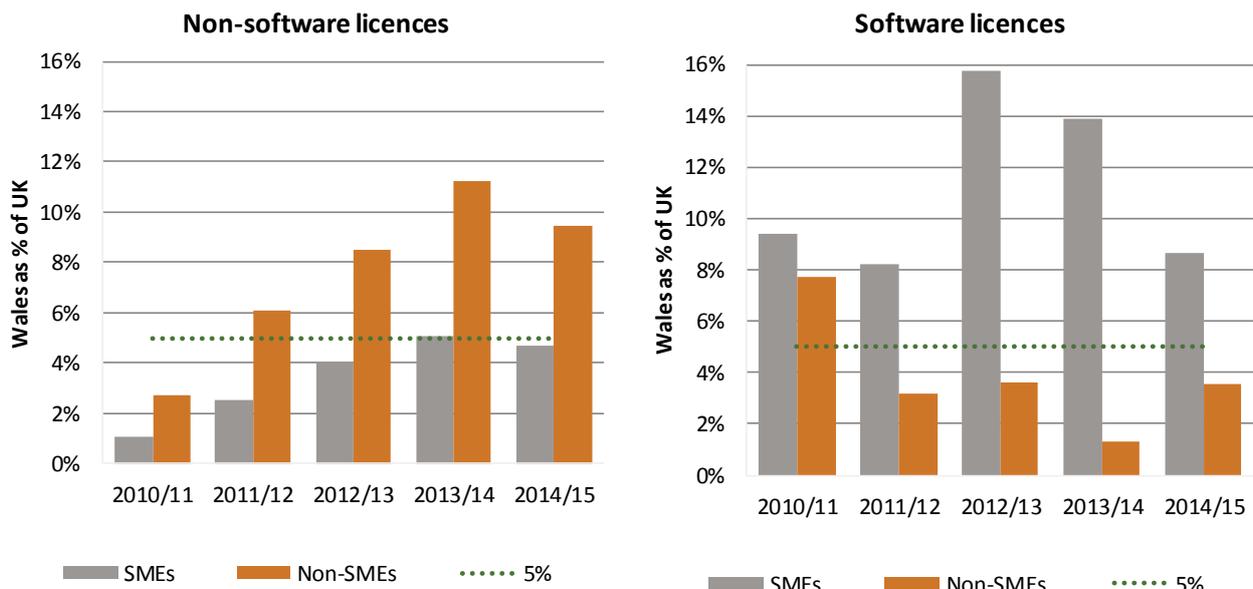
Figure 4.16: Non-software and software licences granted at Wales' HEs, 2014/15



Source: HE-BCIs 2014/15

4.68 Historic performance (Figure 4.17) highlights Wales' strengths in software and non-software licences with non-SME businesses and with SMEs. The 2014/15 academic year represents a decrease in the national share Wales was able to capture in both types of licences, however.

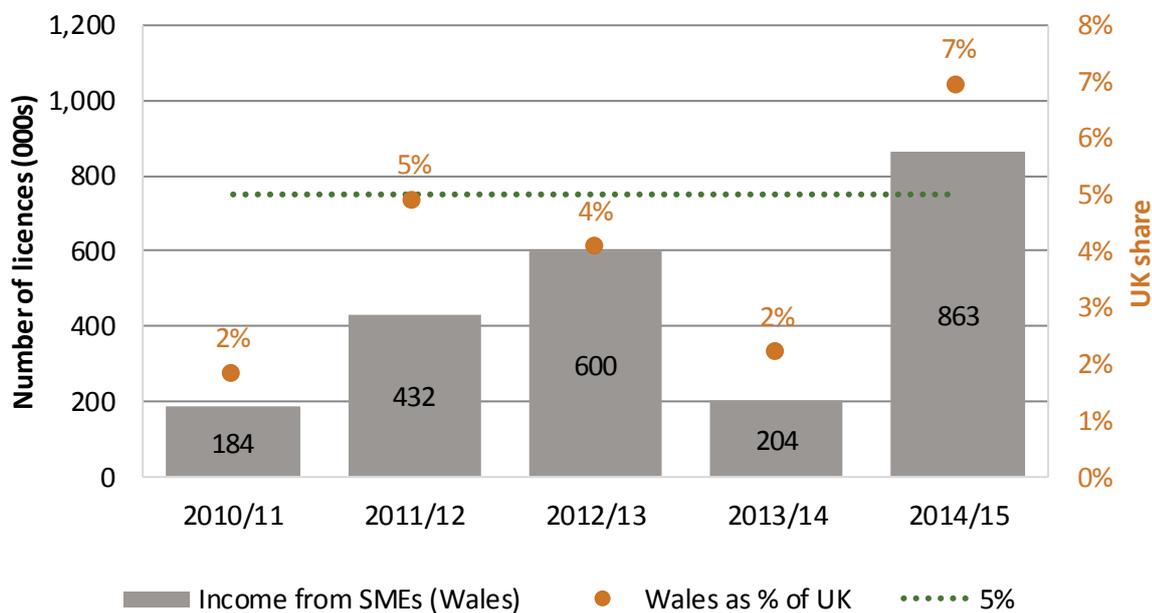
Figure 4.17: Non-software and software licences granted at Wales' HEIs, 2010/11 - 2014/15



Source: HE-BCIs 2010/11-2014/15

- 4.69 Intellectual property generated an income of £1.6m for Wales' HEIs in 2014/15. IP income⁷⁷ can be further analysed by SMEs and commercial businesses. While this is only equivalent to 2 per cent of the UK total, the average hides some areas of strong performance. Income from licences with SMEs was over £860,000 in 2014/15 (7 per cent of UK).
- 4.70 Trends show a steady build-up in SME IP income, with the exception of a fall in 2013/14.

Figure 4.18: IP income with SMEs: software & non-software



Source: HE-BCIs 2010/11-2014/15

- 4.71 Income from licences with other commercial businesses amounted to just over £380,000 which is a relatively small share of the national equivalent, representing less than 1 per cent.
- 4.72 The majority of IP income has been generated by a handful of universities: much of this activity has been driven by Cardiff University (84 per cent of income generated), although Aberystwyth University and Swansea have also contributed to the total (7 per cent of income each).

⁷⁷ IP income includes income from upfront or milestone fees, royalties and patents cost reimbursement (Source: HESA Definitions).

4.73 The table below summarises the performance of Wales' HEIs and regions on intellectual property measures.

Table 4.6: Summary: IP licences and income, Wales 2014/15

	Number of licences		IP income (£000s)	
	Non-software	Software	Non-software	Software
Cardiff University	196	50	1,050	18
Cardiff Metropolitan University	0	0	0	0
Wrexham Glyndŵr University	0	0	0	0
Total East Wales	196	50	1,050	18
Bangor University	6	29	5	9
Swansea University	18	1	28	31
University of South Wales	7	3	0	6
Aberystwyth University	6	9	92	5
University of Wales Trinity Saint David	0	0	0	0
Total West Wales and the Valleys	37	42	125	51
Total Wales	233	92	1,175	69

Source: HE-BCIs 2014/15

Spin-off and start-up activity

4.74 Spin-offs are 'companies set up to exploit IP that has originated from within the HEIs'⁷⁸. The activities are the advanced stages of a research journey, as the initial research projects get closer to commercial business activities and hence closer to contributing to economic objectives.

4.75 The table below summarises the performance of Wales HEIs. Shaded cells highlight the indicators where Wales exceeds 5 per cent UK share. Wales shows a strong performance in all indicators.

Table 4.7: Start-up and spin-off activities at Wales' HEIs, 2014/15

Numbers and percentages	Established (2014/15)		Still active which have survived at least 3 years		Active firms	
	Number	% of UK	Number	% of UK	Number	% of UK
Spin-offs with some HEP ownership	9	7%	63	8%	105	9%
Formal spin-offs, not HEP owned	0	0%	30	17%	34	17%
Staff start-ups	3	4%	50	15%	63	13%
Graduate start-ups	311	7%	551	12%	1,233	11%

Source: HE-BCIs 2014/15; Darker cells highlight where Wales exceeds 5 per cent UK share

⁷⁸ Source: HESA Definitions

4.76 Analysis by geographical area and institutions highlights the following observations:

- West Wales and the Valleys led on spin-offs with some HEI ownership, where Swansea University accounted for much of this activity. Similarly with staff start-ups, Swansea University had 38 active firms, accounting for half of active start-ups in Wales. However, the activity in 2014/15 was modest.
- The area also outperformed East Wales on formal spin-off activities it generated to date, although the latest year shows no contributions.
- HEIs in West Wales and the Valleys generated 193 start-ups in 2014/15, around half of which were associated with University of Wales Trinity Saint David.
- In East Wales, Cardiff University accounted for much of spin-off and start-up activity. However, Cardiff Metropolitan generated more graduate start-ups in 2014/15 and equalled the share of active firms.

Table 4.8: Start-up and spin-off activities at Wales' HEIs, 2014/15

	Spin-offs with some HEP ownership		Formal spin-offs, not HEP owned		Staff start-ups		Graduate start-ups	
	Number established (2014/15)	Number of active firms	Number established (2014/15)	Number of active firms	Number established (2014/15)	Number of active firms	Number established (2014/15)	Number of active firms
Cardiff University	1	30	0	6	0	4	34	204
Cardiff Metropolitan University	1	2	0	0	1	2	69	205
Wrexham Glyndŵr University	0	0	0	5	0	0	15	0
Total East Wales	2	32	0	11	1	6	118	409
Bangor University	1	11	0	1	0	8	9	53
Swansea University	5	51	0	8	1	38	16	88
University of South Wales	1	7	0	3	0	4	37	207
Aberystwyth University	0	3	0	9	0	5	36	56
University of Wales Trinity Saint David	0	1	0	2	1	2	95	420
Total West Wales and the Valleys	7	73	0	23	2	57	193	824
Total Wales	9	105	0	34	3	63	311	1233

Source: HEBCIS 2014/15

Synopsis

4.77 Our assessment is summarised in Table 4.9. The table sets out the performance of the Wales' research base against research capacity indicators quantifying the additional requirement to reach the 5 per cent target national share (where appropriate). The table links the data to earlier analysis by Halligan and Bright for comparison.

Table 4.9: Baseline position – Research in Wales

Indicator	Baseline position	% Share of UK	Additional annual requirement to achieve 5 % UK share
Research income (2015/16)			
Total research income in Wales	£204.6m	3.5%	£89.9m
Research income per researcher	£36,900	-	£6,500*
STEMM research income in Wales	£179m	3.5%	£80m
STEMM research income – East Wales	£103m	-	-
STEMM research income – West Wales and the Valleys	£76m	-	-
Research staff (2015/16)			
Research staff, Wales	5,540	4%	1,240
STEMM research staff, Wales	3,045	4%	1,070
Research income and staff by STEMM subject (2015/16)			
Medicine, dentistry and health – research income	£77.9m	3%	-
Medicine, dentistry and health – research staff	1315	4%	480
Agriculture, forestry & veterinary science– research income	£13.3m	11%	-
Agriculture, forestry & veterinary science– research staff	100	6%	0
Biological, mathematical & physical sciences– research income	£42.6m	3%	-
Biological, mathematical & physical sciences– research staff	925	4%	360
Engineering & technology– research income	£45.5m	4%	-

Engineering & technology– research staff	705	4%	250
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Interactions between HE providers and businesses (2014/15)

Collaborative research income	£16.1m	6.7%	-
Intellectual property income	£1.6m	2%	-
Spin-offs with some HEP ownership	9	7%	-
Formal spin-offs, not HEP owned	0	0%	-
Staff start-ups	3	4%	-
Graduate start-ups	311	7%	-

Research output and quality

Published articles (Wales 2012)	-	4.4%	-
Citations (Wales 2012)	-	4.3%	-

Source: Research staff and income - HESA 2015/16; Interactions between HE providers and businesses – HEBCIS 2014/15; Research output and quality - Elsevier (2012 data)*Additional income per researcher required denotes the value needed to achieve parity with the UK.

5. Sêr Cymru II: Design and Rationale

5.1 This chapter considers the design of and rationale for the Sêr Cymru II operations. It draws on a desk based review of the Sêr Cymru II Business Plans, monitoring information, monitoring and reporting templates and the views of stakeholders, as expressed in interview.

5.2 The chapter begins with brief consideration of Sêr Cymru I and the COFUND element of the wider Sêr Cymru package in order to provide some broader background context.

Context: Sêr Cymru I

5.3 Through Sêr Cymru I, three National Research Networks (NRNs) were created. The three NRNs are:

- The Life Sciences and Health NRN. This provides funding opportunities aimed at supporting collaborations, the development of research ideas and building long term capacity. As of May 2016, the NRN had funded 56 PhD Studentships, 47 and Post-Doctoral Research Projects.
- The Advanced Engineering and Materials NRN with Cardiff, Swansea and Bangor universities collaborating on a common research agenda.
- The Low Carbon, Energy and Environment NRN awarded to Bangor University on behalf of the Aberystwyth Bangor Strategic Partnership.

5.4 Sêr Cymru I also funded seven research clusters which all form part of the Low Carbon, Energy and Environment Network in the areas of:

- Sustainable aquaculture
- Marine renewable energy
- Geological carbon storage and geothermal energy
- Plants and architecture
- Resilience of saltmarshes and sustainable coastal planning
- Multifunctional Future landscapes; Sustainable agriculture and resilience.

5.5 Each cluster involves the appointment of, on average, 2.4 Research Fellows supported by 1.8 Ph.D. students and has multiple University partners.

5.6 Four senior research chairs were appointed via Sêr Cymru I. These are:

- Professor Yves Barde, Cardiff University. Professor Barde holds a Sêr Cymru funded Chair in Neurobiology. He is pursuing research to explore brain-derived neurotrophic factor (BDNF) and its possible link to depression. Professor Barde's work also involved research to enhance understanding the modes of action of the drug Fingolimod in the context of multiple sclerosis (MS). In addition, Professor Barde is undertaking collaborative activity with the Life Sciences and Health NRN.
- Professor James Durrant, Swansea University. Professor Durrant is undertaking research into the invention and development of a new flexible electrode technology for solar cells. This has been done in collaboration with Oxford University and further collaborative work is on-going with Bristol.
- Professor Andrew Barron, Swansea University. Professor Barron is conducting research into the application of nanotechnology to fundamental problems in energy research.
- Professor Diana Huffaker, Cardiff University. Professor Huffaker, previously at the University of California, Los Angeles (UCLA) holds a Sêr Cymru funded Chair in Advanced Engineering and biomaterials. Professor Huffaker's area of expertise is compound semiconductors and she is a key part of the Compound Semiconductor Catapult's activities in Cardiff.

5.7 These Sêr Cymru Chairs have established research teams within their host institutions and are expected to be involved in 'actively identifying potential candidates to encourage them to apply' to Sêr Cymru II.

5.8 In interview, stakeholders were asked whether any key learning points from Sêr Cymru I had been incorporated into Sêr Cymru II. The majority of the stakeholders interviewed could not point to any evidence of this having occurred and mentioned that there had been a number of key personnel changes at the Welsh Government between the two programmes, as well as a change in the Chief Scientific Advisor postholder who oversaw implementation. Professor John Harries held this post when Sêr Cymru I was developed and implemented whilst Professor Julie Williams was appointed to the role in 2013. Some felt that these personnel changes had not been a major issue since the focus of Sêr Cymru II was quite different. However, others felt that opportunities may have been missed to transfer knowledge and learning, particularly relating to implementation issues which are dealt with later on

in this chapter (sections 5.42 -5.69). Some respondents said that Sêr Cymru I had not been subject to formal review or evaluation.

Context: The Marie Skłodowska-Curie Actions COFUND (MSCA) Fellowship Scheme

- 5.9 In May 2015, the European Commission awarded the Welsh Government a Marie Skłodowska-Curie COFUND grant of £17m to operate a fellowship scheme. The grant agreement was formally signed in August 2015. The grant commenced in September 2015 and closes at the end of August 2020. This award provides support for up to 90 fellows in a pan Wales operation that runs alongside the ERDF operations.
- 5.10 Applications to the COFUND operation need to demonstrate scientific excellence. They need to complement activity already taking place in Wales and contribute to Science for Wales and the Smart Specialisation strategy where appropriate. Excellence is defined by:
- The research potential of the applicant.
 - The expertise of the supervisor (for fellows).
 - The appropriateness of the research environment.
 - The scientific case for the project proposed.
- 5.11 COFUND applicants are expected to be 3-5 years post-PhD. They can be of any nationality but must not have been resident in the UK for more than 12 months in the last three years.
- 5.12 Applications are scored on the basis of a 50 per cent weighting for excellence, 30 per cent for impact and 20 per cent for implementation⁷⁹.
- 5.13 At the time of writing, 34 COFUND fellows had already or were about to take up their posts.

Sêr Cymru II: The ERDF Operations

- 5.14 The Welsh Government submitted two Business Plans to the Welsh European Funding Office (WEFO) to apply for European Regional Development Fund (ERDF) funding for the Sêr Cymru II operation. The Business plans related to the West Wales and the Valleys (WWV) ERDF Programme and the East Wales (EW) ERDF Programme.

⁷⁹ Welsh Government. Business Wales website, Expertise Wales pages. Available at: <https://businesswales.gov.wales/expertisewales> (Accessed June 2017).

5.15 The Business Plans were submitted for funding under Priority Axis 1: Research and Innovation and Specific Objective 1.1 which aims to increase the success of Wales' research institutions in attracting competitive and private research funding⁸⁰.

The ERDF Operational Programmes

5.16 Priority 1 of the West Wales and Valleys and East Wales ERDF Operational Programmes (2014-2020) focus on the 'development of research, technological development and innovation'. The Priority is intended to 'make a specific contribution to climate change objectives, supporting the transition to a low carbon economy'⁸¹.

5.17 Sitting beneath this, Specific Objective (SO)1.1 set the aim of increasing the success of Wales' research institutions in attracting competitive and private research funding⁸².

5.18 In the description of SO1.1, the Operational Programmes set out the ambitions to:

- Support institutions to develop the capacity to carry out internationally recognised collaborative research and to be bidding collaboratively for competitive research funding from the UK and the EU.
- Support the continued development of Wales' research base, which in turn will help encourage inward investment, business expenditure on research and the development of research-intensive innovative clusters.
- Build on already emerging clusters and existing infrastructure in Wales including major investments in grand challenge areas⁸³.

5.19 The Operational Programmes outlined a number of actions that ERDF funding would be used to support. Of specific reference to Sêr Cymru II, these actions included:

- Building research capacity and capability through 'applied research, collaboration and networks with industrial and international links, investment in technology and technology transfer, building partnerships and increasing interaction and influence with external bodies'.

⁸⁰ Welsh European Funding Office (2014) *ERDF West Wales and the Valleys Operational Programme*. Page 35.

⁸¹ Ibid. Page 33.

⁸² Ibid. Page 35.

⁸³ Ibid. Page 36.

- Capacity building to address barriers to accessing competitive research funding. For example to ‘develop more competitive bids, building networks, finding international partners and new ways of working’.
- The need to focus on developing or strengthening ‘world-class excellence’ through the Smart Specialisation strategy and link with the Sêr Cymru I and the National Research Networks (NRNs)⁸⁴.

ERDF: Funding Packages

5.20 The funding packages approved by WEFO for Sêr Cymru II are set out in Table 5.1.

Table 5.1: Funding Packages Approved for Sêr Cymru II

	WWV	East Wales
ERDF Approved	£14.7m	£8m
Total Project Cost	£20.6m	£18.5m

Source: WEFO Approved Projects List (Updated April 2017)

5.21 The Higher Education Funding Council for Wales (HEFCW) has invested £3.8m in Sêr Cymru II while Health and Care Research Wales have invested £0.4m. The Welsh Government Economy, Science and Natural Resources Group (ESNR) has committed £3.5m to the programme.

5.22 For each ERDF funded fellowship award, the participating university is expected to make a financial contribution to the overall cost. Table 5.2 outlines the financial contribution rates for universities in WWV and EW.

Table 5.2: Financial intervention rates for Sêr Cymru II

	Sêr Cymru II contribution ⁸⁵	University contributions
Sêr Cymru II fellows and returners	83 per cent (WWV) 66 per cent (East Wales)	17 per cent (WWV) 34 per cent (East Wales)
Rising stars	83 per cent (WWV) 66 per cent (East Wales)	17 per cent (WWV) 34 per cent (East Wales)

Source: ERDF Business Plans

⁸⁴ Ibid. Page 37.

⁸⁵ Consisting of Welsh Government, ERDF, HEFCW and HCRW funding.

Evidence of Need

- 5.23 The business plans submitted to WEFO set out the case that ‘science in Wales is high quality, efficient, productive and impactful and in many cases, world leading’. Wales has 0.14 per cent of the world’s researchers, yet produces 0.3 per cent of the world’s published articles. Citations of research articles produced in Wales make up 0.49 per cent of the global total and 0.7 per cent of the top 1 per cent most highly cited papers.
- 5.24 Measuring all journal publications with associated patent applications, the business plans outlined that ‘Wales achieves a disproportionately healthy 0.85 per cent’. The business plans presented this as ‘evidence of the efficiency of Welsh research, its impact and the world-leading nature of a significant proportion of outputs, making it an excellent research environment to invest in and to develop careers’. Moreover, the plans referred to the fact that Welsh scientists collaborate internationally more frequently than those in other UK countries and Wales has the highest percentage of collaborations outside of its borders of all UK nations, at 60 per cent of all research⁸⁶.
- 5.25 The business plans also set the context of research in terms of its economic development contribution. It outlined that ‘Welsh researchers make a major contribution to the economy’ citing that ‘Welsh universities turnover €4.7 billion (4 per cent of Wales’ Gross Added Value) per annum and host 39,000 quality jobs⁸⁷.
- 5.26 Despite these positive foundations, the business plans referred to research⁸⁸ that shows Wales has too few scientists, relative to its population share, with an estimated shortfall of 600 researchers in areas crucial to the development of the Welsh economy⁸⁹.
- 5.27 As already seen in Chapter 4 (baseline), the key metrics which demonstrate the need for Sêr Cymru II are constantly changing. The findings in Chapter 4 suggest that on a number of measures, the scale of the gap and therefore the challenge, particularly in terms of Wales’ relative position to the UK is actually increasing.

⁸⁶ Welsh Government (2015), *Sêr Cymru II West Wales and the Valleys. 80761. WEFO Business Plan 2015/16. Office of the Chief Scientific Adviser for Wales. Cardiff Version 4. Page 3.*

⁸⁷ Ibid.

⁸⁸ RECOGNISING THE QUALITY OF RESEARCH AT UNIVERSITIES IN WALES, A paper prepared for those interested in the research performance of Wales’ universities by Professor Robin Williams CBE FInstP FLSW FRS, Founding Fellow of the Learned Society of Wales and a member of the Society’s Council Chair of the Research, Innovation and Engagement Committee of the Higher Education Funding Council for Wales.

⁸⁹ Clinical medicine, engineering, mathematics and physics.

5.28 All of the stakeholders interviewed felt that the need for Sêr Cymru II was very clearly articulated in Science for Wales and in relevant research that had highlighted the challenge of building critical mass in Wales' scientific research base. The distinction between the lack of capacity and the strengths Wales has in terms of its existing research base was also clearly understood by all of the stakeholders we interviewed. Thus one commented that:

'The need is essentially more people. Wales has perilously few fellows in some key areas. It has no pipeline. It's been lagging behind'.

[Stakeholder]

Aims and Objectives

5.29 The Sêr Cymru initiative was initially launched in 2012 by the Welsh Government to address the STEMM capacity deficit in Wales and build a stronger science base in Wales. Sêr Cymru II builds upon the original Sêr Cymru I initiative with the objective of securing the critical mass which would be necessary to secure sufficient research capacity in Wales. Based on the assessment of need, the Business Plans outlined that Sêr Cymru II aims to generate a 'step change in the science base by supporting over 150 high quality researchers in Wales (up to 68 via the ERDF operations and a further 90 through the COFUND operation)'. They set out that it will work with leading scholars in universities across Wales, undertaking research in areas that, although excellent, lack critical mass. The intention is that this will result in increased success of Welsh research institutions in attracting competitive and private research funding and bring Wales closer to the 5 per cent share of the Research Council UK (RCUK) funding Wales should achieve according to its population size⁹⁰.

5.30 The Business Plans explained that the operations will achieve the changes sought via the recruitment of 'excellent scientists early in their research careers to come to Wales to support and build capacity'. The plan specified that Sêr Cymru II will be open to all research-active universities in Wales to enable them to address capacity issues in their area of strength and will encourage them to undertake collaborative applications for research funding, linking groups together through shared expertise. Calls for proposals will be invited in the four grand challenge areas of Life Sciences

⁹⁰ Welsh Government (2015), *Sêr Cymru II West Wales and the Valleys*. 80761. WEFO Business Plan 2015/16. Office of the Chief Scientific Adviser for Wales. Cardiff Version 4. page 3. This Business Plan is not a published document.

and Health; Low Carbon, Energy and Environment; Advanced Engineering and Materials; and ICT and Digital Economy⁹¹.

Programme architecture

5.31 The Business Plans outlined that the ERDF operations would form part of a wider, overarching Sêr Cymru II strategy comprising:

- A £1.74m strategic call for infrastructure
- The £17m MSCA COFUND scheme
- 26 Rising Star Packages
- 30 Research fellowships
- 12 recapturing talent fellowships

5.32 Table 5.3 provides an overview of the different types of fellowship opportunities available via Sêr Cymru II.

Table 5.3: Overview of Sêr Cymru II Fellowship Categories

Fellowship Category	Description
Rising Star	<p>There are prestigious and competitive positions, designed to attract the very best ‘rising stars’ of academic research. These fellowships are intended to provide a base for developing research in Wales with more high quality research posts expected to be created around the Rising Stars and more research income brought into Wales.</p> <p>Rising Stars are expected to increase collaboration between universities and commercial organisations. They are also expected to generate research publications and undertake STEM-related public engagement activities.</p> <p>Rising stars are expected to enable universities to attract the highest calibre applicants and provide them with supporting research assistants (RA) and/or equipment. A typical package would include two RAs and a ‘Rising Star’ over five years. Selection of the fellows involved using international peer review and an independent panel of experts.</p>

⁹¹ Ibid. Page 4.

	Approximately 20 five-year Rising Star fellowship packages are to be delivered (10 in WWV and 10 in East Wales), each funded at £200k per annum. The original intention was to deliver 26 packages.
Research	Research Fellowships are aimed at stellar candidates; 3-5 years post PhD, from anywhere in the world to come to work in Wales. The fellowships are three years in duration with up to 30 researchers being supported via this route (15 in WWV and 15 in East Wales). Selection of the fellows will be done using the same international peer review and independent panel of experts as for the Rising Stars in key strategic areas.
Recapturing Talent	This strand of Sêr Cymru II aims to provide support for stellar researchers returning to work following a career break. Up to 12 fellows (6 in WWV and 6 in East Wales) will be awarded through this strand of the programme. Selection of the fellows will be done using the same international peer review and independent panel of experts as for the Rising Stars. Assistance will be provided in terms of training and pastoral support for this particular group of researchers.
Chair	These awards were initially suggested as part of the operation in order to provide opportunities to attract the best senior academic researchers into Wales with the expectation that they would bring with them a productive research programme and the ability to build a team of research excellence. Researchers at this level have proven ability to attract substantial levels of external research funding and are well placed to bring significant impact and outputs from their research. Following initial consultation work with universities as part of the design phase of Sêr Cymru II, this category was excluded from the operation, but was subsequently re-introduced as a result of unexpected demand for a small number of Chair positions through the applications process.

Source: Sêr Cymru II ERDF Business Plans

5.33 Fellows funded via Sêr Cymru II are offered the opportunity to complement their research work with some teaching activity though this is limited to 10 per cent of their overall time. The business plans outlined that enabling fellows to participate in teaching activity is seen as being beneficial in that students will be ‘attracted to a university if the teaching element is strong, therefore the introduction of high calibre

candidates such as those that will be appointed through Sêr Cymru II will help to attract high quality and greater numbers of students to the host institution, bringing with them all the benefits that an increasing student number would provide⁹².

- 5.34 Stakeholders universally welcomed the fact that the Welsh Government and in particular the Chief Scientific Adviser had taken the initiative to develop Sêr Cymru II. They argued that there was a very clear rationale for it and that its strategic aims and objectives were very clear.

‘It’s very well-conceived...an absolutely brilliant idea’.

[Stakeholder]

- 5.35 The majority of stakeholders were also very supportive of the fact that Sêr Cymru II is targeted at STEMM subjects and the grand challenge areas identified via the Smart Specialisation Strategy. They argued that there was clear logic in investing resources to build on Wales’ existing research strengths, thereby creating a supportive, collaborative and sustainable ‘eco-system’ within the Welsh higher education sector.

‘It’s all about increasing our research capacity and building upon areas of excellence for us [university]. It will help us perform at a much higher level’.

[Stakeholder]

- 5.36 There was also universal support amongst all stakeholders in relation to the change in emphasis within Sêr Cymru II (from Sêr Cymru I) to focus on targeting early and mid-career researchers. While high profile chairs offered the opportunity to make a ‘more dramatic’ impact on academic research in Wales, most stakeholders felt that the funding of fellowships and Rising Stars enabled a more ‘incremental’ approach. Thus, the general feeling amongst stakeholders was that the various categories of fellowships on offer, including the recapturing talent fellowships were both relevant and appropriate. They also thought that the 10 per cent teaching element was appropriate.

- 5.37 None of the stakeholders argued against the inclusion of a small number of chair positions being funded via Sêr Cymru II, with several commenting that the ‘mix’ of fellowship types within the approved portfolio should provide a good return on investment in terms of the key outcomes being pursued. In particular, most stakeholders were conscious of the fact that Research Fellows, Rising Stars and

⁹² Ibid. Page 9.

those returning to research via the Recapturing Talent fellowships will be ‘senior enough’ to make a difference in terms of securing external research funding. Stakeholders from one university felt however that future programmes to fund researchers would benefit from allowing a greater social science flavour to the research topics covered.

5.38 Several of the interviewed stakeholders commented that having had COFUND and ERDF operations approved and aligned in the way that they are has been a major achievement and in itself has gained kudos for Wales amongst European colleagues.

Indicators and Targets

5.39 The current indicators and targets for Sêr Cymru II are set out in Table 5.4⁹³. This shows that the WWV and EW operations each have one result target and nine output targets.

Table 5.4: Sêr Cymru II Indicators and Targets

Indicator	Indicator Type	WWV Target	EW Target	Total
Amount of funding secured to carry out applied research (over seven years)	Result	£6.9m	£6.1m	£13m
Number of new researchers in supported entities across the life of the programme	Output	35	33	68
Number of enterprises (commercial and non-governmental organisations) co-operating with research institutions	Output	13	13	26
Number of research publications produced by researchers	Output	26	26	52
Number of other jobs and PhD studentships created by/linked to the new posts put in place through this programme and funded through research income generated by the researchers	Output	26	26	52
Number of commercialisable outcomes	Output	5	5	10
Number of societal or economic benefits	Output	5	5	10

⁹³ At the time of writing this report Welsh Government officials were re-negotiating these targets with WEFO.

Number of Research Fellows going into academic or commercial research jobs at or before the end of their 'Sêr Cymru II' fellowship	Output	13	13	26
Number of Research Fellows becoming STEMM ambassadors	Output	26	26	52
Number of Research Fellows undertaking activities outside of standard postdoctoral role e.g. organising a conference in their area of research; submitting a research proposal as Principle Investigator	Output	10	10	20

Source: Sêr Cymru II ERDF Business Plans

5.40 In terms of the result indicator, the Business Plans explained that the annual research income for the HE sector in Wales is in the region of £175 million. The combined £13m of additional research funding estimated to be generated via the Sêr Cymru II ERDF operations would thus represent a seven per cent increase and on the assumption that the £175 million of income stays constant, this would increase total research income coming into Wales' universities to £188 million, thereby moving the Welsh proportion to the UK research income total from 3.4 per cent to 3.7 per cent helping to contribute towards the efforts to reach 5 per cent.

5.41 The Business Plans also set out data requirements and suggested evidence which would need to be collected in order to demonstrate progress against each of the indicators.

Management, governance and delivery arrangements

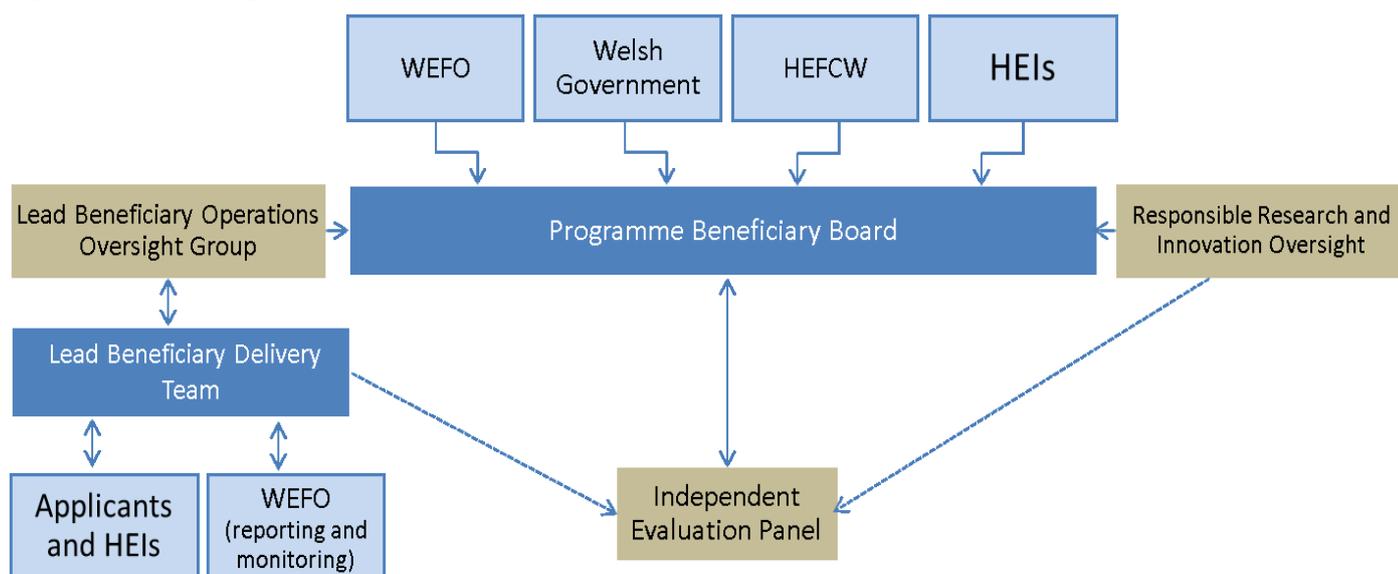
5.42 The Business Plans outlined that the process of applying for Sêr Cymru II funding would broadly follow the systems adopted by UK Research Councils. Thus, a competitive bidding process has been adopted with the aim that candidates should be supported by two key groups, namely:

- The Independent Evaluation Panel.
- The Programme Beneficiary Board.

5.43 Prior to submitting applications to the Welsh Government, universities play a key role in advertising and developing initial proposals (via an expression of interest process).

- 5.44 Proposals are reviewed by international external peer reviewers who are approached and recruited by the Welsh Government and chosen specifically to match the individual research proposal on an ad hoc basis 'with no charge to the ERDF operation'.
- 5.45 Applications are then presented to the Independent Evaluation Panel. Candidates are given an opportunity to respond to the comments made by expert reviewers.
- 5.46 The evaluation panel then make funding recommendations to the Programme Beneficiary Board. The Beneficiary Board is chaired by the Chief Scientific Adviser for Wales and includes the Pro Vice-Chancellors of Wales' universities, a HEFCW representative, senior Welsh Government officials and a representative of Health and Care Research Wales.
- 5.47 Grant awards are made by Welsh Government officials on behalf of the Welsh Ministers on the basis of the recommendations made by the Programme Beneficiary Board.
- 5.48 At the time of writing, the Welsh Government was also in the process of recruiting members for a Responsible Research and Innovation Oversight (RRI) group. The RRI will be a small group of experts with experience of sitting on ethical review panels and/or expertise in equality and diversity issues. This group will oversee the management of ethical issues and receive annual reports on the way RRI issues are being addressed through the programme and by individual awarded fellowships.
- 5.49 These organisational and governance arrangements are summarised in Figure 5.1.

Figure 5.1 Sêr Cymru II Governance Structure⁹⁴



Source: Sêr Cymru II ERDF Business Plans

5.50 Overall, the majority of stakeholders interviewed held the view that the Sêr Cymru II application process was rigorous and robust from an academic point of view with a clear focus on securing research excellence. The Programme Beneficiary Board was thought to be working effectively and is being well attended by Pro Vice Chancellors from each of Wales’ universities. Some stakeholders also commented that it was positive the Board consisted of members with this level of seniority.

5.51 Most stakeholders felt that the Welsh Government was doing a very good job of securing peer reviewers to comment on research proposals. One stakeholder summed up the views of several of those we spoke to by saying:

‘I know how difficult it is to get people to review proposals – they [Welsh Government] are working hard’.

[Stakeholder]

5.52 Another stakeholder commented that:

‘I’m very happy that it is a robust and fair mechanism. It’s science not politics driving the decisions’.

[Stakeholder]

⁹⁴ The Welsh Government is the main beneficiary.

- 5.53 However, a handful of university stakeholders felt that there had been a lack of consistency in the peer review process both from the point of view of a variance in the number of external people reviewing individual proposals but also in terms of a perceived inconsistency relating to reviewer scores.
- 5.54 In this context, members of the independent evaluation panel stressed that they had been pragmatic in how they had viewed and used the scores of independent reviewers. The fact that applicants are offered the opportunity to respond directly to the comments of reviewers was also thought to be a crucially important and very valued part of the process.
- 5.55 Some university stakeholders were also critical of the time it had taken (in the first round calls under the ERDF operations) to issue approval letters after applications had been approved. This had caused practical difficulties for a number of universities in terms of being able to issue employment contracts and secure the researchers in question. The delay in issuing the approval letters had meant that in several instances, the lead in-time to enable practical arrangements to be put in place had been too short. In a very limited number of cases, the researchers had decided to pursue other opportunities due to the delays in receiving an official offer of employment.

‘These people don’t hang around. They get their offers and if something takes too long, they’re off somewhere else’.

[HEI representative]

- 5.56 A further common point made by representatives of the universities involved with submitting applications to Sêr Cymru II to date was that the ERDF operations in particular were resource intensive and ‘onerous’ in terms of the inputs of non-funded staff.
- 5.57 The up-front process of promoting, identifying, evaluating, prioritising and supporting the development of applications for submission to the Welsh Government had been particularly time consuming for various academic and non-academic staff. Universities recognised that this was a strategically important part of the process and that ultimately the time invested up-front meant that overall success rates were better. However, they made the point that there was no funding available to cover the costs of the internal support needed.

- 5.58 University stakeholders pointed out that promoting Sêr Cymru II opportunities was, in the main done via advertising (e.g. via intranet sites) to existing research academics who in turn made contact with potential candidates across the world to raise awareness. Some universities also advertised opportunities on their websites and via specific journals.
- 5.59 In general, the more direct route of promoting Sêr Cymru II opportunities via existing research staff was thought to have been the most effective means of raising awareness of the fellowships to prospective candidates of sufficient calibre and stature. This also met the requirement to build on pre-existing research strengths in STEMM subject areas.
- 5.60 At least two universities however felt that on reflection, they could probably have done more to promote fellowship opportunities at the faculty level, which in turn may have resulted in greater interest being shown by candidates of the appropriate calibre. The extent to which universities have been proactive in promoting awareness of Sêr Cymru II opportunities via their existing academic staff appears to have a direct link through to the number and quality of the applications received and subsequently the number of fellowships placed at those institutions.
- 5.61 Several of the university stakeholders made the same point in relation to on-going (i.e. post-award) support that funded fellows would need, particularly in terms of the claims and monitoring requirements. They argued that it was unrealistic to expect that fellows would be able to complete the monitoring requirements on their own (with many of the early career researchers in particular being unfamiliar with ERDF requirements). The point was also made that returns would need to be validated and checked for instance to reduce the risk of any double-counting.
- 5.62 In this context, university stakeholders commonly felt that while the financial grant contribution rate for ERDF fellowships was higher than COFUND, the administrative burdens were much greater and effectively cancelled-out the benefits of the higher contribution rate.
- 5.63 The Welsh Government acknowledged the additional administrative burdens placed on universities (i.e. over and above match funding fellowships) and put forward an internal business case for a 'one off payment' to support Sêr Cymru II participating universities to help meet some of these costs. The internal business case outlined that 'there is a heightened level of monitoring with the ERDF funding provided by part of the scheme, all of which is adding pressure on the administrative sections of

the university charged with making these awards a success both in terms of provision of funding for the researchers as well as ensuring high quality record keeping⁹⁵.

The document went on to suggest that ‘a one off payment’ should be awarded to each of the universities currently involved in Sêr Cymru II at a level set according to the burden of applications they are supporting to help them increase their reporting capacity and lessen the burden⁹⁶.

- 5.64 Based on a formula of attributing costs relating to the number of applications submitted and approved, awards were made to participating universities. The awards are set out in Table 5.5.

Table 5.5: ‘One off’ financial awards to Universities to help meet administrative costs associated with delivering Sêr Cymru II

University	Suggested one off award to help meet administrative costs £000s
Cardiff University	£47.0
Swansea University	£33.0
Bangor University	£29.0
Aberystwyth University	£20.0
University of South Wales	£1.6

Source: Welsh Government

- 5.65 A number of university staff who were interviewed as part of the evaluation also made the point that while match funding for approved fellows was now ring-fenced, future uncertainties over university funding meant that there is more uncertainty about whether further fellowships could be applied for. This was highlighted as a key risk in terms of on-going sustainability.

⁹⁵ Business case for a one off payment to support administrative burden experienced by Wales’ Universities involved in Sêr Cymru II. Page 1.

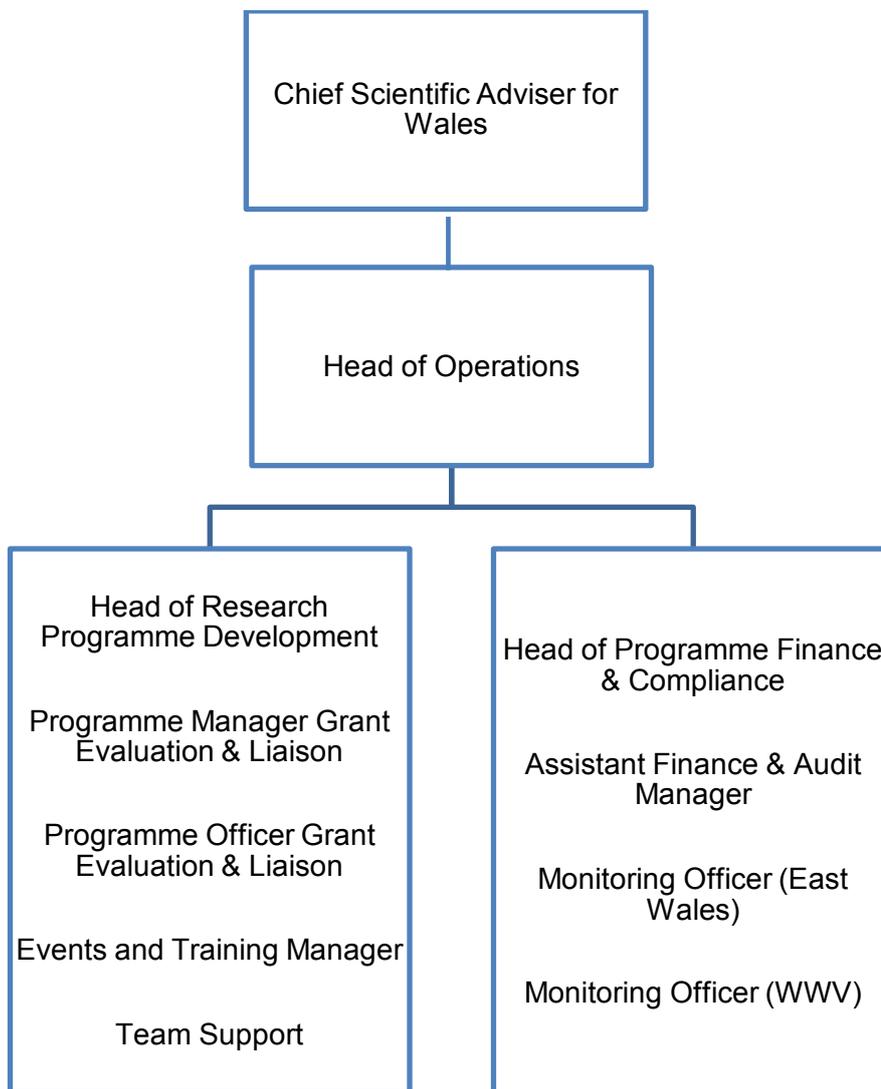
⁹⁶ Ibid.

Sêr Cymru II Delivery Team

5.66 The Sêr Cymru II delivery team within the Welsh Government consists of nine officials who divide their time between the ERDF and COFUND elements of the programme II. The programme as a whole (including COFUND and ERDF operations) is overseen by the Head of Research Programme Development who reports to the Head of Operations in the Chief Scientific Adviser for Wales' division.

5.67 The team structure is outlined in Figure 5.2

Figure 5.2: Sêr Cymru II Welsh Government Delivery Team



Source: Produced from information supplied by the Welsh Government

5.68 Many of the interviewed stakeholders were very complementary about the work of the Head of Research Programme Development. They felt that she has played an instrumental role in the design, development and latterly the implementation of the Sêr Cymru II package.

5.69 However, a small number of stakeholders argued that the programme as a whole (ERDF and COFUND) was probably over-dependent on an individual Welsh Government official, recognising that the post-holder is a secondee from a university in Wales. Several identified this as being a potential risk.

‘Without her, I don’t think they’d cope. She’s so central and crucial to the whole project’.

[Stakeholder]

5.70 Some of the university stakeholders felt that the Welsh Government’s programme delivery team as a whole had been on ‘a steep learning curve’ in establishing Sêr Cymru II and they argued that at times, this had led to confusing, slow and sometimes even contradictory guidance (e.g. around technical queries involving WEFO) being issued to universities involved in the application process and more recently in relation to monitoring requirements. In this context, university colleagues in particular felt that the Welsh Government could have done more to draw on the collective knowledge and intelligence available across the Welsh HE sector in setting up ERDF operations.

5.71 In response to these concerns, a group of Wales Higher Education European Liaison Officers (WHEELOs) had been sharing knowledge and information relating to the process of applying for (and more recently) in supporting fellows around the implementation and monitoring requirements of Sêr Cymru II. Several members of this group had found the network of value to them when providing technical assistance in relation to Sêr Cymru II within their institutions.

Fellows and Research Projects funded to date

5.72 In summary, of the 31 fellowships which have been awarded across the two round of calls:

- 14 were awarded during the first round and 17 were awarded during the second round

- Cardiff and Swansea Universities between them have been awarded the vast majority (28 in total with 11 allocated to Cardiff University and 17 to Swansea University)
- South Wales University was awarded funding for two Research Fellowships and Aberystwyth University was awarded funding for one
- 26 of the 31 awards have been for Research Fellowships, with one Recapturing Talent, three Rising Stars and one Chair position.

5.73 Table 5.6 provides an overview of the fellowships awarded to date against the output targets for each category. As explained, there are no targets relating to chair positions since these were not originally included in the ERDF business plans.

Table 5.6: Overview of awarded fellowships against targets

Fellowship Type	WWV Target	WWV Achieved	EW Target	EW Achieved
Research	15	15 (100%)	15	11 (73%)
Rising Star	14	3 (21%)	12	-
Recapturing Talent	6	1 (17%)	6	-
Chairs	-	1	-	-
Total		20		11

Source: Welsh Government Monitoring Data (July 2017)

5.74 This shows that after two rounds, the target number of Research Fellows in West Wales and the Valleys has been met and solid progress has been made against the equivalent target in East Wales.

5.75 However, progress relating to the award of Rising Star and Recapturing Talent fellowships has been less positive although Welsh Government officials did point to an increased level of interest in the Rising Star fellowships of late and suggested that possible projects were forthcoming.

- 5.76 Several of the stakeholders interviewed were conscious of the low level of interest in the Recapturing Talent category in particular. They felt that it was challenging to identify the target cohort of people who might be interested in a recapturing talent fellowship and that as a result it would prove challenging to meet the targets in place. Some stakeholders questioned whether there was sufficient demand for this category of fellowship whilst others suggested that the focus needed to be on trialling alternative marketing and communications approaches (including outreach activity) that would enable Sêr Cymru II and participating universities to reach people that are 'off-grid'.
- 5.77 Beyond the issues relating to the fellowship types funded to date, most stakeholders felt that the research topics funded provided reasonable coverage in terms of the three original grand challenge areas and built on the pre-existing strengths of universities as intended. In terms of coverage against the grand challenge areas, a high number of fellowships in three of the four grand challenge areas have been awarded:
- 39 per cent (12 of 31) of the fellowships relate to low carbon, energy and the environment as their main grand challenge area.
 - 35 per cent (11 of 31) of the fellowships relate to life sciences and health as their main grand challenge area.
 - 19 per cent (6 of 31) of the fellowships relate to advanced engineering and materials as their main grand challenge area.
 - One of the fellowships relates to ICT and the digital economy as their main grand challenge area.
 - One of the fellowships cuts across all of the grand challenge areas.
- 5.78 Several of the interviewed stakeholders also commented that the application process and the independent evaluation panel had taken account of the industrial relevance and links of the research being proposed and that this was a positive feature.

Monitoring Arrangements

- 5.79 The Welsh Government has developed a draft template for funded fellows to use in reporting progress on their work.
- 5.80 Fellows will be required to complete update reports at three months, 18 months and at the end of the fellowship funding period. The draft template includes:
- Basic background information on the funded fellow.
 - Narrative sections requesting brief (400 word limit) information on research abstract, methods adopted and timescales.
 - A narrative section requesting information about results being achieved to date.
 - A section requesting information about publications including papers, book chapters and books/monographs.
 - Information (in the form of a narrative) about intellectual property, patentable or commercially exploitable results emerging from the research being undertaken.
 - A section requesting information about communication, dissemination and public engagement activities undertaken.
 - A section requesting information about any awards or prizes received as a result of the funded research activity.
 - A section requesting (narrative) information about societal and economic benefits.
 - A section requesting information about new research posts (i.e. jobs) created as a result of the funded research.
- 5.81 Accompanying guidance is provided to assist fellows with the completion of their progress reports.
- 5.82 Having reviewed the progress report template as part of this evaluation, it was found to be broadly fit for purpose, though the comments from university stakeholder respondents, should be noted: some felt that fellows will need to be supported in completing these reports given that many will not have any prior experience of similar templates and to ensure that the data and information provided is validated.

5.83 The template itself provides reasonable coverage against the range of output, and outcome measures set out in the series of logic models which we set out in Chapter 6 of this report. The proposed intervals for collecting this information also seem appropriate. However, there are a small number of apparent gaps which the Welsh Government may wish to consider. These relate to:

- Any training or professional development activities that funded fellows may have undertaken. This would be relevant in the context of the anticipated intermediate outcomes around career progression and professional development for less experienced researchers in particular. It would also be relevant in capturing activity and outcomes relating to the CCTs, for instance around any equalities training (e.g. Athena SWANN, Welsh language training or in relation to environmental sustainability).
- Activity and outcomes relating to the 10 per cent of teaching time where this is utilised. This will be a relevant consideration at mid-term but more so at the summative stage in terms of exploring indirect or intermediate outcomes for students i.e. by asking the question: do students feel that they have benefitted in any way from having been taught by a Sêr Cymru funded fellow?

5.84 A further consideration relates to the 'open' narrative nature of the report template itself. This is could to lead to variances and inconsistencies in the way in which the reports are completed and in turn, this will make overall analysis of outputs and impacts more challenging and less robust. In this context, the Welsh Government may wish to consider 'tightening up' the template to include a greater number of closed or option- based responses (based on the helpful guidance provided in Annex 1 of the report template) in order to enable a greater degree of consistency in the analysis.

6. Theory of Change Logic Models

6.1 This chapter articulates the theory of change for Sêr Cymru II. This is based on the development of a series of inter-linked logic models that draw on:

- The findings of the document review and baseline exercise.
- The Sêr Cymru II ERDF Business Plans.
- Evidence from the stakeholder interviews.

6.2 An over-arching logic model outlines the theory of change for the Sêr Cymru II ERDF operations as a whole, while individualised logic models for each of the Rising Stars, Research Fellows, Recapturing Talent and Research Chairs demonstrate how these elements are expected to contribute to the overall outputs, and anticipated outcomes that the operations have been established to achieve.

6.3 Each logic model sets out:

- The context and need for the Sêr Cymru II operations.
- The aim.
- The inputs and activities being delivered.
- The outputs and targets set.
- The intended outcomes and impacts to be achieved.

Key considerations

6.4 In developing the logic models, we have been mindful of the ERDF-related output and result indicators set out in the Business Plans but have not constrained the scope of the theory of change to these. Rather, we have sought to identify a broader range of appropriate outputs and outcomes that could reasonably be anticipated to materialise as a result of the Sêr Cymru II intervention.

6.5 In addition, we have identified the main assumptions that have informed the design of Sêr Cymru II, drawing upon the views of stakeholders, and these are presented as 'levers for change' that are expected to lead to the outcomes set out in the Logic Models.

Levers for change that are expected to lead to outcomes

6.6 One of the key assumptions underpinning the theory of change for the Sêr Cymru II Logic Models is that investing in an additional number of STEMM research fellows is an efficient and effective method of increasing Wales' share of Research Council

funding. The basis of this assumption is that appointed research fellows will be motivated and capable of applying for, and securing prestigious research funding from sources outside of Wales. It is also assumed that by securing this additional funding from outside of Wales, funded fellows will be able to generate additional research jobs and PhD studentship opportunities within their respective departments and institutions. It is also assumed that investing in STEMM-related research fellows, as opposed to other subject disciplines, represents the most effective route of increasing the funding secured from sources outside of Wales. This also fits with the SMART Specialisation Strategy and the identified Grand Challenge areas for Wales.

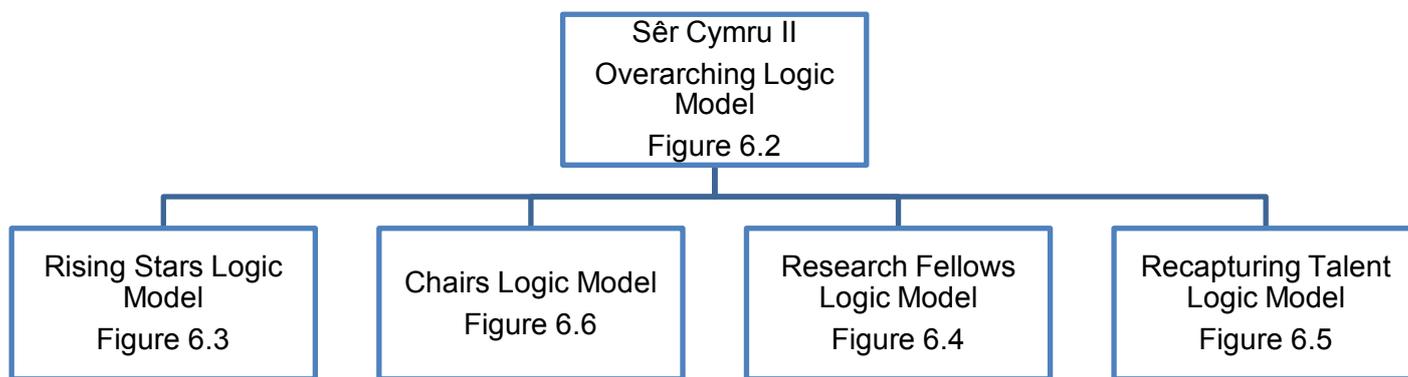
- 6.7 The Logic Models are also based on the assumption that increasing the number of researchers in Wales by a total of 68 postholders will contribute to addressing collective shortfall (estimated by the Leadership Foundation for Higher Education to be in the region of 600 researchers in 2013/14 and assessed in this report to have risen to 1,070 by 2015/16) currently in place across STEMM-related disciplines in Wales. The common assumption amongst stakeholders interviewed is that the intervention of recruiting and appointing these additional researchers will make a positive, albeit limited contribution to STEMM research capacity across Wales' HEIs.
- 6.8 A further important assumption that underpins the Sêr Cymru II Logic Models is that the intervention is intended to build upon existing academic research strengths as opposed to addressing broader weaknesses or gaps in subject areas beyond STEMM. In this sense, stakeholders expect that more funded fellows will be supported across those institutions with a strong record in STEMM research. It is also assumed that by targeting early and mid-career researchers, it is reasonable to expect that the Sêr Cymru II intervention will result in a gradual, incremental change in achieving the critical mass of Welsh scientific researchers required to meet Welsh Government policy objectives.
- 6.9 The Sêr Cymru II Logic Model is based on the assumption that there will be an adequate level of interest and demand in the funded fellow opportunities created. Aligned to this, it is assumed that high calibre researchers will want to work within Wales' HEIs. It follows that if demand for some of the fellowship opportunities will be lower than expected, (for instance as seems to be the case for the Recapturing Talent Fellows to date), there is an inherent risk that not all programme outputs will be achieved. There are also some subtle nuances implicit in the way in which

demand for Sêr Cymru II fellowships is expected to materialise. For instance interest in Rising Star positions are expected to come about as a result of contacts, networks and relationships between prospective candidates and researchers (including Chairs) already incumbent within universities in Wales.

- 6.10 A number of important assumptions are also made in relation to the links between the activities of Sêr Cymru II-funded fellows and the outcomes they will contribute to. For instance, it is assumed that their publications and dissemination activities will be of excellent academic standard so as to gain international recognition. It is also assumed that some appointed fellows will wish to continue working in Wales after Sêr Cymru II funding comes to an end.
- 6.11 Another key assumption, implicit in the logic models is that the processes adopted to scrutinise and select applications (initially via HEIs and via the work of the Evaluation Panel, External Reviewers and the Programme Beneficiary Board) are the most efficient, robust and appropriate route to ensuring that strategically important and genuinely excellent research projects are supported.
- 6.12 The Logic Model is also based on the assumption that potential students who may be considering studying at departments which are supported by Sêr Cymru II funding are likely to be positively influenced by the fact that leading academic researchers will be based at those departments. Aligned to this, another critical assumption is that students will benefit from their contact with/exposure to Sêr Cymru II funded fellows via the allocation of up to 10 per cent of their overall time to teaching.
- 6.13 Furthermore, the Logic Model is based on the underlying assumption that private enterprises (including SMEs) will want to engage with those departments hosting Sêr Cymru II Research Fellows and that the research projects funded will be of interest to and offer commercialisable benefits to them. It is envisaged that these opportunities will have a positive effect on business performance, including enhanced productivity through increased innovation.
- 6.14 We have developed two categories of outcomes. The first, defined as intermediate outcomes consider how the ERDF operations and the individual fellowship types might reasonably be expected to enable positive changes through 'softer' gains such as experiences and perceptions. The second category deals with 'harder' outcomes such as job creation and research income secured by Wales' universities.

- 6.15 The logic models also consider a range of external forces (or externalities) that are beyond the control of the Sêr Cymru II operations and those involved in delivery but may nevertheless have a substantive bearing on how the operations evolve and what they are ultimately able to achieve.
- 6.16 Figure 6.1 provides an overview of the logic models and how they inter-link with each other.

Figure 6.1: Overview of Sêr Cymru II Logic Models



Source: OB3

- 6.17 Most stakeholders felt that in addition to the ERDF output and result indicators, it was reasonable to expect that the operations would lead to a broader set of outcomes including a number of what might be considered as ‘softer’ or intermediate outcomes. The range of anticipated outcomes identified by these stakeholders included:
- The perceived attractiveness of host institutions to students and other academics from having ‘world-class’ research talent.
 - Enhanced experience for students e.g. via exposure to Sêr Cymru II academics via the 10 per cent teaching time allocation.
 - Career progression opportunities and general ‘CV development’ for funded fellows, particularly those in the relatively early stages of their careers.
 - Improved relationships and inter-linkages between universities and businesses/industry via the specific research projects commissioned.

- The ability of Wales' universities to sustain Sêr Cymru research posts after ERDF funding has expired. This was referred to by several as the 'stickability' of the funded fellows.

6.18 Most stakeholders were also able to highlight a number of external forces or 'externalities' that could fundamentally affect the delivery of Sêr Cymru II but would be outside of the control of those involved with it. These included:

- On-going austerity and financial pressures affecting universities in Wales. All of the universities pointed to concerns about potentially being able to match fund fellowship opportunities of this nature in the future.
- EU transition, which again had a direct bearing on available funding but was also highlighted by some universities as a concern in terms of being able to attract foreign talent to work in Wales.
- Redundancy programmes at some of Wales' universities which means that some research talent may be lost. In this context, a handful of stakeholders pointed out that Sêr Cymru II might have the effect of replacing researchers being lost due to funding constraints and that the 'step-change' in numbers being sought might not be as realistic given these wider set of circumstances.

6.19 These outcomes and externalities highlighted by various stakeholders have been incorporated into the logic models outlined.

Figure 6.2: Sêr Cymru II Overarching Logic Model

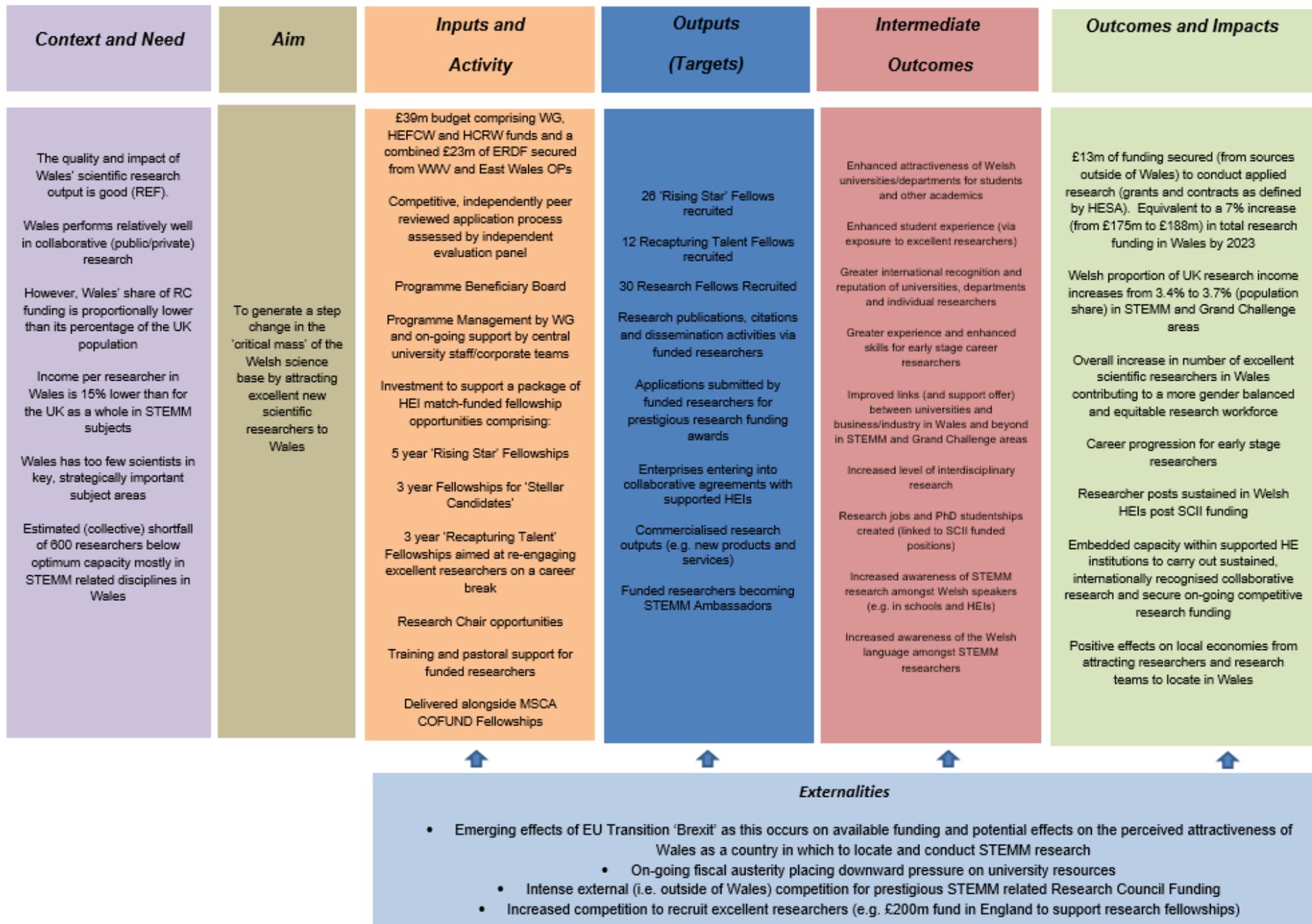


Figure 6.3: Sêr Cymru II Rising Stars Logic Model

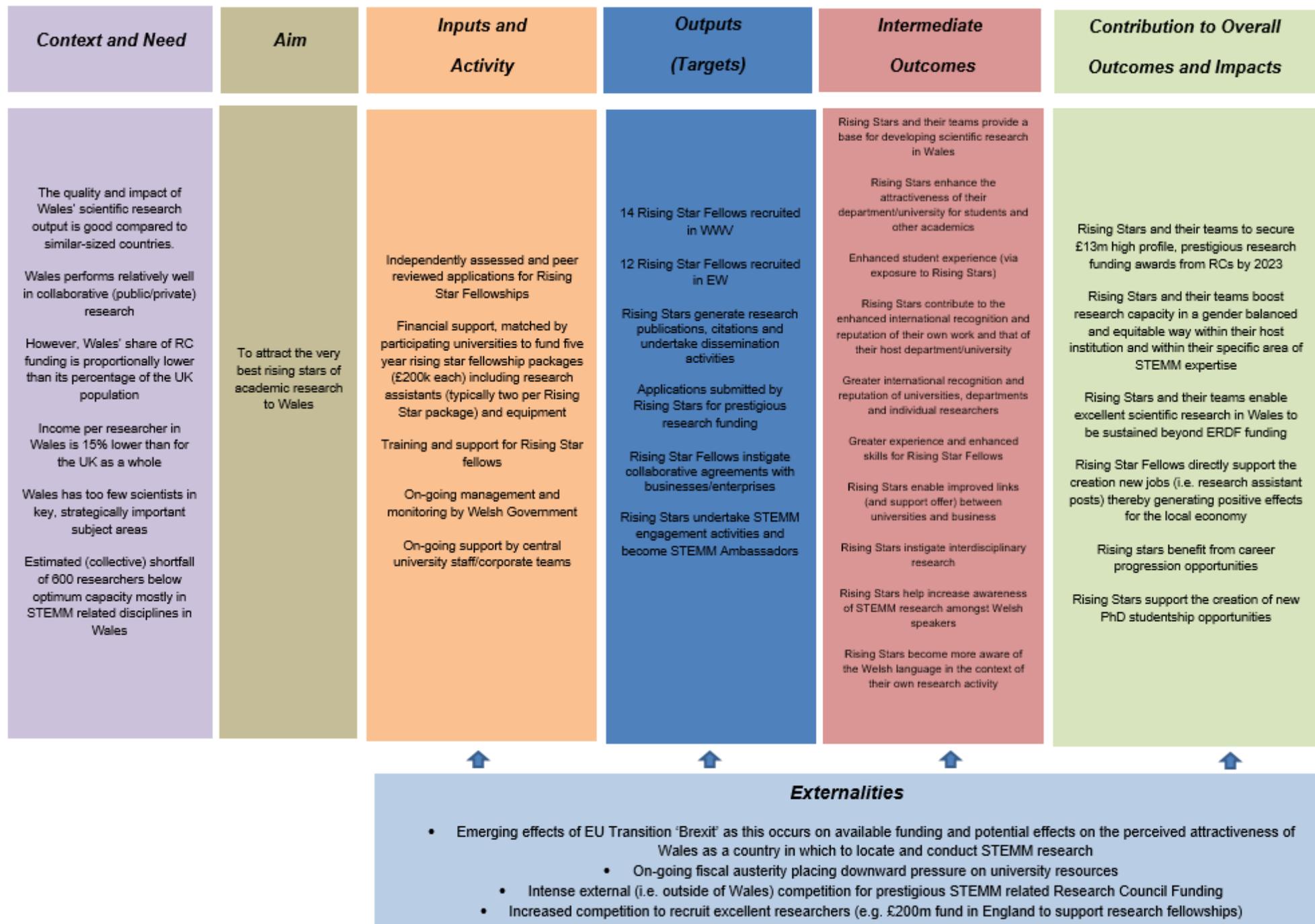


Figure 6.4: Sêr Cymru II Research Fellows Logic Model

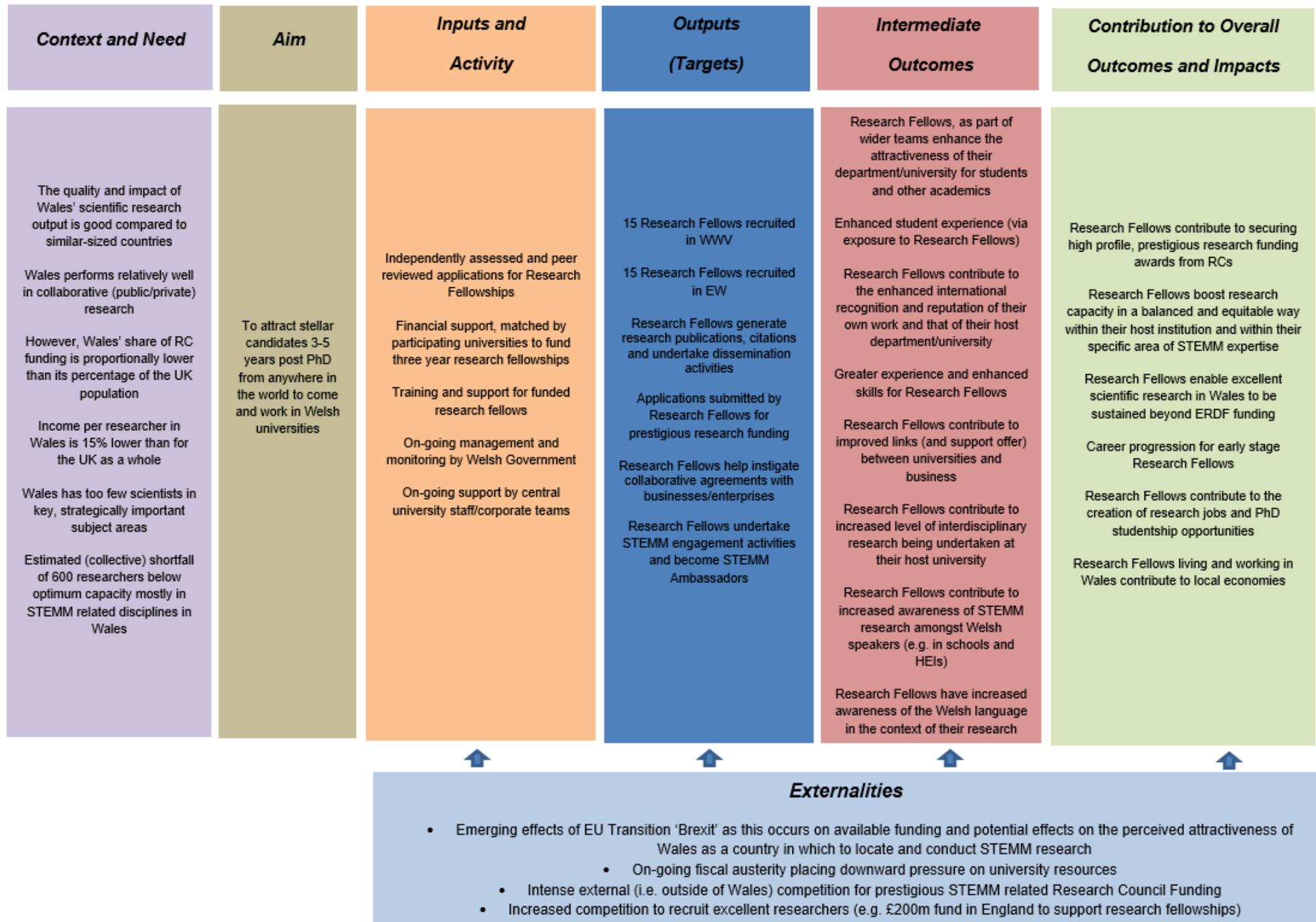


Figure 6.5: Sêr Cymru II Recapturing Talent (RT) Logic Model

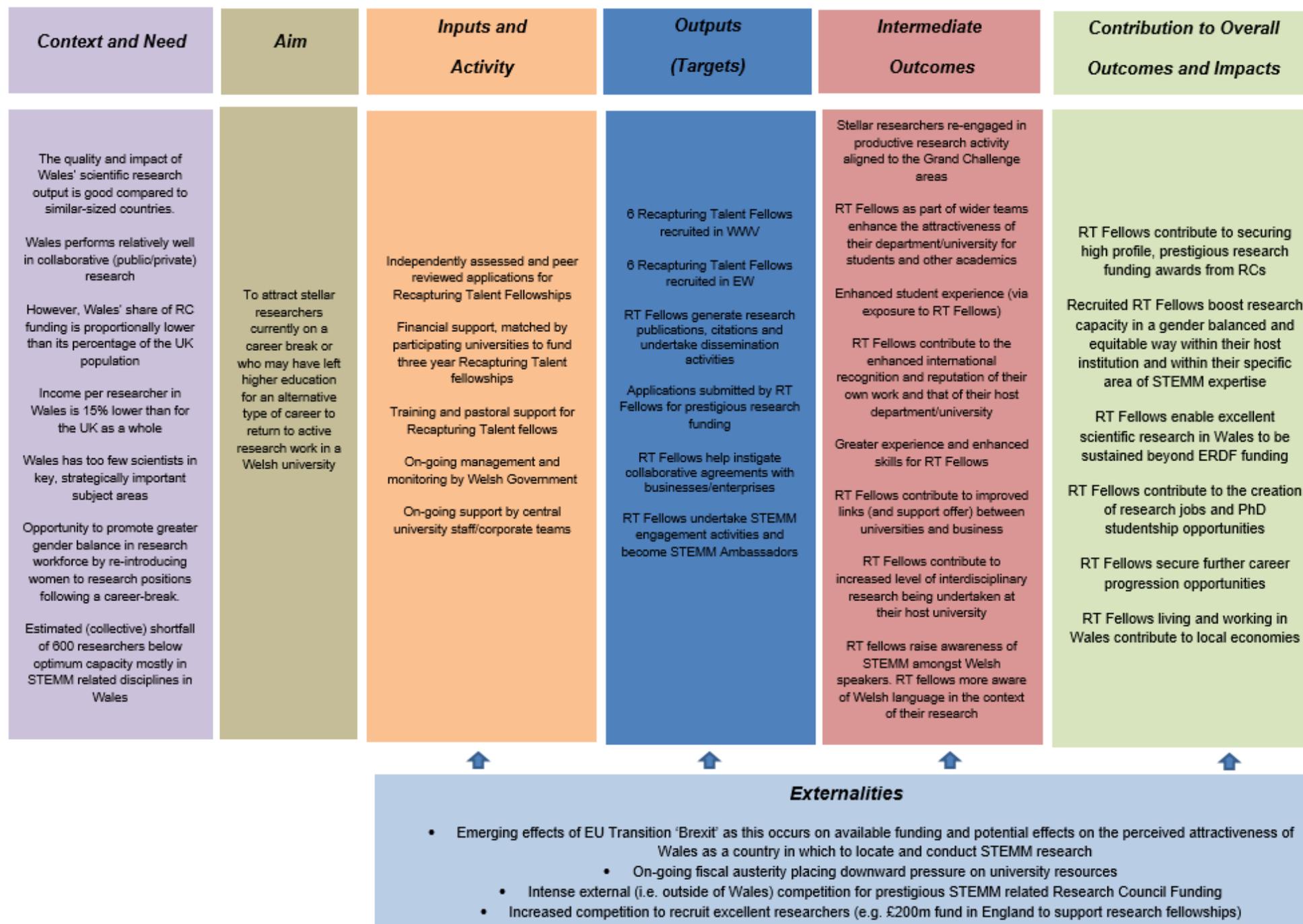
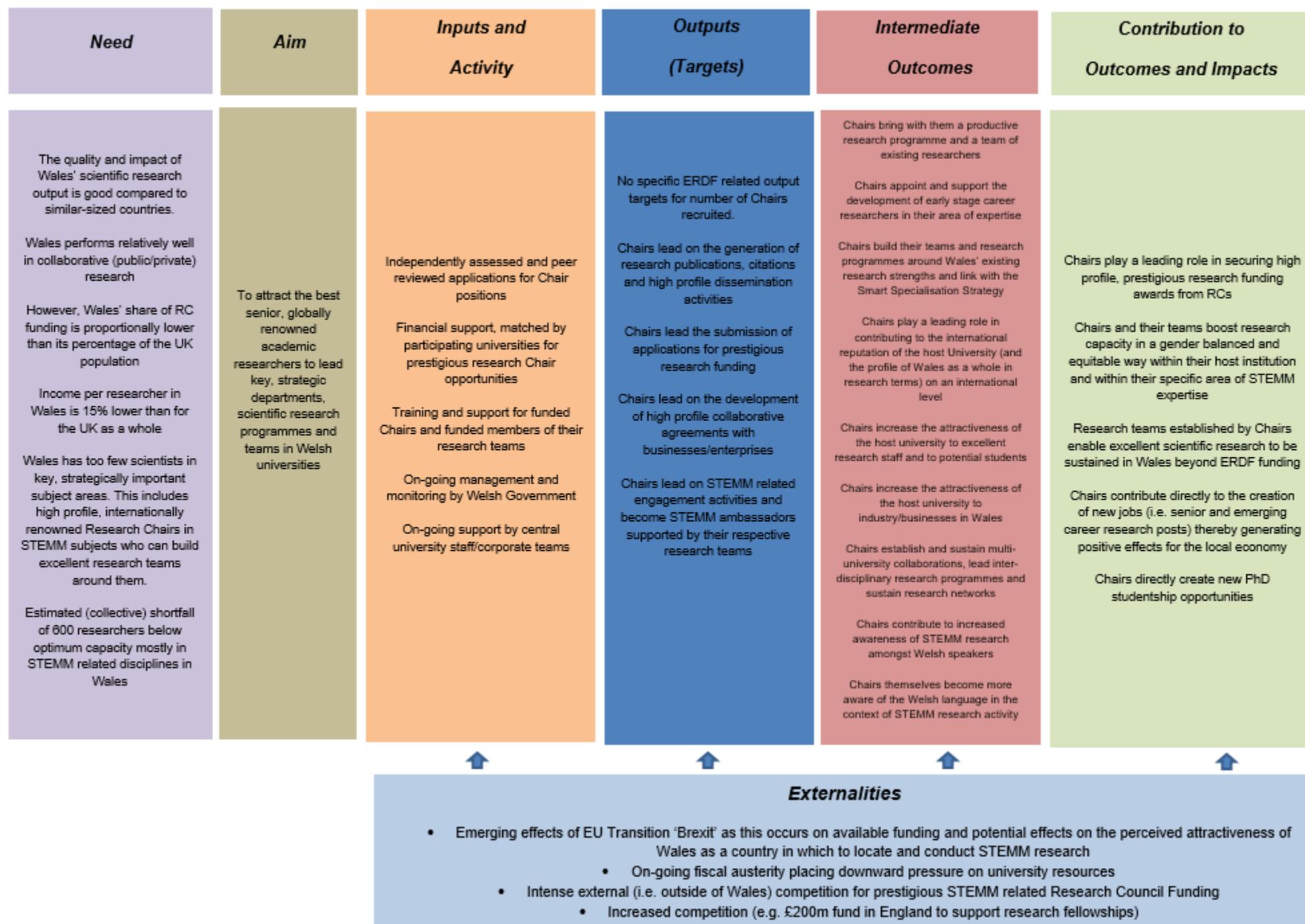


Figure 6.6: Sêr Cymru II Chairs Logic Model



7. Cross-cutting Themes and the Welsh Language

- 7.1 This chapter considers the approach taken within the ERDF-funded Sêr Cymru II operations to promoting and supporting the cross-cutting themes (CCTs) and the Welsh language. It also sets out the research landscape in Wales in terms of Welsh-medium research activity.
- 7.2 The chapter draws on a review of Sêr Cymru II documents (principally the ERDF Business Plans) and evidence from the interviews conducted with various stakeholders.
- 7.3 As an ERDF-funded operation, Sêr Cymru II is expected to contribute to the three cross-cutting themes of equal opportunities, environmental sustainability and tackling poverty. The operations are expected to report to WEFO on actions against a number of cross-cutting indicators, namely:
- Equal opportunities: positive action measures taken for women, female participation in STEMM and actively supporting speakers of the Welsh language
 - Sustainable Development: local supply chain development and resource efficiency measures
 - Tackling poverty: volunteering schemes
 - Developing and engaging CCT champions.

Equal Opportunities

- 7.4 The Business Plans outlined that equal opportunities would be the 'main CCT relevant to the operation'. They set out that the main way in which Sêr Cymru will contribute to the equal opportunities CCT is by supporting researchers to return to work following a career break. These researchers may have left work because of caring responsibilities, ill health or maternity leave. The Welsh Government aims to provide support via Sêr Cymru II to facilitate the re-integration of returning researchers into the Welsh higher education workforce.
- 7.5 The Business Plans also set out the intention to procure training from specialist organisations to improve understanding of equal opportunities and diversity issues.

7.6 Moreover, the Business Plans outlined that the Sêr Cymru ERDF operations would:

- Ensure equal treatment for all fellowship applicants on the grounds of gender, marital status, sexual orientation, gender re-assignment, race, colour, nationality, ethnicity or national origins, religion or similar philosophical belief, spent criminal conviction, age or disability.
- Ensure that research proposals will be assessed on equal terms and by an objective scoring system.
- Provide applicants with monitoring forms to collect data relating to the protected characteristics⁹⁷. If this highlights any under-representation via the recruitment process, the Business Plan outlined that the advertising and assessment process will be reassessed by the Programme Beneficiary Board.
- Monitoring the female to male ratio in relation to fellowship applications. The Business Plan set out the ambition of achieving a 50:50 male female ratio, with a minimum of 40 per cent women.
- Making efforts to increase the participation of women researchers by ensuring host institutions have measures in place to allow an appropriate work/life balance.
- Encouraging applications from researchers resuming a research career after a break and briefing peer reviewers to take into consideration recorded career breaks when assessing the track record of applicants.
- Supporting the Athena SWAN Charter⁹⁸ which sets out good employment practices relating to women working in higher education and specifically research.

7.7 A brief Equality Impact Assessment (EIA) was carried out and included in the Business Plans. A key conclusion from this was that it would be 'very difficult to set targets for any under-represented groups other than female'⁹⁹.

⁹⁷ The Equality Act 2010 sets out nine protected characteristic groups based on age, disability, gender reassignment, marriage and civil partnership, pregnancy and maternity, race, religion and belief, sex and sexual orientation.

⁹⁸ The Athena SWAN Charter was established in 2005 to encourage and recognise commitment to advancing the careers of women in science, technology, engineering, maths and medicine employment in higher education research.

⁹⁹ ERDF Business Plans. Page 25.

7.8 Most of the stakeholders interviewed agreed that equal opportunities were the main way in which Sêr Cymru II should be expected to contribute to the CCT objectives. Several pointed to the fact that the Recapturing Talent fellowships should provide a direct opportunity to encourage women to return to research careers thereby helping to achieve a more gender-balanced workforce. Given the lack of interest to date in this category of fellowship, this is likely to be a key consideration for the delivery team in the future and will also be an important consideration at the mid-term evaluation stage.

7.9 Most of the stakeholders interviewed also felt it was important for funded fellows to conduct outreach activities to promote their work and careers in research, particularly with young people. Several suggested that this should be an area in which the Welsh Government should support fellows with training and by facilitating links and networks with organisations who promote science with young people.

Environmental Sustainability

7.10 Sêr Cymru II will encourage applicants to conduct research in the grand challenge area of low carbon, energy and the environment. In doing so, the ERDF operations also intend to help improve the sustainability of the research community in the WWV and EW regions¹⁰⁰.

7.11 The Business Plan explained that there are no specific indicators relating to this CCT for Sêr Cymru II, but that a number of generic actions will be undertaken, including:

- The identification of a Sustainable Development ‘champion’ within the programme delivery team. This person will be responsible for reporting activity to the WEFO Sustainable Development Adviser.
- That fellowships in the grand challenge area of low carbon and the environment will be ‘particularly encouraged’ in order to develop and promote effective and innovative technologies to reduce the causes and effects of climate change.
- The use wherever possible (by the Programme Delivery Team) of local, sustainable supply chains as well as the promotion of sustainable transport and maximising waste, water and energy efficiency¹⁰¹.

¹⁰⁰ Ibid. Page 15.

¹⁰¹ Ibid. Page 23.

Tackling Poverty

- 7.12 The main way in which Sêr Cymru II is expected to contribute to the tackling poverty agenda is via its work to 'develop research excellence and the industrial capacity base in Wales' in STEMM areas. This is expected 'over the longer term' to generate a 'range of highly skilled, skilled and semi-skilled jobs, thus providing a range of new employment opportunities not otherwise available'¹⁰².
- 7.13 There are no indicators on tackling poverty but a 'small number of opportunities' to assist with the tackling poverty agenda are identified in the Business Plans. These include:
- Advertising fellowship opportunities via local networks.
 - Raising awareness of the Recapturing Talent fellowships by targeting advertising and awareness raising activity at appropriate websites i.e. ones likely to be viewed by people on career breaks
 - Commissioning specialist organisations with experience of supporting returning researchers to provide support and advice to Sêr Cymru II Recapturing Talent fellows.

Monitoring activity in relation to CCTs

- 7.14 The Business Plans outlined the intention to monitor activity in relation to the CCTs in the following ways:
- In relation to the Recapturing Talent Fellowships, data will be collected on the numbers of individuals applying for these fellowships, how many years they had been out of the research environment, how their scores (i.e. applications) compare against those that had not left research, and during the fellowship itself, they will be required to report on their progress e.g. number of papers published, number of conferences attended, any grant funding secured, and any new collaborations set up. The Welsh Government delivery team will appoint a member of staff who will be responsible for this monitoring activity and each year a report of progress will be made to the Programme Beneficiary Board, the Responsible Research and Oversight Board and the Independent Evaluation Panel. Should any weaknesses be identified, the Programme Beneficiary Board will consider alternative methods of assessment and funding.

¹⁰² WEFO Business Plans. Page 14.

- At the end of their funded periods, fellows will be invited to complete a brief questionnaire about their experiences. Data obtained in this way will be used to measure the success of the equal opportunities aspect of the operation. Data will be compared to those of organisations such as the Daphne Jackson Trust or the Wellcome Trust who already run schemes to attract returning researchers.
- Data on the organisations that employ the fellows will be captured via the Programme Delivery Team e.g. the level of the host organisation's status regarding Athena SWAN Charter for good employment practice for women working in higher education and research.
- On-going monitoring of the female to male ratio in the fellowship applications, in panel membership and in the peer reviewers approached and those used.
- The Programme Management Team will issue a monitoring form to applicants for data collection relating to protected characteristics. If this highlights any groups not applying or not performing well in the recruitment process, the advertising and assessment processes will be reassessed by
- the Programme Beneficiary Board.

The Welsh-medium research landscape

7.15 In its most recent published strategic plan, the Coleg Cymraeg Cenedlaethol sets out its strategy to develop Welsh-medium higher education and notes that it will support institutions 'to achieve and maintain the aim of creating at least 100 new Welsh medium posts by 2015/16'¹⁰³, which would include posts across STEM subjects, who can teach and conduct research through the medium of Welsh. Welsh medium academic research is undertaken across most universities in Wales, although its extent does vary from subject to subject. Traditionally, there is more Welsh-medium research conducted across arts and humanities subjects but there has been a notable increase of late in Welsh-medium research across social sciences and STEM subjects.

¹⁰³ Coleg Cymraeg Cenedlaethol 'Strategic Plan 2014/15 to 2016/17' Page. 4

7.16 The following higher education STEMM Welsh-medium research provisions are currently in place:

- An annual Welsh medium science conference¹⁰⁴ supported by the Coleg Cymraeg Cenedlaethol with the objective of showcasing leading scientific research undertaken by Welsh language scientists
- The publication of an on-line academic journal 'Gwerddon'¹⁰⁵ which conforms to the REF academic guidelines
- Funding for PhD scholarships to be submitted through the medium of Welsh – the Coleg Cymraeg Cenedlaethol awards funding for up to ten scholarships every year and to date, at least 15 STEMM-related PhD scholarships have been awarded¹⁰⁶.

The Welsh Language

7.17 The Business Plans outline that Sêr Cymru II is aimed at the international academic labour market. As such is likely only to be able to 'achieve a limited impact on the Welsh Language agenda'¹⁰⁷. However, the Plans also set out the intention that Sêr Cymru II will support and promote the Welsh Language in line with the Welsh Language (Wales) Measure 2011. This included:

- Ensuring direct access to Welsh Language resources.
- Access to Welsh speaking staff needed for the delivery of the operation.
- Targeting of suitably skilled/qualified Welsh Speakers, ensuring partners / service deliverers have adequate provision to provide support in the Welsh language (where required/requested), and bilingual materials/website will be available.¹⁰⁸

¹⁰⁴ <http://www.colegcymraeg.ac.uk/en/thecoleg/projects/conferences/scienceconference/>

¹⁰⁵ <http://www.gwerddon.cymru/en/home/> Note that this is not a graded research publication

¹⁰⁶ Based upon an analysis of information accessed 27 July 2017 via

<http://www.colegcymraeg.ac.uk/en/research/researchscholarships/>

¹⁰⁷ Ibid. Page 28.

¹⁰⁸ Ibid. Page 28.

7.18 There was a widespread view amongst stakeholders that Sêr Cymru II would be quite limited in what it could potentially achieve as far as the Welsh language is concerned. The comment (below) made by one stakeholder summed up the view of many of those we spoke to:

‘The international language of science is English and I think to expect Sêr Cymru to make a difference [on the use of Welsh language within STEMM research] would be asking too much’.

[Stakeholder]

7.19 Others however, and specifically the Coleg Cymraeg Cenedlaethol, while recognising that Sêr Cymru II could not be expected to achieve transformational change in respect of the language suggested a number of practical ways in which it might help progress things. These included:

- Developing a proactive approach to targeting people from Wales (including Welsh speakers) back to Wales’ universities via Sêr Cymru II – especially those less established in their careers to date (i.e. relatively early career researchers if possible).
- Identifying those researchers who have already been funded via Sêr Cymru II, who are keen to learn Welsh (at whatever level) and provide them with every possible opportunity to learn Welsh. It was also suggested that training could be provided to ensure that all funded fellows develop an understanding and appreciation of the Welsh language, culture and history – possibly as part of the induction/welcome process.
- That the Welsh Government could open a dialogue with the Coleg Cymraeg Cenedlaethol to share information about the funded cohort of Sêr Cymru II researchers (in particular those who can speak Welsh of which there are already known to be at least two individuals) and explore what, if any, role some of these might play in helping to build the capacity of STEMM academics able to teach in Welsh.

Suitability of the CCT Actions

7.20 Our overall assessment is that the CCTs have been adequately considered in the design and development of Sêr Cymru II and the actions proposed in terms of implementing CCT activity via the ERDF funded operation are reasonable and logical.

- 7.21 The operation will have more direct control over the actions and positive outcomes under the equalities CCT. In this context, it will be important for those responsible for delivering Sêr Cymru (both Welsh Government and individual institutions) to be proactive in promoting the importance of funded fellows conducting different forms of outreach activity to promote awareness of STEMM research and the careers opportunities presented by it, for instance amongst young people and Welsh speakers.
- 7.22 This is a key area in which Sêr Cymru II can proactively complement and add value to the (varied) training and support funded fellows will be offered within their host institutions.
- 7.23 It will also be crucially important to ensure that greater up-take of the Recapturing Talent fellowships leads to genuine opportunities for women to re-enter the research workforce in Wales.

8. Methodological Considerations – Evaluating the Impact of Sêr Cymru II

Requirement

- 8.1 The long-term aim of the evaluation programme is to understand the effectiveness of Sêr Cymru II in achieving the intended outputs, outcomes and impacts, including the extent to which the operations contributed to these.
- 8.2 At the inception evaluation stage, the objective is to establish a framework for a robust impact assessment, in so far as this is achievable.
- 8.3 Chapter 6 sets out a series of inter-linked logic models including an over-arching logic model for the Sêr Cymru II operations. The direct outcomes of the operations relate to increasing the number of high quality researchers in Wales' HEIs, with more publications and research output, citations, securing additional research income and increasing commercialisation.
- 8.4 Greater research capacity among HEIs in Wales, should in turn be expected to contribute indirectly to economic development, although given the less tangible nature of the relationship it is not practical to assess through counterfactual impact evaluation methods.
- 8.5 One of the other indirect outcomes of Sêr Cymru II is likely to be enhanced career development for participating researchers as a result of the support, enabling them to achieve more research outputs and publications, attract increased research funding and enhance the reputation of the institution and the sector. However, as this is not the primary focus of the operation (and is more of an indirect or intermediate outcome) we have not focused on it as an outcome within the counterfactual impact assessment.

Nature of Counterfactual Impact Evaluation

- 8.6 Counterfactual impact evaluation (CIE) is one method of evaluation which will sit alongside and supplement theory of change methods (of which contribution analysis is one example) which will also be used at the mid-term and summative evaluation stages. CIE aims to attribute changes in key impacts and results measures to the Sêr Cymru II operations, allowing for other observable factors which may contribute to these changes.

8.7 In essence, by attributing the change to the operations, the CIE aims to establish the difference between changes in research capacity and the associated outcomes achieved as a result of Sêr Cymru II, and the change in research capacity which would have happened in the absence of the Sêr Cymru operations. In other words the CIE approach uses a hypothetical control or comparator which enables the comparison of the Sêr Cymru intervention against a condition of no strategic intervention to grow research capacity in Wales.

8.8 Thus, there are two objectives a CIE needs to fulfil:

- Accurately measuring a baseline for the relevant outcomes or impact indicators and monitoring the change that occurs after the operation has been implemented.
- Disentangle the influence of Sêr Cymru II from other factors (such as past or other concurrent investments in research capacity and facilities, external influences or relevant policy changes) on impact indicators to isolate the impact of the operations.

8.9 Both of these can potentially be achieved using various counterfactual methods, which can be selected based on the nature of the intervention, the impacts it is aiming to support, and practical considerations such as the data which is available to carry out the CIE.

Measuring change in research capacity and outcomes

8.10 There are varying options for measuring change in research capacity in Wales, depending on the institutional level at which the intervention and the outcomes are being observed (varying from researchers to the whole HEI):

- Measuring change at the level of researchers or research groups would involve an analysis of research outputs (publications and citations) and could enable the tracking of both capacity and output performance before (if relevant, as not all groups may exist pre-Sêr Cymru), during and after the timeframe of the Sêr Cymru II operations.
- Measuring at the level of STEMM departments within HEIs: A breakdown of research income and research staff by the four STEMM departments/subject areas is available from HESA, allowing us to observe changes in research capacity in areas of research and at HEIs which Sêr Cymru will have financially supported.

- Measuring at the HEI level. This would involve analysis of datasets on HE performance published by HESA (research income and research staff numbers), which allows aggregating up to all-Wales level.

- 8.11 Ideally, subject to the availability of data, the analysis would be undertaken at all of these levels and the potential contribution of research outcomes from the Sêr Cymru funded researchers could be tracked through to changes at the level of the HEI. However, given availability of the data and the scale and intensity of the Sêr Cymru operation at the institutional and Wales level, it might be difficult to track these changes through in this manner.
- 8.12 Analysis at the HEI level of relevant STEMM subjects within HEIs provides a more aggregated approach. The difficulty in measuring change at this level rests in isolating the effects of Sêr Cymru II from other interventions that are taking place simultaneously (such as HEIF, COFUND, Sêr Cymru I and other activities).
- 8.13 It is also worth noting that the intended outcomes will take considerable time to materialise. The more immediate outcomes which may be observed, such as changes in research outputs will take time to feed through into increased research income, and then additional research capacity which this extra income will support. This means there may be a lag of several years before impacts can be picked up by the data. In addition, there is a lag in data being gathered, processed and published, which adds to the delay of impacts being observable.
- 8.14 In addition to using quantitative analysis, qualitative methods should be used to understand the intervention in context (for example, consultations or surveys of participating bodies). While this is not a substitute for quantitative analysis, it is nevertheless important in understanding the processes of the intervention and the participant journeys on the way to generating impacts (to elucidate how and why impacts are realised).

Establishing a Counterfactual

- 8.15 Establishing an appropriate counterfactual is the essential step in isolating and understanding the true impact that an operation has created.
- 8.16 The most technically robust approaches to the counterfactual draw upon comparator or control groups of non-participants for the intervention being evaluated. The main assumption is that the post-policy outcome in the control group can provide an estimate of what would have happened to the treatment groups had

the project not been implemented. As part of a robust CIE it is necessary to demonstrate that this assumption is plausible.

8.17 An ideal approach is to use a Randomised Control Trial, (RCT) which is the 'gold standard' of CIE used in medicine and other disciplines. However, interventions such as Sêr Cymru II do not use a random assignment, so the best alternative is to simulate randomness by introducing quasi-experimental methods. These are also not always possible, in which case counterfactual alternatives need to be applied. One of the possible options is to compare changes in key measures between:

- Researchers in Wales and in each operation area with researchers elsewhere with the same characteristics.
- Research groups or departments in Wales and in each operation area with others with the same specialisms or subject focus in other universities outside Wales.
- Wales HEIs with other comparable universities outside Wales.

8.18 While it has its merits, it is important to note the issues which the comparable analysis approach introduces for the CIE. These include:

- Selection bias. There is a possibility that Sêr Cymru II funded researchers are different in some significant way that we cannot observe, and therefore cannot control for. It may be that participants have more motivation which drove them to apply to Sêr Cymru II, or conversely, they may be less good at research which is why they require Sêr Cymru II support. These unobservable factors are problematic in the context of evaluating Sêr Cymru II as they hamper comparison on a like-for-like basis.
- Other Contributory Factors. Universities are complex organisations affected by many factors which influence research capacity and outcomes. The standard regression or difference in difference (DiD) analysis can be used to statistically control for differences in characteristics between the treatment and control groups and to account for the other factors which can affect changes in impact variables. However, not all factors can be observed and controlled for.

8.19 These considerations have informed our approach to considering counterfactual impact evaluation options for Sêr Cymru II.

Approach

8.20 The method has been informed by undertaking the following tasks:

- Reviewing guidance on counterfactual impact evaluation methods and the types of requirements for different methodological approaches.
- Reviewing good practice evidence for CIEs primarily in the higher education context but also more generally for economic development and regeneration.
- Examining the type of applications (both successful and unsuccessful) which have been received to date by the Welsh Government.
- Considering the application of these methods to Sêr Cymru II, allowing for the current and future policy, economic and investment context.

Guidance

8.21 The review has covered:

- The UK Government's Magenta Book which provides evaluation guidance¹⁰⁹. This covers the purpose of CIE but is limited in terms of its coverage of methodologies.
- WEFO project monitoring and evaluation guidance. This provides high level coverage of both CIE and ToC approaches.
- European Commission Evalsed Unit. This source provides detailed guidance on CIE methods, the context in which they can be used, data requirements and some consideration of respective 'pros' and 'cons'.
- Material by the What Works Centre. This work focuses on making the case for CIE and objective measures of the robustness of CIE methods (e.g. the Maryland Scale). However, it contains less information relating to lessons from the adoption of different CIE methods.

Good Practice

8.22 There is currently little use of the more robust CIE methods to assess the impact of policies or investment programmes in higher education, including randomised control trials, quasi-experimental methods or simple matched comparator groups. This includes the Department of Education, funding agencies and research councils.

¹⁰⁹ <https://www.gov.uk/government/publications/the-magenta-book>

- 8.23 There are a few exceptions, including the evaluation of the Higher Education Investment Fund (HEIF). The more common approach is theory of change, using mixed methods to explore the nature of change and the factors which contribute to this including consultations, stakeholder focus groups and beneficiary surveys i.e. the triangulation of evidence generated from various methodological approaches.
- 8.24 Consequently, there are few comparable examples and hence opportunities to learn from the experience of other evaluators. The lessons from the use of CIE methods from other thematic intervention areas can however be applied to research capacity investment and are helpful.
- 8.25 Among the identified studies is the impact evaluation of the COFUND financed Schrödinger Erwin Fellowships¹¹⁰. The intervention has two goals: to enable researchers to gain experience at foreign research institutions at the post-doctoral level, and to contribute to the development of science in Austria by gaining access to new scientific areas.
- 8.26 Thus, the impact of the Schrödinger Program was assessed at three levels:
- The level of individual researchers.
 - Impact on research institutions.
 - Impact on the Austrian science system and the European research area.
- 8.27 The evaluation approach used a combination of methods, including an online survey, bibliometric analysis and a workshop. The assessment was undertaken using a control group of researchers by matching participants to comparable researchers using bibliographic information in the Scopus database¹¹¹.
- 8.28 The database provided access to contact information for researchers, which enabled a survey of both participants and a 'non-treated' control. The database allowed the creation of a control group based on the following criteria:
- Research field in which most publications were published.
 - Gender of the researcher.
 - Scientific age of the researcher (i.e. the number of years the researcher has been actively publishing).
 - Austrian institution as research address.

¹¹⁰ Meyer, N & Buhner, S (2014) *Impact Evaluation of the Erwin Schrödinger Fellowships with Return Phase*

¹¹¹ Scopus is a database of scientific publications containing bibliographical information.

- 8.29 To allow for the likelihood of a lower survey response rate among the control group, the control group selected was three times larger than the number of Schrödinger fellows, i.e. three matches were identified for each fellow. In addition to the survey, the evaluation used bibliometric analysis of publication output of fellows and the control group, to assess the differences in publication and citation rates between the two groups. The evaluation does not explicitly state whether or how the issue of selection bias was dealt with.
- 8.30 This approach to control group creation could be a useful illustration for Sêr Cymru II as an example of impact assessment at the level of individual researchers. The evaluation showcases the methodological opportunities presented by having access to a rich data source on publications and citations.
- 8.31 Sêr Cymru II and the Schrödinger Erwin Fellowships have a number of key differences in terms of their objectives: Sêr Cymru II is focused on growing STEMM research capacity in Wales, while the Schrödinger programme was also interested in improving career development of individuals who took part. Nevertheless, both evaluations are interested in observing the changes to research outputs in participants. The approach to control group creation and matching used in Schrödinger can inform the approach for Sêr Cymru II. Moreover, it opens up possibilities about the types of analysis that can be conducted by having access to Scopus and similar commercial datasets.

Data

- 8.32 There are broadly three groups of data sources which the Sêr Cymru II evaluation will be able to draw upon to gain inference on outcomes and impacts.

Project monitoring data

- 8.33 Monitoring data is collected on a quarterly basis as part of the project, which is a rich source of quantitative and qualitative information. The gathering of data takes place after 3 months, 18 months and at the end of the project.
- Qualitative information includes a project abstract from researcher, the methods and results of the project, as well as progress against the original timeline.
 - Quantitative information includes the number of published research papers, book chapters, books/monographs, commercialisable outcomes, public

engagement activities, awards, societal and economic benefits arising from the work.

8.34 For the purposes of the CIE, quantifiable information from the monitoring reports is the more valuable source. Evidently, the data which is collected is only available for the project participants who are being monitored. This poses a constraint for the CIE, as the information cannot be replicated for researchers from other non-treated institutions. This limits the extent to which the data can be used in the context of a CIE approach, although it is still a useful source of information on the progress of the ERDF operations.

Published sources of HE indicators

8.35 A range of published data sources are available on research income, research capacity (as measured by the number of research staff at HEs), collaborative research contracts and income, as well as commercial outcomes (these sources have been detailed in the baseline chapter).

8.36 The benefit of the outlined indicators is the accessibility of data and the fact that these are available for all UK institutions across academic years. This is useful for the purposes of the CIE, as it enables matching of universities in Wales and elsewhere in the UK, as well as analysis on a regional level.

8.37 However, there is a question of how visible the activities of Sêr Cymru II will be at an institutional level and in this context there are a number of time lag considerations that need to be noted:

- Supported researchers will take time to produce their research and turn it into publications.
- The published outputs need to be recorded by the HEI, and the gathered data submitted to HESA.
- The data submitted to HESA then needs to be processed and published. The release dates for HESA are around spring time each year for data gathered in the previous academic year. This creates a lag of more than a full academic year just to release the data (i.e. at the time of writing, the latest data available is for academic year 2015/16).

8.38 Considering all time lags simultaneously, there may be a delay of several years between impacts materialising, being recorded and then published. As well as time lags involved in publishing data, there are lags in impacts that would be measured using the given sources. These are discussed later in this chapter.

Bibliographical data on research output

8.39 There are commercial data sources providing information on research outputs, such as publications and citations. One of the examples mentioned earlier is Scopus by Elsevier, containing bibliometric information on individual researchers and their affiliations with institutions. The Schrodinger evaluation demonstrates the use of Scopus for constructing control groups.

8.40 This is a potentially useful source of information for the CIE of Sêr Cymru II. It would require a careful matching of 40-50 Sêr Cymru II participants with counterparts, which would be a complex undertaking in itself but is achievable. One limitation is that Scopus might not include data on research grants, which means the data would need to be cross-referenced or supplemented by other sources on research income measures. While it is straightforward to obtain grant information for participants (from project monitoring data), this may be a challenge for control group participants. HESA research income is not available at the level of individual researchers or even research groups, so alternatives would need to be explored.

8.41 A potential option using the example of the Schrodinger evaluation, would be to use the contact information from Scopus to survey the control group researchers and ask for information on research grants.

8.42 A major issue is gaining access to Scopus which is a commercial database of bibliographical data run by Elsevier. Whilst it is the world's largest abstract and citation database of peer-reviewed literature, it also includes data on research grant income secured by researchers (although coverage is more partial). As Elsevier is a commercial provider of data, there is a charge for access to Scopus and strict terms governing the use and publication of data. The options for access are:

- i. Welsh Government subscribe to Scopus at an annual cost of c£10,000 and negotiate access to the database for the evaluators
- ii. Specific data analysis and extraction is commissioned from Elsevier's analytical team, with the data being provided to the evaluators to enable the CIE analysis – the exact costs of this option will depend on the precise

specification, although initial discussions suggest it could be between £12-£15,000

- iii. Welsh Government explore the possibility of commissioning Elsevier’s analytical team to undertake the CIE analysis (in addition to the data selection and cleaning).

Sêr Cymru II Projects and Application processes

8.43 A summary of Sêr Cymru II awards is presented in Table 8.1. At the time of writing, 11 fellowships had been awarded in East Wales, and 18 fellowships and one Chair in West Wales and the Valleys. The project has a high success rate in terms of the proportion of approved applications. The success rate reflects the targeting and selection approach which was undertaken, discussed below.

Table 8.1 Applications Summary

	East Wales		West Wales and the Valleys	
	Number of applications	Number of successful applications	Number of applications	Number of successful applications
Fellows	12	11	23	15
Recapturing talent	0	0	2	1
Rising star	0	0	5	3
Total fellowships	12	11	30	18
Research Chairs	2	0	2	1

Source: Sêr Cymru II application record

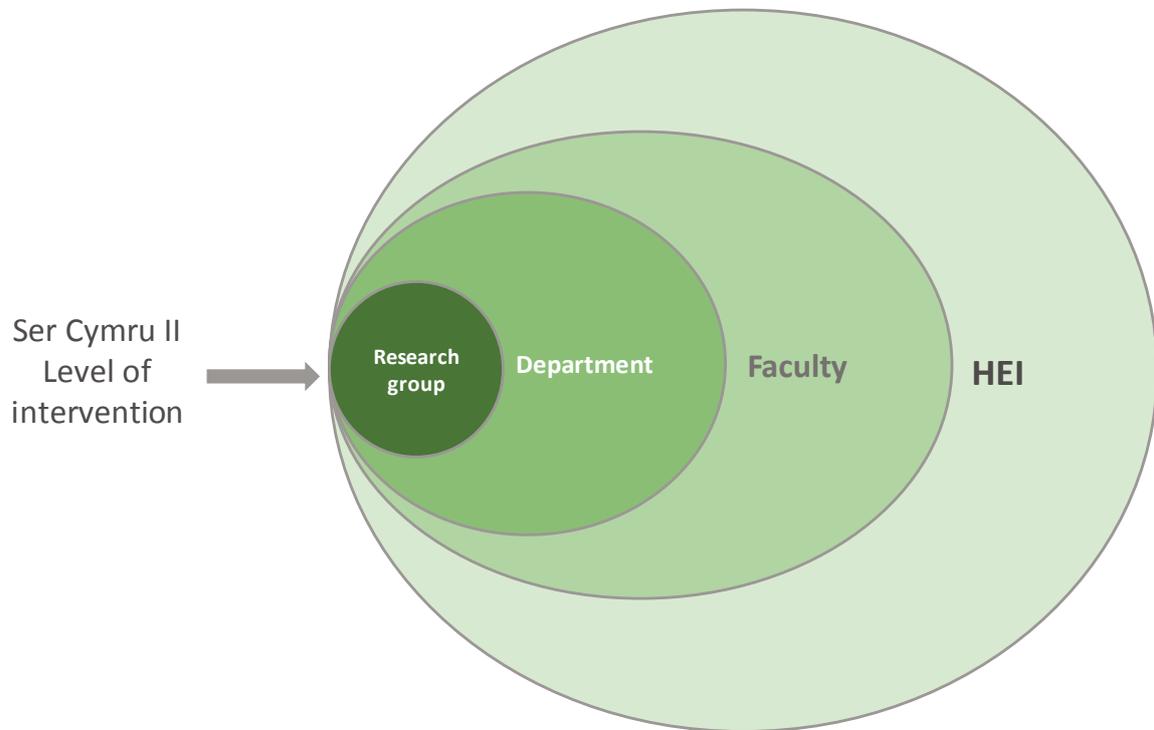
- 8.44 The bidding process was subject to initial filtering and as outlined earlier in this report universities have played a key role in seeking expressions of interest from their departments and research groups (formally or informally), prioritising applications, and then engaging in dialogue about the strengths of the potential bid and its fit with the Welsh Government priorities, such as sector specialisms and the grand challenge areas. As a result of this process, Sêr Cymru II has a high approval rate among applicants.
- 8.45 This process has implications for the CIE options in as much as it limits the number of unsuccessful applicants as potential control group participants. These implications are discussed later in chapter.

Approaches to use of CIE in the context of Sêr Cymru II

- 8.46 In broad terms, the main methods of CIE are Randomised Control Trials (RCT) and Quasi Experimental Methods.
- 8.47 RCTs aim to approximate natural experiments by randomly assigning participants treatment and control groups, and then observing the outcomes for both groups. In RCT, any differences in outcomes can therefore be attributed to the intervention. However, RCT is not a feasible method for Sêr Cymru II as it is a selective process and does not include any element of random assignment.
- 8.48 When RCTs are not feasible, there are methods that resemble randomisation by selecting a control group of non-participants that closely resemble those receiving the intervention, i.e. quasi-experimental methods.
- 8.49 Examples of quasi-experimental and other CIE techniques used to evaluate policy interventions include regression discontinuity, matched comparison groups (such as propensity score matching), difference in-difference (pre and post, with and without comparisons), non-equivalent comparison groups etc. The ease of application and robustness of the methods varies in this context, offering both advantages and disadvantages. These methods and their applicability to Sêr Cymru II are examined in more detail, bearing in mind the following factors which influence the design of the approach:
- Scale of the intervention. Although Sêr Cymru II is a major strategic investment (taking place alongside COFUND) into research capacity of Wales' eight Universities, it is relatively modest in the context of the scale of annual research income (circa £8m compared to £205m annually). Putting this into the context of the annual gap of £94m in research income which Sêr Cymru II is aiming to help close, the intervention is still relatively small-scale in relation to the problem it aims to help solve. The implication of this for the CIE is that it ideally requires a large sample of participants to improve the robustness of the method.
 - Level of intervention. The investment is highly targeted at specific STEM-related research expertise and supporting individual researchers. These researchers typically form part of a research group, which is within a department, which is itself within a faculty at an institution. In this context, the more aggregated the level of assessment gets, the more difficult it becomes to disentangle the research outcomes, and attribute the impact of the

intervention on research capacity across Wales. The further away we move from the level at which Sêr Cymru II is applied, the more factors come into play which can influence the outcomes that are observable.

Figure 8.1: Sêr Cymru II. Level of Intervention in Context



Source: Regeneris Consulting

- Other interventions. Although different in its focus, Sêr Cymru II is a successor programme, with the research outcome benefits from the original programme still likely to be occurring but not substantiated by evaluation evidence. The COFUND element also has similar investment objectives and is delivered in parallel with the ERDF operations. The past and current ERDF programme are also investing in complementary HE infrastructure and facilities (for instance through Priority Axis 1 of the WWV and EW Operational Programmes) which will contribute directly or indirectly to research and collaborative outcomes. Disentangling these effects from Sêr Cymru II is a major challenge for CIE. With simultaneous interventions focusing on growing research capacity, directly attributing impacts to any given operation is extremely difficult.
- Timing of impact. As outlined earlier in the section, there will be time lags involved in impacts materialising and being captured by datasets. It can be argued that an intervention such as Sêr Cymru II should be evaluated over a decade to capture the true extent of its impact.

Regression Discontinuity Analysis (RDA)

- 8.50 In light of the above considerations, RDA is a method which aims to approximate RCTs and is one of the best relevant approaches, scoring 3 on the Maryland Scientific Methods Scale (SMS)¹¹².
- 8.51 Given the competitive application process involved in Sêr Cymru II, it may be possible to use RDA to compare the characteristics and outcomes for similar successful and unsuccessful applicants. A degree of quasi-randomness could be introduced in treatment or non-treatment groups, for example, by choosing applicants which just fall short or just surpass the selection threshold. This requires an objective, quantified scoring application process, as well as a large volume of applicants.
- 8.52 A key requirement for RDA is a scoring framework which can determine the threshold for the pool of successful and unsuccessful applicants, where both groups possess a similar likelihood of being selected. By comparing the outcomes between the two groups around the threshold, the process resembles a RCT.
- 8.53 Another requirement for the method to work is a sufficiently large enough sample of applicants, so that a sufficient number of participants can be identified around the threshold. If the sample is small, there is an option to increase the threshold, but this would result in more bias introduced to the process potentially undermining the method.
- 8.54 In addition, the approach requires a relatively large amount of information to be captured on the unsuccessful applicants either through:
- Databases which track the research performance and outcomes. This would require information on publications, citations, and information to tie back the individual researchers to research groups and institutions. As already discussed in the data section, we do not currently have access to such a database, which limits the use of this approach.

¹¹² Where level 5 score includes the use of RCT. Level 3 score is defined as “Comparison of outcomes in treated group after an intervention, with outcomes in the treated group before the intervention, and a comparison group used to provide a counterfactual (e.g. difference in difference). Justification given to choice of comparator group that is argued to be similar to the treatment group. Evidence presented on comparability of treatment and control groups. Techniques such as regression and (propensity score matching may be used to adjust for difference between treated and untreated groups, but there are likely to be important unobserved differences remaining.”

- Surveys of unsuccessful applicants. This raises some challenges around the research method and introduces an element of self-reporting into the process. However, it is a useful tool which can be used in isolation as well as in combination with bibliographical analysis (as discussed in the Schrodinger evaluation example). One of the likely challenges would be the response rate realistically achievable as well as the breadth, depth and robustness of the information which can reasonably be gathered.
- An RDA needs to draw on a clear application and scoring process, (which Sêr Cymru II has in place) and would allow for analysis of applicants based on obtained scores. Another requirement is a large volume of applicants. This creates a difficulty for Sêr Cymru II due to the filtering process involved which determined focus areas for bidding among HEIs.
- By focusing on select research areas within institutions, the project secured high success rate with a limited pool of unsuccessful applicants. This therefore limits the ability to create a threshold around marginally successful and unsuccessful applicants, as the pool of these is very limited. This rules out the possibility of using CIE at this stage.

Benchmarking Comparative Performance

8.55 Benchmarking the performance of HEIs in Wales with comparable institutions in the UK can provide the basis for a basic difference in difference analysis. The approach is not strictly using a control group and is not a CIE, which would allow for selection bias. However, given the available data sources, it is a pragmatic approach of comparing performance pre and post intervention.

8.56 There are several ways to approach this:

- Within treatment institution comparisons. Using the data on research income and number of researchers, comparison can be made on an overall HEI level, HEI by STEMM level or more detailed subject categories. A limitation of the approach is that it does not allow the tracking of dynamics within HEIs and to explicitly trace back activities to Sêr Cymru II. It may also introduce bias if the funding for Sêr Cymru II researchers is displacing other STEMM or non-STEMM research activities.
- Comparator geographies. Aggregated comparisons can be made between all HEIs based in the UK as a whole, and UK regions. The comparison can be made using STEMM research income or researchers, as well as the more

detailed subject areas. This approach would be a simple benchmarking comparison in practice, as opposed to a CIE.

- Comparator institutions. There are ways of selecting groupings of institutions (e.g. Russell Group) or selecting individually matched institutions to those in Wales. This can be done based on research income and staff measures, university size and specialisms in a given research area by subject. Time series data enables comparison of growth trajectories across these indicators in individual HEIs to improve or validate the matches. Again, this is a comparative benchmarking approach, although more sophisticated through focusing on comparable institutions based on chosen measures.

- 8.57 The latter seems to be the most feasible approach to apply to Sêr Cymru II given the data which is available and the methodological issues discussed. The comparator institutions (i.e. our control group) can be selected on the range of indicators available allowing for a few versions of the analysis. The comparison can then be made over time and between groups, as well as within groups and over time.
- 8.58 One of the key assumptions for this DiD approach is a common trend, that is, it assumes that without Sêr Cymru II, the HEIs in Wales and matched institutions would follow the same trend in research capacity measures. Achieving this assumption might be challenging, considering the effect of policy environments and external forces (highlighted in the logic models) that affect how institutions operate. This will be kept in mind during the matching process, as the closer the match, the more likely this assumption would be satisfied.
- 8.59 The data that is currently available covers research income and staff indicators for the 2015/16 academic year. A key requirement is the availability of the data to measure post-intervention performance. HESA publish the outlined indicators on an annual basis, so data availability should not be a constraint. Another consideration are time lags involved in publishing the data, as well as the time lag in actual impacts materialising. It is worth bearing in mind that this may limit the effectiveness of the approach and the extent to which it can capture the true impact of the intervention. To improve the robustness of the method, a longer timescale post-intervention might need to be considered. This may help inform thinking about the design of the summative evaluation specification for Sêr Cymru II.

8.60 All of the approaches outlined above include some degree of compromise. Comparisons of treatment and control groups at the institution level is less analytically and data-demanding, but also less analytically powerful. Analysis at the level of research teams or groups is more robust, but would require comparable data for treatment and control groups, and information at the level we currently do not have access to.

Qualitative Research

8.61 Qualitative research can be used to supplement the quantitative analysis. One of the options would be to undertake a survey of successful and unsuccessful applicants to observe the differences in research output performance between the two groups. A key challenge here would be securing a reasonable response rate from the unsuccessful applicants to be able to make conclusive comments on the findings, as well as the restrictions imposed by the bidding and filtering process at the participating HEIs.

8.62 It would also be important to design a survey with the appropriate focus. As discussed at the start of the chapter, Sêr Cymru II is focused on growing STEMM research capacity across Welsh institutions, as opposed to career development of individual researchers. This may limit the relevance of the survey for the outcomes of Sêr Cymru II.

8.63 Finally, a major limitation of conducting a survey of applicants is the design of the application process and its filtering. We discussed the targeted approach participating institutions had taken in accepting applications, which resulted in a high success rate. So in fact, there is a very limited pool of unsuccessful applicants to draw on for a survey which would be compounded with the likelihood of a low response rate.

8.64 Aside from a survey, semi-structured consultations with participating universities would be beneficial to gain an understanding of the differences in context at each of the institutions. Wales' universities have varying research strengths in different areas, so it is important to understand how this would impact on the comparability of results across the board.

Evaluating Impact: Conclusion

8.65 Based on the considerations outlined in this chapter, a plausible approach to the CIE of Sêr Cymru II is a comparative benchmarking exercise at the level of HEIs and STEMM subjects.

8.66 The approach would match participating HEIs in Wales with comparators across the UK based on the following criteria:

- STEMM research income (data source: HESA 2015/16).
- Number of STEMM researchers (data source: HESA 2015/16).
- STEMM research strengths by available subject breakdown (data source: HESA 2015/16).
- Trends in STEMM research income (data source: HESA 2012/13 and 2015/16).

8.67 To do this, all HEIs in the UK can be ranked on these indicators. Comparators can then be identified around each Wales' HEI by a defined threshold, allowing for more than one match for each HEI in Wales. This should allow for a sizeable control group to be created and observed.

8.68 The table below is an example of how benchmarking can be carried out. The table benchmarks the performance of Cardiff University in research in medicine, dentistry and health. It shows that Cardiff ranks 13th for both the subject research income and the number of FTE researchers in this field.

8.69 A comparative approach would be to select a group of HEIs in the rest of the UK that perform similarly to Cardiff University on these measures. To do this, we would need to decide on a threshold of which universities to include. Ideally, we would also undertake an analysis of change over time to exclude any outliers and validate the comparator group.

Table 8.2: Cardiff University: Medicine, dentistry and health rankings

Rank	HEI	Research income (£m)	Rank	HEI	Researchers (FTE)
10	Queen Mary University of London	67	10	Queen Mary University of London	740
11	University of Newcastle-upon-Tyne	66	11	University of Nottingham	730
12	The University of Birmingham	64	12	The University of Glasgow	715
13	Cardiff University	62	13	Cardiff University	705
14	The University of Bristol	49	14	The University of Bristol	690
15	Liverpool School of Tropical Medicine	45	15	The University of Leeds	685
16	The University of Liverpool	44	16	The University of Sheffield	655

Source: Regeneris Consulting analysis using 2015/16 HESA data

- 8.70 To supplement the quantitative analysis, it would be beneficial to consult (as planned during the mid-term evaluation) with participating HEIs in Wales to better understand the research context at each of the institutions, and clarify any implications this has for Sêr Cymru II.
- 8.71 The recommendation above is made on the basis of data which is available to evaluators at present. The CIE could allow for more options if additional data became available, particularly on research outputs (i.e. Scopus). Getting access to publications and citations information would allow additional analysis around research outcomes and for comparison at the level of researchers and research groups, as well as HEIs.
- 8.72 In addition, Scopus would allow the construction of research group comparators including the possibility of surveys of non Sêr Cymru II supported researchers using the contact information from the database.
- 8.73 We would therefore recommend the Welsh Government explore the possibility of gaining access to Scopus, given the options for CIE it would open-up for future evaluation of Sêr Cymru II but also for other research focused ERDF operations funded via the ERDF Programmes and specifically through Priority Axis 1, Specific Objective 1.1.
- 8.74 With regard to monitoring information, we recommend that the data is made available in an anonymised and quantifiable format, which would allow analysis and consistency.

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Annex 1: Analysis of data sources and their potential utility in the context of Sêr Cymru II

Source	Variables available	Time period	Breakdowns available	Conclusion
HESA	Research income	2015/16 Time series back to 2012/13	Source of income STEMM/Non-STEMM Subject area Institutional	<p>Very useful for the baseline: enables benchmarking with UK as a whole, trend analysis and analysis by subject area (cost centres) Not possible to break down research staff by grade/type of researcher (other than nature of contract) Can be benchmarked as a percentage of UK total and per researcher (for income) Income can be analysed at institutional level if needed Can be tracked annually</p>
	Research staff		Research only Research and teaching STEMM/Non-STEMM Subject area Gender	
HE-BCIS	Income from collaborative/ contract research, consultancy Number of contracts with businesses Patents filed Licenses IP income Spin-offs	2014/15 (2015/16 unlikely to be available in time for our baseline) Time series back to 2011/12	Institutional contracts and income broken down by SME/Non-SME	<p>Useful for the baseline: enables benchmarking with UK as a whole, trend analysis and comparison with other HEIs Can be benchmarked as a percentage of UK total and per researcher/academic) Can be tracked annually but need to bear in mind time lags between appointment of researchers and achievement of the outputs covered here Main limitation is lack of subject area breakdown available.</p>
Elsevier (drawing on Scopus)	HE and all researchers Publications Citations	2000-2014 (2000, 2005, 2011, 2014)	Subject area Co-authored Publications by location of co-author	<p>Useful as contextual baseline data on productivity, efficiency, citation impact and collaboration But no firm commitments to update this report, so usefulness unclear for later monitoring and evaluation. If access to Scopus can be acquired for the later evaluation, the source will provide useful and up-to-date information of research outputs. However, need to bear in mind time lags between appointment of researchers and subsequent publications and citations. Also worth noting that</p>

				publications data is as much a reflection of the number of journals and the volume of competing articles for publication.
REF 2014	Star rating of research submitted	Sept 2013 submissions	Unit of Assessment/ Subject area Institution Research group Staff member	Useful as contextual baseline data on quality, less so on capacity and is now four years out of date Cannot be tracked annually Depends on research submitted for assessment Comparability of REF 2020 and REF 2014 unclear Timing of REF 2020 does not fit with Sêr Cymru II timescales

Source: Regeneris Consulting

Annex 2: Summary of Round 1 Approved ERDF Fellowships

Host university (Operational Programme)	Fellowship Title	Category	Principal Grand Challenge Area
Cardiff (EW)	InGaAs nanopillar SPADs for single photon sensing at near infrared wavelength	Research Fellow	Advanced engineering and materials
Cardiff (EW)	Monolithically grown InAs nanowire APD on silicon-on-insulator substrate for high speed and low cost coherent optical communication system	Research Fellow	Advanced engineering and materials
Cardiff (EW)	Synthetic Bioluminescence: Next-Generation Technology for Dual-Colour Deep-Tissue High-Resolution Bioluminescence Imaging	Research Fellow	Life sciences and health
Cardiff (EW)	Biomolecular mechanisms underlying cellular responses to non-thermal electromagnetic fields: getting to the 'heart' of the matter	Research Fellow	Life sciences and health
Cardiff (EW)	Vector-borne emerging diseases: computer-aided design, synthesis and biological evaluation of novel antiviral compounds against Chikungunya and Zika viruses.	Research Fellow	Life sciences and health
Swansea (WWV)	Exploiting triplet excited states in organic semiconductors for organic electronic and spintronic devices	Research Fellow	Advanced engineering and materials
Swansea (WWV)	Green low surface energy materials	Research Fellow	Advanced engineering and materials

Swansea (WWV)	Ultra conductive copper-carbon nanotube wire: enhancing electrical performance, achieving processing reproducibility, and ensuring stability	Recapturing Talent	Advanced engineering and materials
Swansea (WWV)	Towards enabling the quantification of the manufacturing process on the efficiency of aerodynamic components	Research Fellow	Advanced engineering and materials
Swansea (WWV)	The armchair quantum wire: energy distribution for the 21st century	Research Fellow	Low carbon, energy and the environment
Swansea (WWV)	Stability of Solution Processed Solar Cells	Research Fellow	Low carbon, energy and the environment
Swansea (WWV)	Ser SAM	Chair	Low carbon, energy and the environment
South Wales (WWV)	Consensus analysis and synthesis for networked multi-agent systems with randomly occurring incomplete information	Research Fellow	ICT and digital economy
South Wales (WWV)	Novel operational control and mitigation strategies for nitrous oxide (N ₂ O) emissions from wastewater treatment plants-Control N ₂ O	Research Fellow	Low carbon, energy and the environment

Source: Welsh Government Monitoring Data

Annex 3: Summary of Round 2 Approved ERDF Fellowships

Host institution (Operational Programme)	Fellowship Title	Category	Principal Grand Challenge Area
Cardiff (EW)	In Vivo Functional Imaging of Top-down Cortical Dynamics in Health and Disease	Research Fellow	Life sciences and health
Cardiff (EW)	Global Sustainability and Food Security: assembling sustainable and just cities	Research Fellow	Life sciences and health
Cardiff (EW)	Biotic versus abiotic drivers of nutrient generation in subglacial environments	Research Fellow	Life sciences and health
Cardiff (EW)	The holy-grail of diabetes management: bloodless, painless, and accurate microwave continuous blood glucose monitor	Research Fellow	Life sciences and health
Cardiff (EW)	Accelerating Chemical Transformations Using Renewable Energy	Research Fellow	Low carbon, energy and the environment
Cardiff (EW)	Development, evaluation and validation of a microfluidic device for pathogen detection and quantification using Loop-mediated Amplification (LAMP) and Bioluminescent Assay in Real Time (BART)	Research Fellow	Life sciences and health
Aberystwyth (WWV)	SoIHeat - The key to heating the Sun's atmosphere: ubiquitous small-scale plasma flows	Research Fellow	Low carbon, energy and the environment
Swansea (WWV)	Nanostructured materials with target modifiers for electro-catalytic	Research	Low carbon, energy and the

	reduction of carbon dioxide (TMERC)	Fellow	environment
Swansea (WWV)	Advanced computational methods for optimal feedback control with applications in engineering and life sciences	Research Fellow	All
Swansea (WWV)	Discovering the crustal structure beneath the Greenland Ice Sheet and its control of ice mass loss and sea level rise	Research Fellow	Low carbon, energy and the environment
Swansea (WWV)	Synergy of Nanocatalysts and Nanowires for a New Sensing Platform	Research Fellow	Low carbon, energy and the environment
Swansea (WWV)	Engineering the new generation of biomimetic artificial muscles	Research Fellow	Life sciences and health
Swansea (WWV)	A practical toolkit for metallurgists to study plastic deformation	Research Fellow	Low carbon, energy and the environment
Swansea (WWV)	Printable Graphene Metal Organic Frameworks (GMOF) Composite Sensor platform	Research Fellow	Life sciences and health
Swansea (WWV)	Developing Light and Electron Driven Nanoscale Catalysts for Water Treatment and Renewable Green Fuel Generation (LED-NaCat)	Rising Star	Low carbon, energy and the environment
Swansea (WWV)	Cholesterol metabolites in dopamine neuron development and Parkinson's disease diagnosis and therapy.	Rising Star	Life sciences and health
Swansea (WWV)	Next-generation semiconductors for photodetectors and optoelectronics	Rising Star	Low carbon, energy and the environment

Source: Welsh Government Monitoring Data

Annex 4: List of organisations consulted

Aberystwyth University
Bangor University
Bristol University
Cardiff Metropolitan University
Cardiff University
Chester University
Coleg Cymraeg Cenedlaethol
HEFCW
Life Science Research Network Wales
Medical Research Council
See Science
Sêr Cymru National Research Network for Low Carbon, Energy and Environment
Swansea University
Tenovus Cancer Care
The Engineering Education Scheme Wales
The Learned Society of Wales
TWI Ltd.
Ulster University
University of South Wales
University of Wales Trinity St David
WEFO
Welsh Government

Annex 5: Semi-Structured Discussion Guides used for scoping and stakeholder interviews

Involvement with Sêr Cymru

1. First of all, could you tell me about your role and how you are involved with Sêr Cymru II? *Ask about any involvement in the predecessor Sêr Cymru I programme for background context.*
2. Specifically, have you been involved with the design, development and implementation of Sêr Cymru II? If so, what was your involvement?

Design and Rationale of Sêr Cymru II

3. In your view, is there a need for Sêr Cymru II?
 - If so, specifically, what evidence is there to support this view?
 - Is the need consistent across West Wales and Valleys and East Wales or are there nuances/differences?
 - Do you feel that there are gaps in research capacity? If so, in what subjects and geographical areas particularly?
 - *[If the respondent believes that there is a need for Sêr Cymru II]* How does the need to build critical mass and research capacity in Wales compare with the situation in the UK, Europe and more broadly?
4. What are the policy/strategy drivers that have shaped and informed Sêr Cymru II?
5. What are Sêr Cymru II's aims and objectives (i.e. what is it setting out to achieve)?
6. Are you aware of any comparable interventions in other parts of the UK or Europe? *[If aware of other, comparable initiatives]*
 - What outcomes and impacts have these other initiatives achieved?
 - What evidence is there to support that view?
7. What lessons or evidence from the delivery of Sêr Cymru I have been used to help inform the design of the Sêr Cymru II ERDF project?
8. In what ways is it reasonable to expect that Sêr Cymru II could contribute to:
 - the objectives of the Future Generations (Wales) Act
 - Welsh Language objectives?
 - The respective strengths and opportunities (e.g. of the existing research base and economic performance) in the West Wales and Valleys and East Wales areas

9. In seeking opportunities to promote the Welsh language, the Welsh Government is keen to explore the extent to which Welsh is currently used in research as a medium for discussion and dissemination. To what extent do you think the Welsh language is currently being used in the context of STEMM research in Wales?

- On what basis do you say that?
- What [if any] role can you see Sêr Cymru II playing in this?

Baseline Position

10. What sources of data could be used to inform the baseline position of STEMM-related research capacity in Wales?

11. To what extent do you think these (and any other) evidence sources could potentially be used to track and assess the progress and impact of Sêr Cymru II?

Implementation Model

12. Is the way in which Sêr Cymru II is implemented appropriate and fit-for-purpose?

13. *The ERDF element of Sêr Cymru II is structured around attracting Rising Stars (26), Research Fellows (30) and Recapturing Talent (12).* Is this structure appropriate?

- Why do you say that?
- Are there any early stage lessons that can be identified in this respect? Do these lessons apply equally to West Wales and the Valleys and East Wales?
- Is there anything about the delivery model that could be improved? Again, do these improvements apply equally to West Wales and the Valleys and East Wales?

14. What role do Welsh HEIs play within Sêr Cymru II? Are they undertaking their role effectively?

15. [*If relevant*] How well aligned are the ERDF and COFUND elements of the wider Sêr Cymru II project?

- How well does this work in practice?
- What issues, if any, does it present?

16. What are your views on the structure of and resources available within the Sêr Cymru II project management team at WG and why?

17. Tell me a little about how the Sêr Cymru II application process works?

- How effective is this?
- What improvements, if any, might be made?

18. How does the Sêr Cymru II selection and awarding process work?

- How effective is the work of reviewers and the evaluation panel?
- How do the reviewers and the evaluation panel ensure that Sêr Cymru II funding is awarded to the research areas with greatest potential?
- Does the process support the aim to achieve increased capacity and income? Why do you say this?
- If there are increases in capacity and/or income, what potential is there for that increase to be sustained after the funding for the operations finishes?

19. Tell me a little about the Programme Beneficiary Board.

- What is its role and how does it work?
- How effective is it? Does it need to be changed or improved in any way?

20. *[If relevant]* Tell me a little about what monitoring processes are in place?

- How effective in your view is the system to date?
- What improvements or alterations if any, should be made?

21. What potential is there for the operations to deliver the cross-cutting themes objectives? [Equal opportunities and gender mainstreaming; Sustainable development and Tackling Poverty and Social Inclusion]?

- What needs to be done to ensure that this potential is fully realised?
- Are there ways in which these themes could be delivered more effectively?

Externalities

22. What external factors have had a bearing on the design and early stage delivery of Sêr Cymru II?

23. In what way could these external factors affect the implementation of the project – now and in the future?

24. What are the potential risks, at both an operational and institutional level, to achieving successful outcomes with the Sêr Cymru II funding?

25. How well is Sêr Cymru II aligned with other funded interventions aiming to promote research excellence and knowledge transfer/R&D between higher education and businesses in Wales?

- Could you provide some examples of where linkages between Sêr Cymru II and other interventions are working well?
- Are there any examples where there may be duplication, overlap or less effective linkages between Sêr Cymru and other funded interventions?

Delivery and Performance

26. How has Sêr Cymru II been promoted to HEIs, prospective applicants (fellows) and prospective partner organisations? (*Prompt: What methods have been used?*)

27. In your view, how effective are these promotion methods?

- To date, what seems to be working well?
- What isn't working so well?
- What lessons have been identified to date?
- Are there specific eligibility related barriers?
- What if anything could be done to stimulate demand for these fellowships

28. It seems that there was some unexpected demand for Chairs (the best, senior academics).

- Why do you think that has been the case?
- Do you think that adapting to this demand, by adjusting the number of Chairs and Fellows, was an appropriate response by Sêr Cymru II? (If no, ask what would have been a better response)

29. What do you know about the nature of the research projects funded by Sêr Cymru II to date?

- In your view, how do the funded research projects compare with the original plan for Sêr Cymru II?
- Specifically, to what extent do the research themes relate to STEMM subjects and the grand challenge areas¹¹³?
- Has the project commissioned a good balance of research activities across the approved fellowships to date?
- Are there any gaps?
- Are there any themes/research areas that you feel may be over-represented?

30. Bearing in mind that researchers have only recently taken up post and some are yet to start, what early-stage feedback (if any) do you have in relation to funded researchers' experience of Sêr Cymru II?

Impact, Attribution and Counterfactual

31. Turning to the indicators and targets for Sêr Cymru II. How familiar are you with these? (*If they are familiar*):

- Are all of the indicators appropriate?
- Are the targets realistic?
- What, if any changes have been made to the suite of indicators and targets to date and why?

¹¹³ Life sciences and health; Low carbon, energy and environment; Advanced engineering and materials

- Overall, to what extent will the impact indicators (which we discussed a little earlier) enable a robust assessment of Sêr Cymru II's achievements?

32. How challenging will it be to isolate the positive effects of Sêr Cymru from other interventions that aim to stimulate research, knowledge transfer, innovation and R&D?

- Do you have any particular views on how that might be done?

33. Are there particular projects/interventions where it may be difficult to identify and isolate their effects from those of Sêr Cymru II?

- If so, which ones are these and are there any agreed methods in place to attribute outputs, results and impacts?

34. To what extent do you think the design of Sêr Cymru II will enable some of the research capacity it invests in to be sustained after the funding?

- How likely is it that institutions will be able to sustain these increased levels of research in future, after the Sêr Cymru II funding ceases to exist?
- What needs to be in place to ensure the sustainability of the increased research capacity for the future?

35. To what extent do you think Sêr Cymru II has the potential to attract commercial and third sector interest?

- What needs to be done to ensure that this potential is fully realised?
- Do you have any views on Sêr Cymru II's potential ability will generate more partnership working in future?
- Do you have any views on Sêr Cymru II's potential ability to attract further funding?

36. Do you think that Sêr Cymru II could result in any unintended (positive or negative) consequences? If so, what might these be and on what basis do you say that?

Semi-structured discussion guide for use during scoping interviews with stakeholders

Involvement with Sêr Cymru

1. First of all, could you tell me about your role and how you are involved with Sêr Cymru II? Ask about any involvement in the predecessor Sêr Cymru I programme for background context.

2. Specifically, have you been involved with the design, development and implementation of Sêr Cymru II? If so, what was your involvement?

Design and Rationale of Sêr Cymru II

3. In your view, is there a need for Sêr Cymru II? If so, specifically, what evidence is there to support this view? Is the need consistent across West Wales and Valleys and East Wales or are there nuances/differences?

4. *[If the respondent believes that there is a need for Sêr Cymru II]* How does the need to build critical mass and research capacity in Wales compare with the situation in the UK, Europe and more broadly?

5. What are the policy and strategy drivers that have helped shape and inform Sêr Cymru II?

6. What in your view has Sêr Cymru II set out to achieve? What are its specific aims and objectives? Are these aims and objectives appropriate and commensurate with the nature and scale of the need and the Welsh Government's policy choices?

7. Are you aware of any comparable interventions in other parts of the UK or Europe? If so, could you tell us a little about them and whether they may have been evaluated? *[If aware of other, comparable initiatives]* What outcomes and impacts have these other initiatives achieved? What evidence is there to support that view?

8. In what ways is it reasonable to expect that Sêr Cymru II could contribute to the objectives of the Future Generations (Wales) Act and Welsh Language objectives?

9. What lessons or evidence from the delivery of Sêr Cymru I and COFUND have been used to help inform the design of the Sêr Cymru II ERDF project?

Baseline Position

10. What sources of data could be used to inform the baseline position of STEMM-related research capacity in Wales?

11. To what extent do you think these (and any other) evidence sources could potentially be used to track and assess the progress and impact of Sêr Cymru II?

12. In seeking opportunities to promote the Welsh language, the Welsh Government is keen to explore the extent to which Welsh is currently used in research as a medium for discussion and dissemination. To what extent do you think the Welsh language is currently being used in the context of STEMM research in Wales? On what basis do you say that? What [if any] role can you see Sêr Cymru II playing in this?

Implementation Model

13. How familiar are you with the Sêr Cymru II implementation model? Depending on familiarity: How appropriate in your view is the delivery and operational model?

14. The ERDF element of Sêr Cymru II is structured around attracting Rising Stars (target of 26), Research Fellows (30) and Recapturing Talent(12). In your view, is this structure appropriate? Why do you say that? Are there any early stage lessons that can be identified in this respect?

15. At this stage, do you think anything in relation to the delivery model could be improved?
16. What role do Welsh HEIs play within Sêr Cymru II? How effectively do they undertake their role?
17. How well aligned are the ERDF and COFUND elements of the wider Sêr Cymru II project? How well does this work in practice? What issues, if any, does it present?
18. What are your views on the structure of and resources available within the Sêr Cymru II project management team at WG?
19. Tell me a little about how the Sêr Cymru II application process works? How effective is this? What improvements, if any, might be made?
20. How does the Sêr Cymru II selection and awarding process work? How effective is the work of reviewers and the evaluation panel? How do the reviewers and the evaluation panel ensure that Sêr Cymru II funding is awarded to the research areas with greatest potential?
21. Tell me a little about the Programme Beneficiary Board. What is its role and how does it work? How effective is it? Do you think it needs to be changed or improved in any way?
22. Tell me a little about what monitoring processes are in place? How effective in your view is the system to date? What improvements or alterations if any, should be made? Are the evaluation panel and the Programme Beneficiary Board getting the information that they need?
23. What plans/provisions have been made to deliver the cross-cutting themes objectives? What is your view on how effective these plans/provisions are to date?

Externalities

24. What external factors, drivers or effects have had a bearing on the design and early stage delivery of Sêr Cymru II?
25. In what way are these external factors affecting the implementation of the project – now and in the future?
26. How well is Sêr Cymru II aligned with other funded interventions aiming to promote research excellence and knowledge transfer/R&D between higher education and businesses in Wales? Could you provide some examples of where it's working well? Are there any examples where there may be duplication, overlap or less effective linkages?

Delivery and Performance

27. How has Sêr Cymru II been promoted to HEIs, prospective applicants (fellows) and prospective partner organisations? What methods have been used?
28. In your view, how effective are these promotion methods? To date, what seems to be working well? What isn't working so well? What lessons have been identified to date?
29. What level of interest has Sêr Cymru II generated amongst target researchers/fellows? How does this compare to what was envisaged at the development stage?

30. What factors have had bearing upon the number of applications received for each element of the project?

31. Specifically, it seems that interest has been lower than expected in relation to Recapturing Talent fellowships? Why is that? Are there specific eligibility related barriers? What if anything could be done to stimulate demand for these fellowships?

32. It also seems that there was some unexpected latent demand for Chairs (the best, senior academics). Why do you think that has been the case? How has the project adapted and responded to this demand?

33. How aware are you of the nature of the research projects funded by Sêr Cymru II to date? In your view, how do the funded research projects compare with the original plan for Sêr Cymru II? Specifically, to what extent do the research themes relate to STEMM themes and the grand challenge areas? Does the balance across these themes and areas strike you as being appropriate to date? On what basis do you say that?

34. In your view, has the project commissioned a good balance of research projects across the approved fellowships to date? Are there any gaps? Are there any themes/research areas that you feel may be over-represented?

35. To what extent do you think the fellowships/research projects commissioned to date include opportunities for interdisciplinary research? (i.e. that combines approaches/data from two or more disciplines or bodies of specialised knowledge)

36. Turning to the indicators and targets for Sêr Cymru II. How familiar are you with these? Probe for awareness of the ERDF output and result indicators and the 'additional' indicators set out in the Sêr Cymru II Business Plan. Probe for any issues that are distinctive to West Wales and the Valleys or East Wales.

37. Are all of the indicators appropriate? Are the targets realistic? What, if any changes have been made to the suite of indicators and targets to date and why?

38. Bearing in mind that researchers have only recently taken up post and some are yet to start, what early-stage feedback (if any) do you have in relation to funded researchers' experience of Sêr Cymru II?

Impact, Attribution and Counterfactual

At this stage, we are not attempting to assess the impacts of Sêr Cymru II since it would be too early to do that. However, we are interested in building solid foundations for a robust impact assessment in due course. In that context:

39. Overall, to what extent will the impact indicators (which we discussed a little earlier) enable a robust assessment of Sêr Cymru II's achievements?

40. How challenging will it be to isolate the positive effects of Sêr Cymru from other interventions that aim to stimulate research, knowledge transfer, innovation and R&D? Do you have any particular views on how that might be done?

41. Are there particular projects/interventions where it may be difficult to identify and isolate their effects from those of Sêr Cymru II? If so, which ones are these and are there any agreed methods in place to attribute outputs, results and impacts?

42. To what extent do you think the design of Sêr Cymru II will enable some of the research capacity it invests in to be sustained after the funding?

43. Do you think that Sêr Cymru II could result in any unintended (positive or negative) consequences? If so, what might these be and on what basis do you say that?

At the inception stage, we are investigating some possible ways of exploring what might have happened if Sêr Cymru did not exist as a means of contextualising some of its achievements (referred to as the counterfactual scenario).

44. Are there any particular data or evidence sources or approaches that you are aware of which might be of use in assisting this process?