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& Industrial Strategy

UK Secondary Benefits Study

The Newton Fund

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TETRA TECH
International Development

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Disclaimer

The views expressed in this report are those of the evaluators. They do not represent those of the Department for Business, Energy and Industrial Strategy, the Newton Fund or of any of the individuals and organisations referred to in the report.

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Acronyms

BEIS	Department for Business, Energy & Industrial Strategy
BGS	British Geological Survey
CSSP	Climate Science for Service Partnership
DFID	Department for International Development (incorporated into FCDO in 2020)
DIT	Department for International Trade
DP	Delivery Partner
EU	European Union
FCDO	Foreign, Commonwealth and Development Office
GBP	British Pound
GCRF	Global Challenges Research Fund
GDP	Gross Domestic Product
HE	Higher Education
HMG	Her Majesty's Government
ICT	In-Country Team
IP	Intellectual Property
KII	Key Informant Interview
MHRA	Medicines and Healthcare products Regulatory Agency
MoU	Memorandum of Understanding
NZD	New Zealand Dollar
ODA	Official Development Assistance
PI	Principal Investigator
R&D	Research and Development
R&I	Research and Innovation
SAC	Satellite Applications Catapult
SDG	Sustainable Development Goals
SIN	Science and Innovation Network
SME	Small and Medium-sized Enterprises
STI	Science, Technology, and Innovation
ToC	Theory of Change
UK	United Kingdom of Great Britain and Northern Ireland
UKRI	UK Research and Innovation

UKTI	UK Trade and Investment (now defunct)
USA	United States of America
UUK	Universities UK

Executive Summary

Overview

The primary purpose of the Newton Fund is development impact, generated through science and innovation partnerships with collaborating countries. In the course of delivering its primary purpose, the Newton Fund also generates secondary benefits, also termed UK Benefits, which arise from Newton Fund activity directly, for example through research projects which are of clear relevance to UK policy goals; or indirectly, for example developing relationships as a result of the collaboration.

This report explores the type and nature of benefits for the UK arising from Newton Fund activity. This report is part of a suite of evidence feeding in to the 2021 Newton Fund Final Evaluation Report, which is published separately. We expect these findings to also be of interest to organisations in the UK research and innovation sector involved in international collaborations.

The methodology for this study included key informant interviews; analysis of data from online and telephone surveys; case studies of UK benefits arising from Newton Fund projects; a review of findings from a close-out survey of businesses and academic partners participating in Innovate UK Newton Fund projects; and a desk review of reports focusing on Newton Fund activity in eight partner countries. Key informant interviewees included senior representatives within HMG and the UK R&I sector, chosen for their ability to provide a perspective on activity across the Newton Fund portfolio of grants. These included stakeholders identified by BEIS and stakeholders identified by the research team directly.

Four types of benefits for the UK are presented in this report: research capacity, knowledge generation, economic and commercial, and relationships and reputation. The findings in each area are summarised below.

Research capacity

Interviewees were highly positive about the Fund and reported a number of ways in which they felt it had benefited UK research institutions, by enabling **new and different types of collaborations** and **improving the quality** of those collaborations.

The Newton Fund **provides funding for academic projects** which respondents felt was not available from other sources. Specifically, Newton Fund funding was seen to be enabling collaborations particularly with middle-income economies and for applied research which respondents valued but were not available from other sources.

Academic respondents emphasised the value of the **academic links and networks** developed through Newton Fund projects. Academic stakeholders reported that the Fund had expanded the size of their research networks in the partner countries, including developing wider institutional links beyond Newton (such as student exchanges). Respondents noted the value of gaining a greater understanding of the academic landscape in partner countries.

In addition, multiple interviewees felt that universities more broadly had been able to **develop their expertise on global challenge topics**. This included capacity improvements in terms of the

management of ODA grants, and developing capacity among UK researchers to develop their knowledge and expertise in applied and impact-focused research.

Online survey respondents indicated that participating in a Newton Fund project had resulted in **personal benefits for them as researchers**, including new opportunities, strengthened relationships, raising the quality of their research, and improving their skills. Many were positive about securing additional funding.

Knowledge generation

Stakeholders were positive about the benefits for the UK in terms of knowledge generation, although the ways in which stakeholders considered it would do so are varied.

While projects are intended to primarily result in impact in partner countries, there are examples of the **potential application of knowledge generated through Newton Fund projects to the UK context**. Numerous interviewees and survey respondents noted the link between **addressing global challenges and UK objectives**, for example through the mitigation of climate change, global food sustainability or global health issues, which would ultimately benefit the UK as well.

Award Holders provided examples of where Newton Fund collaborations had enabled them to **access specific resources and facilities** to which they would not otherwise have access and **tap into partner country networks for dissemination and impact.** Respondents **valued accessing partner country expertise** and the two-way exchange of skills.

Respondents reported that the collaborations made possible through the Fund had allowed them to **develop knowledge in new areas of research** and a **greater understanding of ways of working with researchers in the Global South**, including models for ensuring equitable partnerships.

Economic and commercial

Although half of UK-based respondents to the telephone survey felt there could be (direct or indirect) economic benefits for the UK as a result of participation in the Newton Fund, evidence for the **direct economic benefits arising from Newton-funded research** is currently limited. This is to be expected as the majority of Newton Fund partnerships are not explicitly structured to result in secondary economic benefits given its nature as an ODA fund, and these outcomes have not been centrally tracked by the majority of Newton Fund Delivery Partners. Two examples were identified in country-level case studies of follow-on commercial opportunities for UK organisations arising from Newton Fund activity. Evidence from a survey of businesses and academic partners participating in Innovate UK projects reported more concrete economic outcomes, including many who were expecting to introduce a new product, process or service to the market or firm itself.

In addition, our interviews and case studies found that many **respondents were positive about the wider economic opportunities presented by the Newton Fund**. In particular, respondents noted that Innovate UK calls had enabled UK businesses to engage with **new markets** and develop **new partnerships** that might otherwise be considered too risky, particularly for small and medium-sized enterprises (SMEs). These calls were also seen to provide a unique form of support for early-stage innovation partnerships with emerging economies that is not currently available from Department for International Trade (DIT) activities or other sources.

Interviewees and survey respondents reported benefits in terms of **wider economic links to overseas companies, and the partner country economies more broadly**. This included high expectation on the part of businesses of future collaborations or partnerships in the partner country.

Evidence from the Innovate UK survey also indicates that respondents were positive about **skills development as a result of participating in Newton-funded projects**, with 95% reporting that it had resulted in new or improved technical skills and knowledge among the workforce.

Relationships and reputation

Respondents were overwhelmingly positive about the potential or observed benefits for the UK, in terms of relationships and reputation arising from Newton Fund activity. This included strong feelings among UK interviewees involved in delivering the Fund that the Fund had **strengthened links with government stakeholders in partner countries**. Similarly, interviewees were **positive about the impact of the Fund on relationships between UK Delivery Partners and partner country science and research institutions**. Across the board, UK Delivery Partners were very positive about the impact of the Newton Fund in building partnerships, including extending the work of some UK bodies into countries they had not previously worked in, or developing their networks in these countries.

Concerns were raised about the extent to which relationships between governments and Delivery Partners could be maintained in the absence of a clear reason and mechanism to engage with the partner country institutions (through the Newton Fund or other arrangement). The impact on relationships of uncertainty over the future of funding was also raised as a challenge.

The Fund was seen to **strengthen positive views of UK research and innovation (R&I)**. Views of UK research and innovation were already positive prior to the Newton Fund, and respondents indicated that participating in the research had strengthened these perceptions. Enabling factors included the value of focussing on issues of relevance and importance for the partner country, and the nature of Newton Fund collaborations as equitable partnerships.

Conclusions

Stakeholders hold consistently positive views of the benefits of Newton Fund activity for the UK. The Newton Fund is seen to be leveraging the strength of the UK in science and innovation to develop relationships at all levels (academic/industry, research institutions and governments) with emerging research and innovation leaders, which will be of particular value now the UK-EU funding landscape is changing. The unique structure of the Fund, including the equitable partnership model and funding for early-stage partnerships, is also providing benefits that are not necessarily available through other funding mechanisms.

Even though many projects were not structured in a way to produce benefits directly applicable to the UK, many respondents cited multiple ways in which the UK benefits from project-level activity. These included **developing academic links**, **high-quality academic outputs, tapping into partner country expertise,** and in some cases, potential **economic outcomes**.

Respondents cited many UK benefits arising from the process of implementing the Fund itself – for example, contacts developed between governments and science bodies as a result of

administering the Fund; and academic outcomes, such as developing university capacity to undertake global challenge research.

Detailed conclusions are set out in Section 6.

1. Introduction

1.1. Objective of this report

The Newton Fund is financed from official development assistance (ODA) and as such its primary purpose is poverty reduction and sustainable development in partner countries, achieved through its development of science and innovation partnerships. The UK is a critical and active participant in the international research and innovation ecosystem – the development of which is a central long-term outcome of the Newton Fund. The goal of the Fund is to contribute to economic development and welfare within low- and middle-income countries and the sustainable development goals (SDGs) more generally.

The primary purpose of the Newton Fund is development impact, generated through science and innovation partnerships with collaborating countries. The Fund's Theory of Change (ToC) also recognises that there will be direct and indirect benefits (termed 'secondary benefits') to the UK itself as a result of the partnerships developed through the Newton Fund.[1] Leveraging global research and innovation partnerships not only draws on the UK's research and scientific expertise, it may strengthen and expand it. Interim and long-term outcomes within the Fund's ToC relate to the UK being regarded as a 'partner of choice' for investing in sustainable partnerships; the UK benefiting from an enhanced research and innovation reputation; and the UK participating in mutually beneficial trade and investment opportunities.

This report forms part of a suite of evidence feeding in to the 2021 final report of the independent evaluation of the Newton Fund.[2] Benefits for partner countries arising from Newton Fund activity are reviewed in separate workstreams. However, we hope this report will also make a useful contribution to the wider evidence base on the value and implementation of international research and innovation partnerships.

1.2. Types of UK Benefit

No specific definition of UK benefits has been set by BEIS on the grounds that achieving these benefits is not the primary objective of the Fund, although certain direct and indirect 'secondary benefits' are included in the Newton Fund Theory of Change. For the purposes of this workstream, we define UK benefits as benefits for the UK which have arisen from Newton Fund activity. These may arise directly, for example through research projects which are relevant to UK policy goals (such as climate change mitigation); or indirectly, for example developing relationships as a result of collaboration.[3]

We identified four types of benefit during the research, which are summarised below:[4]

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[1] Further details on the Theory of Change can be found in the Newton Fund Final Evaluation Report.
[2] See Annex B for further details.
[3] We count the direct economic benefits of UK funding (i.e. research funding and staff salaries for UK universities) as direct costs, not as secondary benefits, and so these are not included in this study.
[4] While these were developed by the study team as a framing device during the inception period (in addition to an 'unexpected' category), no additional benefits were identified in the course of data collection that did not fit under one of these categories; for this reason we have used these categories to frame this report.

- Research Capacity: benefits to UK institutions and researchers arising from Newton Fund activities (for example, development of leadership skills and expertise).
- Knowledge Generation: the benefits of the knowledge generated by Newton Fund activities as applied to the UK.
- Economic and Commercial: economic and commercial benefits for the UK arising from the Fund, for example the commercialisation of new technologies; new commercial relationships between UK and overseas businesses; and new start-ups/spinouts.
- Relationships and Reputation: benefits accruing to the UK as a result of positive change to the UK's reputation, diplomatic and research networks and 'soft power'.

It is important to note that these benefit types do not exist in isolation, and Newton Fund activities may contribute to more than one of these areas. In addition, all are interrelated: for example, improved cultural understanding may result in an increase in soft power and knowledge may in turn result in economic benefits. In principle, UK benefits may be independent of whether the Fund's primary objectives (linked to the SDGs) are achieved.[5]

1.3. Structure of this report

The report is structured as follows:

- **Section 1** is an introduction to this paper, including a summary of methods and an overview of the role of UK benefits within the Newton Fund.
- **Sections 2-5** present a summary of data collected for this workstream against the four areas of UK benefits.
- **Section 6** provides conclusions and wider learning in relation to the data collected.

Annexes A - F present references, methods, data, and analysis from case studies, online and telephone surveys, and analysis from Innovate UK's own project completion surveys.

1.4. Methods and sources

This report forms part of a suite of evidence feeding in to the 2021 final report of the independent evaluation of the Newton Fund.[6] The overall approach to our evaluation of the Newton Fund is theory-based, using a combination of qualitative and quantitative methods as our main analytical approaches.

This workstream assesses the type and nature of benefits for the UK arising from Newton Fund activity. Benefits for partner countries arising from Newton Fund activity are reviewed in separate

[5] The Newton Fund Final Evaluation Report contains a recommendation that BEIS publish a strategy to provide clarity on the Fund's overall primary and secondary purposes, including the extent to which secondary benefits are (or are not) expected to guide project selection. For further details, see the Final Evaluation Report (published separately).
[6] See Annex B for further details.

partner country case study reports and the Newton Fund Final Evaluation Report (published separately).

Specifically, UK benefits were explored under four key workstreams**:**

- Desk-based analysis of online survey data (August/September 2020). This comprised a sample of 1,516 Award Holders, of which 206 were UK-based respondents.
- Desk-based analysis of telephone survey data (October/November 2020). This comprised a sample of 217 Award Holders from the online survey sample who agreed to participate in a follow-up telephone survey, of which 67 were UK-based respondents.
- 16 key informant interviews (November/December 2020) with representatives from BEIS, Newton Fund Delivery Partners and academia (see list of interviewees in Annex B).
- six case studies of UK impacts (November/December 2020), involving 13 interviews with UK-based Award Holders and collaborators.

In addition, the workstream team drew upon findings from a review of 'Tetra Tech's partner country case studies' produced in the separate case study workstream, but which also sought to identify benefits for the UK at project- and country-level (reports published separately).

Two key considerations should be held in mind in interpreting the findings of this report. Firstly, the diverse nature of Newton-funded projects may mean that the extent and form of UK benefits differ across contexts, sectors, and countries, or become more than the sum of its parts at fund level. For this reason, it has not been possible to produce quantitative assessment of the extent of UK benefits across the Newton Fund portfolio, although this report seeks to highlight the varied types of UK benefits arising from different types of project activity.

Secondly, it is likely that only one of the earlier 'UK benefit-related' effects described in the Theory of Change (that the UK's Research & Innovation reputation, expertise and talent is enhanced and the UK being regarded as a 'partner of choice' for investing in sustainable partnerships) will have been achieved during the Newton Fund funding period under review by this evaluation.

While we have sought to explore below the various current and expected benefits arising from the Fund, the full extent of realisation of benefits expected in the 2021-2029 period (the UK benefiting from an enhanced research and innovation reputation; and the UK participating in mutually beneficial trade and investment opportunities) will only be fully assessed at a later stage.[7] These long-term outcomes of the Newton Fund are expected to be analysed later by the proposed Impact Evaluation.

A fuller description of methods and limitations is included in Annex B.

[7] Further discussion of the extent to which specific ToC outcomes have been achieved is included in the Newton Fund Final Evaluation Report.

2. Research capacity

This section considers benefits for the UK research and academic sector arising from Newton Fund activity.

2.1. Section Overview

Interviewees across the board (including stakeholders involved in Newton Fund delivery, representatives from academic institutions and academic Award Holders) were highly positive about the scheme and reported a number of ways in which they felt it had benefited UK research institutions.[8]

Respondents to the telephone survey were overwhelmingly positive about the potential benefits to research or institutional capacity arising from Newton Fund activity. Of 67 UK-based respondents to the telephone survey, 60 (90%) reported 'Yes' when asked whether they felt the UK would benefit in terms of the development of research or institutional capacity compared to six answering 'no' (9%).[9]

Below we present further detail from the open-text survey responses and interviews.

Notably, the Fund was providing funding for academic projects which **respondents widely felt was not available from other sources**. Specifically, Newton Fund funding was seen to be **enabling collaborations with middle-income economies** (as opposed to low- or high-income economies). In addition, it was seen to be providing funding for **applied research** which respondents valued but were not considered to be available from other funding streams. The majority of UK-based respondents to the telephone survey indicated they could not have done the research nor produced the benefits from the project without the Newton Fund funding, and non-UK respondents reported that they felt the Fund had given them the opportunity to develop UK partnerships they would not otherwise have, or which would otherwise not have been as good.

Academic respondents to the surveys and country case studies also emphasised the **value of the academic links and networks** developed through Newton Fund projects. Academic stakeholders reported that it had **expanded the size of their research networks** in the partner countries and examples were provided of how this had led to further collaborations with partner countries, as well as wider institutional links outside of Newton Fund projects (such as student exchanges). Respondents also noted the value of gaining a **greater understanding of the academic landscape** in partner countries. In this regard, the Fund was seen as **providing a valuable umbrella structure for establishing these kinds of links**.

In addition, multiple interviewees noted that they felt universities more broadly had been able to **develop their expertise on global challenge topics**. This included both capacity in terms of the management of ODA grants, but also developing the UK research base's knowledge and expertise in impact-driven research.

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[8] Throughout this paper, we make a distinction between stakeholders involved in Newton Fund delivery, such as Delivery Partners (e.g. UKRI) and BEIS, and academic grant-holders. As set out in Annex B, we also interviewed some representatives of academic institutions (universities and Universities UK) as part of this workstream.

[9] The online and telephone surveys represent a small sample of the 8,614 Newton Fund award-holders. Further details are available in the methodology section (Annex B).

Online survey respondents also indicated that participating in the Newton Fund project had resulted in **personal benefits for them as researchers**, including new opportunities, strengthened relationships, raising the quality of their research, and improving their skills, and were positive about the potential **impact for their chances of securing additional funding**.

2.2. Providing funding for research projects not available elsewhere

A common theme arising from key informant interviews, country case studies and survey responses was that Newton Fund funding was **offering UK researchers funding for projects that they could not get elsewhere**. As a result, they were able to establish collaborations and undertake projects with country partners (and thus unlock the other benefits cited in this report) that they may not have otherwise been able to do.

When asked about this in greater depth, a common report from survey respondents and interviewees was that the Fund was specifically offering **funding for international collaborations which could not be funded by other funding streams**. This arose as a common theme among interviewees and in country-level case studies,[10] and was the reason stated by almost half of UK-based telephone survey respondents (27) when asked about whether the benefits could have been realised by other means in the absence of Newton Fund funding.[11]

> *"...there's always other ways you can get research money, but the added value of Newton was precisely the encouragement of the collaboration with Mexican institutions.*

> *"…the Newton Fund has a very specific role in promoting science which has benefits for the host country and has impact there. It is hard to think of other comparable schemes that exist.*

In particular, the Fund was seen to be **enabling work with the specific partner countries,** and specifically middle-income countries, which respondents often noted was not provided for by other funding sources for international collaboration (which some noted was focused on low-income countries, such as Wellcome Foundation or Gates Foundation funding, or other high-income economies).

> *"I don't think many Newton Fund type projects would be funded through standard streams, because the way you present the idea, and develop projects, is very different from the way the traditional system works.*

> *"Nobody else is offering the same opportunities for applied research overseas.*

Evidence from the telephone and online surveys indicates that the funding was **seen by UK researchers as having additionality**.[12] Among UK-based respondents to the telephone survey,

[10] See also the NUCLEUS (Annex C.3), BEFEW (Annex C.4) and BIOREVIEW (Annex C.5) case studies in this report.

[11] Question text: *Do you feel that these benefits could be realised by other means if Newton Fund funding was not available and why do you think so?* [Free text response]

[12] See the Newton Fund Final Evaluation Report for further discussion of the additionality of the Fund.

82% indicated that they could not have done the research or produced the benefits from the project without the Newton Fund funding.[13] In free-text responses, most cited the reason as that Newton Fund funding had enabled the project to take place, or explicitly referred to a lack of alternative funding sources for collaborations such as these.

Similarly, UK-based respondents to the online survey were evenly split as to whether they would have pursued funding for a collaboration with the other country in the absence of the Newton Fund, with 35% agreeing that they would have, 31% disagreeing and 34% selecting 'neither agree nor disagree' or 'don't know'. The vast majority of UK-based online survey respondents (80%) reported that it has definitely made it possible for them to do new research or business activities. (See Annex E.1 for further detail.)

The Newton Fund was also felt by non-UK-based respondents to have enabled or improved partnerships with UK organisations; 22% felt that they could not have had any partnerships with UK institutions, while almost half (47%) felt that while they may have had partnerships with UK organisations, these would not have been as good as those facilitated by the Newton Fund project (see Annex E.1).

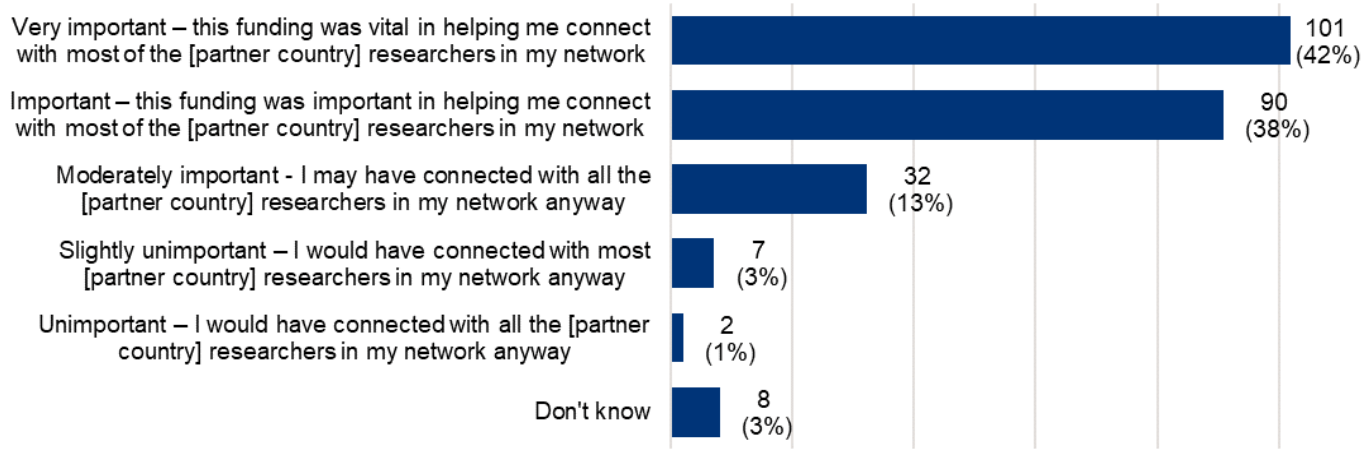
2.3. Enabling the development of academic links and networks

Respondents frequently reported that the Fund had **enabled UK-based researchers and institutions to develop academic links and networks**, that would be valuable for conducting further research collaborations, securing funding, or wider academic networking.

As shown in Figure 1, a large majority of UK-based respondents to the online survey reported that Newton Fund funding had been important for expanding their research networks in partner countries. This was also widely reported in the country-level case studies (and those in this report), in which UK interviewees frequently reported that participating in the Newton-funded projects had enabled them to develop new or strengthen existing academic links.

[13] Question text: *Do you feel that these benefits could be realised by other means if Newton Fund funding was not available and why do you think so?* As a semi-structured interview, there was naturally some variation in the way this question was interpreted by respondents; some focused specifically on the outputs, while others considered the conduct of the research more broadly. Eight (12%) respondents indicated they could have done; four respondents (6%) provided unclear responses.

Figure 1: Importance of funding for size of network



Sample size: 240; survey question G11: *How much has the funding influenced the size of your research network in [partner country] (by this we mean the number of researchers in [partner country] whom you now know)?*[14]

One interviewee noted specifically that this gave the UK an opportunity to expand networks and research horizons in areas where it does not have traditionally strong research networks.

This was also apparent in a separate survey conducted by Universities UK (UUK) of universities[15] who had participated in Global Challenges Research Fund (GCRF) and Newton Fund projects, which found that Newton '*Has been instrumental in developing researcher links (especially important for early career researchers)*' and that '*ODA funding has enabled UK institutions to position both themselves, and the UK higher education sector as a whole, as a research partner of choice with leading universities internationally*.'[16]

In this regard, these networks and links were widely expected by survey respondents to **lead to new collaborations between UK and overseas partner institutions**. This was also evident from the aforementioned UUK survey, which found strong agreement among institutional respondents that ODA funding has led to *'strengthening and building new partnerships – bilateral and multilateral*'.[17]

> *"The Chinese partner wants a wider collaboration beyond the actual project, the Chinese collaborator wants an institutional collaboration on [topic]. So that is a wide benefit.*

> *"We've got the UK institutions benefitting from new… research students coming to the UK, but then they're also returning … we're building up good relationships with these different institutions, so that's going to lead to an increased volume of research collaboration in the future.*

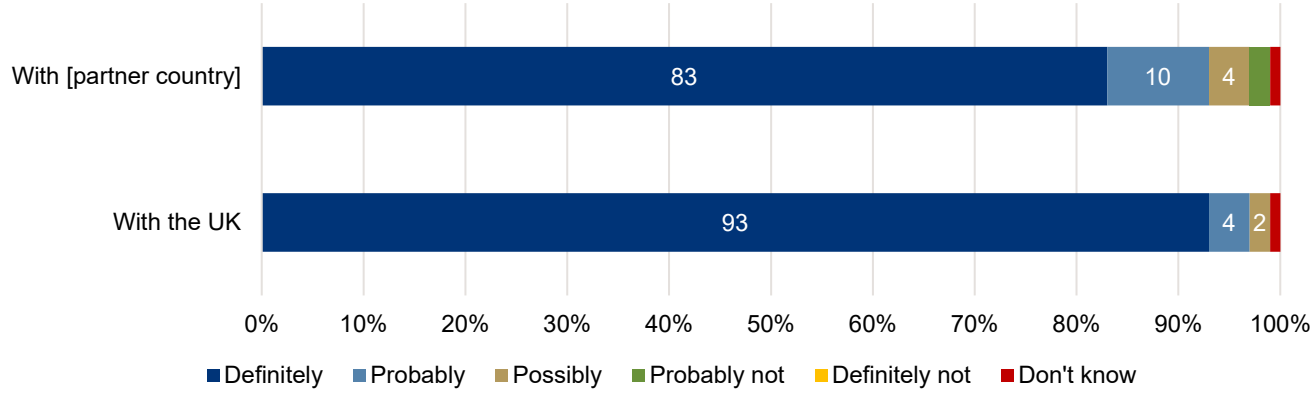
[14] The sample size is bigger than 206 due to looping (for those who had more than two partners).
[15] 20 universities submitted individual responses and one consortium submitted a response representing two additional institutions; 11 Russell Group and 11 non-Russell Group institutions represented.
[16] Universities UK (2020). *ODA funding and its impact on the UK higher education sector*. Available at: https://www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2020/Impact-of-ODA-funding.pdf. The survey does not distinguish between GCRF and Newton funding.
[17] Universities UK (2020) op. cit. The survey does not distinguish between GCRF and Newton funding.

> *"The international mobility provides excellent opportunities to develop personal working relationships with key colleagues and a solid basis to apply for larger scale research funding.*

The majority (58%) of UK-based respondents to the online survey indicated that they would seek to continue the research project or collaboration in some form following the end of Newton Fund funding, including continuing or expanding the project or other ways to continue the collaboration with country partners. In addition, 36% indicated that they intended to apply for new funding or further grants. (See Annex E.7 for further detail.)

More broadly, as shown in Figure 2, there was also keen interest among UK-based and non-UK Award Holders in collaborating again with the partner country in the future. 97% of non-UK-based respondents reported that they would be willing to collaborate with UK partners in the future, and none indicated that they would *not* collaborate with UK partners in the future.

Figure 2: Willingness to collaborate with partners in the partner country in the future (UK-based and non-UK based respondents)



Sample size: 872 (non-UK-based respondents), 243 (UK-based respondents); survey question G4 & G8: *Would you be willing to collaborate with partners in [country] again in the future?*[18]

Evidence from country-level case studies indicates that many collaborations will be dependent on securing funding, which may or may not be available, depending on the sector; this was identified as a potential limitation in some cases, as researchers felt that there would not necessarily be funding available for the collaborations they hoped to undertake.[19]

However, a number of respondents also offered concrete examples in the surveys of how this **had already translated into new collaboration opportunities**. For example:

> *"We have actually new ongoing project…] with more participants from [UK and Brazil institutions] where we are proceeding with the studies initiated with the Newton Fund.*

> *"We have secured funding for a GCRF hub including [seven countries] building on the NEWTON work.*

> *"I developed an important network with policymakers and relevant stakeholders... We got funding for continuing the partnership by other funding agencies. A new research agenda has been created based on the Newton Fund research.*

[18] The sample size is bigger than 206 due to looping (for those who had more than two partners).
[19] Tetra Tech (2021) Partner Country Case studies: Kenya and Peru.

> *We have established strong links to several academic institutions in China as part of the Newton Fund. As part of this, we have also secured additional research grant funding.*

> *In terms of future research, I have progressed two proposals with new and existing Malaysian researchers from the project … [in addition] this has led to potential consultancy links in Malaysia.*

> *The Newton Fund grant gave the opportunity to develop collaborative grant application with the partners from Indonesia. I have published papers through this collaboration.*

It should be noted that collaborative links generated through the Fund are not purely academic; for example, the creation of a partnership between a UK and Jordan museum (the Citadel museum in Amman and Oriental museum in Durham, which are planning to establish a sisterhood partnership)[20], and businesses interviewed for the UK benefit case studies (Annex C) were positive about the value for their own links abroad.[21]

Respondents also reported examples of **wider benefits for UK institutions in terms of institutional links** as a result of participating in Newton-funded projects, including the recruitment of students and researchers and the establishment of formal academic collaborations, such as joint courses or supervision of PhD students. (Indeed, one interviewee attributed the expectation that the Fund would increase student recruitment as a key reason for positive views of the Newton Fund among UK universities.) In the online survey, UK-based respondents on average reported strong agreement that working in a partnership had led to stronger institutional ties (see Annex E.2 for further detail).

> *I am receiving a lot of excellent students from this route, which has definitely enlarged and strengthened my research team in the UK. It is actually not just my own team, for example… the people joined [company] in London also because of the connection we have with this project… so they are bringing in a lot of talent in different parts of UK.*

> *Opportunities to recruit PhD students from Indonesia in future.*

> *… recruitment of talented PhD who came to visit my lab and joined the group as a postdoc…*

> *It may lead to co-supervision of a PhD student in Malaysia.*

> *New joint MSc course established between two [partner country] universities, which will have input from UK university.*

An example of this is also found in the NUCLEUS case study, in which memorandum of understandings (MoUs) signed with Brazilian institutions in the course of the project were subsequently being used to facilitate wider student exchanges and collaborations, in addition to the recruitment of Brazilian postdocs and PhD student (see Annex C.3.)

More broadly, respondents indicated a further outcome of Newton Fund collaborations was that it had helped them to **develop a better understanding of the academic landscapes in the partner countries,** which would be of value for wider academic collaboration and engagement.[22] In the online survey, UK-based respondents on average reported strong agreement that working

[20] Tetra Tech (2021) Partner Country Case study: Jordan
[21] See PRORALVAC (Annex C.2) and BIOREVIEW (Annex C.5) case studies.
[22] Tetra Tech (2021) Partner Country Case study: Turkey

in a partnership had helped the team to develop new skills, including intercultural skills (see Annex E.2 for further detail).

> *"I think that it will help the UK to make this cultural shift. If you look at the average British research institution, it is very Europe-centric … So, this definitely has a far-reaching kind of impact in this aspect, it definitely changes the perspective and thinking of UK-based researchers.*

> *"… the project has a profound way of thinking about [the research topic] from a Chinese perspective. This is increasingly important as a large number of students who attend the [UK institution's master's degree course] are from China.*

> *"The point about intercultural exchange should not be underestimated as the bilateral visits really facilitate [a] much greater depth of understanding than would be feasible at, say, an annual international conference.*

> *"Understanding their culture, attitude to collaboration and data sharing, approach to publishing and research hierarchy.*

> *"Increased our awareness of cultural and intellectual issues in the Middle East generally.*

> *"Helped me understand the context in which tertiary education takes place in Malaysia.*

In addition to offering the funding that may not otherwise be available for these collaborations (see section 2.2), respondents noted that the Fund **enabled an open channel and umbrella structure for establishing these kinds of links**, rather than having to 'scramble and start relationships'. This was expressed in terms of providing a structure for establishing connections that would otherwise be difficult to establish.[23] (One example of this is the BIOREVIEW project, in which interviewees noted it would have been difficult to set up the complex commercial and academic relationships with Indian organisations without the coordinating structure; see Annex C.5)

> *"Without [the Newton Fund], the focus would have been on countries they know, or that have overseas offices in the UK. If you don't have to worry about the difficulties of starting that relationship conversation, then you can start to see good research innovation opportunities*.

Interviewees noted that the selection of countries also served to focus researchers' minds on which countries to build relationships in, and make it easier to forge those relationships by providing a specific supporting fund; one interviewee felt that the relative 'openness' of the GCRF made it more difficult to establish partnerships for this reason.

However, some respondents also spoke about this in terms of providing a brand and structure that researchers could return to throughout their career.[24]

> *"For me, that's where the UK benefit comes in – providing further opportunities … [for] the Newton Fund [to] be the things that people structure their future research partnerships around. … so, in future years when the people become research leaders in their country, they're thinking 'who could we partner with…' hopefully, they think 'there's some great people in the UK'.*

[23] As discussed in section 4, this was also felt to be a particular use for SMEs for whom establishing overseas links may otherwise be considered too risky in terms of time and resource investment.
[24] See also the LIF programme in the Tetra Tech (2021) Partner Country Case study: Kenya.

2.4. Develop research expertise and institutional capacity relating to global challenges

In particular, multiple interviewees noted that they felt universities more broadly had been able to **develop their expertise on SDG and global challenge topics**.[25]

This was sometimes expressed at a project level (for example, developing specific topic or applied research expertise in related areas), and in relation specifically to aligning UK research along SDG lines and developing SDG expertise; for example the University of Strathclyde has set up a new Centre for Sustainable Development, which has received interest from corporate partners in engaging on matters of corporate responsibility[26], and similar examples from other institutions were highlighted in interviews. One interviewee noted that they had witnessed more researchers looking for ways to apply UK-based research to the Global South in response to the ODA funds, thus increasing the number of researchers working in the space.

> *"Being [from another European country] … I am always surprised and touched by how much the UK invests in research. That is really nice, but we have to see what type of research … That is why I see a role for the UK, which other countries, even in Europe, do not have. I think the UK is very advanced in being a leader in knowledge development, but it has to be applied knowledge: that is my point.*

In addition, interviewees also noted broader capacity development in universities with regard to the management of ODA grants. (This was also apparent in the aforementioned UUK survey; of 21 respondents, all agreed or strongly agreed that ODA funds have led to changes in '*institutional research strategies and/or institutional approaches*' and '*institutional global/international strategies and/or institutional approaches*'.[27])

More broadly, the impact-oriented approach was also felt to have encouraged a greater focus on interdisciplinary working. Interdisciplinary research is often considered a key component of addressing complex problems or 'Grand Challenges' (including in the global context) by bringing together different perspectives on a problem.[28] The greater focus as a result of Newton Fund activity was attributed to the need to bring together researchers from across disciplines to address the impact-oriented approach to projects: while this approach was encouraged generally by UKRI, it is in practice necessary to meet Newton Fund call goals.[29] This shift was attributed in part to wider appetite for interdisciplinary ways of working among researchers (including the formation of UKRI in 2018 as a cross-disciplinary body, thereby sending a signal the researchers that BEIS was interested in that kind of collaboration) but was felt by interviewees that this would have been more difficult to do and taken longer with the ODA funds, which had driven it in this direction.

Notably, some stakeholders felt that some of these changes to ways of working would outlast the specific ODA funds, on the grounds that they had been found to produce high-quality research; and showed the relevance of interdisciplinary and partnership approaches to global challenges

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[25] Note that some interviewees may also have read and thus been influenced in their answers by the Universities UK report cited in this section.
[26] University of Strathclyde (2021). Available at: https://www.strath.ac.uk/workwithus/centreforsustainabledevelopment/
[27] Universities UK (2020) op. cit. The survey does not distinguish between Newton and GCRF funding.
[28] See for example, British Academy (2016), *Crossing Paths: Interdisciplinary Institutions, Careers, Education and Applications*. Available at: https://www.thebritishacademy.ac.uk/documents/213/crossing-paths.pdf
[29] See also Tetra Tech (2021) Partner Country Case study: Jordan. The increasing focus on interdisciplinary approaches was also a finding of the aforementioned UUK survey of institutions.

(made the more prescient by COVID-19). One interviewee noted feedback they had received from a university Vice Chancellor who had been surprised at how engaging with ODA funds had increased the quality of research at their institution and were now looking at similar ways of working for non-ODA funding streams.

However, two interviewees also voiced concerns about a potential cessation of Newton Fund funding, given the time universities have invested in developing the capacity to manage these funding streams; this was also seen as a potential source of reputational damage given that partner institutions and countries had also invested time and effort in the relationships. Similarly, one UK-based respondent to the telephone survey raised concerns about a fundamental change to Newton Fund funding:

> *"A big worry of mine and a lot of colleagues that have launched our careers in the midst of the Newton Fund is that as we move forward there is the possibility of this fund disappearing with the changes in general in the UK. We are really quite worried about our research and innovation activities.*

It is important in this regard to note that the aforementioned UUK survey concludes by recommending that '*universities would strongly support a continuation of ODA funding to enable this solid platform to reach its full potential and ensure that the UK remains at the forefront of global developments'.*[30]

2.5. Researcher capacity

UK-based respondents indicated positively in the online survey that the scheme had resulted in personal benefits for themselves as researchers.[31] This included:

- 83% who agreed that the funding had opened new opportunities for them.
- 72% who indicated they had been able to strengthen relationships with their project partners.
- 64% who felt the collaboration had raised the quality of their research.
- 77% who felt the collaboration had raised their own profile in their field.
- 81% who felt the collaboration had raised their chance of securing further funding.
- 83% who agreed that the collaboration had improved their own skills.

Overall, 91% of UK-based respondents indicated that the impact on their team had been positive, with just 3% indicating they disagreed. (See Annex E.5 for further details.)

One interviewee also emphasised the spill over effects of this kind of skill development, in that the community of researchers exposed to the development sector would potentially move into the business or policy sectors taking these experiences and learning from the collaborations with them. Another interviewee noted that the fact the Fund was of particular interest to early-career researchers, rather than established researchers, would itself have wider benefits for academia thanks to the capacity-building impact.

[30] Universities UK (2020) op. cit.
[31] Sample size: 237

2.6. Publications and outputs

At its most basic, the funding was considered by UK-based researchers to have enabled a number of academic outputs as a result of international collaborations. UK-based researchers in the online survey reported a range of outputs from projects, including 60% of respondents indicating that at least one peer-reviewed journal article had been published and 38% who indicated that a new research group or network had been established.

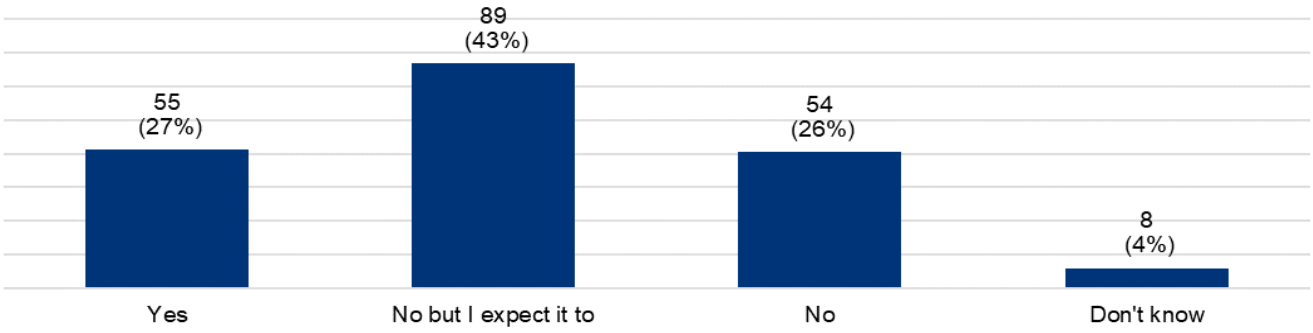
High-quality academic publications were also widely cited by telephone and online survey respondents as a key output arising from the collaboration, which would in turn enhance the reputation of their research institution and the UK more broadly. This may be further strengthened by the international nature of the collaborations; analysis for Universities UK found that the citation impact is greater for UK papers with international co-authors than for papers that have only UK (domestic) authors, with the gap growing between 2001 and 2011,[32] although it should be noted that the majority of UK collaborations to date have been with selected other high-income economies.[33]

> *"The data that we published is extremely good data and it was published in a high-quality journal … Many thousands of papers are published every year, but ours will, in a small way, enhance the reputation of the UK.*

2.7. Securing additional funding

As shown in Figure 3, involvement in Newton Fund projects was seen by UK-based respondents to **positively impact their chance of securing additional funding**: 27% reported that it had already done so and 43% expected it to do so in the future, while only 26% felt that it would not do so.

Figure 3: UK-based respondents' ability to access additional funding for research and/or business activities



Sample size: 206; survey question I3: *Has your involvement in the fund enabled you to access additional funding for your research and / or business activities?*

[32] Adams, J. and Gurney, K.A. (2016). *The Implications of International Research Collaboration for UK Universities*. Available at: implications-research-digital-collaboration-uk-universities.pdf (universitiesuk.ac.uk)
See also Deloitte (2017). *Universities New Zealand: Assessing returns on international collaboration*. Available at: https://www.universitiesnz.ac.nz/sites/default/files/Deloitte%20Access%20Economics_UNZ_International_collaboration_FINAL_report.pdf.

[33] Adams, J., & Gurney, K. A. (2018). Bilateral and multilateral coauthorship and citation impact: patterns in UK and US international collaboration. *Frontiers in Research Metrics and* Analytics, 3, 12.

3. Knowledge generation

This section considers benefits for the UK arising from knowledge generated by Newton Fund activity.

3.1. Section Overview

Stakeholders were positive about the benefits for the UK in terms of knowledge generation, and the ways in which stakeholders considered it would do so are varied.

While Newton Fund projects are intended to result primarily in impact in the overseas context, various examples were provided by survey respondents and in case studies of the **potential application of knowledge generated through Newton Fund projects to the UK context**. This was sometimes direct, for example projects which researched specific health conditions and so would be directly relevant to the treatment of those conditions in the UK; and sometimes incidental, as a model or findings generated in the overseas context could be also applied in the UK context, although additional funding would need to be sought in many examples to enable the translation.

More widely, numerous participants noted the link between **addressing global challenges and UK objectives**, for example through the mitigation of climate change, global food sustainability or global health issues, which would ultimately benefit the UK.

Stakeholders provided examples of where Newton Fund collaborations had enabled them to **access specific resources and facilities,** they would not otherwise have access to, and **tap into partner country networks for dissemination and impact.**

Notably, respondents also emphasised the **value of accessing partner country expertise** and the two-way exchange of skills. This was often considered critical for the project at hand, but stakeholders also highlighted the value of wider learning from research excellence abroad, as well as wider benefits of conducting science in overseas environments to better understand contextual variables.

More broadly, respondents also reported that the collaborations enabled by the Newton Fund had allowed them to **develop their knowledge in new areas of research**, and the value of the collaboration in terms of developing a **greater understanding of ways of working with researchers in the Global South**, including models for ensuring equitable partnerships.

Further detail is available below.

3.2. Findings applicable in UK contexts

Stakeholders were very positive about the potential benefits for the UK of knowledge generated by Newton Fund projects.

Of 67 UK-based respondents to the telephone survey, 66 reported ‘Yes’ when asked whether they felt the UK would benefit from the knowledge generation through the project; the lone ‘no’

response was due to project difficulties which meant the research could not be undertaken as planned.[34]

Of those who indicated 'yes' to this question, the responses were varied: 22 reported some form of possible or planned direct application of the research findings to the UK context; 11 cited some form of indirect application, such as improving UK researchers' understanding of methodologies and research topics, and understanding of the overseas culture; and 28 respondents provided general responses about knowledge generation, such as the ability to generate publications.[35]

A number of examples were provided in the case studies and surveys of how learning could be applied in the UK. This was sometimes direct, for example projects which researched health conditions affecting the UK public and so would be directly relevant to the treatment of those conditions in the UK; and sometimes incidental, as a model or findings generated in the overseas context could be also applied in the UK context.

> *"The outputs from our research contributed directly to policy development in both UK and China regarding agricultural [practice], feeding through to farmer behaviours.*

> *"That is, if the study is positive elsewhere, it can be adopted in the UK and therefore provide lower healthcare cost for the prevention of [health condition].*

> *"[Technology] has become the standard [health domain] monitoring device in a number of UK hospitals.*

For respondents who did not feel that their findings were directly applicable to the UK, the most commonly cited reason was that the projects had been designed to specifically address the partner country context. Even where findings could theoretically be applicable in a UK context, some respondents noted that this would be dependent on securing follow-on funding for translation, as translation into a UK context had not been built into the original project design.[36]

However, one interviewee also raised concerns that a more systematic integration of UK benefits into research questions might require additional UK funding to avoid the expectation that the partner (and ODA recipient) country would fund this, and might affect the selection of research topics at hand as some are not easily translated into a UK context; they noted that this may cause disillusionment among researchers, although researchers could be potentially encouraged to think about benefits to the UK context as an addendum to their specific project.

More widely, numerous participants noted the link between **addressing global challenges and UK goals**, for example through the mitigation of climate change, global food sustainability or global health issues, which would ultimately benefit the UK (with one interviewee emphasising that the SDGs are also relevant to the UK).

> *"It's not going to have a big economic impact on the UK economy yet, because the problem is mostly linked to [partner country], but it could be a potential problem emerging in the UK in the future climate-change scenario.*

[34] Of all areas, this was the highest relative share of positive responses, compared to the share for the UK's reputation and influence (96%), improving UK research capacity (90%), and economic and commercial benefits (47%).

[35] Six responses were missing or unclear.

[36] See for example NUCLEUS (annex C.3) and BEFEW (annex C.4) case studies and Tetra Tech (2021) Partner Country Case study: Turkey.

> *Greater understanding of climate change impacts in a part of the world with which I was not familiar - leading to inclusion of new teaching material in UK Masters level course.*

> *The amount of data that we provided on the [health condition] from hospitals in [partner country] will certainly increase the understanding of the nature of these infections, in the UK, but also, generally, worldwide.*

Two prominent examples of this are Newton-funded projects focusing on antimicrobial resistance, considered a key challenge for the UK and globally; and the Climate Services for Science Partnership between the Met Office and a number of Newton Fund countries, which was considered to have generated valuable findings and data to improve Met Office climate modelling as well as enabling strong collaborative links with the partner country institutes.[37]

3.3. Access to knowledge, facilities, and resources

In the telephone survey and online survey, respondents reported that the collaborations enabled by the Newton Fund had allowed them to **access or develop facilities and resources** that they would not otherwise have had access to. In the online survey, UK-based respondents on average reported strong agreement that working in a partnership had provided the team with access to complementary materials, resources, or facilities (see Annex E.2 for further detail).

Examples were provided of specific resources (for example, supercomputers, virus strains[38] and data[39]), but also the ability for the research teams to utilise more resources relative to the funding than might be possible in the UK context as a result of relatively lower research costs in partner country.

> *India has more lab facilities and access to equipment than I have in the UK...!!*

> *… without this project, it is quite difficult from the UK site to access data from some sites in Turkey … Thanks to this project, we could secure access to the data through field trips and, as a result, the understanding of the UK team on the physical process of [research topic] as a whole was improved.*

3.4. Access to dissemination networks

In addition, a number of respondents indicated that a particular benefit of funding was being able to **tap into local stakeholders and networks in the partner country to aid research dissemination and impact**, with different stakeholders citing both local networks available thorough partner institutions, and the structured nature of the Fund enabling active buy-in by government. In the online survey, UK-based respondents on average reported strong agreement that working in a partnership had aided dissemination/reach of the project results (see Annex E.2 for further detail).

> *Recruitment and liaising with participants have been considerably enhanced by the network of contacts from the Mexican partners.*

[37] See also Tetra Tech (2021) Partner Country Case studies: China, Philippines, and Brazil.
[38] See Zika case study, Annex C.1
[39] See for example the CSSP projects in the Tetra Tech (2021) Partner Country Case studies: Philippines and China.

> *Access to Government stakeholders. Contextual expertise vital for interpretation of qualitative data.*

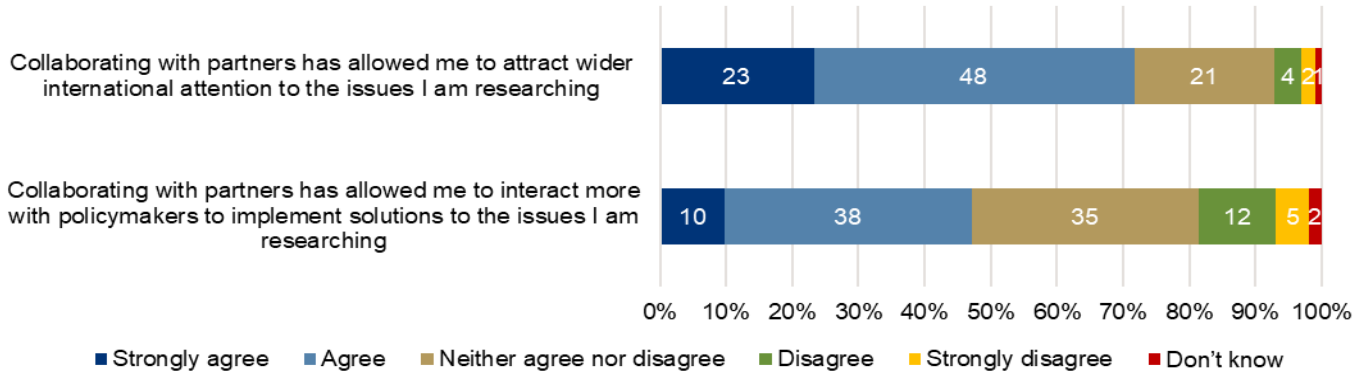
> *Links to local stakeholders to disseminate research results and embed findings into practice.*

> *[Newton] has opened up opportunities for my research findings and practice framework to be adapted in Malaysia … We are currently engaging with the [relevant government department].*

> *… having a system already in place in the low income country context … the [ministries in the partner country] … means that an active buy-in, right from the beginning … [which] may not be there in other funding that is available for us in the same context.*

As set out in Figure 4, 71% of UK-based respondents agreed that collaborating with their Newton Fund partners had allowed them to attract wider international attention to the issues they were researching. Additionally, 48% agreed that collaborating with partners had allowed them to interact more with policymakers to implement solutions to the issues they were researching, compared to 17% who disagreed.

Figure 4: Level of agreement with statements on collaboration benefits



[40]

The sample size is bigger than 206 due to looping for respondents who identified more than two partners.

3.5. Access to partner country expertise

Respondents also emphasised the value of tapping into expertise from researchers in partner countries, both to access specific knowledge required for the project and in terms of a broader exchange of expertise and learning. In the online survey, UK-based respondents on average reported strong agreement that working in a partnership had helped to improve the quality of the research design and outputs (see Annex E.2 for further detail).

> *The university I work with is the best in China, top twenty in the world. They are much better than a lot of the British home institutions, so in a way that is a significant boost to our reputation as well.*

[40] The sample size is bigger than 206 due to looping for respondents who identified more than two partners.

Respondents frequently noted that partners often had **specific areas of subject expertise or understanding of the context that were critical to producing the research**:[41]

> *"Local cultural understanding is required, and this was provided by the team in India. They also were able to provide training and local governance which would have been difficult from the UK.*

> *"We developed a whole new perspective and have worked with the Malaysian researchers very much as partners. Their expertise… led to a new dimension on the project at the proposal stage as well as new audiences for the research from across South East Asia.*

This was sometimes expressed in more general terms, with respondents emphasising the **value of two-way exchange of expertise** arising from collaborative projects.[42] Some interviewees emphasised the importance generally of working with partner countries to address global challenges, noting that many had contextual knowledge or expertise or access to environments that are critical for studying these challenges.

More broadly, respondents emphasised the need for cross-context working and intercultural perspectives to recognise that what works well in the UK may not always work well in other countries.

> *"The Newton Fund is unique because it really sees the importance and the benefits that we in the UK can accrue from collaborating, from learning from very developed countries like Brazil or Mexico or other Latin American countries. There is a lot to learn from those ways of working, not the usual top-down approach where we build capacity for them.*

> *"Understanding and comparing different approaches, theories, or methodologies. In that way, we are generating knowledge that is important for British academia...*

3.6. Wider learning for UK-based researchers and institutions

In the telephone survey and online survey, some respondents also reported that the collaborations enabled by the Newton Fund had allowed them to **develop their knowledge in new areas of research**.

> *"…before this project, we did not work in this particular area … And now we have a model [tool] in the university campus, something you are going to continue using for future research and development.*

> *"Involvement in the Newton Fund project has opened completely new research areas for me and my team to work on in Southeast Asian [subject field]. My research team will be seeking new funding sources to continue the work that we have started thanks to the Newton Fund.*

> *"… this is where the collaboration has been really important because it has allowed me to work on a topic that otherwise I would not have probably worked on because of the importance of this topic to my Chinese partner. And because of that, it's meant that my lab has acquired new [technical] resources,*

[41] See for example BIOREVIEW case study (Annex C.5). This was also a frequent report in partner country case studies.

[42] See for example NUCELUS case study (Annex C.3). This was also a frequent report in partner country case studies.

> *new techniques, new collaborators that allow me to leverage additional research funding in the UK. It's quite a specialist topic. And I would argue that it's probably attracting less funding in the UK than it is outside of the UK.*

A further theme highlighted by respondents was also the value of the collaboration in terms of developing a **greater understanding of ways of working with researchers in the Global South**, including models for ensuring equitable partnerships.[43]

> *"Greater awareness of the relationships between researchers in the global north and south and the need for all parts to a project; theoretical framing, methods, and project management to take this into account.*

> *"Through the Newton Fund we developed a model for equitable partnerships with institutes in the global south for the [research topic]. This model has been applied to a number of grant applications for project based in Sub-Saharan Africa, though securing funding remains a challenge.*

This was also a finding of the Universities UK survey of institutions, which found that '[respondents reported] *greater awareness of developing country challenges through cocreation and equitable partnerships … In their words, 'this approach has significantly enhanced the UK's ability to engage with the best researchers in the Global South*'.[44]

[43] See also Zika case study (Annex C.1).
[44] Universities UK (2020) op. cit.

4. Economic and commercial benefits

This section considers economic and commercial benefits for the UK arising from Newton Fund activity.

4.1. Section overview

Stakeholders identified a number of ways in which they expected the Newton Fund to result in potential secondary economic benefits for the UK:

- direct economic benefits arising from Newton-funded research, such as the commercialisation of research outputs.
- wider economic opportunities for businesses by enabling them to engage and develop partnerships with organisations and businesses in Fund partner countries.
- development of broader economic links with the partner economies arising from improved relations and 'soft power'.

Almost half of UK-based respondents to the telephone survey felt there could be (direct or indirect) economic benefits as a result of participation in the Newton Fund, including increasing the quality or reducing the cost of products the UK imports; the direct commercialisation of research; and other benefits arising from the knowledge generated, such as wider productivity improvements. However, evidence for the **direct economic benefits arising from Newton-funded research** is currently limited. This is to be expected as the majority of Newton Fund partnerships are not explicitly structured to result in secondary economic benefits given its nature as an ODA fund, and these outcomes have not been centrally tracked by the majority of Newton Fund Delivery Partners. For those who felt the collaboration would not result in economic benefits, the most frequently cited reason was that the project had not been designed in a way to enable these.

Firms and academic partners participating in Innovate UK projects, which sometimes have an explicit goal of encouraging economic partnerships with firms in the partner country, reported more concrete economic outcomes: 63% of respondents surveyed for post-project closure surveys reported they expected to introduce a new product to the market as a result of the collaboration and 15% to the firm, with smaller numbers expecting to introduce a new service or process to the market or firm.[45]

Our interviews and case studies found that **respondents were positive about the wider economic opportunities for businesses presented by the Newton Fund**. In particular, respondents noted that funding provided by the Newton Fund had enabled businesses to engage with new markets and develop new partnerships that might otherwise be considered

[45] This is taken from an analysis conducted by Innovate UK of close-out forms from businesses and academic partners participating in Innovate UK Newton Fund programmes. The analysis was conducted in August 2020 of data up to 24 July 2020; this comprised 88 close-out survey responses from 80 different organisations across 42 projects (out of 62 completed projects and 111 projects overall at the time of writing), 111 completed or ongoing projects represents around 2% of all Newton Fund projects.

too risky, particularly for SMEs. Newton Fund funding was also seen to provide a unique form of support for early-stage innovation partnerships with emerging economies that is not currently available from DIT or other sources.

Evidence from the survey of businesses and academic partners who have completed Innovate UK projects found that respondents were positive about **skill development as a result of participating in Newton-funded projects**, with 95% reporting that it had enabled them to improve their workforce's existing technical skills or knowledge, or develop new ones.

In addition, interviewees and survey respondents reported benefits in terms of **wider economic links to overseas companies, and the partner country economies more broadly**. This included high expectation on the part of businesses of future collaborations or partnerships in the partner country.

Further detail is available below and in the Annexes.

4.2. Direct economic benefits of Newton Fund research

Direct economic benefits are those which arise as a direct result of the research investment (for example, the commercialisation of research outputs).

Evidence for the direct economic benefits arising from Newton-funded research is currently limited. This is in part because no central monitoring of commercialisation or other economic outcomes has been undertaken by BEIS.[46] In addition, this is to be expected given that the majority of Newton Fund partnerships are not explicitly structured to result in secondary economic benefits, as an ODA fund[47]: for example, some projects have chosen to release research tools as open-source software rather than commercialise them, in order to maximise impact.[48] The early-stage nature of many collaborations may also mean that further research or testing is required before the solutions reach a market-ready stage.[49]

Nonetheless, evidence from the surveys provides some indication of ways in which stakeholders expect direct or indirect economic benefits to arise from Newton Fund projects. The 67 UK-based award-holders who participated in the telephone survey were broadly evenly split as to whether their project could or would result in economic or commercial benefits for the UK, with 46% responding 'Yes' and 45% responding 'no'.[50]

Of the 32 of 68 respondents who responded 'yes', the most common responses were that the research findings themselves would potentially lead to wider economic benefits for the UK,

[46] For further detail on the availability of monitoring data, see the Newton Fund Final Evaluation Report. This includes a recommendation that BEIS further develops the recently launched reporting system to capture wider data to aid monitoring, evaluation and learning.
[47] Although some Innovate UK calls have been structured to develop partnerships between UK and partner country companies, with the expectation that these will result in the development of solutions beneficial to the partner country to be brought to a commercial or market stage (and, therefore, presumably with economic benefits for participating UK companies). See for example the PRORALVAC case study (Annex C.2).
[48] See for example the BEFEW case study (Annex C.4).
[49] For further discussion on this point, see the Final Evaluation Report (published separately).
[50] Of all areas, this was the lowest relative share of positive responses, compared to the share for knowledge generation (99%), the UK's reputation and influence (96%), and improving UK research capacity (90%).

such as agricultural productivity improvements; or because they could potentially commercialise or capitalise upon some aspect of the project.[51]

> *"In terms of the benefit to the UK more broadly, I think the area of work that we are involved with [agriculture] has been picked up and developed fairly extensively by countries like New Zealand and Ireland, and perhaps the USA. The UK has been lagging behind in this area. I think that, by doing this work, we will improve our capacity for research and our profile in this area.*

> *"There are companies which have right solutions which are relevant for the Malaysian market and we have put that linkage in place here … so commercially speaking there is a massive opportunity here, because of the environment and how Malaysia functions.*

> *"As we have mentioned before, we are developing new [medical devices]. So, in the fullness of time, probably a five-year timeframe, we need to mass produce that. The nature of that … is that some of that production probably will occur in [partner country] and that will bring about a significant amount of [partner country] trade.*

> *"Our project was piloting improvements in the crop yields of [crop] … improving production of [crop] will have a global impact, including in the UK, as it will make [crop] more readily available, and also cheaper, because it will be more sustainable to produce.*

Of the 30 respondents who indicated that the project had *not* had (or they did not expect it to have) economic or commercial benefits, the majority stated this was because the project had not been designed in a way to enable this. It is important to note that the sample of telephone survey respondents includes all project types (including, for example, academic exchanges, workshops, and basic research, which do not include explicit research commercialisation or economic objectives).

While the telephone survey primarily surveyed academic Award Holders, data on the outcomes for businesses is available from Innovate UK analysis of project completion surveys from businesses and academic partners participating in Innovate UK Newton Fund projects (see Annex F for further details).[52] Of 88 respondents, only one reported that they did not expect to introduce a new product, process or service to the market or their firm. Of these, 63% (55) reported they expected to introduce some new product to the market as a result of the collaboration, with a further 15% (13) expecting to introduce a new product to the firm.

4.3. Economic opportunities for UK businesses

Evidence from the surveys and interviews provided strong evidence that stakeholders felt that Newton Fund activity had enabled **wider economic and commercial opportunities for UK businesses, including new markets**.

[51] See Annex D for further detail.

[52] Analysis conducted in August 2020 of data up to 24 July 2020; this comprised 88 close-out survey responses from 80 different organisations across 42 projects (out of 62 completed projects at the time of writing).

The majority of the case studies and projects reviewed for this section have been implemented under Innovate UK calls. This reflects the Newton Fund portfolio, in which the majority of projects focusing on innovation and commercialisation activities involving UK-based businesses have been implemented as a result of Innovate UK calls. Innovate UK programmes comprised 8.4% of total Newton Fund expenditure from April 2014 – December 2020.

Overall, of 88 industry and academic respondents who completed the Innovate UK project completion survey, 61% reported new commercial, research or partnership opportunities as a result of participating in Newton-funded activity. The most frequently cited opportunities were that of new commercial or research opportunities in the partner countries (33%); new collaborations, networks, and links (39%); and an improved understanding of the technology/innovation (33%). (See Annex F for further detail.) Of the 33 case studies sampled for the final evaluation, one provided clear evidence of follow-on projects, as set out in Box 1.

Box 1: Project Hephaestus[53]

A collaboration in Chile involving the Satellite Applications Catapult (SAC) and British Geological Survey (BGS) who, in collaboration with Chilean partners, explored how satellite technology can be used to improve the social, economic and environmental impacts of mining operations by piloting software that allows virtual investigation of different aspects of mining and supply chain operations. Involvement in the project has been a key factor in SAC and BGS carrying out additional commercial projects with a collective value of several million pounds. Both organisations stated that the project was key in developing their presence in extractive industries and in developing commercial networks in Chile and elsewhere in South America. The project led to increased income for SAC and BGS by several million pounds, principally from sale of commercial services and successful grant applications, in addition to scientific benefits for the BGS. Specific follow-on projects include:

- Work with the government of Minas Gerais state in Brazil, demonstrating how space has a role in monitoring tailings dam stability. This has led to the concept of a multimillion-pound monitoring centre which aims to provide opportunities for UK organisations.
- SAC has provided analysis using satellite data, AI, and machine learning for the Church of England's pension fund on the stability and seepage of tailings storage facilities. The first phase was worth £0.5 million. It also contributed to the creation of the first global database of tailings dams in the context of the Church of England's Mining and Tailings Safety Initiative. The Initiative was set up in the aftermath of the 2017 Brumadinho dam disaster in Brazil which killed 270 people.
- Ongoing work with BGS to identify sources of high-grade lithium deposits in Bolivia and Cornwall (value of £0.75M for all partners, including SAC, BGS and others).

The project also substantially increased SAC's understanding of the mining sector, and helped it build a strong relationship with the British Geological Society. This is expected to support SAC further build its presence in using satellite data the mining sector.

Further detail on the benefits for UK businesses was provided by the key informant interviews. It should be noted that these benefits may differ across programmes and projects, depending on the nature of the call; for example, businesses participating in the T-DEB programme (see

[53] Tetra Tech (2021). Partner Country Case study: Chile.

Annex C.6) were directly matched with Turkish business partners and given a programme of support to nurture partnerships, while industrial partners participating in R&D projects (see for example the BIOREVIEW project in Annex C.5) were working within a specific project framework. However, some common themes can be identified.

Notably, a number of interviewees felt that Newton Fund programmes which involved business participants had enabled UK businesses to establish links and collaborate abroad by **de-risking the process of making overseas links**. As one interviewee put it: '*If I'm very blunt, on secondary benefits, [Newton] has enabled businesses to try and fail and try and succeed in some cases.'*

Many participating businesses had reportedly not previously worked in the partner countries before engaging in Newton Fund collaborations. Interviewees noted that this was because it could be costly and time-intensive to develop these kinds of relationships in emerging economies; involve a high risk of working with a new partner; and take a longer time to see returns. The Fund was seen as providing important support to enable these partnerships by providing a structure under which businesses could test and engage in partnerships, with the result that interviewees felt many businesses were engaging with countries which they would not otherwise have thought about doing so.

> *"Think it's been hugely beneficial to lots of businesses because they weren't all working internationally before, and even where they were, they were working in developed country markets for the most part. So, it's heightened their ambition, and appetite for risk, and helped them internationalise in places they might not have thought of.*

In this regard, Newton Fund programmes were seen as offering a clear, overarching structure for working with these countries, by providing an opportunity to engage; encouraging businesses to think directly about applying their technology to solve partner country problems; making pathways for engaging in senior partnerships easier and less resource-intensive; providing financial stability, by enabling companies to put invoices into the UK government, rather than overseas governments; and, at a more basic level, making UK firms aware of funding opportunities from the UK government of which they may not otherwise have known about.

This kind of support was seen as **particularly valuable for SMEs** as the funding itself would be a greater relative value; as SMEs were more likely to be adaptive and opportunistic than larger companies which have set internationalisation strategies (although some larger multinationals have been involved in Newton Fund activity); and as SMEs were unlikely to have the existing networks and supplier links in overseas markets of bigger firms. However, one interviewee noted that it also presented an opportunity for medium and large organisations who may otherwise rely on board approval to undertake these kinds of partnerships abroad.

Notably, the structured approach offered by Newton Fund programmes was cited by some interviewees as **enabling businesses to find business partners**, in that the Fund was able to facilitate finding business partners through the structured competition and support: '*for an SME, at the smaller end, having that support and facilitated relationship-building is invaluable. It's very hard to make things happen without it, quite often you're searching for a needle in a haystack'*. This was also evident in the enteric fever vaccine case study, in which the partners were brought together through an Innovate UK mission designed to facilitate collaborations, with one interviewee noting the value of this in terms of helping UK firms to connect with

suitable partners abroad and reduce the perception of risk (see Annex C.2); and in the T-DEB case study, in which the selection process for Turkish business participants was seen as enabling UK firms to identify potential partner organisations working in their sector who were 'serious' about collaboration (see Annex C.6).

Similarly, the co-development of the calls was cited by some interviewee as a particular strength, as it provided **reassurance to businesses that the economic opportunity was a solid one**, given the initial scoping by the UK Delivery Partners and partner government. More broadly, the joint setting of priorities enabled UK stakeholders to identify potential areas of shared economic interest with partner countries which may not otherwise have been identified. One example of this was a cluster of innovations in relation to microalgae which arose from a call with Mexico, which one stakeholder was surprised to learn through the call development process was an innovation hotspot; while sector experts in DIT and Innovate UK may have a good understanding of their sector, it is difficult to have this kind of detailed knowledge of niche international clusters.

In this regard, interviewees emphasised the nature of the Fund as a co-owned fund as an enabler; that the Newton Fund approach of developing links across the landscape on matters of mutual interest, rather than '*just looking for that kind of immediate prosperity angle'*, had positioned it well, and enabled a level of access to resources, stakeholders and policy levers to make innovations effective:

> *"Because the partner government isn't involved, those doors aren't open in the same way [without Newton]. You can get good access via the team in the High Commission or embassy, or DIT or SIN[54], depending on who you're trying to visit… and that's not bad, but to have the support of the [partner country] government itself is many times more powerful. And you only really get that through Newton …. And it does bring a lot of goodwill as well, I think.*

Specifically, interviewees also widely agreed that the Newton Fund offered specific benefits for businesses in terms of **establishing overseas partnerships that they could not get from other sources.** Notably, Newton Fund funding was seen as providing a distinct opportunity from trade missions run by the Department of International Trade (DIT) (and the former UK Trade and Investment [UKTI]); while respondents noted that the latter are highly export-oriented, targeted at market-ready products, the Fund was unique in the landscape in terms of providing a platform for early-stage innovation collaborations, which would also lead to commercial outcomes but with a different time horizon.

> *"[We] could have sent an entrepreneur mission to South Africa, impact-oriented, and try to achieve that ourselves … [or] a standard global business innovation mission that Innovate UK runs, and it wouldn't have had anywhere near the impact or potential.*

This was seen as beneficial both for commercial relations, but also the innovation process itself, by enabling firms to combine their innovation with complementary partners to deliver something effective: for example, matching a high-technology firm with a partner with an appropriate distribution channel; pooling intellectual property (IP) more broadly to facilitate international R&D where DIT programmes do not; and enabling a link to academia.[55] One

[54] Science and Innovation Network (SIN)
[55] See also the PRORALVAC case study (Annex C.2)

interviewee noted that this was especially useful for companies developing products which may be more suitable for overseas markets rather than the domestic market - such as some agricultural innovations, or low-cost technology. Similarly, while interviewees primarily spoke about this in terms of early-stage innovations, one telephone survey respondent also noted the value in terms of broader manufacturing:

> *"In the UK, for example, it is quite hard to have parts made, and when you do have things made in machine shops, it can be expensive, and time consuming to work with those people. Some of the parts that were made for our apparatus in [the UK] were actually machined in India and shipped over because it was easier to do it that way. So sometimes having Indian partners could help you when producing prototypes, when producing hardware, because it might just be easier or cheaper to bring things from there.*

In this regard, businesses were also felt to benefit by being able to **trial technology in overseas markets** and leveraging the learning to develop their own product offerings. Participating in the Fund was also felt to give businesses the opportunity to test and validate their products against other competitors, and in potential target markets:

> *"Just the exposure UK businesses get when partnering with another country, they get to validate their technology in a way, you get businesses saying 'I'm a world leader in ozone water filtration solutions' or something, and how do they know that? They might have done desk research, but if you go to speak to businesses in other countries, work with them, then you get to realise how unique or innovative your technology is. So that's another thing that our businesses have got out of it as well.*

Other benefits suggested by interviewees and survey respondents noted that businesses would benefit more broadly through **exposure to overseas markets** and **better understanding of the overseas markets.**[56]

> *"… UK institutions, higher education institutions, and SMEs will have better engagement with stakeholders in the Philippines, not only the project partners but also other UK–Philippines organisations, such as the UK–Philippines Business Association… They continue to be in touch with us, as well as the British Council and the British Embassy in Manila… So, in this way, we are trying to leverage this project in different dimensions that further the influence of the UK internationally.*

> *"These days we work in data science, AI, and things like that… and it is all about knowledge transfer. The more you know, the more chance you have got to actually build commercial systems, start companies, etc. Therefore, collaborating with the [partner country] helps in those respects.*

Interviewees also provided suggestions as to how to further the sustainability and impact of R&D collaborations launched under Newton Fund calls.

Two interviewees focused on **ensuring innovations are able to achieve impact**. The 'stage-gating' approach of Newton, in which businesses could engage with some programmes at a small feasibility level before moving to an advanced demonstration stage was seen as a useful aspect of the programme. However, one interviewee felt this this could be better implemented

[56] See also Tetra Tech (2021) Partner Country case studies: Turkey and Malaysia.

with a longer project timeframe to enable projects to run a feasibility stage and concentrate funding on projects likely to result in impact.[57]

Similarly, another interviewee felt that the Fund could potentially also include programmes focusing on later-stage and market-ready innovations and business growth (rather than primarily innovation alone), which they noted is available in the UK but not often supported abroad. They felt that expectations in the Newton Fund were sometimes that funding would lead to commercialisation, while a number had not been able to do that in the timeframe available; in this regard they emphasised the value of impact-focused programmes in the GCRF to connect businesses and potential end-users of the new technology, and get customer feedback in the target country.

While intellectual property was considered an important issue, interviewees did not feel this had been a significant barrier for businesses; this was credited to a focus on setting clear IP arrangements at the commencement of projects, and the involvement of UK IP attachés in missions to engage with businesses on this issue.[58]

4.4. Development of skills or knowledge among UK businesses

Evidence from the Innovate UK analysis of project completion surveys also provides evidence of the ways in which participation in the Newton Fund had helped them **extend their technical skills or knowledge** through participation in Newton Fund projects.

Evidence from a survey of businesses and academic partners who have completed Innovate UK projects found that respondents were very positive about the impact on the skills of their workforce: for all skill domains except fundraising, over 60% of respondents felt their skills had been in some way improved or new skills developed as a result of participation.[59] (See Annex F for further detail.) . Notably, 95% of respondents to this survey (84) stated that the Newton Fund project had positively changed their technical skills or knowledge, of which 40% felt this had enabled the development of new skills and 66% improving existing skills.

> *“Lots to be said in terms of the softer side of stuff, the business benefits international collaboration brings in terms of changes in mindset, attitudes, worldviews, let alone the harder business side.*

4.5. Developing broader economic links to the partner country

Evidence from the case studies and surveys found that participating in the Newton Fund enabled firms and universities to **establish links in the partner country** and in doing so tap into overseas expertise. 89% of business and academic respondents who completed the

[57] Further discussion on the sustainability of Newton-funded projects and collaborations is available in the Final Evaluation Report (published separately).
[58] Tetra Tech (2021) Partner Country case study: China
[59] 95% of respondents reported improved or new technical skills/knowledge; 89% on collaborating and partnership; 86% on problem solving; 80% on strategic thinking; 78% on project management; 74% on leadership; 60% on business planning; and 47% on fundraising.

Innovate UK project completion survey stated an improvement to their existing Collaborating and Partnership Skills, or the development of new ones.[60]

In addition, 70% of respondents (62) stated they expect to continue collaboration with their overseas partners through continuation of R&D on the current project or on a new project; the most commonly reported collaboration outcome was conducting R&D on current or new projects (56% and 51% of responses respectively), with a smaller proportion reporting new licensing agreements or joint ventures arising from the collaboration (28%). (See Annex F for further detail.)

At a broader level, interviewees felt that the Newton Fund had to date **enabled innovation partnerships to be developed** that would have been difficult to establish through other means, and with countries that may not otherwise have been prioritised through alternative streams. This was considered a benefit, as some of the countries that may not otherwise have been prioritised have better sector expertise than the UK and will be key innovation economies in coming years (for example, one interviewee felt this was the case in particular for Malaysia and Mexico). However,, only one concrete example of an economic spill over was reported in country case studies: the sale of satellite technology to the Philippines, which one respondent considered would have been challenging to achieve without the relationships and networks established through Newton.[61]

Some stakeholders also felt that the programme would also benefit by engaging with **young innovation leaders and entrepreneurs** who would later think again of the UK; this was also apparent in some country-level case studies where this is an explicit goal (see for example the Leaders in Innovation Fellowship programme in Kenya).[62]

> *“… you form really strong relationships between the higher education spheres, but it also means that, for me, the students that we have come into contact within Mexico who then go into industry... They will remember that they had contacts in the UK...*

As discussed in section 2, it was felt by a number of stakeholders that stronger links would result in stronger academic collaborations and student flows, with subsequent benefits for UK institutions. One example of this from the NUCLEUS case study was Brazilian collaborators who continued to visit the UK partner institution following the project end (funded by Brazilian funding streams), and collaborators who had remained in the UK following project visits to undertake English language courses (see Annex C.3).

One interviewee emphasised that more focus on the integration between research and postgraduate education could be a useful tool in this regard, noting that alumni from UK universities are 'fabulous ambassadors' for the UK and their institution of study, and noting also that students were more likely to be mobile than established researchers.

[60] This is taken from an analysis conducted by Innovate UK of close-out forms from businesses and academic partners participating in Innovate UK Newton Fund programmes. The analysis was conducted in August 2020 of data up to 24 July 2020; this comprised 88 close-out survey responses from 80 different organisations across 42 projects (out of 62 completed projects and 111 projects overall at the time of writing), 111 completed or ongoing projects represents around 2% of all Newton Fund projects.

[61] Tetra Tech (2021) Partner Country Case study: Philippines

[62] Tetra Tech (2021) Partner Country Case study: Kenya

While stronger economic links and trade deals with the countries in question are a stated objective of many Newton Fund country strategies, it is too early to assess the extent to which Newton Fund activity has had an impact in this area, although some interviewees felt the UK was in a good position to capitalise on Newton Fund relationships in this regard (see section 5).

More generally, there is a significant body of literature on the positive returns from investment in R&D[63]; both in terms of benefits for the research agent itself (for example, through improved commercial products and higher returns), and for the wider economy (for example by consumer benefits, increased tax receipts and knowledge spill overs for other economic actors). However, research on the economic benefits of specifically transnational research collaborations (such as those funded by Newton) to date is limited. While potential benefits have been identified in literature (including the economic impact of R&D, such as productivity increases; improved institutional rankings, attractiveness to foreign academics and student flows; and increased skills and labour market opportunities for researchers), the majority of studies to date have focused on anecdotal data or evidence from specific research sectors, and focus on collaborations between countries with advanced research sectors.[64]

A literature search by the evaluation team identified only one paper which had sought to directly quantify the economic returns of transnational research collaboration in the New Zealand context.[65] The modelling by Deloitte Economics of the returns to international research collaboration estimated a benefit for the New Zealand economy after 15 years of NZD $2.46 from every NZD $1 spent on international research collaborations (compared to NZD $2.28 for domestic collaboration); $0.55 for academic exchanges; $0.63 for student exchanges; and $2.94 for work placements.[66] In all cases, this value was concentrated in benefits for the public (e.g. for business and government) rather than accruing to the Higher Education (HE) institution or individual. As productivity benefits take a while to embed in the economy, the increase to GDP from international research collaboration would reach $7.46 after 20 years.

[63] See for an overview: Georghiou, L. (2015), *Value of Research: Policy Paper by the Research, Innovation, and Science Policy Experts (RISE).* European Commission: EUR 27367 EN. Available at: https://ec.europa.eu/futurium/en/system/files/ged/60_-_rise-value_of_research-june15_1.pdf

[64] Crăciun, D. and Orosz, K. (2018). Benefits and costs of transnational collaborative partnerships in higher education. European Expert Network on the Economics of Education Analytical Report No. 36. Available at: https://research.utwente.nl/en/publications/benefits-and-costs-of-transnational-collaborative-partnerships-in

[65] Deloitte (2017) op. cit.

[66] Net present value of increases in GDP after 15 years for every $1.00 dollars invested, annual discount rate of 7%.

5. Relationships and reputation

This section considers relationship and reputation benefits for the UK arising from Newton Fund activity.

5.1. Section overview

Enhancing the UK's Research & Innovation reputation is an output in the Newton Fund's Theory of Change. The subjective nature of perceptions and 'soft power' makes this a difficult concept to monitor and measure objectively, and to isolate the specific contribution of the Newton Fund in relation to other UK initiatives and collaborations with partner countries. As with the other benefit types reviewed here, no central-level monitoring of outcomes relating to relationships and reputation has been undertaken by BEIS, with the exception of this workstream.

Evidence from the telephone survey and KIIs indicate that respondents were almost unanimously positive about the potential benefits for the UK in terms of relationships and reputation arising from Newton Fund activity. This included strong feelings among interviewees involved in the delivery of the Fund, that Newton Fund activity had **strengthened links with government stakeholders in partner countries**. This was attributed by many to the partnership nature of the Fund, with the necessary senior-level involvement in partner countries and the co-ownership of research priorities seen as enabling partner country buy-in. The in-country presence was considered an important enabler.

Similarly, interviewees were **positive about the impact of the Fund on relationships between science and research institutions**. Across the board, UK Delivery Partners were very positive about the impact of the Newton Fund in building partnerships, including extending the work of some UK bodies into countries they had not previously worked in, or developing the networks therein. The success of Newton Fund funding in enabling these relationships was attributed by some to the stability and structured nature of the Fund.

Some interviewees felt that the elements were in place for these relationships to be sustainable; however, others raised concerns about the extent to which relationships could be maintained in the absence of a clear reason and mechanism to engage with the partner country institutions (through the Newton Fund or other arrangement), and some expressed concerns about the impact on relationships of uncertainty over the future of Newton Fund funding.

More broadly, the Fund was seen to be **strengthening positive views of UK R&I**. Respondents (both UK- and non-UK-based) to the online survey reported positive views of UK R&I prior to the Newton Fund, and indicated that participating in the research had strengthened these perceptions. As the UK was already viewed as a leading R&I base, it is unclear the extent to which The Fund had a marginal or significant change; however, a number of stakeholders reported improved views as a result of their direct engagement with their UK partners. Reasons for this cited include the value of being seen to focus on issues of relevance and importance for the partner country, and the nature of Newton Fund collaborations as equitable partnerships.

This was also true of Award Holders: UK-based respondents to the telephone survey were almost unanimous in considering that their projects had or could have benefits for the UK's reputation or influence, with only three respondents responding 'no' compared to 64 responding affirmatively.

Further detail is available below and in the Annexes.

5.2. Government and diplomatic relations

Interviewees were positive about Newton's impact on **government and diplomatic relationships**.

While acknowledging the difficulty in isolating the contribution of Newton, interviewees felt that the Newton Fund was a significant source of 'soft power' for the UK and had been successful in helping the UK to establish relations with government bodies. This was expressed both in terms of developing new relationships in regions where existing links were few (such as Southeast Asia) and strengthening links in countries with existing partnerships (such as Brazil). A number of interviewees also felt the Fund had contributed positively towards making the UK a partner of choice in partner countries,[67] or more broadly positioned the UK well in the competing science space as a key partner.[68]

> *"So, seen as not just lucrative, it's really about that relationship development … that's incredibly important, and critical to developing much longer relationships, trade partnerships, new research partnerships… it broadens the strength of the sector at home as much as it does in the foreign context.*

> *"Wouldn't want to underplay that relationship building… I think that there are trade and investment wins, and government to government and wider benefits way beyond the science base through close engagement with some of the host governments… Not a primary benefit, certainly wouldn't be a driver of the Fund… but it's important to recognise it's something the UK benefits from.*

A number of interviewees emphasised the importance of soft power for engaging in the world, and the role of science and universities in encouraging this. Science and innovation cooperation is recognised as providing support to broader ongoing diplomatic relations in otherwise challenging circumstances. Multiple interviewees also cited this in the context of Brexit and potential changes to existing European funding streams and networks, and the need to forge partnerships with emerging research leaders.

> *"Unless the UK government starts pumping a lot more money to science research, India is going to move ahead and so we want to go with them… I think in the long term, adding other countries to scientific research helps us too.*

While evidence was primarily anecdotal, examples were provided of being able to engage with the Fund in wider diplomatic or overseas engagement activity as examples of existing research collaborations; for example, stakeholders in Kenya emphasised the way that relationships built on the Newton Fund had enabled FCDO staff to engage with Kenyan policymakers through a

[67] Tetra Tech (2021) Partner Country Case studies: Peru, Brazil, Malaysia, and Jordan
[68] Tetra Tech (2021) Partner Country Case study: Philippines

wider high-level bilateral Science Board,[69] and stakeholders in Jordan noted that DIT colleagues have had conversations with key stakeholders as a result of Newton-Khalidi Fund activity.[70]

One interviewee speculated that there may be further follow-on effects in which DIT teams in-country are able to gain a better understanding of import regulations for business through these interactions. For example, with regard to the aforementioned microalgae call, Mexico had had to introduce regulations in relation to importing microalgae organisms to cover a gap in the regulation. However, few examples of this type of alignment were offered by interviewees and given the Newton focus on specific scientific fields it is possible these are niche.

One interviewee also felt that an important systematic change arising from the Newton Fund was that it helped partner countries develop their own ideas of how they wanted to engage with the UK, by understanding better what areas of strength the UK could offer in different sectors and so becoming more 'sophisticated consumers' of the UK offer.

One interviewee however raised concerns about the strength of the Fund as a diplomatic tool in the specific context of the innovation sector, which naturally involves activity at a system level. The interviewee felt there had not been a strategic attempt to engage with the Newton Fund as a tool for innovation diplomacy, as they considered more innovation-focused actors (such as the Science and Innovation Network [SIN] and DIT) had been more of an afterthought to the Newton Fund structure. In this regard, the interviewee felt that there could be better coordination between actors in the Newton Fund and FCDO ecosystem to engage with the innovation needs of the partner country and key stakeholders, and coordinate Newton Fund programmes on the basis of these. (However, the interviewee also noted that they felt the Fund had contributed to a change in perspective among senior stakeholders towards the UK and appreciated the existence of the Newton Fund as a mechanism to make these connections).

5.3. Science and research relations

Evidence from the key informant interviews also indicated that stakeholders felt that Newton Fund funding had succeeded in helping to **enable and strengthen science and innovation partnerships with the partner countries**.

Across the board, UK Delivery Partners were very positive about the impact of the Newton Fund in **extending partnerships**[71], sometimes significantly, including extending the work of some UK bodies into countries they had not previously worked in (or developing the networks therein),[72] undertaking other activities outside the Newton Fund framework through the links they had created, testing new ways of working and new partnerships, and laying the groundwork for future broader activity. One interviewee from a UK delivery organisation noted that they had been frequently invited to participate in meetings with high-level officials from

[69] Tetra Tech (2021) Partner Country Case study: Kenya
[70] Tetra Tech (2021) Partner Country Case study: Jordan
[71] See also Tetra Tech (2021) Partner Country Case studies: Kenya, Jordan, Philippines, Peru, and Brazil.
[72] Tetra Tech (2021) Partner Country Case study: Kenya

Newton Fund countries and it had increased attention on their own activities, and another noted strong interest from other countries they work in to participate in the Fund.

For example, while the UK was not considered yet to be a partner of choice in the Philippines given deeper existing relationships with other countries, the Newton Fund was considered to have put the countries 'on each other's radar', and provided a structure for more systematic collaboration, and in doing so provide contextual understanding, cultural bridging and network-building essential to strengthening the linkages between the two countries which did not have extensive experience of working together.[73] A similar dynamic was reported in the Jordan country case study, and in Brazil, the Fund was seen as instrumental in turning existing linkages into a platform for more efficient and effective joint work.[74]

> *"Newton took the UK from a very low base … and has made a significant contribution to the bilateral relationship, and science and innovation is a part of that.*

When asked what had been preventing the formation of these links outside the Newton Fund structure, Delivery Partners cited the need for funding, and the need for a clear reason to engage. The success of Newton Fund funding in enabling these relationships was also attributed to the stability and structured nature of the Fund, and the fact that it enabled conversations over a longer timeframe than prior 'episodic' interactions.

> *"So, we have relations broadly across the world, but Newton provided us with impetus and ability to have a more substantial and concrete discussion about more continuing interaction on a year-by-year basis, which wouldn't be possible beforehand.*

> *"The bilateral links it creates are actually quite deep and quite stable because they go through common funders, they involve a lot of different HE organisations … a real breadth to it that comes from shared definitions of excellence, shared versions of ways grants are awarded and judged, that goes much broader than single research interactions or single partnerships…*

Interviewees and survey respondents also noted the value of the Newton Fund being seen as a sign of the UK's commitment to collaborate internationally, as well as a specific interest in collaborating with the partner countries.

> *"I think the level of the investment that you can offer really gave a lot of confidence to the Mexicans that we were serious about engaging with [them]. It was not just a small amount of money … it gave a good reputation of being serious about engaging outside the UK. It really came off well.*

> *"…we've been trying to get the EU to fund something similar for the last 10 years. But to be honest that's been all talk and no action, whereas the Newton Fund has really delivered on the ground, so that's a real benefit for the UK.*

Interviewees felt that at a broader level, it would help the UK's reputation, by showing the UK is not just interested in high income countries and is prioritising the needs of partner countries. One interviewee also noted the value for broader international collaborative work, in that it would enable the UK to use models designed by partner countries (for example, the South

[73] Tetra Tech (2021) Partner Country Case study: Philippines
[74] Tetra Tech (2021) Partner Country Case studies: Jordan and Brazil

Africa research chairs programme) as good practice to translate into other contexts, rather than just offering a UK-designed scheme.

Interviewees however did not offer specific examples of how the Fund had led to policy or process changes in the research institutions in the target countries (and indeed one interviewee could not think of any examples). One example can be found in the Turkey case study, which notes how Turkish institutions developed protocols for bilateral research as a result of Newton Fund engagement, and also reportedly incentivised Turkish partners to change national legislation to allow for bilateral international research partnerships the size of the Newton Fund, pioneering a previously unexplored avenue of research.[75] Similarly, projects reviewed for country-level case studies offer some examples of how the Fund may have encouraged wider policy change on certain topics of key importance to the UK; for example, the contribution of the Climate Science for Service Partnership (CSSP) programme to inform the Chinese response to climate risks[76]; the prioritisation of anti-microbial resistance research;[77] and engaging Brazilian government counterparts on climate change topics, as issues seen as increasingly sensitive in the Brazilian context.[78]

More generally, one interviewee emphasised the value of working with middle income countries in particular on climate change initiatives, as those which tend to (alongside the UK) be large consumers of fossil fuels, and so maintaining good relationships with these governments and funders to tackle these challenges – which are often politically sensitive – was essential.

5.4. Enablers to relationships

Respondents also reported a number of enablers and challenges in relation to the development of relationships with the partner countries.

The structure of the Newton Fund as **facilitating equitable partnerships and joint ownership of priorities was cited as a key strength**.[79] Interviewees felt that ensuring a shared vision and ownership of priorities helped develop country buy-in at senior levels. For example, one stakeholder in the Philippines case study noted that the UK was 'ahead of the curve' by establishing the Fund as a genuine partnership, which was not common in the country,[80] while an interviewee noted anecdotal feedback that the UK was ahead of international competitors for attention in some partner countries because of the way the Fund is structured and delivered. This was attributed by some specifically to the match funding model, meaning that by design decisions had to be made at a senior level at the partner country and enabled a sense of co-ownership.[81]

> *"I think I felt for the first time this was something that was truly mutual. And that goes to explain why we had a good reception from government. And it was not*

[75] Tetra Tech (2021) Partner Country Case study: Turkey
[76] Tetra Tech (2021) Partner Country Case study: China
[77] Coffey (2018) Mid-Term Country Case study: Brazil
[78] Tetra Tech (2021) Partner Country Case study: Brazil
[79] Tetra Tech (2021) Partner Country Case studies: Brazil, Kenya, Peru, Philippines, and Malaysia
[80] Tetra Tech (2021) Partner Country Case study: Philippines
[81] Tetra Tech (2021) Partner Country Case studies: Jordan, Brazil, Kenya, Peru, Philippines, and Malaysia

> *hard [to work with] government or finding government officials to help… because they have put their money in the pot, the UK has put their money in the pot, and… it's addressing what Kenya had [identified as] their interest.*[82]

Multiple interviewees also cited the **in-country presence as an important enabler of relationships**: they were seen by interviewees to be able to act as a good link to government and research counterparts,[83] aid visibility by communicating the impacts and outputs of Newton Fund activity in-country, give it local prestige, advertise funding opportunities through the right channels and attract the right kind of talent in partner countries[84], and help ensure that the local context and cultural sensitivities are considered in developing the relationship.[85]

The **in-country team** was also highlighted as a key strength by multiple country-level stakeholders in country case studies;[86] for example, the in-country team (ICT) in Peru and the Philippines were acting as the face of science and innovation policy in the absence of SIN staff; in Brazil and Colombia, they were able to engage with state-level actors, who play an important role in the research ecosystem; in Brazil they were found to be acting as a bridge between local research institutions and ministries working on climate change in the country to help translate findings from the CSSP project into policy.

5.5. Sustainability of relationships

When asked about the sustainability of these emerging relationships in the absence of Newton Fund funding, a number of central-level interviewees felt **the elements for long term sustainability were in place for lasting relationships**, including wider collaborations outside of the Newton framework.

> *"If you have properly embedded partnership working, you've shown the value of collaborative research, you've established networking, shared best practice, made institutional change, and demonstrated they can be effective and valuable, then they should have a much longer lifetime than just the cash that you put in to fund the research.*

> *"Once those relationships are built, you expect them to be the same, so long as the enabling framework and environment, which could include Newton, exists.*

However, some interviewees raised **concerns about the extent to which relationships could be maintained in the absence of a clear reason and mechanism to engage with the partner country institutions**.[87] Other interviewees noted that uncertainty about funding streams could also undermine the relationships that The Fund had established: '*it's not helpful if you turn on the tap then turn off the tap'*.[88]

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[82] Tetra Tech (2021) Partner Country Case study: Kenya
[83] See also Tetra Tech (2021) Partner Country Case studies: Peru, Philippines, and Malaysia.
[84] Tetra Tech (2021) Partner Country Case study: Malaysia
[85] Tetra Tech (2021) Partner Country Case study: Philippines
[86] Tetra Tech (2021) Partner Country Case studies: Kenya, Malaysia, Philippines, Peru, and Brazil.
[87] Two interviewees for this workstream were positive on this point, and sentiments to this end were also expressed in the case studies. Three interviewees provided the more cautious view in this second paragraph, and one interviewee who was positive also raised some wider concerns about future funding.
[88] Tetra Tech (2021) Partner Country Case studies: Malaysia and Brazil.

> *"The main barrier would be a perception that the UK was closed to international research collaboration … small things can affect that – you turn off the taps of funding without communicating what would be there further, the perception around X and Y, particularly the immigration system.*

Indeed, one interviewee felt that uncertainty about the next steps for the Fund had already limited some of the conversations with partners, while another emphasised the need to keep up links during any transitional period to future schemes, for example through work on legacy projects. One interviewee felt that when Chile had graduated from the list of ODA-eligible countries, there had been little afterthought about maintaining relationships; while some research activities had been carried forward by mutual interest, they felt that more thought could have been given to transitional approaches.[89]

One interviewee felt that a key aspect of sustainability would be the extent to which relationships developed through the Newton Fund were embedded within the wider networks (such as SIN) and therefore whether FCDO, BEIS or other UK R&I representatives would be available in partner countries with the right skills and resources to maintain relationships with these stakeholders .[90] One interviewee suggested that other ways of engagement, such as staff exchanges, may support continuing links in this regard.

This was also a common theme arising at project level from partner country case studies, in which a large number of UK stakeholders noted that the maintenance of academic links could depend on the future availability of funding to build on collaborations, with some raising concerns about sustainability if such funding was not readily available.[91]

5.6. Perceptions of the UK

Respondents reported positive views of UK research and innovation prior to the Newton Fund and indicated that participating in the research had strengthened these perceptions.

When non-UK-based respondents were asked in the online survey to name countries they associated with research and innovation, the UK was the most frequently cited by respondents (being mentioned in 782 responses / by 60% of respondents), closely followed by the USA (mentioned in 757 responses / by 58% of respondents); no other country received more than 250 mentions.[92]

When asked how they ranked the UK globally, respondents indicated very positive views of the UK: 63% said the UK was 'excellent' and 30% said 'good/high', with just 1% reporting 'poor/low-level' (see Annex E.9).

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[89] For further detail on this point, see Tetra Tech (2021) Partner Country Case study: Chile

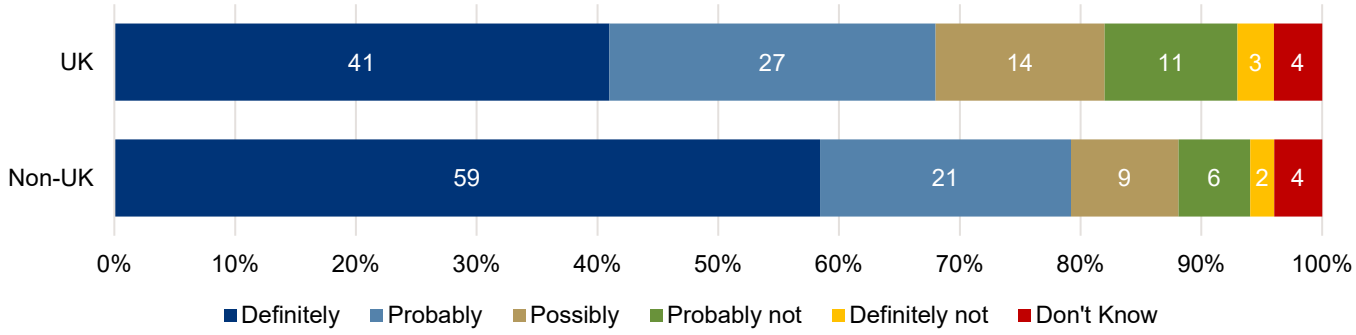
[90] Further detail on the sustainability of the impact of the Newton Fund, including partner country relationships, is included in the Final Evaluation Report.

[91] This is discussed further in the Newton Fund Final Evaluation Report.

[92] Germany (247), China (166) and Japan (125) the only other countries receiving more than 100 mentions. Sample size: 1307, survey question I5: *Which countries do you associate with leading research and innovation in your field on a global level?* Percentage was calculated by dividing the number of responses by sample size (rather than the number of responses).

When asked whether these views had changed as a result of participation in Newton-funded research, the majority of respondents reported that the funding had positively influenced their perception (as shown in Figure 5): 80% of non-UK-based respondents reported that their perceptions of UK research and innovation had 'definitely' or 'probably' improved as a result of participation in a Newton-funded project.[93]

Figure 5: Whether perceptions of UK research and innovation have improved (UK and non-UK-based respondents)



Sample size: 1,513, survey question I5b: *Have your views of UK research and innovation improved as a result of participation in the Newton-funded research?*

This was also evident from the aforementioned UUK survey, which found strong agreement among institutional respondents that ODA research had been *'positively impactful in terms of the UK's positioning in global research excellence and leadership*' and had *'helped create useful opportunities for innovators to explore new overseas collaboration and showcase UK expertise*'.[94]

Interviewees and telephone survey respondents also provided detail in their open responses about the Newton Fund's contribution to an improved view of UK research and innovation abroad. In particular, a number of non-UK-based respondents to the telephone survey noted that collaborating on Newton Fund projects had improved their view of the UK research and innovation sector:

> *"…my previous encounters with some British researchers [kind of] left you with the impression: okay, self-sufficient guys who are not interested in any other people apart from themselves ... that changed in having to interact with this new group of researchers and people. And it did improve…*

> *"…my education was not in the UK. My partners had German or US schooling … Yet, ever since this collaboration was established, we have realised that there is this a huge opportunity for the development of our own [partner country] school of science through the UK. In fact, we have started to rely on the UK to develop our own research… we have changed the way that we look at the equipment in the UK. In a way, as the funding from the [Newton Fund] was limited, I would say the impact was financially a hundred times returned to the UK in terms of advanced equipment and supplies.*

[93] For those who did not indicate a positive change, it is not clear whether this is because of negative experiences with the Fund, or whether their perception of UK research and innovation was high to begin with (and so had limited room to improve).

[94] Universities UK op. cit. The survey does not distinguish between GCRF and Newton funding

> *"I got my training in the US, so I have always believed that the US is the most innovative. But … I started to realise that the UK is attempting to innovate, as well. So, it has changed my view of the UK system.*

> *"My experience was very positive. … As a result of the people that I met, my impression of how UK academia works … improved.*

A common theme highlighted by UK survey respondents was also the **value of being seen to focus on issues of relevance and importance for the partner country**:

> *"I think … the number of Newton Fund projects that have been running in Vietnam have created a good reputation in terms of the UK working collaboratively with researchers in Vietnam to deal with issues that are a particular interest and challenge for Vietnam.*

> *"[I] think the fact that the UK government shows an interest in the social problems of other parts of the world, gives us enormous soft power. And especially if we can find good ways of thinking about those problems that are really helpful.*

As with the development of government and institutional relations, telephone survey respondents also frequently highlighted **equitable partnerships**, and avoiding the perception of colonial relationships,[95] as a key enabler of successful partnerships: '*we are challenging the traditional model of UK people going and studying others'*:

> *"This really played out well with our colleagues in Mexico. I think the generosity of the scheme and the ability to share on equal terms ... I think it gave the impression that we like to value the intellect and the scientific competency of other countries …*

> *"The fact that it is an equal collaboration helps a lot. We are not telling the Malaysians what to do, we are developing it together. We will see some lasting impact from that, just from the way that they would view a country like the UK.*

> *"[Research sector] in the UK has a chequered past ... Indeed, the UK itself has a colonial reputation … So, the fact that we are working with [partner country] institutions mean that we are starting to overturn that colonial reputation in [sector]. We are not going in there and saying give us all your data, give us all your material … we can collaboratively work on this research with [country] researchers.*

> *"It is a joint project; we are working collaboratively and in an equal way with our Indian partners. These kinds of equal collaborative engagements can only be beneficial for the reputation of the UK as a kind of equal partner.*

> "[About whether their view of UK R&I has improved] *Well, I think that there is a good sense that the non-UK partners are equal partners, whereas I did not have such a strong sense initially with respect to this grant mechanism. I think that is one way in which there has been that change.*

The **Newton 'brand' was also cited by a number of stakeholders in country case studies as a useful asset**, by providing consistency and prestige through a well-recognised name.[96] Specifically, the local name and co-branding was also felt by some to help encourage

[95] This was also a common theme in Tetra Tech (2021) Partner Country Case studies, Kenya, and Jordan. See also Zika case study (Annex C.1).
[96] Tetra Tech (2021) Partner Country Case studies: Malaysia, China, Philippines, Peru, and Brazil.

stakeholder buy-in.[97] However, it should be noted that there are some reports of the contribution of country partners being deprioritised in country branding,[98] and the study team identified a number of examples of publications by UK academics during the course of this workstream which use the term 'Newton Fund' rather than the country-specific name, and/or do not cite the contribution of country partners in funding attribution text.[99]

[97] Tetra Tech (2021) Partner Country Case study: Jordan
[98] Tetra Tech (2021) Partner Country Case study: Kenya
[99] This was also remarked upon in passing by ICAI in their 2019 review of the Newton Fund. See: Independent Commission for Aid Impact (2019). 'Report: The Newton Fund'. Available at: https://icai.independent.gov.uk/html-report/the-newton-fund/ (accessed 11 December 2020).

6. Conclusions

Overview

- UK stakeholders hold consistently positive views of the benefits of Newton Fund activity for the UK. The Fund is seen to be leveraging the strength of the UK in science and innovation to develop relationships at all levels (academic/industry, research institutions and governments) with emerging research and innovation leaders, which may be of particular value now the UK has left the EU.

- The type and nature of UK benefits arising from Newton Fund activity varies across project types and contexts. Even though the aims of Newton Fund projects are primarily to provide benefits for the partner country, many respondents could nonetheless cite multiple ways in which they expected the UK to benefit from project-level activity. These included developing academic links, generating high-quality academic outputs, tapping into partner country expertise, and in some cases, potential economic outcomes.

- In addition, respondents cited many UK benefits arising from the process of implementing the Fund itself. This was particularly notable in terms of relationships with partner countries – for example, the contacts developed between governments and science bodies as a result of administering the Fund – but also academic outcomes, such as developing university research capacity with regard to administering and implementing SDG-relevant research.

Research capacity

- The evidence strongly indicates that the Newton Fund is valued by UK institutions and UK-based researchers. The Fund is seen to provide a valuable source of funding for collaborations with emerging research leaders that are not available through other sources. It strengthens the UK research base in new fields and enables the development of strong academic links which are expected to lead to additional collaborations and wider institutional partnerships. However, the extent to which individual researchers are able to maximise the value of new relationships and build longer-term collaborations which outlast Newton Fund funding windows may depend on the availability of future opportunities for collaboration.

- Universities have also been able to develop their expertise on global challenge topics. This included improved capacity to manage ODA grants, and developing UK researchers' knowledge and expertise in impact-driven research. While more difficult to quantify, stakeholders also reported a better understanding of conducting research in the partner countries, which may build confidence to undertake further international activity in the future.

Knowledge generation

- Newton Fund projects are primarily focused on social impact in the partner country, and so not all findings will be relevant to the UK. While some examples arose of applicability to the UK context, further funding may need to be found in some cases to adapt findings for a UK context. However, many emphasised that the wider learning from partner

country expertise as a result of academic exchange should not be underestimated as a benefit for the UK research base.

- Notably, Newton Fund research was seen to be making a strong contribution to addressing global challenges (such as antimicrobial resistance and climate change) and developing the partnerships in order to continue work in these areas. The benefit of this knowledge generation to the UK as a global stakeholder should therefore be appreciated. In some cases, the bilateral nature of the Fund was also seen to be enabling policy transfer in this regard a way that other funds which are UK-focused do not, as a result of senior buy-in among partner country governments and the leading role of the partner country principal investigator (PI).

- More widely, Newton Fund collaborations were seen to be showcasing to UK researchers what expertise is available in partner countries and developing UK researchers' awareness and capacity to engage in collaborations with researchers in the Global South. This may build confidence and capacity for UK researchers to undertake similar collaborations in the future, whether within or outside the Newton Fund or similar frameworks.

Economic and commercial

- The majority of Newton Fund projects were not structured to directly result in economic benefits for the UK. However, a large number of Award Holders were able to articulate direct or indirect links between their projects and potential economic benefits.

- In particular, for industry partners, Innovate UK Newton Fund calls were seen to be providing a source of support for early-stage innovation partnerships not available from DIT or other sources. Newton Fund programmes were seen to help de-risk internationalisation activity for UK SMEs in emerging markets by providing a structure for companies to engage with country partners and develop new markets, including providing policy and regulatory guidance; curating potential collaborators in the partner country; and drawing attention to potential market opportunities and areas of expertise which businesses may not have otherwise known about.

- The choice of projects *not* to commercialise research outputs was sometimes done on the basis of enabling a greater social impact, for example by releasing research tools as open-source software. The commercialisation of research may not by itself necessarily result in positive social impact without steps to ensure that the outputs can be effectively used by the target groups (for example, ensuring that groups in need can access and afford the technologies), and therefore a greater focus on commercialisation may risk detracting from ODA objectives in some scenarios. The Newton Fund Final Evaluation Report recommends that the Fund put in place a strategy to provide clarity on these primary and secondary purposes, setting out how they interact to achieve long-term, sustainable socio-economic impact including the extent to which secondary benefits are (or are not) expected to guide project selection.

- Despite the finding that pathways to UK economic benefits have started to open, it could take more time before these impacts develop further. As the UK capitalises on Newton Fund relationships, in time industry players could place their products in new markets and scientists could find commercial applications for their research. Wider economic

effects of R&D, such as economy-wide productivity increases, increased tax receipts, and consumer benefits, could also start to accrue. Future analyses of the longer-term outcomes and impact pathways could consider exploring these effects.

Relationships and reputation

- Stakeholders were consistently positive about the potential impact of the Fund on 'soft power' and relations with partner countries. Before the Newton Fund, joint work largely consisted of episodic and disparate linkages, often solely at a university to university level. The Fund has helped to develop relationships and build trust between academic institutions and between research funding organisations in the UK and partner countries, as well as at an intergovernmental level, and laid the groundwork for further collaborative activity outside the Newton framework.

- Perceptions of UK R&I were strong to begin with among stakeholders and improved among stakeholders as a result of Newton Fund activity. Similarly, at a project level it is likely that contacts made through the Fund will have benefits in specific ways, such as encouraging them to think of the UK as a research and innovation partner in future, or as a destination for academic exchanges.

- In particular, a common theme raised by stakeholders was that the Fund is appreciated as a result of the equitable nature of Newton Fund partnerships: this encouraged buy-in as a result of shared ownership of priorities, but also perceptions of the Fund as a respectful partnership and avoiding forms of research partnership seen to be implicitly extractive or colonial in nature. This was apparent at both government level and project level, although some examples were identified of the partner country contribution being treated as secondary in practice (for example, an emphasis on the UK contribution in some Newton Fund branding or funding attributions).

- In terms of sustainability, some interviewees raised concerns about the extent to which relationships could be maintained in the absence of a clear reason and mechanism to engage with the partner country institutions, both at the level of funding institutions and higher education institutions. Other interviewees noted that uncertainty about funding streams could also undermine the relationships that the Fund had established. For this reason, the extent to which the UK is able to maintain and maximise the value of these relationships is likely to depend on the nature of the next phase of the Newton Fund or other mechanisms for engagement on research and innovation, and thus the structure in which these contacts continue.

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Annex B: Methodology

This workstream is central to our final evaluation approach and involved an intensive period of remote research by members of the evaluation team.

The relationship of this workstream to the Newton Fund evaluation

This report forms part of a suite of evidence compiled to inform the independent evaluation of the Newton Fund. It is an evidence report rather than a stand-alone evaluation report and it uniquely focuses on UK benefits rather than the Fund's primary purpose.

The evaluation framework for the independent evaluation sets out two key evaluation questions in relation to benefits for the UK:

- Has the Newton Fund led to a change in perceptions of the UK in partner countries? Has this led to any wider benefits such as new or wider opportunities for collaboration and trade?
- What additional or unexpected benefits have occurred as a result of Newton Fund activities? [In the UK and partner countries]

In addition, the Theory of Change sets out three expected outputs/outcomes as a result of Newton Fund activities:

- Years 1-5: The UK's Research & Innovation reputation, expertise and talent enhanced
- Years 5-7: UK established as partner of choice investing in sustainable partnerships
- Years 7-10: UK positioned as international advocate/global leader in Research & Innovation

The Final Evaluation report will be published in 2021 and will synthesise findings across all sources of evidence (online and telephone surveys, case studies, value for money analysis, gender research, senior level stakeholder consultations and Delivery Partner data). This will include an assessment of progress along pathways set out in the Newton Fund Theory of Change (including those relevant to UK benefits).

Overview of methods

UK benefits were explored under four key workstreams**:**

- Desk-based analysis of online survey data (August/September 2020). This comprised a sample of 1,516, of which 209 were UK-based respondents.
- Desk-based analysis of telephone survey data (November 2020). This comprised a sample of 217, of which 58 UK-based respondents.
- 16 key informant interviews (October/November 2020)
- Five case studies of UK impacts (October - December 2020), involving 13 interviews.

In addition, the workstream team drew upon findings from other workstreams where relevant, notably through a review of case studies produced in the separate country-level case study workstream, but which also sought to identify benefits for the UK at project- and country-level.

Key stakeholders

BEIS is the primary user of and audience for the outputs from this evaluation. We expect the findings of this workstream to also be of interest to secondary audiences involved in the delivery or assessment of the Newton Fund or similar initiatives.

We have identified the following key groups of stakeholders for learning and accountability purposes:

- BEIS Global Science and Innovation Team and other teams involved in the delivery of the Newton Fund.
- Newton Fund Delivery Partners.
- Teams and individuals engaged with related programmes and bodies, e.g. Independent Commission on Aid Impact (ICAI), Global Challenges Research Fund (GCRF).
- Other HMG actors (e.g. FCDO, DIT).

The results from this workstream may be of wider interest stakeholders in the UK research and innovation sector, in order to inform the development and evaluation of future international research funding and collaboration initiatives. This may include UK research councils, universities and research institutions, and industry bodies.

We also expect the findings to be of interest to the wider research and evaluation community.

Limitations of the research approach

A number of limitations should be considered when considering the findings of this workstream.

Firstly, as the primary focus of the Newton Fund is impact in partner countries (in line with ODA requirements), no specific objectives or KPIs have been articulated with respect to UK benefits at a Fund level (although outputs relating to UK benefits are included in the Theory of Change). Similarly the extent to which UK benefits were considered in call and project design varies across Newton Fund Delivery Partners: whereas some calls have sought explicitly to develop mutually beneficial partnerships (for example, some Innovate UK calls), and some have included potential impact for the UK as a project selection criterion, others have focused on primary benefits only. For this reason, the focus of this study has been primarily to assess the nature and type of UK benefits arising from the Fund (as set out in the Evaluation Questions), rather than to evaluate progress against a specific objective.

Secondly, the heterogeneous nature of Newton-funded projects may mean that the extent and form of UK benefits differs across contexts, sectors, and countries. To date, no central-level monitoring or evaluation of UK benefits has been conducted (with the exception of this workstream). Some benefits may accrue from the nature of setting up, designing and implementing the Fund itself with partner countries (for example, building stronger government and institutional relations) and so project-level benefits may collectively become more than the

sum of its parts at programme level.[100] It has not been possible to produce quantitative assessment of the extent of UK benefits across the Newton Fund portfolio. Interim and long-term outcomes of the Newton Fund may be explored at a later stage by a proposed Impact Evaluation.

Further limitations specific to each method are set out in the sections below.

Online survey

The objective of the online survey was to gather information about experiences of UK-based and non-UK Award Holders with regard to their Newton Fund projects.

The Final Evaluation Online Survey builds on the Online Survey (launched in August 2017) that was distributed for the 2018 MTE of the Newton Fund. The final (end line) online survey took place March – October 2020, comprising:

1. Survey development: The online survey questionnaires were developed and reviewed by Delivery Partners (DPs), In-Country Teams (ICTs) and BEIS.
2. Piloting: Before launching the survey, the survey provider and the evaluation team conducted a pilot to identify any final adaptations necessary.
3. Data collection: The survey was live for a 6-week period from 24 July to 7 September 2020. The evaluation team, BEIS, ICTs, and DPs shared survey links with all Award Holders.
4. Data processing and cleaning: The dataset and codebook provided by the survey provider were cleaned in Microsoft Excel and analysed using the statistical software package Stata.
5. Analysis: A high-level analysis of the results was conducted. Where differences were observed between the results of the 2017 MTE and 2020 online surveys, this was specified.

The evaluation team identified questions in the survey relevant to understanding UK benefits. For this study, the UK responses only were used, with the exception of the questions about non-UK Award Holders' perception regarding their engagement with the UK. The dataset was cleaned in Microsoft Excel and analysed using the statistical software Stata.

The survey was live for six weeks, from 24 July to 7 September 2020. 1,516 valid responses were received from Award Holders, including 209 UK-based responses. During the review of free-text responses, three responses were identified as non-UK respondents through context and removed from the sample, resulting in a sample of 206.

Based on the profiling information, the most likely profile of a respondent is a male (64.5%) with a research or academic background (89.1%). Within the Newton Fund, the respondents' activities are likely to deal with establishing and developing partners with researchers (544 selected) or collaborating research projects in academia (536 selected) as a main/co-lead applicant (69.2%) in the health sector (477 selected). A typical respondent had a research or academic background. Asked about their current role, 55% of respondents said they were professors, 11.2% were associate professor or readers, 16.4% were lecturers / teachers and 6.5% were post-doctoral researchers (PhD). By contrast, less than 2% of respondents reported they were working as employees of a charitable organisation or at a private sector.

Sample base

Based on information provided by the DPs and ICTs, the evaluation team know that more than 9,622 Award Holders were invited to participate in the online survey. In total, 1,516 valid

[100] As explored further in Tetra Tech (2021) Partner Country Case studies.

responses were received from Award Holders for the 2020 online survey[101]. This gave a response rate of 16% for those directly contacted.[102] Table 1 shows the number of Award Holders invited for the online survey by Deliver Partners and ICT's. By comparison, the mid-term survey received 862 valid responses (in late 2017), which puts the total number of responses received for the final evaluation survey in a reasonably favourable light[103].

Table 1: Number of Award Holders invited to participate in the 2020 online survey by Delivery Partners and in country teams

		Number of Award Holders invited to participate
Delivery Partner	British Council	2,559
	Academy of Medical Sciences	84
	UKRI	3,982
	Royal Academy of Engineering	1,325
	Royal Society	621
	Met Office	66
	British Academy	307
Subtotal (invitation sent to Deliver Partner)		**8,944**
In-country Team	Brazil	493
	Chile	Unknown
	China	Unknown
	Colombia	Unknown
	Egypt	Unknown
	India	Unknown
	Indonesia	121
	Jordan	Unknown
	Kenya	Unknown
	Malaysia	182
	Mexico	Unknown
	Peru	88
	Philippines	Unknown
	South Africa	Unknown
	Thailand	Unknown

[101] The data required cleaning to remove duplicates, invalid responses (for example where data provided was contradictory).
[102] The data required cleaning to remove duplicates, invalid responses (for example where data provided was contradictory).
[103] Note that the number of Award Holders contacts for the mid-term survey was not reported by all Deliver Partners, so we do not have a comparable response rate.

	Turkey	327
	UK	Unknown
	Vietnam	Unknown
Subtotal (invitation sent to in-county team)		**1,211**
Subtotal (invitation sent) (a)		**10,155**
Out of Office received (b)		**339**
Undelivered received (c)		**194**
Number of Award Holders successfully invited to participate (a) – (b) + (c)		**9,622**

The response rate of 16% in the 2020 online survey should be understood in light of the fact that respondents contacted may have been involved in activities at any time since the Newton Fund began in 2015. Given the long intervening period, it is reasonable to assume that for certain potential respondents, their recollection of the Fund would have been low and hence they would have self-selected out of responding. For those who opted in, we included a screening question at the outset of the survey to determine familiarity with the Fund and screened out those who were not familiar with the Fund leaving us with a smaller but better-quality sample.

Limitations

Three key limitations should be considered in relation to the survey data:

- There is a risk of positive or negative response bias, in which individuals who have particularly good or particularly negative experiences with the Newton Fund are more likely to respond to a survey. Also, some award-holders would have had low contact or very short-term involvement with the Newton Fund, which may reduce their inclination to respond to a survey.
- We were reliant on DP's, in-country teams and the BEIS ODA team to disseminate the survey, therefore we did not have full sight of whether all Award Holders received the survey successfully. For this reason, Award Holders connected to a particular DP (and so a particular research discipline) may have been more or less likely to engage with the survey.
- There may have been language barriers which prevented some respondents from engaging with the English-language survey or affected the interpretation of questions.

We have addressed these limitations by triangulating data from other sources (including the KIIs and interviews) where possible to assess the strength of evidence underlying a particular point. For this reason, the focus of this study has been primarily to assess the nature and type of UK benefits arising from the Fund (as set out in the Evaluation Questions), rather than to quantify the extent of those benefits.

In addition, one specific limitation was discovered during the telephone survey (which was sampled from respondents to the online survey). The telephone survey revealed that a number of UK-based respondents (46 of 217) had selected the wrong country in the online survey (indicating their country of partnership rather than the UK). This means that some online

survey respondents counted as non-UK respondents may have in fact been from the UK, and so answering from a UK perspective. Based on internal tests we do not expect this to have significantly impacted the online survey results. A secondary consequence is that this has resulted in a smaller population of UK-based responses although we do not expect this to have affected representativeness.

Telephone Survey

The objective of the telephone survey was to allow a richer analysis on particular issues compared to what is feasible through the online survey. In addition to sections on impact, sustainability and effectiveness sections, some specific questions were included on UK benefits and analysed for this report.

The rationale behind the telephone survey was to allow an additional analysis on particular issues over and above the scope of the online survey, giving a richer account of Award Holders' Newton Fund experiences in specific areas. The 2020 online survey provided information around the profile of respondents, outputs, results, challenges, benefits, and impacts. The telephone survey focused primarily on drilling down on certain results – i.e. (expected) impact, sustainability, effectiveness, and potential UK benefits. The sample for the telephone survey comprised a sub-set who agreed to be contacted again following the 2020 online survey.

The Final Evaluation Telephone Survey built on the Telephone Survey (launched in December 2017) that was distributed for the 2018 Mid Term Evaluation. It added fresh topics, namely effectiveness and followed up directly on responses regarding the effectiveness of the Newton Fund as reported in the 2020 online survey. The following activities took place between August – December 2020.

1. Survey development: The end line survey questionnaire was developed and reviewed by DPs, ICTs and BEIS.
2. Piloting: Before launching the survey, the survey provider (Ipsos) and the evaluation team conducted a pilot to identify any final adaptations necessary and reviewed the online survey data to ensure the usability of results. In doing so, the team identified the need to include additional clarification questions to establish the country of application of the award holder.
3. Translation: the survey was translated by an external provider into Mandarin, Portuguese, and Spanish. The scripts were checked, and some minor changes introduced.
4. Data collection: The survey was live from 13 October to 5 November. The average interview length was 31 minutes, ranging from 23 minutes to 43 minutes.
5. Data processing and cleaning: The dataset provided by Ipsos were cleaned in Microsoft Excel and analysed using the statistical software package SPSS, Stata, and Excel.
6. Analysis: A quantitative and qualitative analysis of the results was conducted. This included coding of the free-text questions specific to UK benefits by one researcher.

Out of the 1516 online survey respondents in 2020, 556 indicated that they would be willing to take part in a telephone follow-up and 217 valid responses were achieved (40% of the effective sample frame). There was at least one award holder who had applied to the survey each active Newton Fund country. 217 valid telephone survey responses were achieved. Of these, 68

respondents were UK-based, although data for one respondent was missing, resulting in 67 valid responses from UK-based Award Holders.[104]

A quantitative and qualitative analysis was subsequently conducted. Given the high volume of open-ended questions, the team manually identified key recurring themes in the dataset and coded the responses accordingly, to assess the frequency of their occurrence. Coding was conducted by one researcher.

Sampling limitations that relate to the online survey can also be expected.

Key informant interviews

16 key informant interviews were conducted. These senior-level interviews provided a rich source of context and perspective around the challenges and accomplishments of the Newton Fund in general, as well an opportunity to explore aspects of UK benefits that are more nuanced, such as soft power, science diplomacy and the additionality and sustainability of the Newton Fund. These were intended to complement country-level interviews in both the UK and partner countries which were conducted as part of the country-level case studies produced in 2020/21 for the final phase of the evaluation.

Key informant interviewees were chosen for their positions within HMG and the UK R&I ecosystem and ability to provide a portfolio-level view of Newton Fund activity. These included both key stakeholders identified by BEIS as being able to provide a potentially useful perspective by virtue of their role, and also stakeholders identified by the research team directly. Only UK-based interviewees were selected for this workstream in order to ensure close familiarity with the UK context.

Interviews were conducted by one interviewer over a remote call facility using a semi-structured interview protocol. Interview data was anonymised to encourage interviewees to speak frankly. A list of interviewees is provided in Table 2.

Table 2: List of interviewees for KIIs

Name	Organisation	Title
Alice Gast	Imperial College London	President of Imperial College London
Linsey Billing	FCDO	Head, Science, Innovation and Technology Team, Global Economic Issue Directorate
Michael Booth	UKRI	Head of International Development Partnerships
Dajana Dzanovic	Universities UK	Head of Strategic Partnerships
Helen Fletcher	UKRI	Head of International Development
Janet Geddes	Innovate UK	Deputy Director - Global
Phillip Lewis	British Academy	Head of International Research & Policy
Chris Maskell	BEIS	Head of Research & Innovation ODA Funds
Peter Piot	London School of Hygiene and Tropical Medicine	Chair of UKCDR's SCOR board and Director of LSHTM

[104] It is not possible to give a direct comparison of the country breakdown for the telephone and online survey. In analysing the online survey replies, it became clear that 46 out of 1,516 (or 3%) had misinterpreted the question regarding the country of application to the Fund. The telephone survey included additional questions to confirm the actual country of application, but this does mean the country of application cannot be directly compared.

Benjamin Reid	NESTA	Head of International Innovation
Liesbeth Renders	BEIS	Head of ODA Research Management Team
Niraj Siraf	Innovate UK	Newton Fund Programme Manager and India Partnership Manager
Nee-Jo The	Knowledge Transfer Network	Head of International and Development

Three further interviewees did not provide permission to be named in this report: two representatives from Delivery Partners and one who worked for a university in a role that gave them oversight of the use of ODA funds.

Two key limitations should be borne in mind with regard to KII data:

- Firstly, it is important to be aware of the risk of bias, particularly as many of the interviewees who are able to comment in detail on Newton Fund activity have been involved in programme implementation, and so may hold different views on the value of Newton Fund activity to those who have not been involved with implementation. The research team sought to mitigate this by triangulating data with the country-level case studies, other project documentation and across multiple interviewees where possible, to assess the strength of evidence underlying different views. In addition, some stakeholders not involved with direct implementation were included in the KII sample.
- Secondly, due to the ongoing COVID-19 pandemic, all interviews for this workstream (and the country-level case studies) were conducted remotely. The quality of interviews may have been affected for several reasons, including problems with connectivity; limited ability to engage with visual or nonverbal cues; and barriers to developing rapport with interviewees.

Case studies

Five case studies were produced for this workstream. The case studies involved interviews with UK Award Holders and in some cases additional collaborators, coupled with desk research from previous reports and UKRI project data where available. Interviews were conducted over a remote call facility by one interviewer, using a semi-structured interview protocol.

13 case study interviews were carried out across the six case studies:

- The emergence of Zika virus in Brazil: investigating viral features and host responses to design preventive strategies (two interviews).
- Development of an oral, thermostable enteric fever vaccine (PRORALVAC) (one interview).
- NUCLEUS: a virtual joint centre to deliver enhanced **N**itrogen **U**se effi**C**iency via an integrated **S**oiL-plant syst**E**ms approach for the UK & Bra**S**il (two interviews).
- Understanding biomass value chains and the environment-food-energy-water nexus in Malaysia through whole-systems analysis and optimisation (BEFEW) (one interview).
- BIOREVIEW: BioREfining Value from Industrial Waste (five interviews).

- T-DEB (one interview involving two participants).

In addition, one further interview was undertaken but not included as a full case study as the contact was not able to share extensive details about the project outcomes.

Case studies were selected purposively to sample projects which had reported, or expected to achieve, some form of UK benefit, in order to explore the precursors to doing so. Case studies were identified from a range of sources, including projects which had reported specific outputs in UKRI data; projects for which examples of UK benefits were apparent in published outputs; projects which had been reviewed for mid-term country reports and reported that they expected to produce UK benefits; and projects which were featured in UKRI/Newton Fund promotional material or were otherwise suggested by interviewees.

Four key limitations should be borne in mind in reviewing case study data:

- Firstly, given the purposive sampling, case studies undertaken for this workstream **should be considered, illustrative, rather than representative of Newton-funded projects as a whole**. However, projects reviewed for country-level case studies (which were selected through a rigorous sampling process to reflect the breadth of Newton Fund activity) also explored the UK benefits arising from Newton-funded activity, and thus provide a more systematic overview of the nature and type of UK benefits across the Newton Fund portfolio. In addition, five invitations to participate in the case study research were sent to additional award-holders but which received no response. This may present a risk of non-response bias, in that award-holders may be more likely to engage with the study team for projects which have been successful.

- Secondly, while project documentation was reviewed where available, the research team was not able to independently verify statements by all the different contributing stakeholders or to verify what was reported in documentation. For this reason, the case studies focused on identifying potential or expected UK benefits rather than assessing the extent or impact of these benefits.

- Thirdly, given resource and time limitations the interviews focused on the UK-based award-holders and research team members, and partner country award-holders were not interviewed for these case studies (unlike those conducted for country-level case studies). For this reason, case studies conducted for this workstream make no assessment of the quality of collaboration, nor the impact in the partner country.

- Finally, as with the KIIs, interviews were conducted remotely due to the ongoing COVID-19 pandemic. The quality of interviews may have been affected for several reasons, including problems with connectivity; limited ability to engage with visual or nonverbal cues; and barriers to developing rapport with interviewees.

Literature review

The study team also ran a limited search for papers and publications on the economic benefits of international research collaborations. This aimed at answering the question:

- What kind of economic benefits are a) theorised and b) evidenced by the existing literature?

The search was conducted online using Google and Google Scholar with strings selected and tested iteratively. The selection started with a more restrictive focus on the economic returns of international research collaboration with LMIC and/or ODA-funded research. This step yield largely unrelated documents, which suggests that the field is not well developed. As a second step, strings were tested for a less restrictive focus on economic returns of international research with any type of country.

The following strings were used to conduct the literature search:

- economic benefits of international research collaboration "emerging economies" OR "middle income" OR "developing countries".
- international science research collaborations economic development returns OR impact OR emerging economies OR low income OR middle income "economic benefit".
- international research science collaboration economic impact development OR benefits OR returns.
- international research collaboration science economic impact OR benefits OR returns.

A large number of results were found to be highly specific to individual fields of research, which were not reviewed for this workstream. In total, 15 papers were identified for close review, of which only one was found to contain a quantitative estimate of returns from specifically transnational collaboration.[105]

Analysis and Synthesis

The workstream drew together insights from case studies, online and telephone surveys, review of secondary data sources, and Key Informant Interviews to identify and analyse UK benefits.

The report draws conclusions against two evaluation questions. Content analysis and thematic coding were the main analytical tools employed to undertake qualitative analysis across evidence sources, enabling the team to reduce large amounts of content into manageable evidence relevant to the evaluation questions. The analysis and synthesis process involved:

- **Systematically coding and triangulating** data sources to identify trends, themes, and patterns to generate insights and inferences. Examples of UK benefits were identified from interviews, case studies and the separate country-level case study workstream, both to identify evidence against the four identified categories (including enablers and barriers to the realisation of these benefits) and also to identify any benefits and trends which were not identified in the original scoping. This combined deductive and inductive approach allowed the team to evolve the categorisation and coding as trends, themes and patterns became clearer. Data from these sources were then triangulated against evidence from the telephone and online surveys and secondary sources in order to assess the strength of evidence underlying different points.
- **Checking and validating emerging findings** to ensure that the evidence underlying the findings was relevant and sufficiently rigorous to support the inferences made. Lead

[105] Deloitte (2017) op. cit.

researchers also cross-checked each other's analysis and conclusions and participated in an internal workshop to refine and challenge findings and develop conclusions.

Annex C: Case studies

Below we present the case studies compiled for this workstream.

C.1 The emergence of Zika virus in Brazil: investigating viral features and host responses to design preventive strategies

Call	UK-Brazil Neglected Infectious Diseases Partnership
Total budget allocated in country	GBP 221,947 UK side Brazil counterpart: R$ 505,000 (GBP 110,291)
Start / end date	Jan 2016 – Jan 2019
DP UK and overseas	UK: MRC; Brazil: CONFAP, FACEPE
Award holders/ grantees	Rafael França (Fundação Oswaldo Cruz – Recife); Alain Kohl (University of Glasgow)

Project overview[106]

The project aimed to increase understanding of the spread and epidemiology of Zika virus infection by investigating the underlying biological processes of the Brazilian strand of the Zika virus and conducting a genetic mapping of the virus and studying how it interacts with hosts. The project ran from January 2016 – 2019 as a collaboration between the University of Glasgow Centre for Virus Research in the UK and the Fundação Oswaldo Cruz (Fiocruz) in Brazil.

At the time of the project proposal, very little was known about the biology and molecular biology of Zika virus, and the research topic was considered 'niche' as relatively few cases were known at the time. The Zika virus diagnostics available at the time were based on molecular techniques, and only available in few specialised laboratories. The research team sought to obtain a basic understanding of the virus, so as to devise an informed public health response and be able to develop lower-cost diagnosis techniques.

This project was the first in the world to focus on Zika virus epidemiology. Zika was declared a global health emergency by the WHO in February 2016, due to the disease's links with severe birth defects. The project resulted in a series of academic publications.[107]

Additionality of the collaboration

Given the prominence of Zika, the UK team considered it likely that they still would have applied for other funding to work on Zika in the absence of Newton Fund funding. However, having the Newton Fund funding in place enabled them to react very quickly to the emerging health emergency when the effects of Zika began to become clear. In addition, one interviewee felt that the relative flexibility of Newton (compared to other funding streams such as Horizon 2020) was useful in the early stages of the collaboration when not much was known about the

[106] This case study draws also from Coffey (2018). Mid Thematic Impact Study Report - Mexico. Available at: https://www.newton-gcrf.org/resources/

[107] To date 13 publications have published in various journals.

pandemic, meaning they were able to adapt to emerging circumstances and ultimately work on the research strand they felt was most productive.

Furthermore, one interviewee felt that the nature of the Newton Fund collaboration enabled a much closer team spirit with the Brazilian partners than may have been possible under other funding streams, in which roles are more discrete.

In addition, since Zika is not found in the UK, the UK team lacked raw material. One advantage of the project is that through the Brazilian partners they were able to secure a virus sample that was close to the patient, and with a clear sample history. This was considered an advantage over other potential virus sources as it enabled them to know the history of the virus. The virus isolate was subsequently shared with other research groups in Europe and the UK.

Secondary benefits for the UK

Developing contacts with Brazilian institutions: The research group remains in touch with Fiocruz. Although some potential follow-on collaborations with their research partner were identified, for example, research on neglected diseases such as Chikungunya, no formal cooperation between these two organisations occurred, although informal work has taken place. In addition, there were discussions about a possible secondment by a Glasgow researcher to one of the Brazilian partners, although this was not able to go ahead.

More widely, interviewees noted the value of funding schemes such as Newton for the infectious and tropical disease research sectors, as these diseases are often not present in the UK and thus international collaboration is a necessity. One interviewee noted that schemes such as Newton, in which there is sustained funding for a partnership with a specific country, enable researchers to think more ‘proactively’ about strategic partnerships with overseas institutions given the known funding opportunities.

Accessing Brazilian expertise: One interviewee noted that the project enabled them to tap into the Brazilian partners’ expertise in areas they were not as strong in, for example in conducting experiments involving mice. The interviewee felt that the nature of the Fund as a ‘level playing field’, involving a PI in both countries, enabled a good flow of ideas between the two groups.

Learning from collaborative experience: One interviewee emphasised the wider value of engaging in collaborations such as this, noting it had given them a different perspective on how to approach collaborative projects and provided valuable learning in terms of working with colleagues overseas.

High profile project: Interviewees felt the project had resulted in significant attention and profile for their research group, and generated wider academic connections in the field. As the project had already begun when Zika was declared a health emergency, the Glasgow research group received significant media attention and contact from other researchers in the field. During and after the project, the UK PI was asked to participate in a number of communications and policy events in the UK, including the sessions of the Science and Technology Committee of the UK on the Zika virus to examine knowledge on the link with babies born with microcephaly and the increased incidence of Guillain-Barre syndrome. The University of Glasgow team also participated in Precautionary Scientific Advisory Group for Emergencies (Pre-SAGE) meetings to provide scientific and technical advice to support government decision-makers during emergencies.

Additional funding and collaborations: The project led to additional collaborations which stakeholders felt may not have been possible without the project. They are also participating in various EU consortia on the topic, such as the Zikalliance.

Academic outputs: A number of academic publications were published as a result of the collaboration, and more are in progress. This has included one journal article which is the most highly cited publication by the Glasgow research group to date.

Personal benefit: One interviewee emphasised the value of having an opportunity to work on a topic which would result in positive benefits for the partner country.

Development of early-career researchers: A number of early-career researchers were involved in the research. One interviewee who had participated in the project as an early-career researcher noted that they were keen to apply for their own Newton Fund grant with a different partner country.

C. 2 Development of an oral, thermostable enteric fever vaccine (PRORALVAC)

Call	Innovate UK – CONACyT Mexico-UK Collaborative R&D Call
Total budget allocated in country	Innovate UK: GBP 374,331; Prokarium: GBP 160,428 CONACYT: GBP 118,784; PROBIOMED: GBP 118,784
Start / end date	September 2016 – October 2018
DP UK and overseas	UK: Innovate UK; Mexico: CONACYT
Award holders/ grantees	Prokarium (UK); PROBIOMED (Mexico)

Project overview[108]

This project consisted of the co-development of an oral, thermostable vaccine for enteric fever (typhoid and paratyphoid) by the British firm Prokarium and the Mexican firm PROBIOMED. Enteric fever, also known as typhoid fever, is endemic in South Asia, South East Asia, and parts of Sub-Saharan Africa. Every year, over 15 million people contract the disease, resulting in an estimated 153,000 deaths worldwide annually.[109] It is a highly contagious food and water-borne disease, given that the bacteria can survive for weeks in water and even in dry sewage.

The expected outcome of the collaboration is an effective, low-cost vaccine to reduce health risks and mortality. Due to its characteristics – oral ingestion and long shelf life in high temperature environments – it is hoped this vaccine will be able to reach rural areas with no electricity and with limited access to health facilities and doctors, as well as be easily employable by tourists visiting affected countries (including Mexico). The Newton Fund collaboration combined Prokarium's vaccine research and delivery platform with PROBIOMED's research on the development and scale-up of bioprocesses in its laboratory facilities to research the possibility of producing vaccines in bulk.

The Newton Fund collaboration with PROBIOMED concluded in 2018, and PROBIOMED are no longer involved in the vaccine development. The collaboration was felt to have generated

[108] This case study draws also from Coffey (2018). Mid Thematic Impact Study Report - Mexico. Available at: https://www.newton-gcrf.org/resources/

[109] Prokarium (2021). Available at: https://www.prokarium.com/#:~:text=Entervax&text=Enteric%20fever%2C%20a%20preventable%20illness,nearly%20153%2C000%20deaths%20worldwide%20annually

useful lessons, however, was not suitable for further manufacturing. At the time of writing, the vaccine – named Entervax - is at a clinical trial stage. Prokarium have been granted UK Medicines and Healthcare products Regulatory Agency (MHRA) to run a clinical trial with human participants; a phase 1 human study in the UK has been completed, and a phase 2 study is planned in South Asia (likely Bangladesh) if phase 1 results are promising. This trial has been made possible by a 2019 investment of £4.59 million as a convertible loan agreement by the Wellcome Foundation.

Prokarium expect that any subsequent vaccine product will be sold or licensed to pharmaceutical companies to move forward with vaccine production. A US patent has also been filed for the vaccine product; this was prioritised as a US-granted patent often sets a global precedent.

Additionality of the collaboration

The collaboration was established to respond to the Innovate UK – CONACyT Mexico-UK Collaborative R&D Call. The firms were introduced as part of a mission to Mexico for British firms run by the Knowledge Transfer Network (on behalf of Innovate UK) for businesses in the pharmaceutical, food, and energy sectors to develop potential Newton Fund partnerships. On that mission, Prokarium's CEO met representatives from PROBIOMED. At the same time, PROBIOMED's staff learned about Prokarium's technological platform and assessed the possibility of a partnership.

As the two firms were first put in contact through Innovate UK, it was felt by interviewees to be unlikely that this collaboration would have occurred without Newton financing and the efforts of Innovate UK to develop partnerships. Although Prokarium knew that Mexico is a significant player in the pharmaceutical sector in Latin America, with a large internal market and companies producing for several countries in the region, they had no pre-existing interest in working with Mexican firms. The success of the collaboration was attributed by an interviewee to a 'good match' between the two firms' technical capabilities and focus areas.

This project underwent a fundamental change in its technical and commercial focus. The initial aim of the project was to create a vaccine against bacterial diarrhoea, as caused by *E. Coli* and *Shigella*, through Prokarium's oral vaccine delivery platform Vaxonella.[110] Due to technical issues related to the survival of the bacteria, the team devised a new technology and business strategy. Prokarium proposed to shift from bacterial diarrhoea to enteric fever, as it was technically more feasible, and also considering that the market for the latter is very large. The change in focus was also driven by commercial considerations, as Prokarium did not observe a strong interest in the diarrhoea vaccine amongst pharmaceutical firms.

Secondary benefits for the UK

Economic and commercial benefits: The main benefit for the UK is that the funding enabled a UK firm (Prokarium) to progress the development of a vaccine which is expected to ultimately result in economic returns. Prokarium is a small company, founded in 2012, which relies strongly on grant funding. While it is possible that Prokarium may have found a way to generate the data generated through the collaboration with PROBIOMED, this may have been

[110] The Vaxonella platform is an oral vaccine delivery platform, which utilises attenuated strains of *Salmonella enterica*. These are ingested, pass through the stomach, and are processed to stimulate immune responses. Additional information available from: http://prokarium.com/vaxonella-platform/

delayed or resulted in a different focus. In this regard, interviewees felt the Newton Fund funding had been critical to getting the vaccine to this stage of development.

In addition, at least five direct jobs at Prokarium, plus the employment of additional consultants, have been generated by the collaboration, and the demonstrated ability of the firm to win funding was considered useful in increasing investor confidence. The Newton Fund funding, as non-dilutive funding, this was seen as a useful financing model, rather than for example the loan model for Wellcome (which sits on the books as debt).

International connections: Staff at Prokarium developed relationships and connections within Mexico at an individual (rather than just company-company level), which may prove beneficial for future collaborations; while no immediate collaborations are planned, one interviewee emphasised that these connections may pay off in the longer term. In addition, the ability to work collaboratively to develop the vaccine meant that the company were able to develop strong links to PROBIOMED, with one interviewee noting that strong, trusted partnerships are only effectively developed through co-working, rather than networking.

In addition, the PROBIOMED research and management team spoke about an improvement in their perception of the UK because of this project. Being able to visit Prokarium facilities exposed them to the infrastructure available in the UK for product development in the biotechnology field. The UK was seen as a place of opportunity for PROBIOMED – including but not limited to their partnership with Prokarium.

Facilitating engagement with partner countries: While Prokarium had had collaborations previously with other countries, these had been high-income economies such as the USA, France, and Belgium. In this regard, the Fund was seen more broadly by one interviewee as a useful tool for facilitating partnerships with low- or middle-income countries, which otherwise might be seen as highly risky places in which to invest, presenting high barriers to entry. In this regard, one interviewee emphasised the value of the Innovate UK missions to encourage UK firms to engage with Newton Fund funding and develop links with organisations in the partner countries directly, noting that sector conferences were often dominated by US and European participants.

C.3. NUCLEUS: a virtual joint centre to deliver enhanced Nitrogen Use efficiency via an integrated soil-plant systems approach for the UK & Brazil

Project overview

Nitrogen is a key nutrient for plants. Synthetic fertilisers are routinely added to soils to increase nitrogen levels and encourage crop growth; however a large amount of this nitrogen (estimated up to >50%[111]) can be lost in the process through leaching into the soil or from the surface as a gas. In addition to reducing the productivity of synthetic fertilisers (thereby necessitating greater use), the escaped nitrogen pollutes ecosystems and increases greenhouse gas emissions. Given that 3.5 million people are estimated to eat food produced using synthetic nitrogen fertilisers,[112] increasing the efficiency of nitrogen use – known as Nitrogen Use

[111] Rosolem, C.A., Ritz, K., Cantarella, H., Galdos, M.V., Hawkesford, M.J., Whalley, W.R., Mooney, S.J. (2017) Enhanced Plant Rooting and Crop System Management for Improved N Use Efficiency. Advances in Agronomy, doi: 101016/bs.agron.2017.07.2201

[112] Our World in Data (2020). 'World population supported by synthetic nitrogen fertilizers'. Available at: https://ourworldindata.org/grapher/world-population-supported-by-synthetic-nitrogen-fertilizers (accessed 12/06/2020).

Efficiency (NUE) management – is considered an important way of reducing harmful pollution while also enabling agricultural systems to meet the growing demand for food production.[113]

A Virtual Joint Centre to undertake interdisciplinary research on NUE was established through the Newton Fund. It involved 12 partner institutions in both the UK and Brazil[114], led by the University of Nottingham and São Paulo State University. The intention was to engage both physical and social scientists in research to 'assess, understand and recommend new strategies' for NUE (e.g. using no-tillage systems, intercropping, combined crop-livestock systems, applying organic wastes to soils as amendments). Ultimately, over 30 scientists from Brazil and the UK, including soil scientists, agronomists, environmental biologists, and social scientists, were involved in research for the centre.

The outputs were a series of research publications in relation to improved NUE, including recommendations for NUE practices in different contexts (such as the use of integrated systems, planting of native trees, adding amendments to soil). In addition, some consortium members secured follow-on funding through the Newton Fund Impact Scheme to work with smallholder farmers in the North of Brazil to encourage greater adoption and implementation of collaboration findings. Outreach events were also held with farmers in Brazil, including 'field days' often with over 1000 attendees per event and on-farm demonstrations.

Additionality of the collaboration

The collaboration was developed in response to the call; the lead UK institution, the University of Nottingham, had existing links with the lead Brazilian institution, São Paulo State University, through earlier networking missions supported by the University of Nottingham as part of their internationalisation activity. The Newton Fund built on this, and earlier networking grants from BBSRC and EPSRC, by enabling the team to build upon the links developed and conduct 'real science' rather than further networking.

In this regard, it was considered by interviewees that Newton Fund funding was critical to enabling the collaboration; while international collaboration is considered important for the soil science field in order to test findings across different environmental contexts and ecosystems, funding for such international collaborations is limited.

In addition, the seed corn funding from the University of Nottingham was considered important in terms of having established the initial links, as one interviewee emphasised the value of personal relationships and face-to-face contacts in establishing successful collaborations.

Secondary benefits for the UK

Learning from Brazilian expertise: While the specific primary impacts of the collaboration are expected to be in Brazil, interviewees emphasised the value of learning from Brazilian expertise in the field. Brazil is considered more advanced than the UK in a number of relevant fields, including some aspects of soil management such as inter-cropping, 'no-till agriculture' (which is widely used in Brazil, but uncommon in the UK) and the use of plants to slow down

[113] See further details at UKRI Gateway to Research (2021). Available at: https://gtr.ukri.org/projects?ref=BB%2FN013204%2F1

[114] The University of Nottingham, the University of Aberdeen, Rothamsted Research, and Bangor University. Partners in Brazil include Sao Paulo State University, the University of Sao Paulo, the University of Western Sao Paulo, the Agronomic Institute of Campinas, Embrapa Rice and Beans, the Goiano Federal Institute, the Federal University of Goias, and Maranhao State University. See further details at UKRI Gateway to Research (2021) - Available at: https://gtr.ukri.org/projects?ref=BB%2FN013204%2F1

nitrogen loss in the soil, which are considered positive alternatives to some intensive agriculture practices which can result in harmful environmental impacts (such as soil degradation and carbon emissions from intensive ploughing activity). Interviewees emphasised the value of learning from Brazilian partners in these areas; while at first one interviewee noted that the focus on Brazil had been driven at first by the nature of the call as necessitating UK-Brazil partnerships, in practice they had found the collaboration very beneficial for the UK research groups given the value of learning from the Brazilian expertise.

Research findings were presented at the World Congress of Soil Science and a recent British Society of Soil Science meeting, although no further plans are in place by the research team to extend the research within a UK context, given that the results are primarily of relevance to the Brazilian context.

Accessing a different research context: Newton Fund funding enabled the UK research teams to work in a different context, and so strengthen their understanding of the science by considering contextual variables. As food sustainability and security needs to be understood at a system level – taking into account imports of crops, as well as what is grown in a particular country – international collaborations were seen as critical in order to understand the impacts of food production across the full global supply chain, and thus the associated climate, economic and social impacts.

As an example, one participating institution (Bangor University) was able to use the collaboration to test a nitrogen sensor designed to try and monitor nitrate levels in the soil, with the intention of developing technology to enable nitrogen inputs to be added only when necessary: matching '*soil supply with plant demand*' in a cost-effective way that could be used by farmers. The sensor had been co-developed by a PhD student in collaboration with the John Innes Institute (who hold the patent for the sensor) and tested in UK contexts to prototype stage; the NUCLEUS project enabled them to also test this in a different context (Brazil), and tap into Brazilian expertise in crop sensors and novel drone techniques to advance the technology and complement UK expertise in soil sensors. While the technology is at an early development stage, it is hoped that these kinds of sensors will be developed over the coming decade to a stage they can be easily used by farmers. Other projects are focusing on adapting similar technologies to produce low-cost and accessible versions of the sensor to make them more marketable for farmers, including a UKRI-funded project to convert the sensor data into user-friendly information for the non-technical target audience.

Interviewees also noted the wider value of developing a better understanding of the diversity of agricultural practices. Similarly, one interviewee also noted that a wider benefit of Newton Fund funding was that it acted as a central 'hub' for transnational learning, by which expertise could transfer for example from Brazil to the UK, then out from the UK to China; joint events involving other nitrogen-based projects funded by the call were seen as a valuable way of encouraging international knowledge translation in this regard.

Applied research: The Newton Fund funding and the focus on impact (as a result of the ODA nature of the funds) were seen as enabling applied agricultural science where other UK-centric funding schemes may focus on more basic research. One interviewee emphasised the value of this for addressing current environmental problems, which may require more low-tech innovations (such as adaptations to social processes and the use of technology such as tractors), rather than focusing primarily on fundamental science or high-technology solutions which may take a longer time to result in positive impact. In this regard, the Fund was

considered by one interviewee to be funding '*things that aren't normally funded, but which should be funded*'.

Strengthening academic links: Interviewees were very positive about the project (with two interviewees independently describing this as the best project they had worked on); it was considered to have strengthened relationships with partner institutions across Brazil (in addition to between UK organisations working on the project) and enabled researchers to tap into the wider academic networks of the Brazilian partners.

Interviewees also reported examples of continuing institutional links. Other University of Nottingham researchers were now collaborating with the Brazilian partners independent of the NUCLEUS team, and the university was considered more widely to have extended its network around the world through its Newton Fund projects. At least two UK institutions signed MoUs with Brazilian institutions they had met through the NUCLEUS collaboration to enable further student exchanges outside the project framework; at the time of writing one interviewee noted this had primarily resulted in Brazilian students travelling to the UK, given resource constraints at the UK side for similar travel. Other examples included a Brazilian early-career researcher who subsequently joined the University of Leeds for a fellowship position, and some institutions who were now hosting PhD students from Brazil as a result of links developed through the collaboration. In addition, some Brazilian collaborators who visited for project activities had subsequently remained in the country for English courses.

While the 'legacy' of the project collaboration was considered strong, including an active email list, interviewees reported one challenge was that the end of the funding period had hindered further collaboration. It was noted that large-scale collaborations such as this often have a long lead-in time (including time required to set up administratively and become familiar with partners' work) before researchers are able to maximise the academic value of the collaboration; in this regard, the funding window was seen as too short, and researchers felt a longer funding window would have enabled them to more fully capitalise on the valuable links created by the project.

Nonetheless, interviewees were keen to collaborate with Brazilian partners again if suitable funding could be found (for example, one interviewee was interested in a project to enable access to a particle accelerator in Sao Paolo State to study nutrient dynamics for improved fertilisers). However, one interviewee voiced concern about whether funding opportunities would be available from 'usual' UKRI sources, in which it would be competing with 'blue-sky', or high-technology research projects, without ring-fencing for applied collaborations such as this.

Academic outputs: The collaboration generated a large number of publications, and more were expected at the time of writing. The team participated in a number of outreach events in Brazil and the UK, including the Royal Welsh Show, and undertook a large number of media engagements, including for radio, television, and newspapers.

Development of early-career researchers: The collaboration also involved a number of early-career researchers and students on both sides: in Brazil, 3 postdoctoral fellows, and 15 PhD, 5 Masters and 15 undergraduate students were engaged in some way in the centre. In the UK, 6 postdoctoral researchers were involved (all of whom subsequently found positions in the science sector).

C. 4 Understanding biomass value chains and the environment-food-energy-water nexus in Malaysia through whole-systems analysis and optimisation (BEFEW)

Call	RCUK Newton-SEA Small Scale Research Call 2016 [Energy-Food – Water-Environment Nexus theme]
Total budget allocated	UK: £98,109 Malaysia: £99,317
Start / end date	May 2017 – October 2019
DP UK and overseas	EPSRC, Ministry of Higher Education Malaysia
Award holders/ grantees	UK: University of Bath Malaysia: University Putra Malaysia, University Kebangsaan Malaysia, Technical University Petronas, University of Nottingham Malaysia Campus

Project overview

The biomass economy must strike a careful balance between the use of land and water, alternative uses for the land (e.g. food production), and the impacts of growth (e.g. deforestation, use of pesticides). Together this is known as the environment-food-energy-water nexus. This requires understanding the potential impact of changes in each of these domains and the interactions between them.

This project sought to map the opportunities for producing high-value biomass products in Malaysia while maintaining the balance of this nexus. It mapped critical environmental factors (e.g. water availability, soil quality), transport dynamics, and available technologies (e.g. processing facilities, site suitability analysis) to develop an optimisation model which can analyse the interplay of crops and technologies to propose which production activity at local, regional and national scales will provide the greatest economic benefit to the local community, with the lowest negative impact on the nexus. For the purposes of the project, the team focused on palm oil and rice crops. Palm oil in particular has been cited as one of the main causes of deforestation in Southeast Asia but is also considered a valuable crop with a high yield of oil per unit area and a long-life span. For this reason, there is interest in exploring ways to optimise sustainable palm oil production (including utilising secondary biomass by-products of the palm oil industry), rather than replacing palm oil production with alternative crops which may require a greater land area to produce (and therefore greater deforestation and resulting greenhouse gas emissions).

The project outputs were: a database of technologies and resources; a mapping and modelling of land use and suitability for oil palm crop in Malaysia; and the optimisation model, which will be integrated into a toolkit for policymakers to use to contribute to decision-making on biomass utilisation and commercial biomass opportunities, both for use by governments (for example, for policy planning) and industrial users (for example palm oil and rice producers who wish to streamline supply chains and reduce environmental impact). In doing so, it is hoped that better decision-making in relation to the biomass economy will provide economic development benefits in Malaysia (with the findings recommending a focus on smallholder farms) and improve environmental outcomes as a result of greater understanding of dependencies between ecosystems, with associated benefits for food security and human health.

Post-project work is focussing on the user interface for the tool and further publications are planned. Although the tool is not currently being used at present, the Malaysian partners are continuing to engage with stakeholders in Malaysia, including engaging with policymakers, to encourage uptake and use of the tool.

As part of the project, an international conference was also held in 2018 involving stakeholders from the UK and four countries in Southeast Asia: Malaysia, Vietnam, Philippines and Thailand,[115] and a series of stakeholder and capacity building events were conducted in Malaysia with stakeholders from industry, academia and government organisations.

Additionality of the collaboration

The UK PI already had connections to some of the partner institutions involved in the project through her existing work in the field; she reached out to these collaborators once the call was announced to establish a consortium in order to respond to the call topic (nexus). The UK PI had previously been involved in a project with UK collaborators to develop a similar model for the UK.

It was felt that the project could not have gone ahead without the Newton Fund as alternative funding may not have been available to develop these kinds of collaborations with, and on topics relevant to, the partner countries. In addition, the project was developed in order to respond to the specific call topic at hand.

The UK PI was not aware of other funding sources which could have supported a collaboration such as this (other than the GCRF, which has not had a call related to the nexus). However, the Newton Fund model of including a PI in the partner country was considered valuable, given the need for local contextual knowledge to undertake research on the topic, and as having a PI in-country had benefits in terms of managing the in-country research.

Secondary benefits for the UK

Academic outputs: The project resulted in a large number of publications (38) with additional publications in progress.[116] A special issue of the Elsevier journal *Food and Bioproducts Processing* was also produced to showcase findings from the research, with the UK PI as the Lead Guest Editor. The project team also reported international awareness of the project through attendance at high-impact international conferences, academic prizes, and invited presentations by the project staff.[117]

While the optimisation model may be copyrighted by the University of Bath to preserve the intellectual property, the research team is currently investigating ways to release an open-source version of this software to maximise the reach and use by stakeholders. Other aspects of the research (including a machine learning algorithm driven mapping tool) have been separately copyrighted by the Malaysian partners.

Skill development for UK and Malaysian researchers: Early-career researchers benefited from the collaboration; two masters students at Malaysian universities who were engaged in

[115] 2018 International Conference on Biomass-Environment-Food-Energy-Water Nexus held on 12-13 December 2018.
[116] See full list at Bath Research Portal (2021). Available at: https://researchportal.bath.ac.uk/en/projects/biomass-value-chain-efew-nexus/publications/
[117] See further details at UKRI Gateway to Research (2021). Available at: https://gtr.ukri.org/project/7E8FEA74-7958-4A36-86D2-70D003E23C28?pn=6&fetchSize=10&selectedSortableField=date&selectedSortOrder=DESC

the project are now pursuing PhDs, and two Postdocs have taken up academic positions in the Philippines and Malaysia (the latter at the University of Nottingham campus in Malaysia). In addition, the British Council Philippines has provided funding for a PhD studentship (through the Newton Agham Fund) in order to conduct a similar study in the Philippines context.

The Newton Fund was considered more generally to be a valuable source of funding for early-career researchers as it enabled them to conduct smaller, proof-of-concept projects before applying to larger competitive schemes such as the GCRF; and funding streams such as Researcher Links workshops gives them an opportunity to widen their networks.

Development of academic links: The project was considered to have widened the researchers' networks in Southeast Asia, and strengthened relations with the partner organisations in Malaysia; the teams are still collaborating despite the end of the project, and the UK PI considered that the network would be the first choice for further collaboration opportunities. The team are currently looking at the GCRF (or further Newton Fund calls) as a potential source of funding for further collaboration in this field.

One of the project researchers has moved back to his home country of Mexico, enabling the UK team to develop further links on this topic with researchers in Mexico. The international visibility of this project also helped the UK PI develop collaborative links with researchers from Brazil. Both of these countries face similar challenges to Southeast Asia in terms of managing biomass resources. The team has secured internal seed funding from the University of Bath to begin adapting the model for the Brazilian context.

Engaging with the Newton Fund was seen to be valuable for the University of Bath's own internationalisation strategy, particularly with regard to an ongoing effort to recruit students from Southeast Asia.

Potential application of the findings in the UK context: The optimisation model itself is considered to be context-neutral, in that it could be employed in a variety of settings, with the results depending on the datasets and scenarios on which the model is run. This means it could potentially be employed also in the UK, for example in relation to assessing land suitability for energy crops or wood pellets for biomass energy generation. The UK PI is engaging with various UK research institutions on this topic and is hoping for additional funding opportunities to potentially build on this topic in the UK context in the future.

UK reputation: It was considered that there may be wider benefits for the UK in terms of reputation, by the UK leading initiatives in this area, and by improving the visibility of the UK as a destination for overseas students from Southeast Asia in comparison to other common destinations (such as the USA).

C. 5 BIOREVIEW: BioREfining Value from Industrial Waste

Call	Newton Bhabha UK–India industrial waste challenge 2017
Total budget allocated	£1,006,479[118]
Start / end date	Sep 18 - Aug 21
UK Deliver Partner	BBSRC / Innovate UK

[118] See https://gtr.ukri.org/projects?ref=104332

Award holders/ grantees	Aberystwyth University; CSIR-Indian Institute of Chemical Technology; Gayatri Sugars Ltd (India); Manrochem Ltd; LCA Works; Fre-Energy; Membranology; Bangor University Further collaborative links: University of Leeds; Arcitekbio Ltd; Nova Pangaea Technologies;

Project overview

BIOREVIEW is a collaboration between UK and Indian academics and business to use biotechnology processes to turn waste streams from the Indian sugar industry into usable products for the agricultural, food and pharmaceutical sectors. The intention is that employing methods of biorefining to create usable products would enable product diversification in the sector. In doing so, the aim is to reduce waste and develop a circular economy; and to encourage economic growth and job creation in India by enabling the production of additional value-added products and reducing the economic cost of waste disposal.

> *'BIOREVIEW has brought together UK waste biorefining, engineering and environmental companies… to address industrial waste issues in India and has connected them with a sugar refinery capable of adopting these UK technologies to meet the sugar industry's needs.'*[119]

The project aims to pilot biorefining processes to create commercial products from wastewater and sugar cane bagasse (left over fibre) from the sugar processing process. This includes the production of volatile fatty acids (VFA), microcrystalline cellulose (MCC), VFA activated filters and xylitol, a common sweetener used around the world as a sugar replacement, including for diabetic foods. The VFA and MCC processes will be piloted with Gayatri Sugars Ltd, a prominent Indian sugarcane refinery. The intention is to demonstrate the viability of the technology, and ultimately develop commercial processes which can be licensed to Indian sugar mills.

The main outputs of the project will be a pilot-scale process design for four main product streams. It is expected that this will form the basis of academic publications, in addition to a commercial design product which can be licensed by sugar mill owners. IP for the outputs will be split across UK and Indian commercial partners in accordance with partnership agreements.

The project is being led by Aberystwyth University and Manrochem Limited (UK) and the Indian Institute of Chemical Technology (India), with the involvement of various industry and academic partners on the UK and Indian sides at different stages of the refining process. UK industrial partners participated on a part-funded basis.

The project has encountered some delays as a result of COVID-19, including a shift to producing some technology in the UK rather than India, and a possible extension is being discussed at the time of writing.

Additionality of Newton Fund funding

The UK PI was introduced to Indian partners through another colleague at Aberystwyth University, and had previously engaged with the partners through a BBSRC travel award; the proposal was then developed by the partners to respond directly to the Newton Fund call.

[119] UKRI (n.d.) Newton Bhabha Industrial Waste BIOREVIEW. Available at: https://gtr.ukri.org/projects?ref=BB%2FS011994%2F1

There were existing links between many of the UK industry and academic partners as a result of existing contacts.

Interviewees did not feel that the collaboration would have gone ahead in the absence of the Newton Fund. The Fund provided a centre point to coordinate the collaboration with expert Indian partners. This enabled the partnership to develop, as the bureaucracy involved in coordinating the various partners would have been difficult in the absence of the umbrella structure; without this, interviewees felt the collaboration was unlikely to have gone ahead, or (as one interviewee suggested) may have progressed among UK partners only as smaller, isolated pockets of technology development, which would have undermined the generation of ideas and the focus on social impact. One industry interviewee felt that the early-stage nature of the project means that it was unlikely to have been of interest to purely commercial investors, who would have had insufficient data on potential impact to adopt the risk.

Interviewees felt the financial structure was good; in particular, it was noted that some partners were SMEs, and may not therefore be able to participate in collaborations such as this outside the structure of an academic collaboration.

Notably, the majority of UK industry partners had existing links to academia (for example, one had previously participated in Horizon 2020 grants, and another was a spin-out from a university). One interviewee felt the opportunity may not have been of interest to purely commercial firms due to the part-funding.

Secondary benefits for the UK

Academic outputs: The award was considered a prestigious, high-profile award, and academic partners expected to generate strong publications and international recognition from the project.

Development of links with Indian and UK partners: Interviewees noted that they had been able to forge useful contacts in both India and the UK as a result of the project. While this is primarily in the form of contacts at present, interviewees hoped this might result in future collaborations.

More widely, the Fund was considered by interviewees to be a valuable research funding architecture given Brexit and uncertainty over future EU funding streams.

Training of UK researchers: The project was also considered to have been valuable for early-career researchers involved in the consortium, by enabling them to engage with the large-scale industrial processing equipment by partners, and engage in cultural exchanges and workshops with the Indian partners and training.

Specifically, interviewees also noted that the project would be valuable for educating early-career biotechnologists with regard to projects which are commercially relevant and can enable societal benefit, in addition to being of academic interest. One interviewee noted that it was difficult to engage with agriculture on this scale in the UK context, compared to the large-scale refining processes which are present in the Indian agricultural economy.

Access to Indian expertise: One industry interviewee noted the value of tapping into specific expertise from the IICT, who had significant research experience in the relevant technical areas, and were able to provide specific guidance on what would work and would not work in the context of the project.

Commercialisation of the technology: If results are promising, some industrial partners expect to benefit commercially from the collaboration (for example, by being involved in the resulting design and build of the product if the technology is adopted by Gayatri Sugars, who have first right of refusal). The project is intending to develop a pilot process; in order to enable the outcomes, additional funding or investment will need to be found to move to demonstration scale and, later, industrial scale. Interviewees felt that some form of government funding, for example from BEIS or Innovate UK, were the likeliest sources for this kind of funding or support, for example through a pitching event.

More broadly, interviewees also noted more widely that this was a good way to showcase UK technology within a potentially large market.

Two industry interviewees also noted that one of the technologies being developed for the project – a bioreactor – may have potential application in the UK context, for example in the distillery sector.

Ability to participate in R&D: Industry interviewees noted the value of being able to participate in R&D; this enabled them to undertake small and innovative early-stage research, and interviewees felt they had improved their technical knowledge of the field and were able to learn from other UK and Indian partners.

One company who was not expecting to directly benefit commercially from the service they were providing (given the partial funding) nonetheless felt that participating would be a strong platform for developing their service offer in this area, thus contributing to wider business development and word-of-mouth marketing (which was considered important in their sector).

In addition, a number of full-time jobs at UK industrial partners were created as part of the project.

C.6 Business Exchanges for Development in Turkey (T-DEB)

Call	Innvoate UK Global Innovation Partnership Programme (GIPP)
Total budget allocated[120]	Innovate UK: GBP 432,562. In-kind contributions: GBP 230,010
Start / end date	January 2018 - March 2020
DP	UK: Innovate UK
Award holders/ grantees	Various businesses in Turkey and the UK; programme delivered by Tekiu Ltd. (UK)

Project overview

Business Exchanges for Development in Turkey (T-DEB) was a two-year programme designed and delivered by Tekiu Ltd and implemented between January 2018 and March 2020. The programme sought to establish partnerships between SMEs, universities and non-profits in Turkey and the UK in the fields of healthcare and life sciences, environmental and agricultural technologies, and smart cities and digital economy, and provide a structured support programme to facilitate the partnerships.

[120] Skarlatidou, A. (2020). *External Evaluation: Overview & assessment of impacts using T-DEB's logic model*. Document received in confidence and reviewed by Tetra Tech study team.

Turkish companies were selected through a competitive selection process which involved an assessment of technology readiness, rationale for international collaboration and clear identification of societal need / problem to be addressed. T-DEB received nearly 500 applications from interested companies and organisations in Turkey.[121] The selection process resulted in 45 successful Turkish applicants across three thematic cohorts, who were subsequently trained and coached to identify the most suitable partners in the UK and carry out an extensive outreach campaign, and met with potential UK collaborators (with 744 UK businesses participating) through a series of visits and engagement events in the UK, ultimately resulting in the establishment of 25 R&D partnerships between 32 Turkish and UK businesses.[122]

Partnerships were subsequently given a programme of coaching and support, including visits by UK participants to their Turkish partner sites; three-way coaching and support meetings with Tekiu staff; a series of webinars on key partnership areas, such as IP; and information on sector-specific funding and investment opportunities. (However, the COVID-19 pandemic caused some disruption to the end of the programme, including limiting investor attendance at its final showcase event.) Businesses covered the costs of their own time, R&D and labour inputs, but support provided by the programme and costs of travel for programme events was covered by the programme budget.

Collaborations aimed to develop innovations to address socio-economic challenges in Turkey, although the specific challenges were not proscriptive and were instead developed by participants themselves on the basis of needs assessment workshops.[123] Example collaborations included a partnership between Rothamsted Research (a specialist UK agricultural research institute) and Turkish firm Biyans Biological Products R&D to develop a tool for soil analysis,[124] and a collaboration between Simbec Orion, a Welsh clinical research organisation, and Turkish firm RS Research to conduct a clinical trial of a chemotherapy drug.[125]

An external evaluation of the programme completed in August 2020 found that '*Tekiu successfully achieved its key GIPP goal through T-DEB, namely "to design and deliver a programme to stimulate and support innovation-focussed collaborations between businesses from the UK and Turkey to result in economic development and social welfare improvements in Turkey*". Alumni will also be tracked throughout the year following programme end to monitor partnership progress.

Following the end of the programme, a further phase (T-DEB+) was launched, subsidised by Tekiu with companies self-funding their spot on the programme. T-DEB+ was co-designed with a private UK investor and based on exit interviews with T-DEB participants, which identified a need for further support in terms of securing funding; the programme therefore focused on training participating businesses to conduct their own product and company profitability assessments and develop scaling strategies. This was considered by Tekiu to be a useful precursor to planning and establishing a successful international collaboration, and Tekiu are therefore interested in building on this for future programmes in this space; one model may be

[121] Ibid.
[122] Ibid.
[123] Ibid.
[124] Rothamsted Research (2021). Available at: https://www.tdebproject.com/company/rothamsted-research
[125] Simbec Orion (2021). Available at: https://www.tdebproject.com/company/simbec-orion

to fund future iterations of a programme such as T-DEB with funding from emerging market governments.

Additionality of the collaboration

Interviewees felt there were various barriers to the kinds of collaborations developed through T-DEB being established directly by SMEs themselves, including a lack of trust and knowledge of the partner market among businesses.[126] It was therefore felt that without this structured programme to facilitate communication and clarify expectations between businesses, provide information about key areas such as regulatory policy, IP generation, and dispelling misconceptions, it was unlikely that such partnerships would have developed organically. One Tekiu interviewee felt that having tailored support such as this for companies to request guidance on specific aspects of progressing their collaboration is particularly useful at the embryonic stages of a partnership. The Newton Fund and Innovate UK brands were also cited by the Tekiu interviewee as useful for building trust.

The Tekiu interviewee also felt that the programme provided UK companies with exposure to an upper middle-income market (Turkey) which they may not otherwise have thought about, whether through lack of knowledge of the country, or because they didn't see their product or service offerings as potentially applicable in an emerging market. While other forms of entrepreneur or trade missions are available through Chambers of Commerce, trade associations and other sources, they felt these are primarily aimed at exposing businesses to one another, rather than facilitating and supporting partnership building. Similarly, few accelerators or incubators for early-stage technologies provide internationalisation support of this kind.

Secondary benefits for the UK

Developing partnerships with Turkish businesses: The external evaluation of T-DEB found that '*The dedication and increased commitment from both UK and Turkish companies participating in the programme and the resulting partnerships demonstrate that* [nurturing trust between UK and Turkish businesses] *has been successfully achieved and T-DEB will act as a legacy for future UK companies planning to enter into R&D collaborations with Turkey.'*[127]

As noted above, interviewees felt that the programme had enabled UK businesses to overcome some barriers to engaging with businesses in Turkey (including a lack of awareness about opportunities, lack of existing trust and a lack of knowledge of the Turkish market), as well as providing a wider opportunity for internationalisation. The selection process for Turkish participants further enabled this by identifying key Turkish businesses in their sector. In addition, the Tekiu interviewee reported, based on internal monitoring data[128] that companies had also developed links within the wider ecosystem for their sector.

In addition, the external evaluation reported that the support offered to Turkish businesses helped them build confidence and communicate their offer in a way that would be of interest to UK partners.[129]

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[126] Tekiu representative; independent M&E representative
[127] See Skarlatidou (2020) op. cit.
[128] Not reviewed by workstream team.
[129] Ibid.

One interviewee however noted that the collaborations were in some respect limited by the ODA nature of the funds, by restricting the ability of the programme to engage with DIT on support for Turkish companies who were interested in potentially establishing bases in the UK (and vice versa), despite this being considered an essential part of taking collaborations to the next step in practice. In the end, T-DEB was able to refer the partnerships to DIT for additional support with permission from Innovate UK, although the interviewee felt that enabling this kind of support at an earlier stage would be useful to help take collaborations to the next step.

Securing further R&D funding: The external evaluation of T-DEB noted that the main assumption underpinning the achievement of medium- and long-term impacts will be the success in partnerships securing funding to create sustained R&D collaborations. Of the 25 partnerships established by the programme, a number had been able to apply for and secure further R&D financing: 2 partnerships successfully received funding (one Innovate UK and one TÜBİTAK, the Turkish innovation agency) and 4 are awaiting results at the time of writing. In terms of individual organisations, 3 Turkish organisations have been successful in receiving TÜBİTAK and EU funds, and 7 Turkish organisations have applied to and are awaiting results from various EU and TÜBİTAK funds to support their partnership work.[130] Of the 25, one partnership was dissolved, as a result of the Turkish company being sold and two have stalled due to staff turnover.[131]

The main reason for companies being unsuccessful was cited in the external evaluation as partnerships not yet being at the right maturity level to seek financing by the end of the programme.[132] (In this regard, the external evaluation noted that in some cases the support programme ended just as businesses might need the most support, for example support to find next-stage funding, and recommended a longer duration or follow-up stages for Global Innovation Partnership Programmes.) An additional reason cited by interviewees was disruption to the funding and investment landscape as a result of COVID-19 during the final programme phase.

One interviewee also noted the breadth of Newton Fund activity made it difficult to have a clear picture of what opportunities are going on at any one time across the Fund. In this regard, they felt that information about what is going on elsewhere in the Fund compiled regularly in one place would be useful, thereby offering opportunities for companies to be offboarded to other programmes.

Wider links to the Turkish economy: Interviewees felt that both sides had gained a better understanding of regulatory policies, market opportunities and the wider ecosystem in the opposite market.

In particular, the Tekiu interviewee also felt that the programme provided UK companies with exposure to a market (Turkey) they would not otherwise have thought about; the programme had enabled companies to think about their product or service offerings as potentially viable in emerging markets, including the specific innovation ecosystem within Turkey (which, as they noted, is more developed than some UK businesses realised). Similarly, the same interviewee reported that UK companies had in some cases been unaware that Turkey is particularly successful at securing EU funding, and so a potentially good partner for collaborations in this

[130] Ibid.
[131] Ibid.
[132] Ibid.

area. Additionally, UK businesses learned about potential opportunities for business support for UK companies by Turkish regional agencies.

One interviewee also felt there was wider value of developing links to emerging markets such as Turkey in the context of Brexit; they felt that, without Newton, some of the countries participating in the programme may not have received the same attention from UK companies.

International benchmarking: The Tekiu interviewee noted that a further reason that UK businesses were interested in participating was the opportunity to be exposed to other ways of working through the collaboration, and also to understand the practices and capabilities of other organisations.

Benefits for delivery organisations: The external evaluation reported that through the programme a number of stakeholders in Turkey will have been exposed to Newton Fund and Innovate UK themselves, including programme applicants and trade associations, incubators, membership associations, and cluster networks with which the programme engaged.[133] In addition, Tekiu was reported to have developed solid relations with participating companies; used monitoring and evaluation processes to inform and improve programme design.

[133] Ibid.

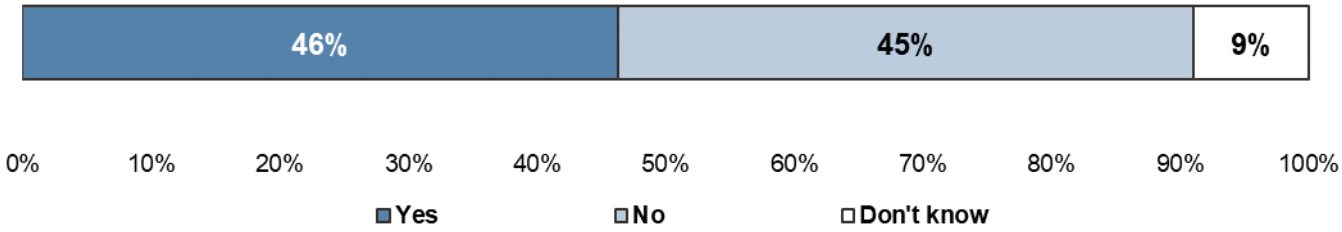
Annex D: Telephone survey results

Further detail on responses to the telephone survey are provided below.

D.1 Economic and commercial benefits

As set out in Figure 6, UK-based award-holders who participated in the telephone survey were broadly evenly split as to whether their project could or would result in economic or commercial benefits for the UK, with 46% responding 'Yes' and 45% responding 'no'.

Figure 6: Percentage of UK-based telephone survey respondents who felt their project did or would have economic or commercial benefits for the UK[134]



Sample: 67 UK-based respondents
Of the 31 / 67 respondents who responded 'yes', the reasons provided in the open responses were varied:[135]

- 13 respondents (41%) indicated that the research findings themselves would potentially lead to wider economic benefits for the UK, through improvements in the fields of population health (4), agricultural processes (3), digital technologies (2), energy efficiency (1), improving the stability of the partner country (1), the direct generation of an economic model (1) and unspecified (1).
- Nine respondents (28%) indicated that this was because they could potentially commercialise or capitalise upon some aspect of the project.
- Three respondents (9%) indicated that the project expected to increase the quality or decrease the price of a product that the UK imports.
- Two respondents (6%) indicated that they expected economic benefit by attracting more funding to their institution.
- Two respondents (6%) indicated that the collaborations would lead to stronger ties with the partner country, with wider economic benefits.

[134] Question text: Do you feel that your project has or could result in wider benefits for the UK in the following areas? [Economic or commercial benefits]
[135] Coded by research team. Some responses coded as more than one category; hence numbers sum to greater than 31.

- One respondent (3%) felt that the people-to-people links created by the collaborations would have later economic benefits.
- One respondent (3%) indicated knowledge of the partner country market would be of potential benefit.
- One respondent (3%) indicated SMEs would benefit directly from support through the project by being able to use the knowledge generated to better tailor their offer to the international development sector.

Of the 30 / 67 respondents who indicated that the project had *not* had (or they did not expect it to have) economic or commercial benefits, 19 (63%) stated this was because the project had not been designed in a way to enable this (i.e. no commercial outputs); two (7%) indicated this was because the project itself had suffered setbacks; one respondent indicated this was because they chose to produce the open-source software outputs to enable greater impact in the partner country; four did not specify or were unclear; and one felt it was too early to say.

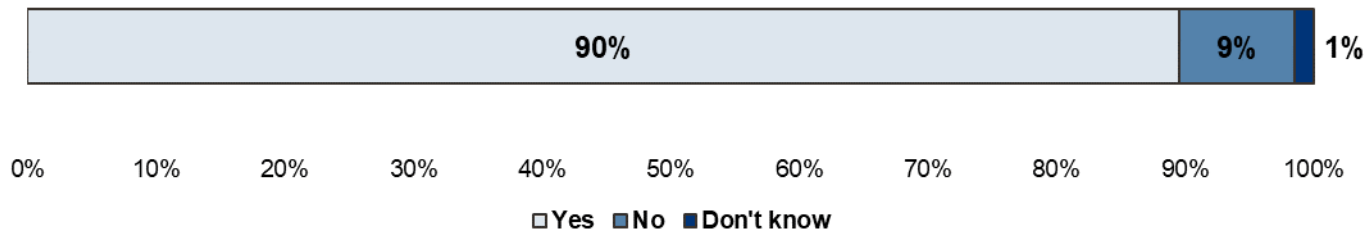
In addition, despite selecting 'no', three respondents (10%) indicated that in fact there could be indirect economic benefits through institutional benefits, for example by attracting more students from the partner country to the UK or improving the UK 'brand' abroad.

A further six respondents (9%) indicated 'don't know', all of which who felt their projects were at too early a stage to tell.

D.2 Research capacity

As shown in Figure 7, of 67 UK-based respondents to the telephone survey, 60 reported 'Yes' when asked whether the felt the UK would benefit in terms of the development of research or institutional capacity; six answered 'no' and one respondent answered, 'don't know'.

Figure 7: Percentage of UK-based telephone survey respondents who felt their project did or would have benefits for the UK in terms of the development of research or institutional capacity [136]



Sample: 67 UK-based respondents

Of the 60 of 67 respondents who indicated 'yes', the following reasons were provided in the open responses:[137]

[136] Question text: *Do you feel that your project has or could result in wider benefits for the UK in the following areas*? [Development of research or institutional capacity]. N=67

[137] Coded by the research team. Some responses coded as more than one category; hence numbers sum to greater than 60.

- 11 mentioned skill or personal development for UK researchers.
- 11 indicated that they or their institution had developed expertise in particular areas.
- Eight mentioned ways that they or their institution would benefit from expertise in the partner country.
- Seven mentioned ways that the knowledge generated through the project would help the academic sector.
- Seven cited benefits for their institution through project outputs or visibility.
- Seven mentioned expanded research networks.
- Six reported that the project had, or they expected it to lead to new funding or specific collaborations.
- Six indicated they expected some form of institutional benefit, such as increased student numbers.
- One mentioned that the funding had enabled them to work on a new collaboration with a new team, which is not easy to get.
- One respondent mentioned access to facilities that they would not be easily able to undertake in the UK.; one mentioned that The Fund had enabled the project by providing the funding to buy materials.
- Two responses were unclear or missing.

Of the six of 67 respondents who answered ‘no’, the reasons were varied: two felt that the project had not provided added value over what was already available at the UK institution; one cited project setbacks; one felt that the time spent on organising was not balanced with the benefits; and one felt that the ability to capitalise on Newton Fund activity was undermined by wider cuts to staff positions at the university. one response was unclear.

> *“There is a lot of time and energy spent organizing, working overseas in very difficult-to-work places, which cannot have benefits. I think the balance is quite wrong at the moment. I think it should be possible to get funding to work overseas, but... It should not be at the level it is at.*

> *“I mean, the University where I used to work has cut hundreds and hundreds of staff positions and as a result, what we were able to achieve with the Newton project, is two years later [it was] impossible to do anything with because of all these cutbacks and reductions...*

One respondent answered ‘don’t know’ as the project had encountered difficulties and thus not progressed as planned, however the respondent had expected the collaboration to result in skill development and knowledge exchange at both sides.

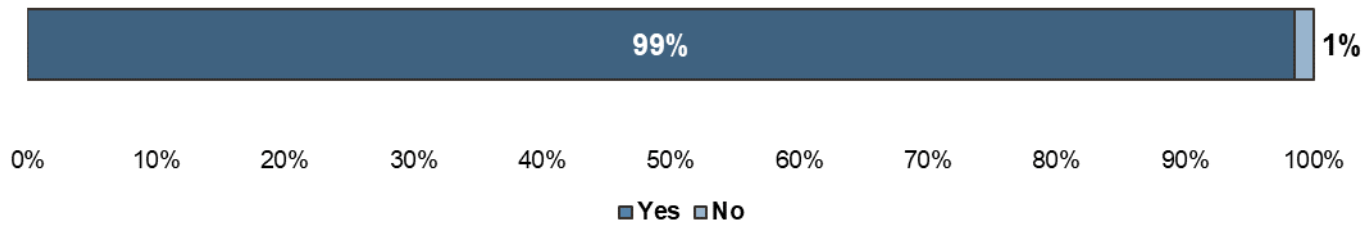
D.3. Knowledge generation

As shown in Figure 8, of 67 UK-based respondents to the telephone survey, 66 reported ‘Yes’ when asked whether the felt the UK would benefit from the knowledge generation through the

project. The lone 'no' response was due to project difficulties which meant the research could not be undertaken as planned.

Of those who indicated 'yes' to this question, the responses were varied: 22 reported some form of possible or planned direct application of the research findings to the UK context; 11 cited some form of indirect application, such as improving UK researchers' understanding of methodologies and research topics, and understanding of the overseas culture; and 28 respondents provided general responses about knowledge generation. Six responses were missing or unclear.

Figure 8: Percentage of UK-based telephone survey respondents who felt their project did or would have benefits for the UK in terms of the development of knowledge generation [138]



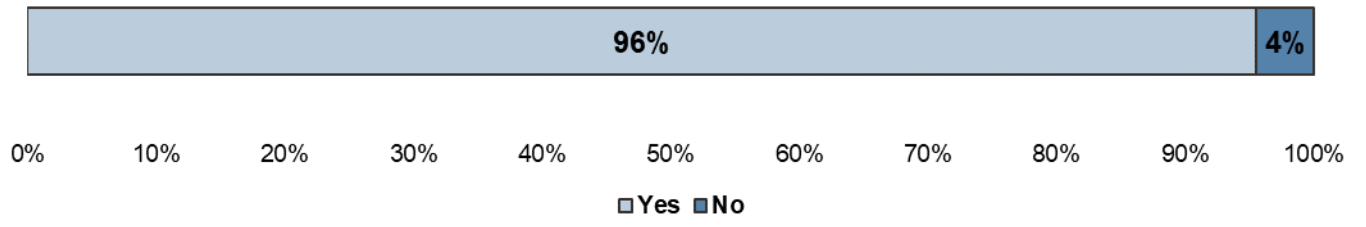
Sample: 67 UK-based respondents

D.4 Reputation and influence

As set out in Figure 9, UK-based respondents were almost unanimous in considering that their projects had or could have benefits for the UK's reputation or influence, with only three respondents responding 'no' compared to 64 responding affirmatively.

Of the three 'no' responses, one related to projects which had experienced difficulties; one was because of administrative difficulties in transferring funding by the UK university, which the respondent felt had harmed their standing in the eyes of the partner institution; and a third felt their project was too small to have any influence in this area.

Figure 9: Percentage of UK-based telephone survey respondents who felt their project did or would have benefits for the UK in terms of the UK's reputation or influence



[138] Question text: *Do you feel that your project has or could result in wider benefits for the UK in the following areas*? [Knowledge generation]. N=67

D.5 Additional benefits

Of 59 responses from UK-based researchers to the question '*In what other way(s), if any, do you feel your project may result in wider benefits for the UK in the future?*', 30 expanded on ways in which the outputs from the project itself would benefit or could be applied in a UK context. 13 mentioned future collaborations; seven mentioned benefits for the UK HE sectors, such as increased students and funding; five mentioned broader benefits for UK researchers through exposure to other cultures and teaching practices; four mentioned benefits for the UK's reputation.

Just four respondents explicitly said they felt the project would not result in benefits: two because the wider political landscape (such as budget cuts in the HE sector) would undermine any benefits; one who felt the benefits from the specific research were primarily at the partner side; and one who felt that while the Newton Fund in theory could produce reputational benefits for UK science, the Fund at present was not working effectively and so 'damaging our reputation'.

Nine respondents indicated they had nothing further to add.

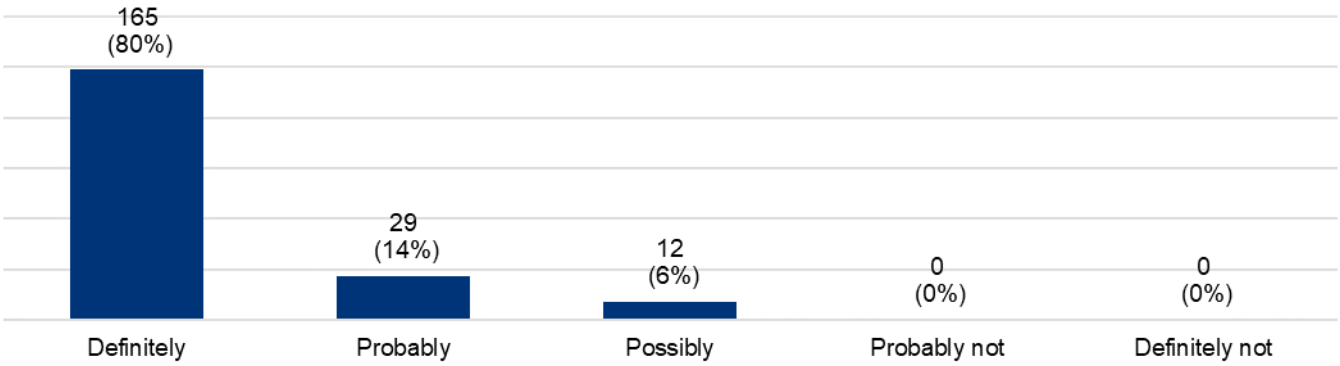
Annex E: Online survey results

This section sets out additional results from the online survey relevant to the experience of UK researchers and UK benefits.

E.1 Additionality of Newton Fund funding for UK-based participants

As shown in Figure 10, UK-based respondents to the online survey were asked to rate the probability that the funding made it possible to undertake new research or business activities. Most respondents (80%) reported that it has definitely made it possible for them to do new research or business activities and 14 selected “probably”. No respondents reported “definitely not” or “probably not”.

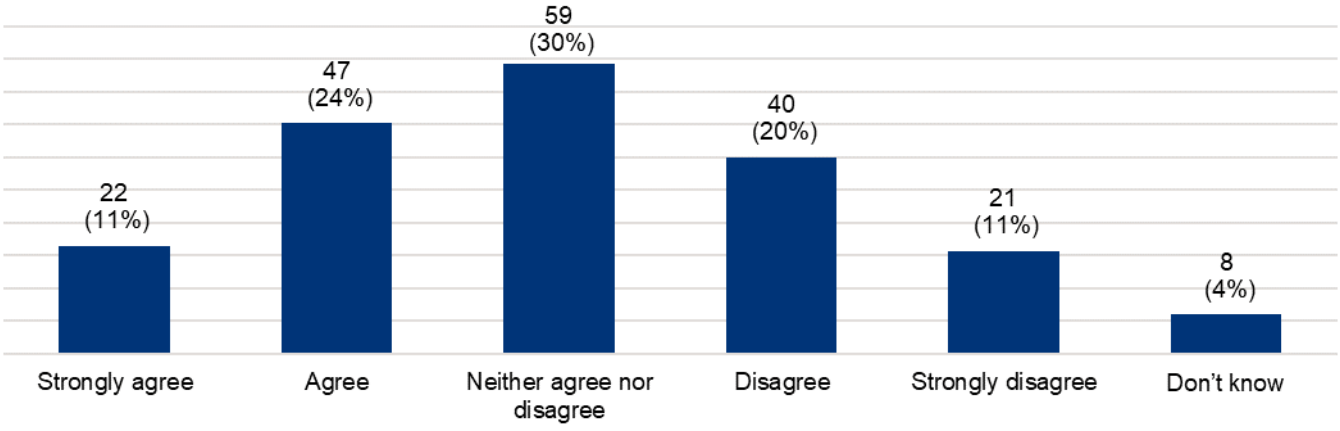
Figure 10: Additionality of Newton Fund funding



Sample size: 206; survey question G1: *Do you think that the funding provided by the Newton Fund made it possible for you to do new research or business activities that you could not have done otherwise?*

As shown in Figure 11, UK-based respondents to the online survey were split on whether they would have pursued funding for a collaboration with the other country in the absence of the Newton Fund, with 35% agreeing; 34% selecting ‘neither agree nor disagree’ or ‘don’t know’; and 31% disagreeing.

Figure 11: Proportion of UK Award Holders who agreed that they would have pursued funding to secure a collaboration with an organisation based in partner countries



Sample size:197; survey question F3: *To what extent do you agree or disagree with the following? If I/my team had NOT secured the funding, it is likely I/my team would have pursued other funding to secure a collaboration with an organisation based in partner countries.*

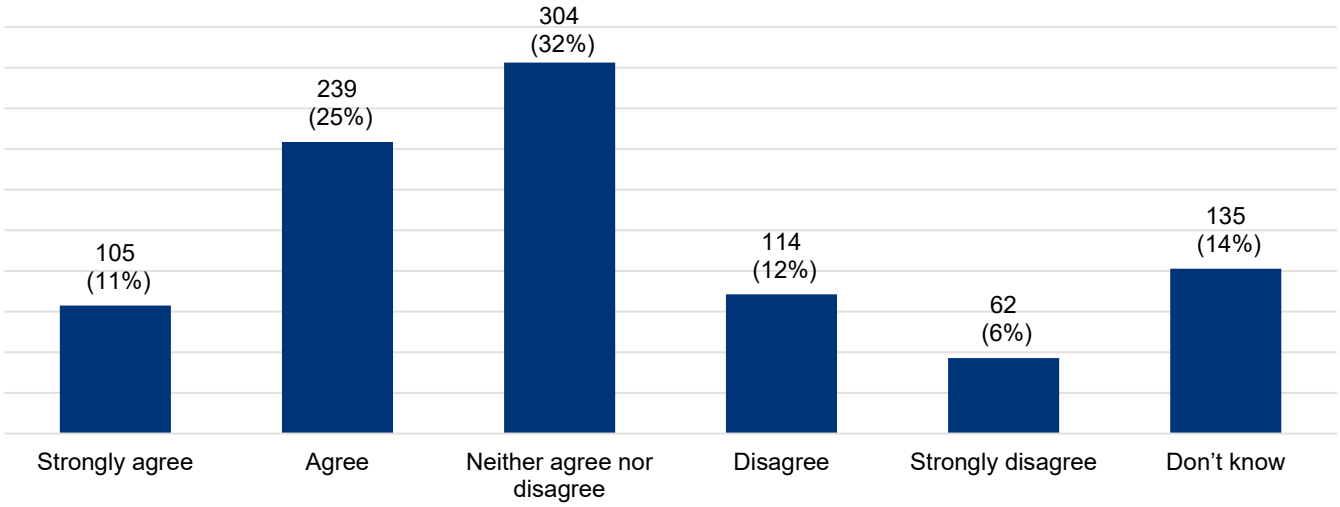
Of the 69 UK-based respondents who answered what other funding sources they would have pursued in the absence of Newton Fund funding[139], ten mentioned the Global Challenges Research Fund (GCRF); eight mentioned UKRI-associated funding streams; and seven others mentioned non-specific international funding sources. A small number of the respondents also mentioned other funding opportunities such as Economic and Social Research Council (three), Bill & Melinda Gates Foundation (three), The British Academy (three), Horizon 2020 (two), Arts and Humanities Research Council (two) and British Council (one). Three mentioned that they would have applied for other Newton Fund funding. Also, two respondents mentioned EU funding (non-specific) and their university funding (non-specific).

Of the 61 UK-based respondents who answered why they would not have sought alternative funding[140], more than half of the respondents (33) reported that this is due to lack of funding opportunities or they were not aware of other funding sources. When looking into more detail, nine of the 33 respondents indicated few other funding sources for the project area (research), and eight of the 33 respondents indicated there were mainly looking for an international funding source. Other nine respondents indicated that the links between their institutions / the collaboration would not have been possible without the Fund; seven indicated that they had not been actively looking, but had been approached about the proposal for collaboration by the other partners and seven reported that the Fund provided us with an opportunity that we took advantage of.[141]

However, the responses by non- UK-based respondents when asked about whether they would have pursued funding for a collaboration with UK organisations in the absence of Newton Fund funding are more mixed: the modal response was ‘neither agree nor disagree’ (32% of respondents), with 36% indicated agreement or strong agreement that they would have pursued funding, and 18% indicated they were unlikely to have done so. Of those indicating they would not have pursued funding, it is not clear from survey responses whether this reflects a preference for other collaborators, or a perceived lack of alternative funding sources.

[139] Survey question F3a (routed): *Please specify which types of other funding you/your team would have pursued, indicating if any of these were actively pursued.*
[140] Survey question F3b (routed): *Please specify the reason you/your team would not have pursued other funding*
[141] Not aware of any other source of funding (2), lack of funding (2), no connections (2), difficult to get funding (3), no bilateral funding (2),

Figure 12: Proportion of non-UK Award Holders who agreed that they would have pursued funding to secure a collaboration with a UK-based organisation



Sample size: 959; survey question E3: *To what extent do you agree or disagree with the following? If I/my team had NOT secured the funding, it is likely I/my team would have pursued other funding to secure a collaboration with a UK-based organisation.*

When asked to clarify which kind of funding they would have pursued, respondents predominantly indicated specific funding from their national research institutions (e.g. National Natural Science Foundation of China, the UK research councils). A large proportion indicated general non-specific international funding. Of 344 responses (including non- UK-based respondents), 14 also mentioned the GCRF; 23 mentioned Horizon 2020 or 'EU funding'; and 20 mentioned other Newton Fund funding. When asked conversely why they would not have pursued other funding, the vast majority of the free-text responses referred to not being able to find suitable funding for partnerships such as this from other sources. Only a small handful of responses mentioned other reasons, such as COVID disruption, time constraints or a lack of suitable connections with research partners.

As depicted in Figure 13, the Newton Fund was also felt by non- UK-based respondents to have enabled or improved partnerships with UK organisations; 22% felt that they could not have had any partnerships with UK institutions, while almost half (47%) felt that while they may have had partnerships with UK organisations, these would not have been as good as those facilitated by the Newton Fund project. Conversely, 13% felt that the organisation would have the same UK partnerships in the absence of Newton Fund funding, and 8% felt that the partnerships would have in fact been better in the absence of Newton Fund funding.

Figure 13: Expectations of how partnerships would have been different without the funding

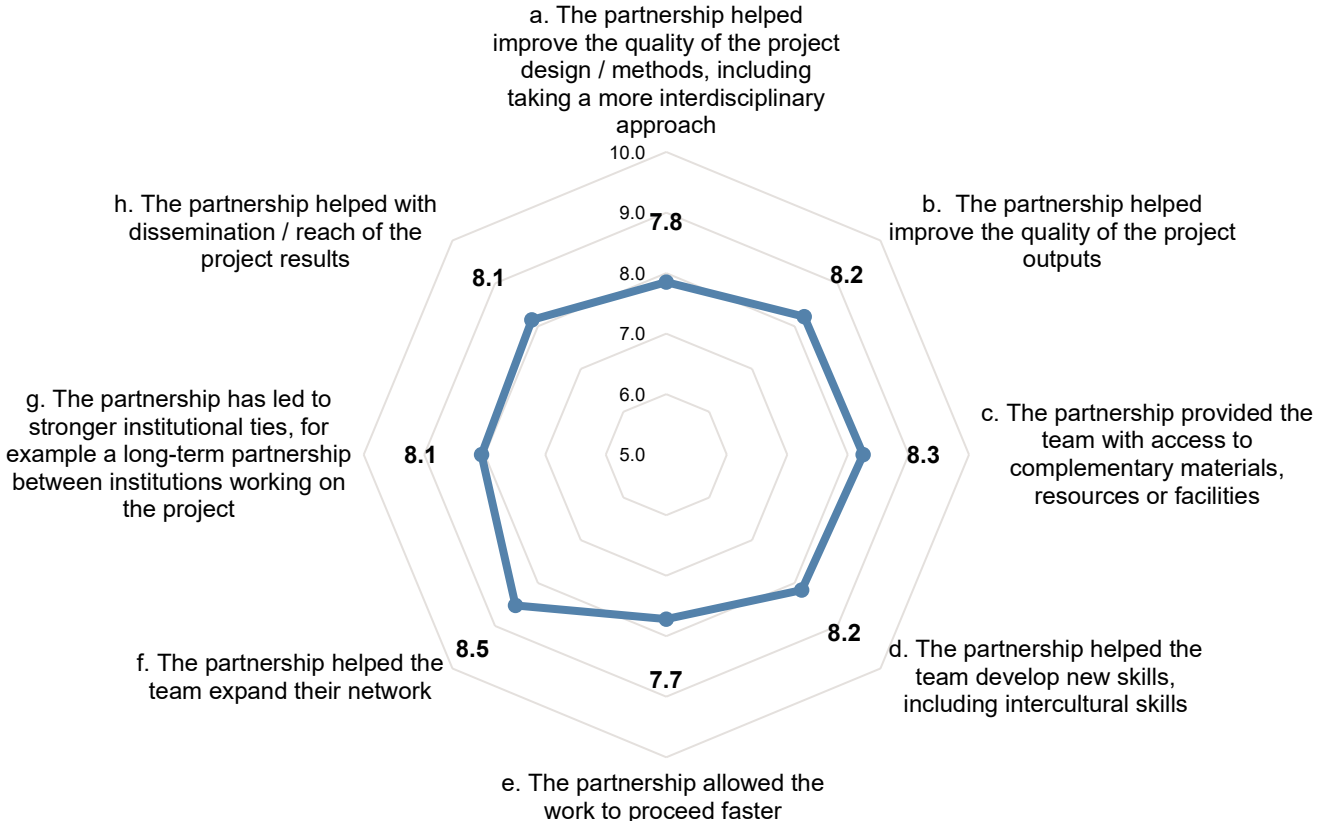
Sample size: 872; survey question D1c: *Which of the following statements do you agree with most? If my institution / organisation had not received the funding*

E.2 Value of working in partnership

As shown in Figure 14, respondents were asked how much added value working in a partnership brought to their project; zero being the most negative impact and ten being the most positive impact. UK-based respondents reported positively that working in partnership with the overseas partner had brought value to the project work.

The average added values selected for each statement were all above 7.5 indicating strong agreement that the partnership had helped improve research quality (mean 7.8/10) and dissemination (8.1/10); provided the UK team with access to complementary resources and facilities (8.3/10); helped the team to develop new skills, including intercultural skills (8.2/10); helped the UK team to expand their network (8.5/10); and that the project had led to stronger institutional ties between the UK and partner institutions (8.1/10).

Figure 14: Value added by partnership



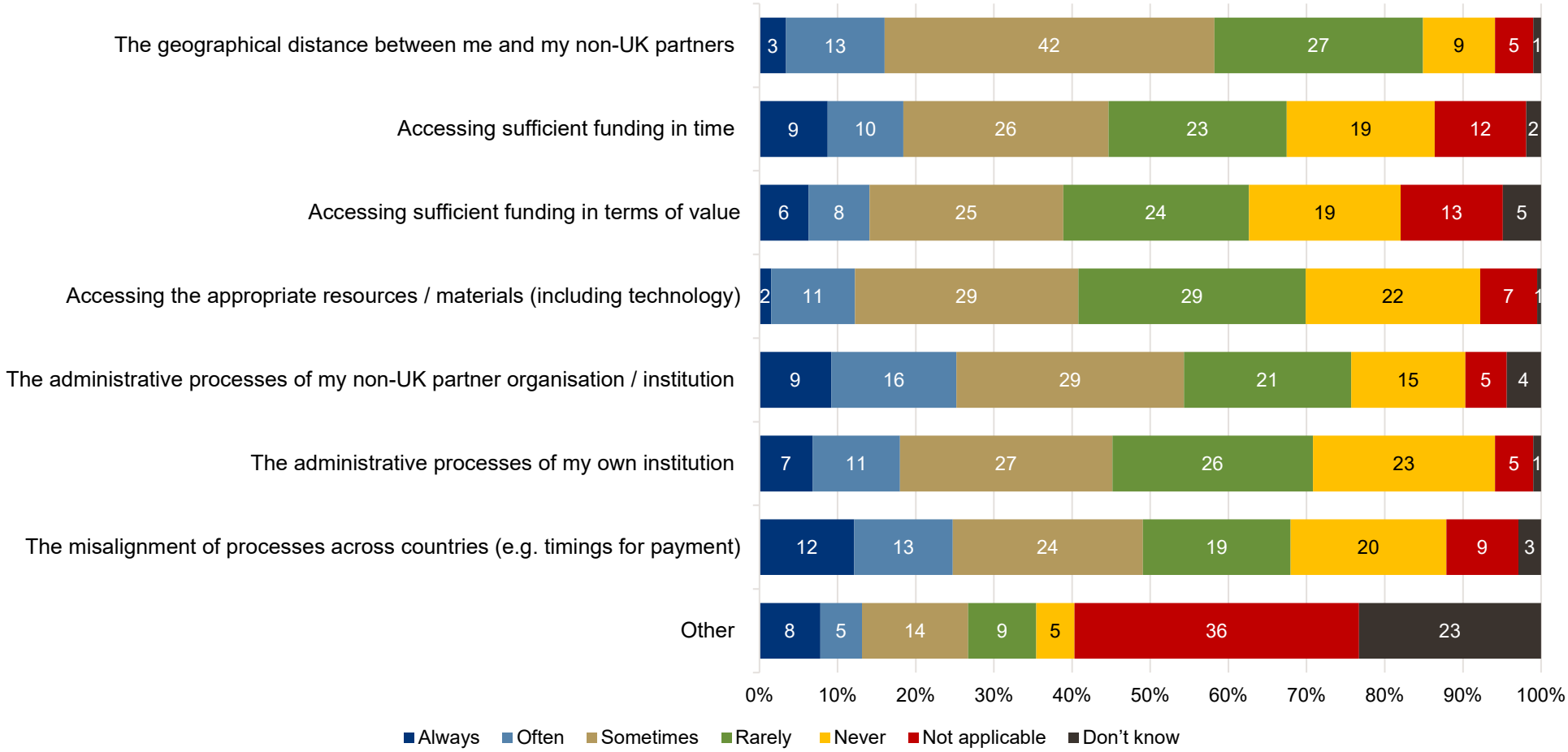
Sample size: 226, 223, 218, 226, 219, 228, 223 and 222 from a. to h. in that order (n/a excluded; UK-based respondents with multiple partnerships asked to answer for each partnership separately); survey question F2: *What added value did working in a partnership with [country partner] bring to your project? If you feel you / your team did not experience a particular benefit, please place it in the "not applicable" box.*

E.3 Project challenges as reported by UK-based respondents

Figure 15 indicates the core difficulties experienced during project implementation as reported by UK-based respondents only. As the data show, there is no clear trend as to difficulties, with all difficulty types reported by more respondents as occurring 'rarely' or 'never' than 'often' or 'always'.

Reinforcing findings from the case studies, the two difficulties reported as 'often' or 'always' occurring by the largest proportion of respondents (25% in both cases) were the administrative processes of the non-UK partner institution, and the misalignment of processes across countries; however in both cases, this was outweighed by the proportion reporting that this was 'rarely' or 'never' an issue (25% and 39% respectively).

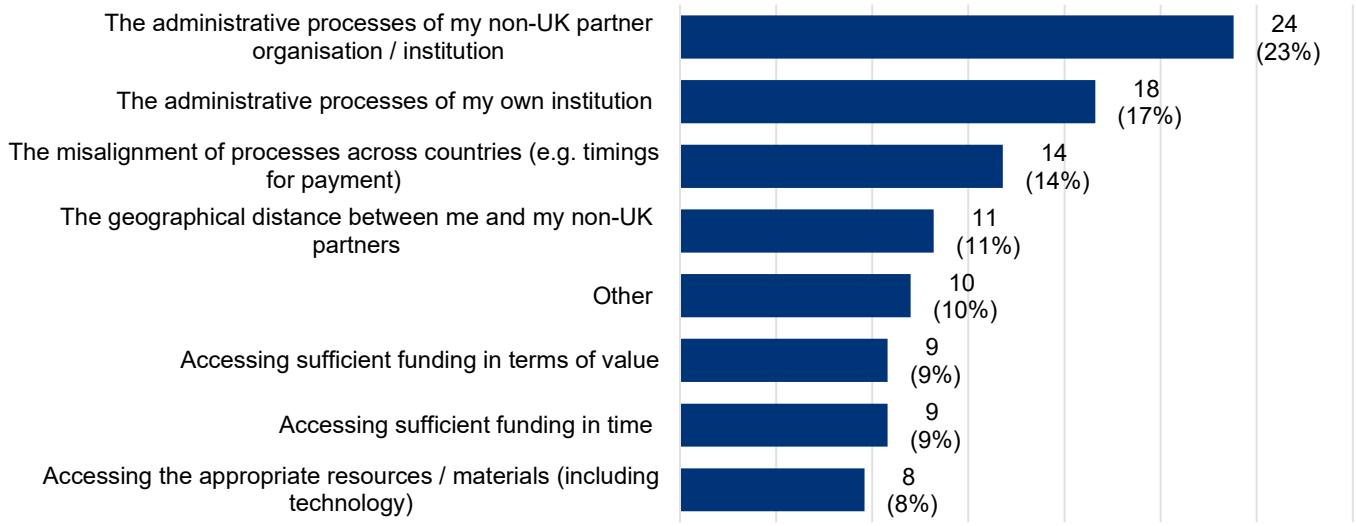
Figure 15: Difficulties reported by UK Award Holders



Sample size: 206; survey question H1: *How much did each of the following make things difficult for you (or not) during your Newton Fund project*

This was reinforced by UK-based respondents' answers in relation to the biggest obstacle to the collaboration, in which 23% of respondents indicated the administrative processes of the non-UK partner organisation, followed by the administrative processes of their own institution (17%).

Figure 16: The biggest obstacle when delivering the Newton Fund project



Sample size: 103; survey question H2: Which of the following made things most difficult for you to deliver your project?

E.4 Enabling project network and dissemination activities

As shown in the Figure 17, UK-based respondents also indicated that funding provided by the Newton Fund had been important in enabling key project network and dissemination activities:

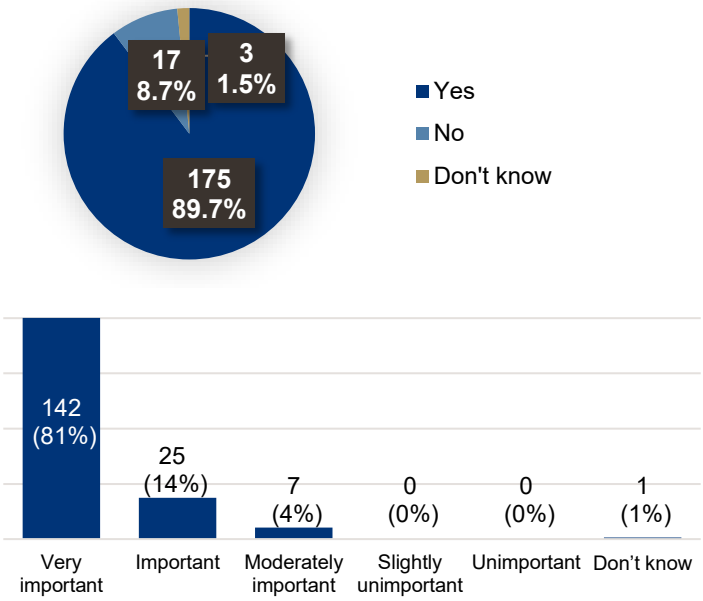
- 95% of UK-based respondents indicated that funding was 'very important' or 'important' for attending/organising workshops.
- 94% indicated that funding was 'very important' or 'important' for attending/organising training programmes.
- 87% indicated that funding was 'very important' or 'important' for attending/organising conferences.
- 91% indicated that funding was 'very important' or 'important' for attending/organising business/academic network events.

For all activities, the proportion which selected 'unimportant' was 1% or fewer, indicating that funding was considered critical across the board for engaging with these activities in relation to their Newton-funded projects.

However, the proportions among those respondents selecting just 'very important' differed: while 81% indicated the funding was 'very important' for workshops and 76% for training programmes, the proportions for conferences and business/academic networking events were 61% and 56% respectively, with higher proportions instead indicating it was 'important' or 'moderately important'.

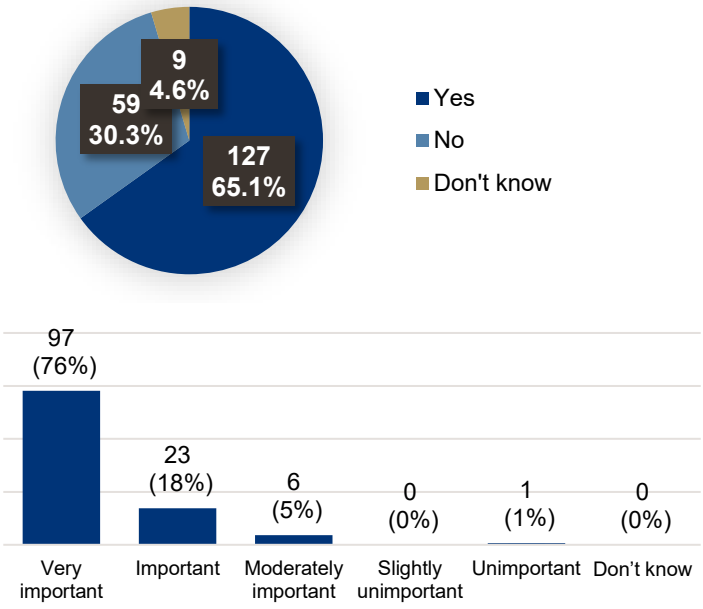
While this still indicates that UK-based respondents placed a strong emphasis on the funding for engaging with these activities, the relatively smaller percentages may reflect for example the wider availability of funding for conference and networking events available in the sector, or the wider expectations for academics to engage with these outside of project contexts.

Figure 17: Proportion of UK-based respondents indicating their project involved attending/organising workshops and stated importance of funding



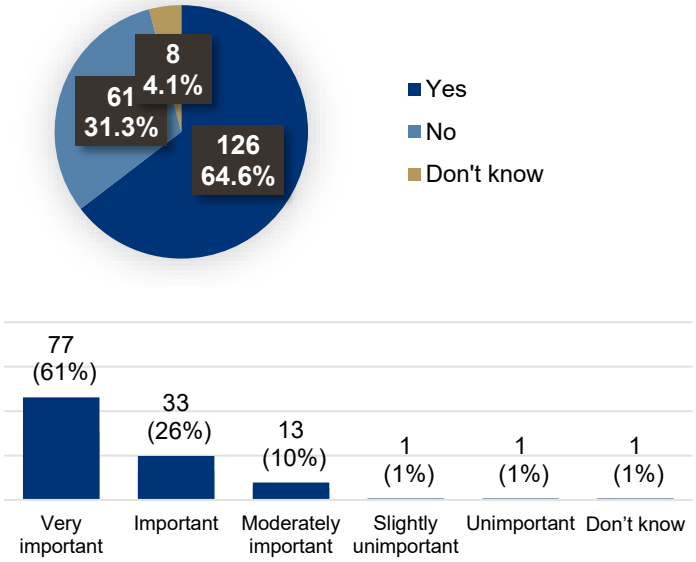
Sample size: 195 and 175 respectively; survey question C2: *To your knowledge, did the project you were involved in include any of the following activities for you or your team?*; and C2a: *To your knowledge, how important or not was the funding you / your team received for the activity / activities?* Option: [Attending /organising workshops].

Figure 18: Proportion of UK-based respondents indicating their project involved attending/organising training programmes and stated importance of funding



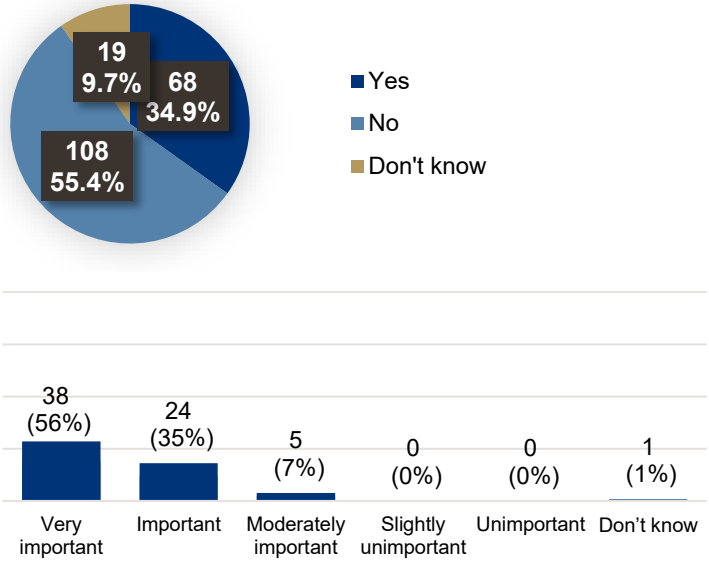
Sample size: 195 and 127 respectively; option [Attending / organising training programmes].

Figure 19: Proportion of UK-based respondents indicating their project involved attending/organising conferences and stated importance of funding



Sample size: 195 and 126 respectively; option [Attending / organising conferences].

Figure 20: Proportion of UK-based respondents indicating their project involved attending/organising business/academia networking and stated importance of funding



Sample size: 195 and 68 respectively; option [Attending / organising business / academia networking (sometimes called "match-making" event

E.5 Developing researcher capacity

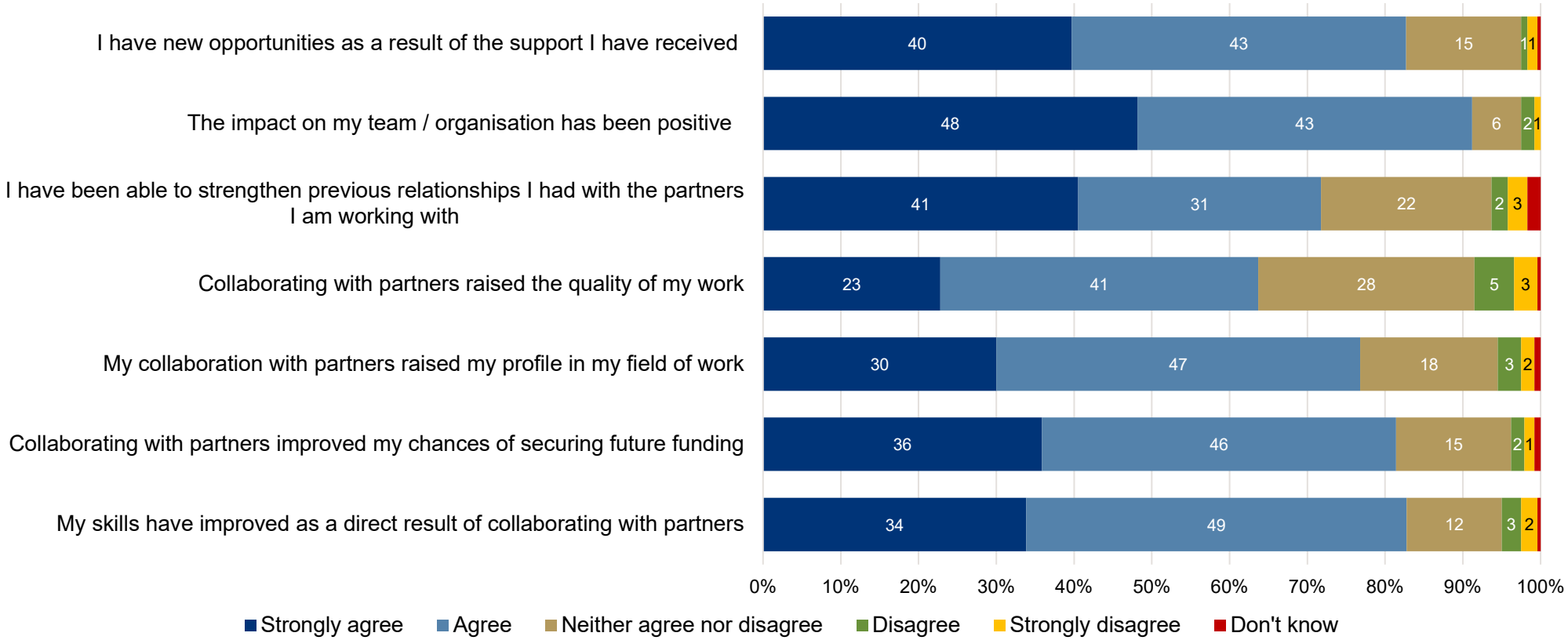
As shown in Figure 21, UK-based respondents indicated positively that the scheme had resulted in personal benefits for themselves as researchers. This included:

- 83% who agreed that the funding had opened new opportunities for them compared to 2% disagreed.

- 72% who indicated they had been able to strengthen relationships with their project partners, compared to 5% who disagreed.
- 64% who felt the collaboration had raised the quality of their research, compared to 8% who disagreed.
- 77% who felt the collaboration had raised their own profile in their field, compared to 5% who disagreed.
- 81% who felt the collaboration had raised their chance of securing further funding, compared to 3% who disagreed.
- 83% who agreed that the collaboration had improved their own skills, compared to 5% who disagreed.

Overall, 91% of UK-based respondents indicated that the impact on their team had been positive, with just 3% indicating they disagreed.

Figure 21: Capacity building benefits reported to be achieved for UK-based respondents



Sample size: 237; survey question G6: *To what extent do you agree or disagree with the following? The sample size is bigger than 206 due to looping (for those who had more than two partners)*

E.6 Additional benefits arising from Newton Fund projects

As shown in Table 3, when asked about other benefits from the project, UK-based respondents broadly answered in five main ways:

- That the collaboration helped them to expand academic networks and institutional ties.
- That the collaboration had enabled them to gain a broader understanding of their research area:
- That the UK research team had been able to access complementary knowledge, materials, resources, or facilities.
- That the collaboration had enabled them to gain a greater understanding of the working/academic environment in the partner country.
- That the collaboration had enabled them to gain a greater understanding of the political, cultural, or social environment in the partner country.

Table 3: Additional benefit perceived by respondents

Other benefits	Freq.	Percent
The partnership has led to stronger institutional ties, for example a long-term partnership between institutions working on the project	38	26%
A greater understanding of the political / cultural / social environment in the partner country	24	16%
A greater understanding of working / academic environment in the partner country	23	15%
The partnership with [partner country] helped the team expand their network	23	15%
I gained a greater / broader understanding of my research / research area	17	11%
Other answers	13	9%
The partnership with [partner country] provided the team with access to complementary materials, resources, or facilities	13	9%
I could access knowledge / expertise required to conduct / enhance my research	10	7%
It enabled applications for further funding / joint funding bids	10	7%
It enables the exchange of personnel / visits / travel between partner countries	10	7%
Don't know / none	9	6%
It assisted with the development / delivery of my research / project / outputs	8	5%
It has enabled the development of new projects / research	7	5%
The partnership with [partner country] helped the team develop new skills, including intercultural skills	7	5%
The partnership with [partner country] helped improve the quality of the project design / methods, including taking a more interdisciplinary approach	7	5%
It facilitated friendships / strong personal bond between researchers	6	4%

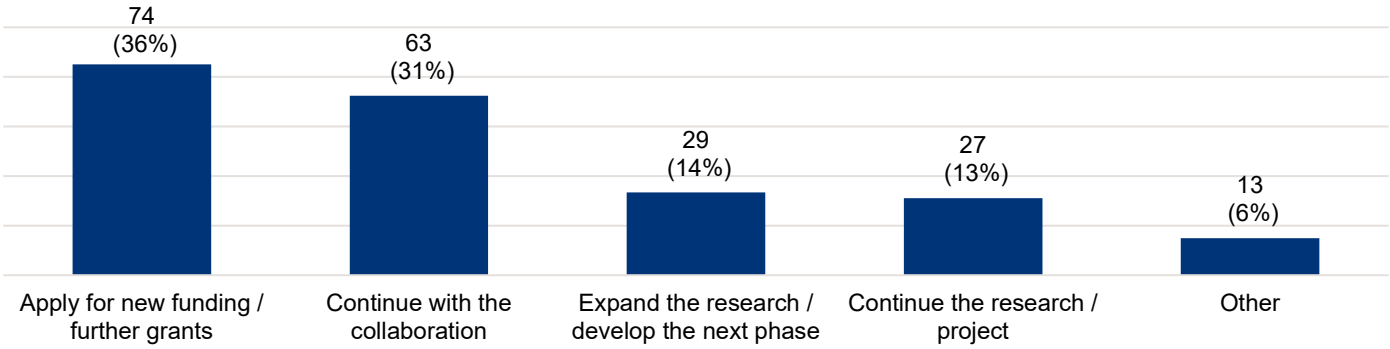
The partnership with [partner country] helped improve the quality of the project outputs	5	3%
It has enhanced / improved my research / enabled high quality research / projects	4	3%
Experience of working in a partner country / had the opportunity to carry out my role in a different environment	3	2%
It enabled joint educational opportunities / curriculum development / co-supervision	3	2%
It has enabled publication / joint publication of research outputs	3	2%
The partnership helped with dissemination / reach of the project results	3	2%
I gained an understanding of other research areas / expanded my research to other areas	2	1%
It enabled career development / I could further my career	2	1%
It was an enjoyable / pleasant experience	2	1%
Total number of responses	250	n/a

Sample size: 149, Survey Question F2a: *What, if any, other benefit did you experience?* Open text box: answers coded by research team. The percentage was calculated by dividing the number of responses by *sample size* (rather than the number of responses).

E.7 Plans to continue collaborations

As set out in Figure 22, the majority (58%) of UK-based respondents indicated that they would seek to continue the research project or collaboration in some form following the end of Newton Fund funding, including continuing or expanding the project or other ways to continue the collaboration with country partners. In addition, 36% indicated that they intended to apply for new funding or further grants.

Figure 22: Professional plans of UK-based respondents following Newton funded-project

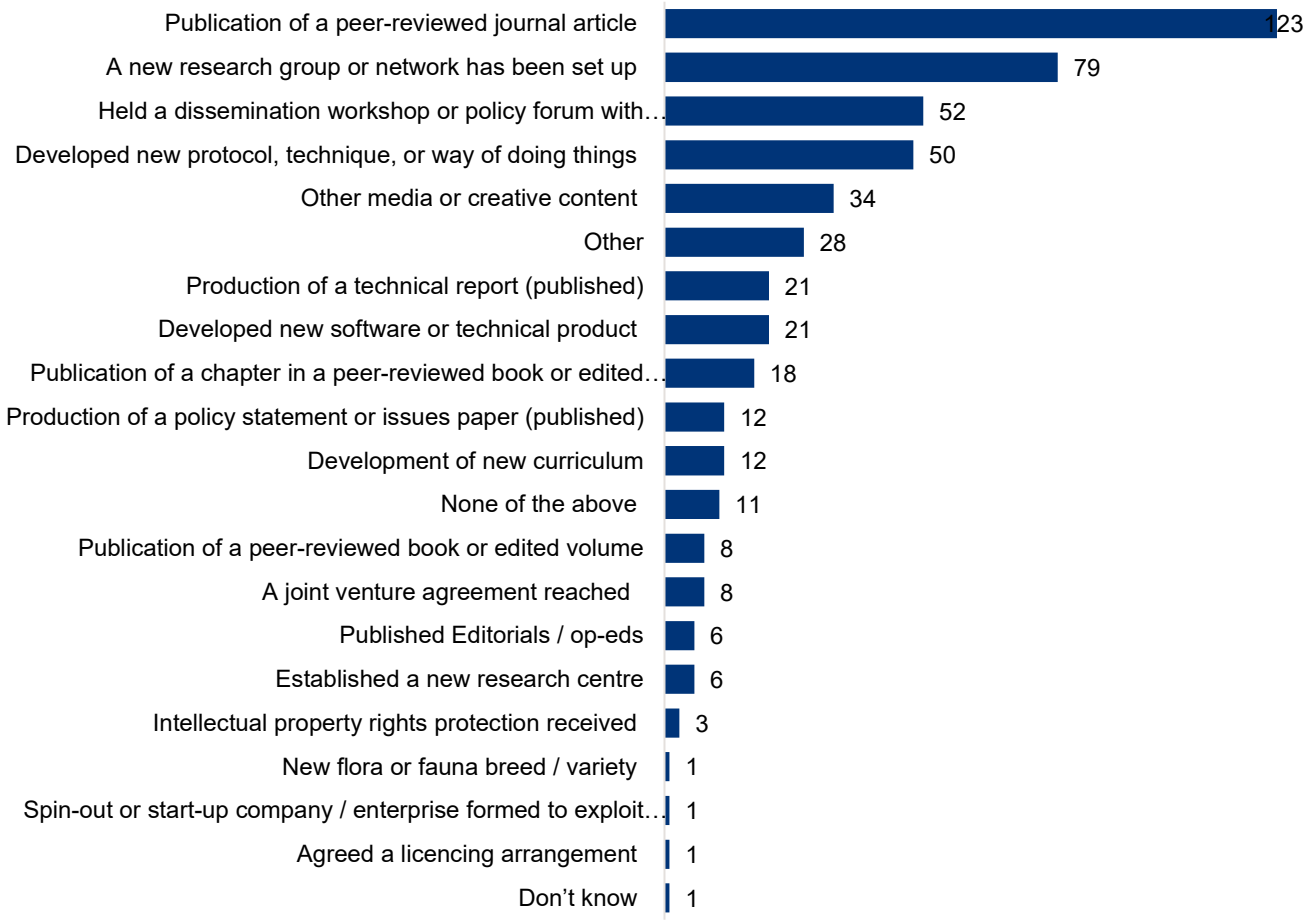


Sample size: 206, survey question G13: *To the extent that you are able to comment, what are your professional plans for once the project funding ends? Please specify how involvement in the project has shaped your plans*. Open text box: answers coded by research team.

E.8 Outputs reported by UK-based respondents

As shown in Figure 23, UK-based researchers reported a range of outputs from projects, including 60% of respondents indicating that at least one peer-reviewed journal article had been published (with a further six responses coded as 'Other' indicating that publication was pending); and 38% who indicated that a new research group or network had been established. 11 incidences were reported of that the project resulting in a joint venture, licensing arrangement, spin-out company, or IP protection.

Figure 23: Outputs reported by UK researchers

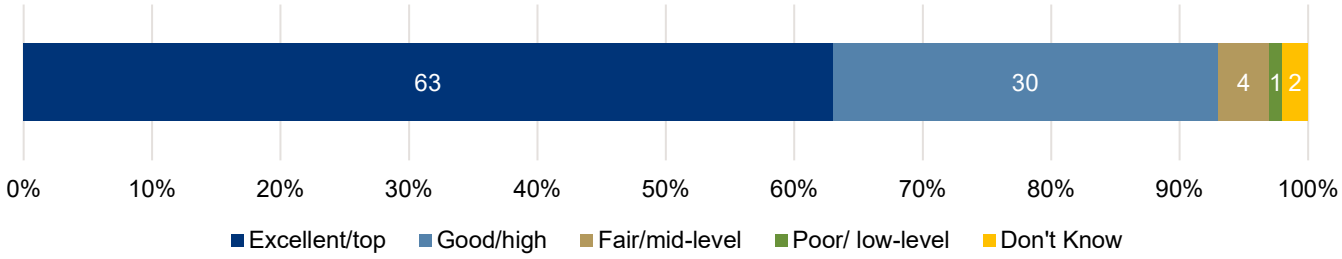


Sample size: 206; survey question C1: *With the funding you received, what outputs have you produced to date? Please select all that apply.*

E.9 Views of UK research and innovation

As show in Figure 24, when asked how they ranked the UK globally, non-UK Award Holders indicated very positive views of the UK: 63% said the UK was 'excellent' and 30% as 'good/high', with just 1% reporting 'Poor/low-level'.

Figure 24: Perceptions of the UK ranking in research and innovation globally (non- UK-based respondents)



Sample size: 1,307, survey question i5a: *How would you rank the UK among other countries globally?*

Annex F: Innovate UK survey results

This section presents data on the outcomes of Innovate UK programmes from an analysis conducted by Innovate UK of close-out forms from UK business and academic partners participating in Innovate UK Newton Fund programmes.

The analysis was conducted in August 2020 of data up to 24 July 2020; this comprised 88 close-out survey responses from 80 different organisations across 42 projects (out of 62 completed projects and 111 projects overall at the time of writing).

Table 4: Percentage of respondents reporting that they expect to introduce new products/ services/ processes to the market as a result of the project

Innovation Outcome	Count	%
New Product to Market	55	63%
New Product to Firm	13	15%
New Process to Firm	7	8%
New Service to Market	5	6%
New Process to Market	5	6%
New Service to Firm	2	2%
N/A	1	1%
Grand Total	88	100%

Table 5: Secondary benefits arising from Newton Fund participation reported by UK firms

Secondary benefit reported by firms	Count	%
New commercial / research opportunities in partner country	29	33 %
New commercial / research opportunities in other markets	15	17 %
Collaboration / networks / links / contacts / communication	34	39 %
Improved understanding of partner country market / challenges	12	14 %
Improved understanding of sector	6	7 %
Improved understanding of technology / innovation	29	33 %
Publications	3	3 %
Improved skills	19	22 %
Further funding / investment	10	11 %

Table 6: Percentage of respondents reporting the development of new skills or improvement of existing skills among their workforce as a result of Newton Fund participation

Skill	Develop new skills	Improve existing skills	Overall change to skills	Overall, no change to skills
Technical Skills/Knowledge	40 %	66 %	95 %	5 %
Problem solving	25 %	70 %	86 %	14 %
Business planning	16 %	47 %	60 %	40 %
Strategic thinking	16 %	69 %	80 %	20 %
Project management	19 %	65 %	78 %	22 %
Fund raising	5 %	42 %	47 %	53 %
Leadership	18 %	59 %	74 %	26 %
Collaborating and Partnership	27 %	73 %	89 %	11 %

Table 7: Collaboration outcomes from Newton Fund projects as reported by UK businesses

Collaboration outcome	Count	%
R&D on new project	45	51%
Continue R&D on current project	49	56%
Licensing agreement of IP to partner	25	28%
Joint venture i.e. new business	19	22%

This publication is available from: www.gov.uk/government/publications/newton-fund-final-evaluation-and-supporting-evidence

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