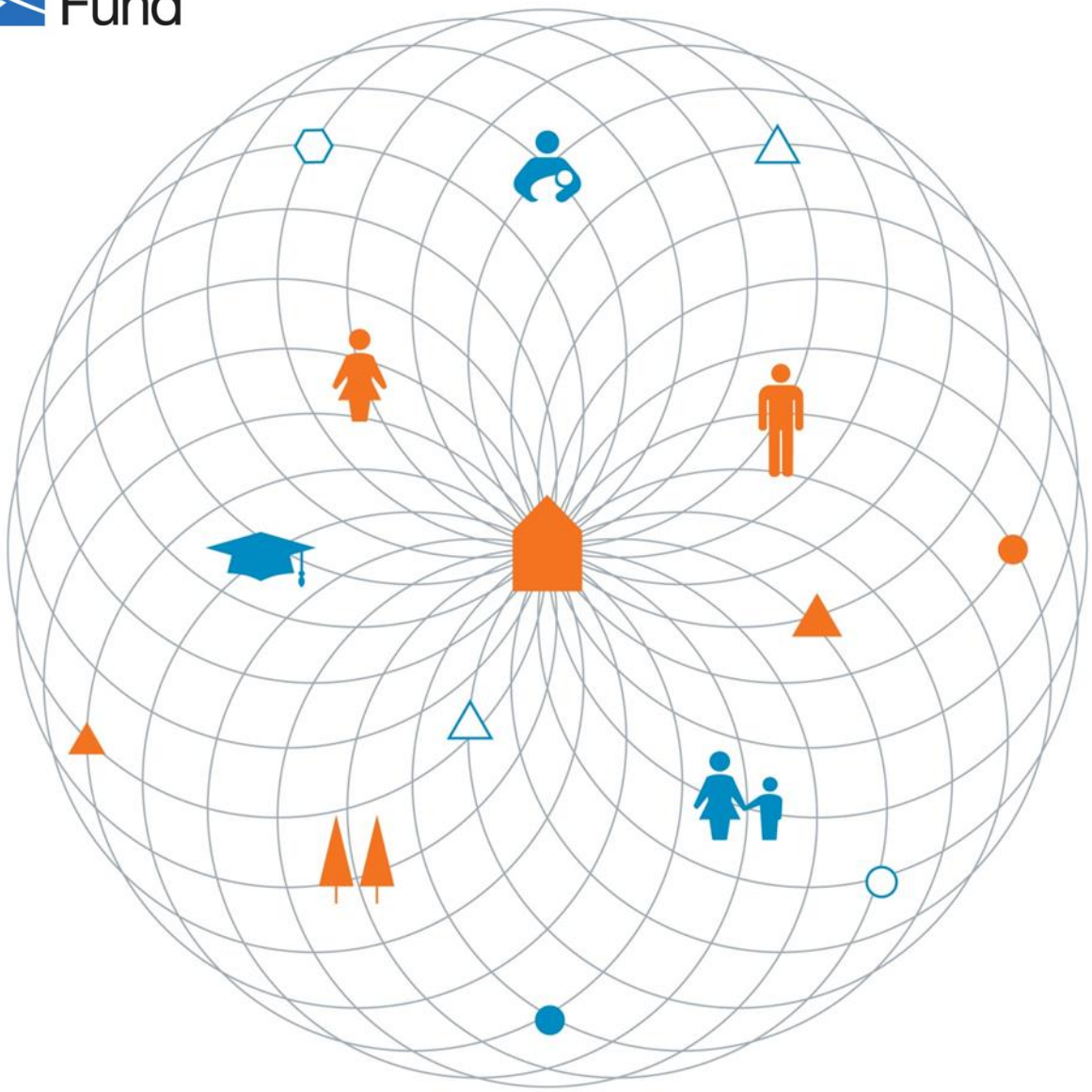
Thematic Impact Study Report - Brazil

Newton Fund Evaluation
April 2018



Thematic Impact Study Report - Brazil

Newton Fund Evaluation

Department of Business, Energy and Industrial Strategy (BEIS)

Newton Fund Evaluation

CR150017BIS

Partners

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April 2018

This document has been approved for submission by Coffey's Project Director, based on a review of satisfactory adherence to our policies on:

- Quality management
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- Financial management and Value for Money (VfM)
- Personnel recruitment and management
- Performance Management and Monitoring and Evaluation (M&E)

Jamie Fotheringham, Project Director

Signature:

Disclaimer

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Acronyms

AISA – Advisory for International Affairs

BNDES – Brazilian Development Bank

CEMADEN – National Centre for Natural Disaster Monitoring and Alerts

CNPq – National Council for Scientific and Technological Development

CONFAP – National Council for State Funding Agencies

EfS – Education for Sustainability

EMBRAPII – Agency for Industrial Research and Innovation

ERC – European Research Council

ESRC – Economic and Social Research Council

FACEPE – State Funding Agency of Pernambuco

FAPESP – State Funding Agency of São Paulo

FAPEG – State Funding Agency of Goiás

FAPEMIG – State Funding Agency of Minas Gerais

FAPERJ – State Funding Agency of Rio de Janeiro

ENCTI – National Strategy for Science, Technology and Innovation

GCRF – Global Challenges Research Fund

ICF – International Climate Fund

IPEN – Institute of Energy and Nuclear Research

IPT – Institute for Technological Research

LSE – London School of Economics and Political Science

MCTIC - Ministry of Science, Technology, Innovation and Communication

MDIC – Ministry of Development, Industry and Trade

MEC – Ministry of Education

MRC – Medical Research Council

ODA – Overseas Development Assistance

PCR - Polymerase Chain Reaction

RCUK – Research Councils UK

SHAFR – Society for Historians of American Foreign Relations

SPRINT – São Paulo Researchers in International Collaboration

UFG – Federal University of Goiás

UN – United Nations

UNESCO - United Nations Educational, Scientific and Cultural Organisation

UNESP – São Paulo State University

USP – State University of São Paulo

1 Introduction

1.1 Purpose of this report

This report presents our findings for our Thematic Study of Newton Fund activities in Brazil, with a focus on three activities in the country. Our findings emerged from an in-depth review of documentation, in-country interviews, and UK-based consultations, as outlined in Section 1.2 below. Findings from this and the other seven country studies will help inform our Mid-term Evaluation report.

As outlined in our Evaluation Strategy, thematic impact studies were carried out in eight countries: Brazil, China, Egypt, India, Malaysia, Mexico, the Philippines and South Africa. The focus on these countries allows for a breadth of coverage across Newton partner countries and regions of focus. It also allows for broad coverage on terms of the existing innovation capacity and infrastructure of Newton partner countries.

As part of our thematic studies, we conducted a comparative analysis of the factors (such as type of local funding agencies, size of secondary universities, local research structures, among others) that contributed to the Fund's outcomes across different contexts. This helped us map the **pathways of change and capture early signs of the Newton Fund's impact**. By focusing on the factors which facilitate specific research activities, increase the quality of research outputs, enhance international collaboration for higher level education and translate research into innovative practices, the thematic impact studies help us understand how sustainable solutions to economic development and poverty reduction have emerged so far from Newton Fund activities.

Case study selection

For each country, we shortlisted potential case study calls based on three measures: size, pillar and sector. The selection of projects took thematic areas of focus into consideration, aiming to include priority areas for Newton Fund in the country. We sought to achieve a spread of Newton Fund Delivery Partners and activity types across the countries in our sample. We also consulted the in-country teams (ICTs) to identify potential impact 'stories'. Following additional consultations with delivery partners and the Newton Fund Central Team, we selected **three cases per country** to be explored in more depth.

In Brazil, the shortlisted activities were:

- British Academy Newton Advanced Fellowship (Year 3 – Round1);
- MRC-CONFAP UK-Brazil Call in Neglected Infectious Diseases;
- ESRC-CONFAP Joint Research Call – Social Science of the Nexus and Healthy Cities.

This allowed for inclusion of two Research actions and one People pillar action. Within those actions, the specific award-holders were selected to ensure as broad a geographical scope and diversity of partners as possible, within the short timeframe of the thematic study. When selecting the award holders, we also considered the relevance of the specific project's research area to the Newton Fund's priorities in Brazil. The selected projects are based in three different states and regions of Brazil (Centre-West, North-East, and South-East). This has allowed the research team to include views and experiences of the Newton Fund in very different contexts within Brazil, especially in terms of each state's economic situation and existing international science and innovation linkages.

1.2 Research approach

Research scope

The thematic impact studies involved wide-ranging in-country consultations, with the inclusion of as many diverse interview respondents as possible within the short time-frame of our fieldwork activities. This was combined with consultations with UK-based partners and researchers involved in the actions included in the study.

This thematic study explored:

- The **development of each activity** – examining its origins, how engagement with the Newton Fund occurred, and an overview of the process of securing Newton funding;
- The **relevance of each activity** to Brazil's development needs and to Newton Fund and ODA goals;
- The **additionality of each activity**;
- The **results of each activity** in terms of the outputs, outcomes and impacts generated in terms of strengthening the science and knowledge base, innovation capacity and influencing policy in Brazil and beyond; and
- The **success factors (and barriers) of each activity**, and examination of possible future benefits from each activity that might be expected to arise in the future.

We took into account that two of the activities included in this study are still ongoing, and that the impact of research projects can often take years or even longer to unfold. Our research approach was adapted to reflect this, and also included signs of impact or intentions to achieve impact as indications of potential future impact.

Research methods and data collection approach

The thematic impact studies are central to our contribution analysis approach and involved an intensive period of in-country research by members of the evaluation team and local experts in the science and innovation sphere. Preparation for the in-country research included a document review of country-specific documents on Brazil's research and development context. Documents reviewed include the evaluation Brazil Baseline Report, Country Situation Note, and findings from the Process Evaluation. We also conducted a literature review of additional documentation on Brazil's science and innovation landscape, and existing UK-Brazil collaboration activities. Project-specific documentation, such as application forms, mid-term and final reports, were reviewed for each action included in the study, where provided by the delivery partner, local partners or researchers.

The document review was accompanied by **one week of intensive data collection in country**¸ as well as data collection in the UK prior to and following the fieldwork. During the week long in-country visit, three main categories of stakeholders were interviewed: i) in-country delivery partners (and Newton in-country team); ii) funders; and iii) participating researchers. In some cases, additional University staff, such as University leadership or management teams, were also interviewed.

Our data collection both in-country and in the UK was complemented with an analysis of the pathway to impact for each action, which can be found in Annex 2. Here, we analysed each project's trajectory to impact by placing it within the Newton Fund Theory of Change. This allowed us to visually represent the pathway to outputs, outcomes and impact of each activity, and highlight its (potential) contribution to broader Newton Fund goals.

Limitations of the research approach

The short timeframe for in-country research meant that we were only able to include three projects within our study. These are not representative of all Newton Fund activities as a whole. The short timeframe also limited the number of stakeholders we were able to interview in Brazil. The volume of documentation provided varied by project, thus limiting the possibility of triangulating findings. The thematic study findings reflect the data provided by each project and what is available online.

Research findings have been triangulated across different stakeholder groups and across various sources of documentation (project documents and online resources such as the RCUK Gateway to Research portal). However, the research team was not able to independently verify statements by all the different contributing stakeholders or to verify what was reported in documentation. Where findings could not be verified we have made this clear in the text.

The need to ensure a sufficient spread of project representation across three pillars and eight countries has meant that it was not possible to include a Translation Pillar project in Brazil.

Finally, two of the projects included were still on-going at the time of data collection. Therefore, the report focuses on emerging signs of impact for both.

2 The Newton Fund in Brazil

2.1 Context and evolution of the Fund in Brazil

Brazil – Current situation

Brazil has a National Strategy for Science, Technology and Innovation (ENCTI) (2016-19)[1], which aims for gross expenditure on research and development to reach 2% of Gross Domestic Product (GDP) in 2019. The strategy sets out four key challenges for policy: i) closing the technological gap with developed economies; ii) reducing social and regional inequalities in accessing the national innovation system; iii) developing innovative solutions for productive and social inclusion; and iv) promoting sustainable development. The strategy's priority sectors are defence, water, food bioeconomy, sciences and social technologies, climate change, energy (including nuclear), health, and converging and enabling technologies. **The Newton Fund aligns well with the Brazilian government's priorities in the science and innovation sphere,** and Brazilian partners were able to co-author Newton calls and help define their thematic focus – largely due to the Fund's partnership approach based on mutual interest and match-funding.

Since the start of the Newton Fund in 2014, the economic and political situation in Brazil has changed significantly. The economy entered a recession in 2014, with the economic situation worsening in 2015 and 2016. [2] The recession was accompanied by a political crisis, which culminated in the impeachment of former President Dilma Rousseff. This was followed by a period of austerity and public sector funding cuts, including in science and research budgets, particularly in the state of Rio de Janeiro.

This contextual change placed a key aspect of the Newton Fund at risk – that Brazilian government institutions would be able to provide match funding to their UK counterparts. **The vast majority of state funding agencies (FAPs) went to great lengths to provide the committed amounts despite the crisis.** There were also important efforts for strategic and financial engagement with the programme by federal partners, such as the National Council for Scientific and Technological Development (CNPq) and the Ministry of Science, Technology, Innovation and Communication (MCTIC). Nonetheless, **funding constraints had a negative impact on projects in some states**, leading to delays and reputational damage for the Brazilian state partners involved. Two FAPs in particularly hard-hit states did not provide the agreed match for some collaborations, though this represents a very small proportion of the match funding provided by Brazil throughout the Newton Fund partnership.

Brazil's economy has recently begun a period of recovery and investor confidence has increased.[3] Despite this, the outlook for science funding remains unfavourable, and lower than pre-2014 levels.[4] In this challenging context, the Newton Fund in-country team (ICT) has made efforts to unlock opportunities and identify new potential partners at both the state and federal level.

UK – Brazil Scientific Cooperation

Brazil has a long history of scientific cooperation with the UK. The BEIS/ FCO Science and Innovation Network (SIN) has been fostering new world-class bilateral science partnerships for almost ten years. When the Newton Fund launched in April 2014, the SIN team already had strong long-standing partnerships and relationships with an array of Ministries, Directors of Research Foundations and Scientific Institutes, and University Rectors. This, in turn, allowed the Newton Fund in Brazil to quickly get up and running.

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[1] Ministry of Science, Technology, Innovation and Communications, 2016. 'National Strategy of Science, Technology and Innovation (2016-2022)', Available from: https://portal.insa.gov.br/images/documentos-oficiais/ENCTI-MCTIC-2016-2022.pdf
[2] 'Brazil Fell Into Recession in First Half of Year, as Investments Dropped', *New York Times*, August 29, 2014. Available at: https://www.nytimes.com/2014/08/30/business/international/brazil-fell-into-recession-in-first-half-of-year.html
[3] 'Investors seem confident that an economic recovery is under way', *The Economist*, August 17, 2017. Available at: https://www.economist.com/news/americas/21726689-there-still-plenty-could-go-wrong-investors-seem-confident-economic-recovery?zid=305&ah=417bd5664dc76da5d98af4f7a640fd8a
[4] Escobar, H., 'In Brazil, Researchers struggle to fend off deepening budget cuts', *Science*, October 20, 2017., Available at: http://www.sciencemag.org/news/2017/10/brazil-researchers-struggle-fend-deepening-budget-cuts

Although long-standing, individual agreements existed previously between UK and Brazilian institutions, the level of pre-existing collaboration varied significantly by state. The São Paulo Research Foundation (FAPESP), the largest state funding agency, has over 30 individual agreements with UK institutions. On the other hand, some Newton state partners, such as the North-Eastern State of Tocantins, previously lacked a single international agreement.

Though the relationship is long-standing, the Newton Fund **has made a difference to the importance of the UK's role in Brazil**. Upcoming high-level initiatives to foster bilateral collaboration include the UK-Brazil Year of Science (2018). It was also mentioned that the UK has recently been able to generate interest in the Brazilian government for some of its priority areas, such as anti-microbial resistance. This was a topic in which the Brazilian government did not express initial interest, and which has grown to become an important cross-agency policy and research topic in the last year.

Other UK initiatives in Brazil include the Prosperity Fund, for which a new phase is set to be launched in 2018.[5] Unlike the Newton Fund, this will not require match funding. The International Climate Fund has been active in Brazil for the past two years, and has a focus on initiatives tacking deforestation, including agri-tech innovation.[6] The Global Challenges Research Fund (GCRF) is also active in the country, with projects on topic areas similar to Newton and with some of the same Delivery Partners.[7] Unlike Newton, GCRF does not require partnership with a specific country, nor does it require match funding. Respondents mentioned that there is potential to ensure more complementarity and synergies between programmes, for example by ensuring that additional information about GCRF projects and their resource allocation is provided to the Newton Fund In-Country Team and SIN network.

Science and innovation landscape in Brazil

Most scientific research in Brazil takes place in public universities and in the research centres created by the Ministry of Science, Technology, Innovation and Communication (MCTIC). A smaller share of research activity occurs in state-owned enterprises and state research institutes such as the Institute for Technological Research (IPT), the Butantan Institute and the Agronomic Institute of Campinas. The industrial sector accounts for a small share of science and technology development.[8]

Scientific activities remain concentrated in the South and South-East of the country. As of 2009, it was estimated that approximately 60% of Brazil-authored research papers published in international journals originated from only seven Universities, all in the South and South-East. According to this study, the State University of São Paulo (USP) alone produced approximately a quarter of all Brazilian scientific research.[9] In 2011, the city of São Paulo became one of the top 20 producers of science knowledge in the world.[10] As of 2010, the vast majority of Brazilian researchers were working in higher education institutions, as shown in Table 1.

[5] The Prosperity Fund was launched in April 2016 to help promote economic growth in developing countries. It is worth £1.2 billion over 6 years. Its priorities include improving the business climate, competitiveness and operation of markets, energy and financial sector reform, and increasing tackling corruption. Activities in Brazil have not yet begun, but will focus on the energy transition sphere. More information on the Fund can be found at: https://www.gov.uk/government/publications/cross-government-prosperity-fund-programme/cross-government-prosperity-fund-update.

[6] The International Climate Fund (ICF), launched in 2011, is the UK government's commitment to developing countries to help them address the challenges presented by climate change and benefit from the opportunities.

[7] The Global Challenges Research Fund, launched in 2017, is a 5-year GBP 1.5bn fund led by BEIS. Delivery partners include UK Research Councils, UK Higher Education Funding bodies, the Academy of Medical Sciences, Royal Society, British Academy, the Royal Academy of Engineering the UK Space Agency. More information can be found at: http://www.rcuk.ac.uk/funding/gcrf/

[8] http://revistapesquisa.fapesp.br/2000/10/01/pesquisa-brasileira-precisa-de-um-novo-perfil/

[9] Sideone, O, J, G. (2016) 'Science in Brazilian Regions' http://www.scielo.br/pdf/tinf/v28n1/0103-3786-tinf-28-01-00015.pdf

[10] Royal Society (2011) 'Knowledge, Networks and Nations' https://royalsociety.org/~/media/Royal_Society_Content/policy/publications/2011/4294976134.pdf

Table 1: Number of researchers per sector

Data	Number	Source	Year
Number of researchers per million inhabitants	698.1	UNESCO	2010
Total researchers	234, 797	UNESCO	2010
Percentage of researchers in business enterprise	25.9%	UNESCO	2010
Percentage of researchers in government	5.5%	UNESCO	2010
Percentage of researchers in higher education	67.8%	UNESCO	2010

Source: http://data.uis.unesco.org

Fieldwork has highlighted that the main strength of Brazilian science is the **production of high-quality research**. Several respondents at both the federal and state level spoke about existing (and internationally recognised) scientific excellence in the areas of aeronautical engineering, neglected tropical diseases such as Zika and dengue, environmental science and biodiversity, agriculture and agribusiness, and others.

A recognised challenge of the science and innovation landscape in Brazil is **the limited translation of high-quality scientific research into innovations at the enterprise level**. Some argue that this is due to a culture of limited risk-taking when it comes to integrating innovations into business systems.[11] Creating stronger linkages between research and business could help generate innovations that tackle Brazilian and global problems.

In terms of recent evolutions in the science and innovation context, one of the most important changes has been the suspension of *Science Without Borders*, a programme of the Ministry of Education (MEC) and the Ministry of Science, Technology, Innovation and Communication (MCTIC), in September 2015. This programme was replaced with the smaller *Brazilian Universities Excellence programme*, which only targets students above undergraduate level.

As previously mentioned, budget cuts under the new administration have had a significant impact. Federal budget cuts in 2017 left MCTIC with its lowest budget in 12 years, at 3.2 billion reais (£700 million).[12] More cuts have been proposed for the 2018 budget.[13]

International relations and research landscape

The Newton Fund fits in well in the ambitions of a country seeking to further increase the international profile and networks of its research. All institutions included in this study had a strong mandate to promote internationalisation of Brazilian Universities and research centres. It seems that international funds are helping to offset some of the consequences of the funding crisis occurring within the country. It was suggested that domestic financial difficulties are having the positive effect of leading Brazilian institutions to seek more partnerships abroad.

The Newton Fund was repeatedly described as **one of the largest programmes of institutionalised cooperation**, while the UK overall was seen as an important, long-standing partner in science collaboration. Frequently mentioned programmes include the British Council's Researcher Links, which was considered particularly important in helping Brazil develop its research capacities for decades.

The UK's importance as a research partner has increased in recent years. According to Thomson Reuters Indicators (2016), the UK is now second after the US in terms of international co-authorship. Since 2010, this represents an evolution of 173%. This is the largest increase among Brazil's top five partners in terms of co-authored papers – the others being the US, Spain, Germany and France (while there was an increase in co-authorship with all of these countries, the increase for the UK was the largest). Other frequently mentioned scientific collaborations exist with Norway, Italy and Israel, though smaller and less complex than those pursued through the Newton Fund. Many of these are in their start-up phases and do not involve institutionalised

[11] https://oglobo.globo.com/sociedade/ciencia/brasil-enfrenta-desafio-da-inovacao-10892758
[12] https://www.nature.com/news/scientists-plead-with-brazilian-government-to-restore-funding-1.22757
[13] https://www.npr.org/sections/13.7/2017/10/12/557099357/brazils-deep-cuts-to-science-funding-will-lock-country-in-the-past

cooperation with country institutions, but rather with individual universities, as is the case for the University of Bologna in Italy.

The European Union is also an important partner for Brazil. Current priority areas for EU – Brazil cooperation include: marine research, bioeconomy, health, sustainable agriculture, energy (particularly advanced biofuels), nanotechnology, information and communication technologies, and nuclear fusion (Euratom-Fusion). Among EU initiatives, one of the largest is **Horizon 2020**. In this programme, Brazilian researchers, enterprises and institutions can team up with European partners to undertake joint research programmes.[14] Individual Brazilian researchers are also eligible for EU funding under the Marie Sklodowska-Curie Individual Fellowships[15] and under the European Research Council (ERC) programme.[16]

At the FAP level, FAPESP is particularly active and well-connected. One of its most important programmes is the São Paulo Researchers in International Collaboration (SPRINT initiative), which has the goal of engaging researchers in the State of São Paulo with research partners abroad. There have been four rounds of funding per year since 2014, and partnerships have so far been established with researchers from universities in the UK, US, Australia, Canada, Germany, France and the Netherlands. In 2015, Denmark's Innovation Fund launched a strategic research collaboration in food science with FAPESP. The overall budget is DKK 10 million (approx. £1 million) with research calls for eight food science topics such as nutrigenomics' impact on human health and new sources of bioactive compounds.[17]

Newton Fund in Brazil

Within the rich funding landscape described above, **respondents described the Newton Fund as a particularly successful programme**. The Newton Fund fits well within the push for further internationalisation within Brazilian institutions, both at the FAP and University level. Before Newton, individual FAPs had, in some cases, existing agreements with UK institutions. Here, Newton has led to more institutionalised cooperation.

Overall, the FAPs found it to be an excellent partnership, which is able to build on research excellence and existing links, while also supporting high-level research in less-known, less internationalised institutions. The wide variety of programmes offered through the Newton Fund was considered beneficial, ranging from large-scale research projects with well-established centres of excellence, to supporting the first international experiences of young researchers at the start of their career.

The majority of Newton Fund activities take place through FAPs, while only 8% occur through Federal Ministries and Agencies. Not only do State agencies have more funding – especially in the case of larger, wealthier states – but they also have shown greater interest in participating in Newton Fund activities. Newton partners at the federal level include the Brazilian National Council for Scientific and Technological Development (CNPq) and the Brazilian Agency for Industrial Research and Innovation (EMBRAPII), both connected to the MCTIC, as well as the Brazilian Development Bank (BNDES), which is a federal public company associated with the Ministry of Development, Industry and Trade (MDIC). It was suggested that some federal partners might feel constrained by the novelty of working under a match funding arrangement. On the other hand, it was also reported that, even in a scenario of lower public investment in science and innovation, international collaboration with the UK has been prioritised by Brazilian funding agencies.

In line with its ODA objectives, one of the aims of the Newton Fund in Brazil has, from the start, been to **promote decentralisation of science and innovation** activities away from the "golden triangle" of São Paulo, Rio de Janeiro and Minas Gerais. The in-country team, the Brazilian National Council for State Funding Agencies (CONFAP), and BEIS have made an active effort to include less internationally known institutions in states with fewer existing international cooperation projects. CONFAP has played a key role by involving federal agencies in the design and application process, and in arranging and coordinating larger programmes across states, involving some which might have otherwise been difficult to reach. According to one respondent, "*if the only criteria was excellence, there would be a lot more representation of São Paulo institutions, which have a long history of*

[14] https://ec.europa.eu/research/participants/data/ref/h2020/other/hi/h2020_localsupp_brazil_en.pdf
[15] https://ec.europa.eu/research/mariecurieactions/msca-actions_en
[16] https://erc.europa.eu/
[17] Please see Coffey's Baseline report – Brazil, pp. 48-49.

international collaboration. But having one project in Manaus (Amazonas) is as important as having 14 in São Paulo". Through this strategy, Newton **helped showcase excellence in smaller, less known institutions**.

Efforts remain somewhat constrained by the match-funding requirement: some State Funding Agencies (FAP) were not able to apply for calls, because of limited funding, and it remains difficult to deliver the programme in all Brazilian states. Also, the capacity of FAPs to manage the Fund is varied: while some have coordinators of international programmes – in some cases, even teams – others lack the capacity and resources to have someone dedicated fully to this role. Despite this, there **has been at least one Newton project in 21 out of 27 Brazilian states between 2014 and 2016.**

Importantly, the Newton Fund has successfully fostered an equal partnership with Brazilian funding counterparts. The thematic design of calls is based on **on-going conversations between the two countries, and on a demand constructed by both partners**. A few respondents mentioned that preferences for research themes usually come from UK partners, and are then adapted to the Brazilian context. Despite this, this aspect was, overall, described as one of Newton's main strengths compared to other initiatives. For example, Horizon 2020, despite launching many calls, does not ask international partners for their contribution in design or thematic preference. Here, **Newton Fund clearly has an added value** compared to other programmes which are more directive than inclusive.

Emerging impacts of the Newton Fund in Brazil

There are strong indications that the Newton Fund is having a large impact on the research landscape in Brazil. Institutional partners interviewed for this study expressed their commitment to the partnership and continued interest in participating in future calls. It is also important to highlight the efforts made by most local partners to continue their match-funding commitments, despite difficult economic conditions.

The Fund has had a particularly significant impact on institutions that never had this type of collaboration before. It is allowing for internationalisation of universities which did not previously participate in global networks. This was seen as valuable in itself: one respondent suggested that promoting internationalisation can expose researchers to a diversity of ideas, leading to improvements in research and fostering participation in global networks, in the UK and beyond. Participating in international networks can also help enhance visibility of Brazilian research, and help place these institutions 'on the global map'.

Due to its size and complexity, the Newton Fund has resulted in **improved management of international programmes within participating institutions**, with increased specialisation of administrative teams. In some cases, FAPs have had to make substantial internal changes to be able to manage the Fund successfully. This change was especially pronounced in smaller states with fewer pre-existing instances of international collaboration. For example, in the case of FAPEMIG, the creation of an area of international relations within the organisation occurred in 2014, corresponding to the start of the Newton Fund. This required internal re-organisation, with the creation of two international coordinator roles – one for the EU and one for the Newton Fund. Another example is the Newton partnership in science management among the funding agencies**.** For example, CNPq and FAPESP staff participated in an exchange with RCUK to understand their management processes for international cooperation. Likewise, RCUK staff are expected to visit Brazil in the coming months to observe management processes within these institutions.

Respondents also identified several benefits to the UK. These include:

- soft power and ability to influence the policy debate in Brazil, through a closer relationship with the Brazilian government, including the President's Office – for example. placing the anti-microbial resistance debate on the map for the first time;
- the opportunity to understand the Brazilian context through fieldwork and on-the-ground research. This is especially relevant in fields such as climate change, biodiversity, and neglected tropical diseases; and
- collaborating with high-quality institutions in specialised fields.

Some projects were perceived to be particularly successful and influential. The MRC – FAPESP collaboration titled 'The emergence of Zika virus in Brazil: investigating viral features and host responses to design preventive strategies' (Section 4 of this report) was highlighted as being particularly influential both in terms of research findings and policy impact. In terms of its long-term impact, it is expected that the sequencing of the virus will

ultimately help inform the development of a vaccine. More generally, respondents mentioned that the British Council's Researcher Links and the UK Academies' Mobility Programmes as being very useful in helping set up initial links between institutions. These are especially important for young researchers, both in the UK and Brazil, helping expose them to international scholarship and networks, and 'kick-start' their career. In turn, these networks can lead to long-term partnerships, as is shown by the case studies included in this study.

Remaining challenges and potential areas for improvement

Despite its many achievements, some challenges remain. One challenge is linked to the issue of how Brazil can continue its progression from **aid recipient to equal partner**. Although the emphasis on equal partnership is greatly appreciated by Brazilian partners, it poses some organisational questions and has required, in several cases, important managerial changes to take place. For example, many institutions have set up entirely new mechanisms and international cooperation departments to manage Newton programmes – largely because of how important and strategic they are. CONFAP, for instance, created a structure specifically to manage the Newton Fund**.**

The **match funding component** is one of Newton's main advantages compared to other initiatives. Despite its importance, it has posed some challenges. Many of the problems are linked to the difficulty of managing the match funding process. Management processes are long and complicated, posing administrative burdens on some participating FAPs and federal institutions. As previously mentioned, a few FAPs also faced issues in complying with their matching commitments. However, the number of projects which faced problems was much smaller than those which ran smoothly: only two FAPs out of 21 were unable to reach the level of match-funding required. Nonetheless, this has meant that those two are no longer eligible for participation, with the exception of UK Academies Mobility Grants and Fellowships. In other cases, it has not yet been possible to find a match among UK counterparts for partnership possibilities, resulting in an unmet demand on the part of Brazilian partners.

Management issues also emerged within the Newton Fund itself. With its complex organisational structure, the lines of **responsibility and accountability within BEIS have not always been clear within the UK Embassy and among Brazilian partners**. This was further complicated by a limited understanding of local processes in Brazil. For example, a lack of understanding of financing mechanisms for universities on the part of some UK partners led to delays – in some instances of up to two years. Also, the Brazilian and UK fiscal years are different, which sometimes led to delays in releasing funds. **Here, the role of the in-country team is essential to facilitate cooperation and understanding across counterparts.** The ICT's contextual knowledge, local understanding and professional connections could still be better taken advantage of by delivery partners.

One of the main challenges being faced in the Brazilian research and innovation landscape is the translation of research into innovative products or business systems. Newton Fund Translation Pillar projects have been delivered through Innovate UK, the Royal Academy of Engineering, the British Council, and the National Service for Industrial Training (SENAI).[18] In this setting, **there is an appetite for additional Newton Fund translation projects on** the part of Brazilian partners, including CONFAP, CNPq, and MCTIC, as well as individual FAPs.

Finally, fieldwork also showed that there is a **monitoring data gap** at the FAP level in terms of their grantees. Collecting and systematising this type of data would be helpful to gain a better understanding of who is being reached where – including collecting data on characteristics such as gender, location and ethnicity, for example – and hence to measure impact, especially on marginalised groups.

[18] http://www.portaldaindustria.com.br/senai/en/about/senai/

3 British Academy Newton Advanced Fellowship

3.1 Summary

Action title	Global Nuclear Vulnerability: the effects of the Cuban Missile Crisis on British, French and Brazilian nuclear policies.
Short description	This was a Newton Advanced Fellowship Joint programme between the Federal University of Goiás and the University of Bristol, aiming to explore an under-researched area of nuclear proliferation studies by focusing on non-central countries. The collaboration involved Prof. Patti working as a visiting professor at Bristol for a duration of two months, as well as several teaching and disseminating activities both in the UK and Brazil.
Objective(s)	This research project sought to investigate the experiences of non-central states during the 1962 Cuban Missile Crisis, thus expanding the literature beyond the experience of the USA and the USSR. Using primary sources – including documents found in the IPEN archives and interviews with Brazilian nuclear scientists – as well as existing literature, this project sheds new light on the nuclear age in general, and on the consequences of the 1962 global nuclear crisis on British, French and Brazilian nuclear histories more specifically.
Pillar	People
Action value (total budget allocated in country, in GBP)	GBP 74,000 BR counterpart: n/a
Start / end date (Status: on-going or complete)	01/03/2015 – 28/02/2017; Status: complete
DP UK and overseas	UK: British Academy
Award holders / grantee	Carlo Patti (Federal University of Goiás – UFG); Benoit Pelopidas (University of Bristol)

3.2 Description of the action

Brief Description of Action

Newton Advanced Fellowships provide "*early to mid-career international researchers who already have a track record with an opportunity to develop their research strengths and capabilities, and those of their group or network, through training, collaboration and visits with a partner in the UK.*"[19] It is expected that these skills should contribute to advancing economic development and social welfare of the partner country.

This Fellowship supported collaboration and reciprocal exchange between Prof. Patti, from the University of Goias, and Prof. Pelopidas, from the University of Bristol. Prof. Patti's research project uses a historical perspective to analyse the consequences of the Cuban Missile crisis on France, the UK and Brazil. The collaboration between the two PIs pre-dated the Newton Fund: it began in September 2013 with a Conference in Bristol, in which Prof. Patti participated. The second phase of the project was funded through the Newton Fund. The project is now in its third phase, which is being financed by the British Academy Rising Star Engagement Awards (BARSEAs), and focuses on improving Brazil's secondary school history curriculum in relation to the Missile Crisis.

[19] https://www.britac.ac.uk/newton-advanced-fellowships

Pathway to Impact

This action fits in well with the Newton Fund's Theory of Change for People pillar projects (despite having a research focus that is not a priority ODA area for Brazil), as shown in the action's Theory of Change, which is presented in Annex 2, Figure 1.

The **main inputs** of this action were several collaborative research activities, including a placement of two months in the UK, where Prof. Patti was a visiting professor at the University of Bristol (December 2015 – January 2016); as well as primary research in Brazil, the UK and France; and joint organisation of several seminars, conferences and workshops both in Bristol and in UFG.

It was foreseen that **outputs** of the collaboration would include increased educational mobility, as well as capacity improvements in the participating researchers, their institutions, and students. In turn, it was expected that this would lead to new and collaborative publications; joint research dissemination activities; and to a more connected and strengthened institution, with increased capacity to engage in international collaborative research.

In terms of resulting **outcomes**, it was thought that this action would lead not only to the production of collaborative research outputs, but also the strengthening of international networks between the participating institutions, and the generation of new knowledge in the field of nuclear proliferation, outside of the traditional scope of this line of research.

The **impact** of this programme will be at both at researcher and institutional capacity level, as well as on the literature in this specific field of international relations.

3.3 Answers to the evaluation questions

3.3.1 Relevance

Activity targeting and ODA relevance

The thematic focus of the research does not have a clear link to the Newton Fund's – or broader ODA – priorities for Brazil. However, there is a clear link with Newton Fund people pillar objectives: this project **strengthened researcher skills and institutional capacity, and has successfully fostered international cooperation**. The idea for the project was pre-existing and emerged from dialogue between the UFG researcher and the UK counterpart, who already had a professional relationship and had previously discussed the complementarity of their research. Newton funding gave them the opportunity to produce research in an unexplored field, as well as to conduct training and dissemination activities both in the UK and Brazil.

Additionality

In terms of additionality**,** there is strong evidence that the project would have not happened without the Newton Fund. In fact, Newton was described as the **only fund with a central focus on cooperation between the UK and Brazil**. Respondents were also interested in participating in a **longer scheme** than the typical one-year options available, to develop a long-term cooperation partnership. Finally, they were drawn to the fact that the call included institutional cooperation and strengthening, rather than focusing only on research.

It was also highlighted that the Newton Fund was able to help **overcome some limitations of the Brazilian system** at that time. Funding was received at a time of crisis in the Brazilian public financing context, characterised by disbursement delays from state institutions, and a reduction in federal scholarships, such as the CNPq *Science Without Borders* scholarships. A key value added of the Fund was to allow research, dissemination and networking activities to continue despite severe budget cuts. For example, Newton funds enabled the research team to run a large event on the Hiroshima anniversary in August 2015, despite it being a period of strike in Brazilian public universities.

3.3.2 Effectiveness

Capacity-building for individuals

There is strong evidence that project activities have **improved the capacity of researchers on both the UK and Brazilian sides**.

Newton funding allowed Prof. Patti to conduct data collection in UK and French archives, deliver a workshop in Bristol, and discuss his findings and ideas with colleagues in Bristol. There were also two shorter international research activities, mostly focused on dissemination of findings (September 2015 and June 2016), the first of which was in the UK and the second in San Diego, California. The main activities were disseminating workshops in UK institutions, including King's College London, the University of Birmingham, University of Oxford, and the British International Studies Association. In San Diego, Prof. Patti and Prof. Pelopidas presented some of their research findings at the Society for Historians of American Foreign Relations (SHAFR) General Conference. Beyond increasing visibility and raising the profile of their research, these dissemination activities were particularly useful to foster debate with other academics and to refine research findings.

Interviews with the two researchers indicate that these activities **strengthened capacity at the individual researcher level**. For example, participation in this project allowed Prof. Patti to grow professionally, especially as receiving constructive criticism on his research helped him improve the quality of his work. According to a respondent, the fund "*helps [researchers] get to the next step of [their] career"*. Participating researchers **reported being more globally connected,** having gained first-hand access to international academic networks and areas of investigation with which they would have not otherwise been familiar. International workshops, seminars and conferences were identified as particularly important. It was particularly helpful for them to discuss papers with an international audience while they were still being developed. One of the respondents mentioned that the critical feedback received from international colleagues greatly helped him grow as a researcher.

Respondents pointed, more broadly, to improved skills and internationalisation of University students and staff. Prof. Pelopidas visited the Federal University of Goiás (UFG) twice, remaining at the institutions for weeks at a time. He taught classes and led a seminar on research methods, as well as advising students on their research project and thesis ideas. For students, participating in conferences with high-level academics and professionals in the field also served to improve their skills, as they had never participated in this type of activity before. Among notable speakers, respondents highlighted the participation of Sergio Duarte, the former UN High Representative for Disarmament Affairs, and of Ambassador Rubens Ricupero, former Secretary General of the United Nations Conference on Trade and Development. Workshops were filmed and are now being used as study material by international relations students. Some are available online for public viewing.[20]

Outputs of the research include a book and a special edition of the *Journal of Cold War Studies* focused on the consequences of the Cuban Missile Crisis, both awaiting publication, as well as the translation of one of Prof. Pelopidas' articles into Portuguese.[21] An additional article is in progress, focused on the construction of a partnership between Brazil and Argentina in the nuclear field, and is set to be published by the International History Review in March 2018. Prof. Patti's book, *Global Nuclear Vulnerability* is set to be published in early 2018.[22] Prof. Patti is also planning on submitting a second book, *Brazil in the Global Nuclear Order, 1945 – 2017,* to Cambridge University Press. This publication will be the outcome of this project and other personal projects, including his PhD research.

The project also helped form links between UK and Brazilian institutions, including access to their library, archives and networks. Prof. Patti was able to involve several students and create what was deemed a strong research team through scholarships for master's students. The project was described as a **good match of complementary skills** – combining Prof. Patti's historical approach with Prof. Pelopidas' theoretical approach.

[20] Videos can be accessed on the project's YouTube channel: https://www.youtube.com/channel/UCEoXWwQ8baI-x8Wk3kKrmEq.
[21] Translation of Pelopidas (2013) 'Avoir la bombe: Repenser la puissance dans un context de vulnerabilite nucleaire globale'
[22] Patti, C. (upcoming) *Global Nuclear Vulnerability, 1962.* Book currently under review by Johns Hopkins University Press, in the collection "Nuclear History and Contemporary Affairs"

Capacity-building for institutions

The programme also had an impact at the institutional level. This is **UFG's largest international cooperation agreement to date**, and has helped strengthen the University's International Relations Department (created in 2013). UFG's administrative staff had to learn how to manage an international grant of this size. A relatively small institution in a state without a long history of cooperation, this programme has helped 'put UFG on the map', showing that smaller institutions can also produce high-quality, internationally acclaimed research.

The grant has also fostered the creation of a new post-graduate programme in Political Science and International Relations, under the leadership of Prof. Patti. Not only did it improve research quality at UFG, but also showcased its work to global partners.

The presence of a European professor teaching Brazilian students was also important. Aside from workshops and conferences, there was a **direct skill-building component**, as Prof. Pelopidas taught classes on research methods and provided thesis advice to students. This is atypical, as highlighted by Brazilian funders: international exchanges traditionally involve Brazilian researchers going to the UK, and not the other way around.

Strengthening UFG's links with the UK led to **the possibility of finding new partners** and attracting more professors from abroad, thus increasing the internationalisation of the institution, which had previously been limited.

Capacity-building of UK researchers and institutions

The collaboration was also described very positively by Prof. Pelopidas. In particular, his capacities and visibility as a researcher have also improved. Bridging language and cultural barriers through this collaboration gave him access to academic literature in this field with which he was not previously familiar. In turn, this has enriched and informed his own research.

New international partnerships

Although they could not apply for more Newton funding, due to Prof. Pelopidas' move to a French institution, the two researchers are continuing to collaborate. This is evidence of the Newton Fund's impact on helping establish long-term linkages between researchers.

Collaboration between the researchers is continuing under a British Academy Rising Star Engagement Award. Moreover, Prof. Pelopidas has received a European Research Council (ERC) grant of €1.5 m (over five years), set to begin in autumn 2018. Although he applied as an individual researcher, he included Prof. Patti in his team as the author of the Brazilian case. This is a further collaboration resulting from the Newton Fund. The two academics are also continuing to cooperate informally, providing academic insights and advice to each other.

Prof. Patti is also planning to **publish papers with other colleagues he met at the University of Bristol**, which can also be considered a result of this partnership. The time spent in Bristol allowed him to strengthen his links to the UK, meet new potential partners, and has resulted in increased interest in applying for UK funds in the future. He also expressed continuing interest in the opportunities offered by the Newton Fund; more specifically, he is interested in applying for a Newton International Fellowship, through which he could spend two years in the UK.

This project has also reportedly supported UFG's broader drive for increased internationalisation. The Newton Fund **provides credibility to both researchers and institutions**, in that they are able to manage such a large and demanding fund. The project also raised UFG's profile and expanded its networks in UK institutions, with the potential for further collaborations, which are currently being discussed. For instance, Prof. Patti is now part of an LSE network which studies the relations between Europe and Latin America during the Cold War.

Despite these promising developments, institutions such as UFG still **struggle to develop, maintain and strengthen international networks**, and participation in Newton has been their largest initiative to date. Brazilian institutions have also faced challenges to adapt to the requirements of international research. In this case, working in a small institution posed issues linked to limited infrastructure, lack of funds, and limited research time for professors. For example, professors at UFG are constrained in that department provisions do not include the possibility to do research or teach abroad: they are required to use their academic leave for research and exchange purposes. This can discourage others in the institution from participating.

It was also highlighted that international collaboration through Newton fellowships **depends on pre-existing professional relationships**. The fact that UK and Brazilian counterparts need to apply together entails that participants need to have existing international networks.

3.3.3 Impact

Potential impact on poverty reduction and economic development

In the long-term, collaboration resulting from this project aims to **improve Brazil's education system** at the tertiary level, through the introduction of new, context-specific scholarship. The two participants are now aiming to extend their focus area to the secondary level, by working on improving the Brazilian school curriculum on nuclear history.[23] By introducing Brazilian students to global scholarship on nuclear vulnerability, and further increasing the focus on the Brazilian case therein, the researchers hope to improve teaching, and subsequently research quality. In this setting, they want to propose studying the nuclear crisis in a new way, which includes a Brazilian perspective.

Another respondent argued that the content of the research is also very relevant for the present day global situation. In his view, analysing the historical behaviour of countries faced with a nuclear threat can help policymakers understand how those countries are likely to behave in the event of a similar situation. However, it is worth keeping in mind that this project has no clear objective of engaging with policymakers.

Change in perceptions of the UK

No significant change in perception of the UK emerged from the fieldwork, though FAPEG and CONFAP respondents spoke positively about the relationship with the UK, and the significant input that local partners are able to have in this partnership.

Discussions with FAPEG showed that the UK is **increasingly becoming a partner of choice** for institutions in the state. The importance of this grant for UFG, and the Department of International Relations in particular, was also emphasised. This was the largest grant ever received by UFG, with considerable impact on both research quality and institutional strengthening. However, **barriers to cooperation** remain, both in terms of Brazilian and British bureaucracy, as well as broader funding issues faced by public institutions. Decisions are taken slowly and with complex processes which are not always fully understood by UK partners. In the case of this project, **there was a delay in receiving funds from the UK counterpart**, due to some confusion in terms of roles and responsibilities. This was attributed to the fact that Bristol lacked the previous experience working with such a large, long-term programme. Other practical issues were linked to participating in a demanding programme such as Newton when faced with funding constraints, limited time for research and the burden of administrative tasks.

Within the context of Goiás, the UK was described as a particularly attractive partner: although FAPEG has international programmes with countries such as Italy and Israel, no other fund was considered as important as Newton. More specifically, Newton was identified as a central partner in the internationalisation process of FAPEG and of Universities in Goiás. The size of the Newton funding, as well as its areas of focus, generated high levels of interest among institutions in the state, including outside the state capital.

3.3.4 Complementarity and coordination

Catalytic and Leadership effects

Policy coordination and influence of this project have been limited to date, but **were not explicit objectives of the collaboration**, which was focused on strengthening researcher and institutional capacity.

Interestingly, the researchers spoke about wanting to bridge the link between theory and practice. For this purpose, UFG was interested in collaborating with the Brazilian Institute of Energy and Nuclear Research (IPEN) by digitalising their archive ("*the written history of Brazilian nuclear physics"*). This would have made future research in this field more easily accessible. However, there was **little interest in the institution to collaborate**, despite the high risk of these archives being lost in the near future.

[23] https://www.bristol.ac.uk/global-insecurities/news/2016/british-academy-rising-star-engagement-award.html

3.4 Conclusions

- This is a clear example of successful cooperation which has led to continued collaboration and long-term links – both through other grants and informally. While the collaboration pre-dated Newton; this funding has allowed it to continue with a large amount of exchange activities.
- Outside the UK, bilateral cooperation grants with Brazil are limited. The Newton Fund here clearly has had additionality: collaborative research in this theme would not have continued otherwise. Respondents did not know of any other grants with this focus and length of funding aside from Newton.
- This project has delivered the expected outcomes of improved researcher and institutional capacity. The length of the project and of the UK partner's visits in Brazil greatly facilitated research, allowed for institutional strengthening, and built capacity of professors and students. It has helped both the UK and Brazilian counterparts strengthen their international networks, increase visibility, and gain access to new primary resources and literature.
- Nonetheless, the lack of an institutional system to support initiatives like this are a barrier to future engagements. The Brazilian researcher had to undertake research activities during holiday time and out of office hours, factors which reduce others' interest in participating.
- The policy influence of the project has been limited, though it is important to keep in mind that its focus was on building researcher and institutional capacity, rather than influence policymaking. There has been little interest in other Brazilian public institutions to collaborate in project activities. An on-going project which emerged from this collaboration seeks to impact the Brazilian school curriculum at the secondary level, improving how nuclear history is taught (as well as researched), though it remains a work in progress.

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

4.1 Summary

Action title	The emergence of Zika virus in Brazil: investigating viral features and host responses to design preventive strategies.
Short description	This project proposes to better understand the spread and epidemiology of Zika virus infection by understanding individual cases and analysing full virus genomes to put them into a global context. It also aims to develop more easily accessible diagnostic tools that can be used in wider settings, thus supporting local health systems.
Objective(s)	The project aims to increase understanding of Zika virus transmission so as to improve diagnosis and treatment, and policy more broadly. Actions include: i) monitor Zika virus circulation in selected areas (including virus isolation and genetic characterisation) and develop improved diagnostic methods to identify Zika virus; ii) use patient material for immunological studies on Zika virus infection (cytokines and antibody responses, gene expression) and set up a mouse model to assess intervention strategies and study pathogenesis further; iii) develop an infectious clone of Zika virus for reverse genetics studies of the virus and vaccine design (including tools to produce virus-like particles); and iv) study viral antagonism of host responses at cellular level. As arbovirus infections are on the rise, there is an urgent need to share knowledge and improve the capacity response of research centres.
Pillar	Research
Action value (total budget allocated in country, in GBP)	GBP 221,947 UK side BR counterpart: R$ 505,000.00 (GBP 110,291.11)
Start / end date (Status: on-going or complete)	Jan 2016 – Jan 2019 (ongoing)
DP UK and overseas	UK: MRC; BR: CONFAP, FACEPE
Award holders / grantee	Rafael França (Fundação Oswaldo Cruz – Recife); Alain Kohl (University of Glasgow)

4.2 Description of the action

Description of the action

The action aims to investigate underlying biological processes of the Brazilian strand of Zika virus, by conducting a genetic mapping of the virus and studying how it interacts with host responses. It brings together experts from Fundação Oswaldo Cruz Recife (Fiocruz) and the MRC – University of Glasgow Centre for Virus Research in a joint research project to study Zika virus genetics. The multidisciplinary team of researchers has a combined expertise in molecular virology, immunology, genetics and vaccine development.

At the time of the project proposal, very little was known about the biology and molecular biology of Zika virus. 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. [24]

The project proposal recognised the likely spread of the virus across the Brazilian territory, and the possibility of a full-blown epidemic, both due to the abundance of vector mosquitoes and to the similarity of symptoms with dengue and Chikungunya, often leading to incorrect diagnosis. Due to this, the project aimed to develop measures to distinguish Zika infections from other viruses, and obtain correct public health data.

Pathway to Impact

As shown in Annex 2, Figure 2, this project has a wide coverage of all pillars' outcomes and impacts described in the Fund-level Theory of Change. It not only aims to improve research capacity and increase internationalisation for both counterparts, but also intends to influence policymaking and practice in the health field. It was expected that results would have an impact on policy, in terms of prevention, treatment and diagnostics.

In terms of **research inputs,** this action fostered the creation of a joint programme in Zika virus research, with a focus on genetic mapping and basic understanding of the virus. The main planned activities were as follows: i) monitor Zika virus circulation in selected areas (including virus isolation and genetic characterisation) and develop improved diagnostic methods to identify Zika virus; ii) use patient material for immunological studies on Zika virus infection (cytokines and antibody responses, gene expression) and set up a mouse model to assess intervention strategies and study pathogenesis further; iii) develop an infectious clone of Zika virus for reverse genetics studies of the virus and vaccine design (including tools to produce virus-like particles); and iv) study viral antagonism of host responses at cellular level.

The **expected outputs** stemming from this collaboration were: i) enhanced research capabilities and scientific impact of Fiocruz; ii) improved understanding of Zika virus outbreaks in Brazil; iii) improvements in viral diagnostics, so as to support public health efforts in Brazil; and iv) contributing to future measures in treatment and prevention of Zika virus infections in Brazil and beyond.

This collaboration has a clear goal in informing policy. Its main **expected outcomes** is to improve both basic understanding and diagnostics of the virus. Fiocruz, Brazil's largest state-funded research institution, has an institutional mission to improve health policy, and works closely together with the Ministry of Health. In line with that institutional mission, this project aimed to **improve capacity for Zika prevention, diagnosis, as well as treatment**.[25] It was thought that this would take the form of lower-cost diagnosis, moving away from reliance from virus genome detection with techniques and methodologies that are only available in a small number of specialised laboratories.

In terms of **potential impact,** though this project was designed before the Zika virus epidemic, it was already recognised that improving the understanding of this virus would help solve a global health threat. It was thought that the research collaboration could help control the spread of the disease, increase preparedness through improved policy response, and help make substantial progress towards addressing the Zika challenge at a global scale. It was thought that the long-term consequence would be contributing to vaccine development. Here, the core idea is that basic understanding of the virus can, in the long term, lead to development of drugs and vaccines. In the view of project participants, collaborative projects such as this one can foster the creation of networks of expertise, in turn leading to more effective disease control in Brazil and beyond.

[24] RCUK project overview (http://gtr.rcuk.ac.uk/projects?ref=MR%2FN017552%2F1).
[25] RCUK project overview (http://gtr.rcuk.ac.uk/projects?ref=MR%2FN017552%2F1).

4.3 Answers to the evaluation questions

4.3.1 Relevance

Activity targeting and ODA relevance

This project was funded as part of MRC's UK-Brazil Neglected Infectious Diseases Partnership Call, launched in 2015. It was defined in close collaboration with Brazilian partners, with the MRC hosting a delegation of Brazilian scientists and institutional representatives for a workshop in the UK.

At the time of the research proposal, both the UK and Brazilian researcher thought Zika would be a niche area of research, as there had been few cases at that point. Interested in MRC's call, Prof. França reached out to the University of Glasgow through a professor whom he worked with previously at USP (Riberão Preto). As in all other cases presented in this report, **the collaboration relies on a pre-existing contact**.

With its focus on a neglected infectious disease, this project is closely aligned to the Newton Fund's priorities in Brazil. 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.[26] Due to its timing, coinciding with the epidemic's outbreak and the increased recognition of its link with microcephaly in babies, it has proven crucial in the face of a major health challenge in Brazil and other countries impacted by Zika. Moreover, it has generated knowledge which will be relevant for potential outbreaks in the future.

Other than the health field, and particularly emergency response to global health challenges, this research is also **relevant to broader economic development and poverty reduction goals**. Zika is often referred to as a 'disease of poverty', as it thrives in highly populated areas with under-resourced public health infrastructure and poor sanitation.[27] Not only do poorer socio-economic groups have limited access to diagnosis and quality healthcare, they also face challenges in accessing safe water and sanitation. In the short-term, the research helped affected individuals – particularly poorer ones, with limited access to healthcare services – receive low-cost and rapid diagnostics. By facilitating the development of drugs and vaccines, it could have a long-term impact on health outcomes at the global level.

Additionality

Respondents argued that **this project would have not happened in the absence of the Newton Fund**. At the time that this project began, funding for Zika research was very limited and nobody could have foreseen the extent and scale of the epidemic. Here, both the timing and aim of the Newton Fund, as well as the specific focus of the call on neglected infectious diseases, were considered essential to the project taking place at all.

Some characteristics of the Newton Fund also facilitated the collaboration. Respondents reported that, compared to other funds available, Newton suited their needs as it has focused themes and longer timelines.

4.3.2 Effectiveness

Research Collaborations

This project has led to successful collaboration between Fiocruz and the University of Glasgow, and was identified by all stakeholders as an example of 'best practice'. There seems to be **good complementarity between the skills and areas of specialisation of the UK and Brazilian researchers**. This complementarity of skills was central to the project idea itself, as it brings together experts in molecular virology, immunology, genetics and vaccine development. This was considered key to achieving a good understanding of the virus, as well as contributing to treatment and prevention measures.[28]

Crucially, Fiocruz **provided the Brazilian strand of the virus – collected from an infected patient – to the UK counterpart**. This was genetically mapped using highly specialised equipment for genome sequencing in the University of Glasgow's Centre for Virus Research. The Brazilian researcher reported that the UK-based equipment allowed for much quicker results than would have otherwise been possible: access to this equipment allowed for

[26] https://uk.reuters.com/article/us-health-zika-vaccine/trial-results-of-zika-vaccine-sanofi-dropped-show-promise-idUKKBN1DZ03P
[27] http://www.undp.org/content/undp/en/home/librarypage/hiv-aids/a-socio-economic-impact-assessment-of-the-zika-virus-in-latin-am.html
[28] Project proposal, Fundação Oswaldo Cruz.

virus mapping in two weeks, compared to the several years sometimes necessary with less advanced technology. It was the complementarity between the institutions – one providing the virus itself, the other providing the technology necessary to map it – which allowed for such quick results. These, in turn, allowed other, more advanced research into the Zika virus to take place. The speed of results is particularly important because of the urgency brought by the epidemic and the subsequent international focus on it.

According to the most recent project report, research outcomes to date have included the publication of **eight articles** in high-level journals.[29] Project findings have also informed one doctoral thesis, three master's theses and three undergraduate theses of students supervised by the Brazilian PI, Prof. França. Key research findings have included understanding the immunologic response in patients. Namely, the researchers found that the Zika virus produces "*an inhibitory molecule in the immune system – which makes it harder for the patient's organism to defend itself, as occurs with dengue and yellow fever. This is key to understanding how the virus causes the disease. ... Knowing how the virus is able to subvert the immune system allows us to test existing medication or test new ones".*[30] It was highlighted that these findings are more robust than what could have been generated through a purely laboratory-based study.

The project has also improved research capacity, both of the researchers themselves and their team, but also at the institutional level. According to Fiocruz respondents, the project has improved overall quality of the institution, helped bring new funds, and increased administrative flexibility. Being the first research group to undertake this type of research on Zika **brought international visibility to the research team and to the institution as a whole**.

Respondents identified **two differential factors** which allowed such positive results to take place. First, Fiocruz has very high-quality infrastructure with one of the top research labs in the country. After the initial sequencing of the virus at the University of Glasgow, rapid, high-quality diagnostics were made possible by Fiocruz's state-of-the-art technology. Second, Fiocruz policy allows professors to dedicate most of their time to research – in Prof. França's case, approximately 90% of his time.

Despite being the first to launch Zika research, however, the research team was unable to produce results as quickly as US-based researchers. According to respondents, this reflects the fact that the pace of research in Brazil tends to be slower, affected by infrastructural issues and long bureaucratic processes. For example, there were some delays in receiving funds from FACEPE, due to the funding constraints faced by the institution. This posed a severe challenge to the project. It delayed activities and made it difficult to conduct forward planning and be able to respond to research needs by purchasing the necessary materials or hiring additional human resources. However FACEPE ultimately managed to disburse the funds despite the challenging conditions faced.

More broadly, US labs are difficult to compete with due to the sheer size of their funding. Here, respondents contended that Newton Fund has allowed them to get the research going, but not to 'think big' and be able to compete with larger players.

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[29] Publications to date are as follows: França, R. F. O., et al. (2017) 'Establishment and cryptic transmission of Zika virus in Brazil and the Americas', Nature, pp406-410.
França, R. F. O., et al. (2017) 'Central and peripheral nervous system involvement caused by Zika and chikungunya coinfections', *PLoS Neglected Tropical Diseases*, 11, p.e0005583.
França, R. F. O., Kohl, A., et al. (2017) 'Zika virus tropism and interactions in the myelinating neural cell cultures: CNS cells and myelin are preferentially affected', *ACTA Neuropathologica Communications,* 5(1), pp23-50.
França, R. F. O., et al. (2017) 'Mapping putative B-Cell Zika Virus NS1 Epitopes Provides Molecular Basis for Anti-NS1 Antibody Discrimination between Zika and Dengue viruses', *ACS Omega,* 2, pp3913-3920.
França, R. F. O., et al. (2017) 'Zika virus replication in the mosquito Culex quinquefasciatus in Brazil', *Emerging Microbes and Infections*, 6, p.e69.
França, R. F. O., et al. (2016) 'Initial Description of the Presumed Congenital Zika Syndrome', *American Journal of Public Health*, 106, p598-600.
França, R. F. O., et al. (2016) 'Dengue virus (DENV)-specific antibodies enhance Brazilian Zika virus infection', *Journal of Infectious Diseases*, 8, p638-785.
França, R. F. O., Kohl, A., et al. (2016) 'Full Genome Sequence and sfRNA Interferon Antagonist Activity of Zika Virus from Recife, Brazil', *PLoS Neglected Tropical Diseases,* 10.
[30] https://portal.fiocruz.br/noticia/pesquisadores-sequenciam-o-genoma-do-virus-zika-em-pernambuco

New international partnerships

In terms of other collaborations, **both institutions have set up new partnerships and received additional funding** as a result of this project. The largest is within the EU Horizon 2020 ZIKAlliance[31], a one million euro fund involving 53 partners worldwide. The project has also received further funding as part of the MRC Wellcome Trust Zika Rapid Response fund (£32,000 and £36,000).

Though this project is on-going, Fiocruz and the University of Glasgow are in talks exploring **other research projects on neglected diseases**, such as similar research on Chikungunya.

Outside of its partnership with the University of Glasgow, Fiocruz reportedly began more than 23 projects in Zika research, including some with international partners. Participation in the Newton Fund **demonstrated the institution's capacity** to participate in international partnerships, which, in turn, attracted more resources. Fiocruz respondents highlighted that this collaboration increased their visibility and international recognition of their research excellence, leading to new partnerships and opportunities. Having professors visiting from the UK was a good way to showcase the institution's infrastructure and research capacity, further increasing their visibility and international credibility.

As previously mentioned, this research project also allowed a large number of other research projects to take place, including projects attempting to create a vaccine. Fiocruz's isolated strand of the Brazilian virus has now been shared with labs in Brazil, the UK and the US, with several upcoming publications.

The Newton Fund was considered fundamental to help the State Funding Agency of Pernambuco (FACEPE) achieve its plans to increase its international partnerships. This FAP did not have any large-scale international cooperation programmes as little as four years ago. The institution's prior collaboration system was *ad hoc*. Through the Newton Fund alone, they ran eight calls so far, of which five are still running.[32]

Capacity-building of UK researchers and institutions

Within the University of Glasgow, and in particular Dr. Kohl's research team, this project has had a considerable impact on the capacity to undertake Zika research. The underlying reason is **the availability of the virus itself,** which was a key value added of this collaboration. Being a UK institution, and since Zika is not found in the UK, they lacked raw material, except what was available in virus libraries. The uniqueness of this collaboration lies in the possibility to access the specific Brazilian strand of the virus. It seems, in fact, that the project allowed the two institutions to achieve complementarity: one providing the virus itself, the other the machinery necessary for advanced, rapid research results. Furthermore, the UK counterpart repeatedly recognised the importance of Brazilian expertise in this area, and the complementarity of their skills.

Similarly to what occurred in Brazil, **this project has allowed for further Zika research to take place in the UK**. This project had a "snowball effect", in that receiving the virus from Brazil allowed the University of Glasgow's Centre for Virus Research to share it with other research groups within and outside the institution. In turn, this has led to more collaborations, and more funding. For instance, they have set up a new partnership with the University of Oxford undertaking vaccine research, funded by the Department of Health. They are also participating in various EU consortia on the topic, such as the ZikAlliance.

4.3.3 Impact

Potential impact on poverty reduction and economic development

There is a clear link between this activity and potential socio-economic impact, related to Fiocruz's **institutional mission to inform, strengthen and support the work of the Ministry of Health**.[33] Through their research findings, they published a diagnostics method, which was transferred to the Ministry of Health labs at the Pernambuco state level. Here, Ministry of Health staff were trained by Fiocruz – thus informing the state response to the epidemic. The

[31] https://zikalliance.tghn.org/.
[32] More details available at: http://www.facepe.br/fundo-newton/.
[33] https://portal.fiocruz.br/atencao-saude

UK partners' rapid release of funds in response to the Zika outbreak **allowed for a successful response and rapid results.**

Throughout the project, government response changed substantially. Since the beginning of the epidemic, the research team was among the first pushing for recognition of the link between microcephaly and Zika. As part of the emergency response, the research team also set up a mobile health clinic to map the virus in different locations in the North East of Brazil to help track and understand its spread.[34]

Other than informing policy – and in this case, Zika emergency response – Fiocruz offers a diagnostics service. Here, the Fiocruz diagnostics labs **offer services to the public health network**. At the surge of the epidemic, the Brazilian public health system was not prepared for the necessary large-scale diagnostics. In this setting, Fiocruz offered specialised, high-quality diagnostics to the population.

This project is likely to have a considerable impact **at the global level.** For example, the respondents spoke of an international skill transfer initiative where Colombian researchers were trained in Brazil, in response to strong interest from the Colombian government. Respondents also argued that if any of the numerous projects enabled by findings from this research (and from the sharing of the isolated virus itself) have tangible results – such as the creation of a vaccine – that can be considered an **indirect, long-term impact of the project**.

Change in perceptions of the UK

Brazilian partners had a very positive view of the UK as a research partner. In particular, they highlighted the quick release of funds, and the ease of the bureaucratic process, especially compared with other countries they work with. The UK was the quickest to respond to the epidemic and increase funding. Respondents argued that **without UK support, such rapid research results – which led to a rapid, effective response to the Zika outbreak – would have been impossible.**

4.3.4 Complementarity and coordination

Catalytic effects

The results from the sequencing of the virus were deposited in a public database – and are therefore accessible to researchers around the globe. As a result, this research collaboration has been hugely influential – thanks to a mix of subject expertise, high-level technology and good timing. The project has had **a large snowball effect**, as basic understanding of the virus has allowed more advanced research to take place. This includes a project investigating the possibility of creating a Zika vaccine. Indirectly, the project has had many more research outcomes than those outlined in this report, in that it has allowed for a large number of projects to take place both at the Brazilian and global level.

Policy influence and broader societal change – in the form of access to improved health services, and therefore improved health outcomes – was a key aim of this project from the outset. Fiocruz Recife has an institutional mission to reduce inequality and improve socio-sanitary conditions of the Brazilian population, especially in the North-East, through evidence production and technological innovation.[35] To do so, it works closely with the Ministry of Health in Brazil, particularly with AISA (Advisory for International Affairs), which helps formulate Brazil's position vis-à-vis international challenges. In this case, Fiocruz **introduced a new diagnostics method for the Ministry of Health, and also trained Ministry staff in this methodology**. This informed the Ministry of Health's response to the Zika epidemic. Fiocruz also provided a low-cost diagnostics service to the population of Recife, both in their University labs and through their mobile clinic.

Leadership effects

Since the beginning of this project, there have been significant investments in Zika research in Brazil and at the global level. Though this project pioneered the study (and genomic sequencing) of the Zika virus, we cannot attribute this change to the project. However, initial analysis of the virus facilitated the research that followed.

[34] More information on the Zibra Project is available from: http://www.zibraproject.org/who/

[35] https://portal.fiocruz.br/unidade/fiocruz-pernambuco

Respondents argued that effectiveness of this partnership could be further increased through a link to the production of new drugs. According to respondents, this reflects a lack of investment on the part of Brazilian authorities to increase capacity **to transform research into a product**. Namely, Zika diagnostics are still carried out using a – very costly – kit produced by a foreign firm despite existing research capacity and know-how within Brazil.

4.4 Conclusions

- One of the most high-profile projects for the Newton Fund in Brazil, this MRC project can be considered very successful in terms of its research outcomes, institutional strengthening and increased visibility, and improvement of health services available to the general population. Moreover, through its virus mapping and understanding of Zika epidemiology, it has allowed for a large number of other research projects to take place, including one aiming to develop a Zika vaccine.
- Working closely with the Ministry of Health, Fiocruz had, from the outset, the objective of informing and improving Zika response in Brazil. The institution has provided diagnostics to the population of Pernambuco during the Zika epidemic and has helped inform and simplify the public diagnostics system.
- The University of Glasgow benefited from undertaking research the isolated strand of the Brazilian virus. In turn, their advanced equipment and technical expertise allowed for rapid, high-quality results. Although Fiocruz already collaborated with UK institutions prior to the Newton Fund, this project has made it possible to deliver larger-scale, longer-term projects.
- The collaboration was considered highly positive on both sides. The UK was considered an especially strong partner to work with – quick and efficient in the context of emergency response, and able to help overcome issues linked to a slow release of funds from FACEPE.
- There remains a limitation in terms of Brazilian capacity to research and produce drugs for this type of disease, with low government investment in this field. This limits the societal impact of this type of findings in the long-run and provides further weight to the case for a greater Translation Pillar focus in Brazil.

5 (Re)Connect the Nexus: Young Brazilians' experiences of and learning about food-water-energy

Summary

Action title	(Re)Connect the Nexus: Young Brazilians' experiences of and learning about food-water-energy.
Short description	This project seeks to examine young people's (aged 10-24) understandings, experience and participation in the food-water-energy nexus in the metropolitan region of Paraiba do Sul river basin (São Paulo State). The project will also seek to understand how diverse forms of education – particularly Education for Sustainability (EfS) – might address inequalities, social tensions and social mobility in terms of access to nexus resources.
Objective(s)	i) To conduct a large-scale baseline survey of young people's understandings, experiences and participation in the 'food-water-energy' nexus in Brazil. ii) To examine material, embodied connections between people and the nexus through qualitative research with diverse groups of young people. iii) To critically evaluate the landscape of formal, informal and alternative education through the lens of the 'food-water-energy' nexus. iv) To situate the Brazilian context within a critical evaluation of education for sustainability globally. v) To develop a set of evidence-based resources for diverse educational settings that will address the food-water-energy nexus in Brazil.
Pillar	Research
Action value (total budget allocated in country, in GBP)	GBP 299,617 BR side: R$544.774,63 (GBP 118,962), as well as 10 "Scientific Initiation" scholarships and one post-doctoral scholarship
Start / end date (Status: on-going or complete)	September 2016 – September 2018 (ongoing – start date delayed to November 2016)
DP UK and overseas	UK: ESRC; BR: CONFAP, FAPESP
Award holders / grantee	Jose Antonio Perrella Balestrieri (UNESP), Peter Kraftl (University of Birmingham)

5.1 Description of the action

Brief Description of Action

This action consists of a joint research programme investigating young people's (10-24 years old) relationship with the food-water-energy nexus in the metropolitan region of Paraiba do Sul river basin (São Paulo State). This entails both quantitative and qualitative data collection and analysis. The project is part of ESRC's Nexus call, which seeks

to foster research connections across food, energy, water and the environment. The action's Theory of Change can be found in Annex 2, Figure 3.

In a highly **multidisciplinary approach**, "(Re)Connect the Nexus" has brought together engineers from São Paulo State University (UNESP) and geographers from the University of Birmingham. The research has also involved professors from the University of Northampton and University of Leicester, who have participated in different aspects of the data collection and analysis process – namely, stakeholder interviews for the former, and quantitative and qualitative data collection with young people for the latter.

Pathway to Impact

In terms of **inputs,** there are several components to this research collaboration, of which some are still ongoing:

- quantitative Survey with 5,000 young people – both in-school and out-of-school (scheduled for completion in March 2018);
- in-depth interviews with students (40 interviews) and out-of-school youth (ongoing);
- in-depth interviews with private and public sector stakeholders working in food, water, energy and education (completed 65 – out of a target of 50);
- mobile application for data collection with young people (completed); and
- video competition for young people in Brazil, India, Pakistan and the UK (completed).

As for **research outputs**, this collaboration seeks to generate new knowledge on young people's understandings, experiences and participation in the 'food-water-energy' nexus in Brazil, using a multidisciplinary approach. As highlighted in the project proposal, this is a previously under-explored field in Brazil. In this setting, the research collaboration seeks to gain a baseline understanding of young people's experiences by collecting, analysing, and disseminating data from young people themselves and other stakeholders.

In terms of **outcomes**, the project has the long-term objective of generating knowledge which can influence policy. This collaboration seeks to strengthen the knowledge base on the relationship between young people and nexus resources in Brazil, to address development challenges and increase resilience in this field. It aims to raise awareness of and interest in Education for Sustainability (EfS) within the school system, as well as private and public sector stakeholders. It also aims to generate understanding of young people which can, in future phases, inform new and innovative EfS teaching materials.

At the **impact level**, it is thought that this will help address development challenges linked to access to and sustainability of the food-water-energy nexus – particularly those posed by rapid urbanisation and resource constraints in Brazil.

5.2 Answers to the evaluation questions

5.2.1 Relevance

Activity targeting and ODA relevance

The focus areas of ESRC's Nexus call fits well with the Newton Fund priorities in Brazil of environment, climate variability and change, as well as sustainable urbanisation and economic development and social welfare. This call closely responds to the Brazilian government's interest in energy and the environment, as defined in the ENCTI, as well as ESRC's priority area of Urban Transformation. To define the call's area of focus, ESRC organised a workshop with participation of potential partners. Approximately 15 Brazilian academics and representatives from funding institutions participated in the discussions.

The idea for this particular project emerged through Newton Fund activity: both institutions were part of a previous, smaller network project, Sharing Futures.[36] The scope of the action studied here was defined as **a follow-up from the Sharing Futures project**, which was part of the first ESRC Network call. This first collaboration was a positive

[36] http://www.sharing-futures.com/

experience for both sides, and increased interest in both the UK and Brazil institutions to cooperate further in this field. This was a bilateral partnership seeking to address key challenges in planning for sustainable urban environments, and evolved from the University of Birmingham's Geography department's interest in collaborating with a team of technical specialists in the area of water and energy (Engineering Department of UNESP). One of the outputs of the Sharing Futures project was a grant application to ESRC's Nexus call. Both Sharing Futures and the Nexus project were devised to provide a multi-disciplinary approach to sustainable urban development and environmental education. As in the other case studies in this report, the collaboration was initially facilitated by a personal connection: a PhD student at the University of Birmingham who had studied at UNESP under Prof. Perrella.

The **multi-disciplinary** area of focus seems to be well aligned with the country priorities for Brazil. On the one hand, the environmental education component fits well with the environment, climate variability and change priority area. On the other, the focus on working with young people from different socio-economic groups (public and private school; out-of-school; rural and peri-urban) aims to provide a better understanding on how to improve access to resources and services and thus decrease urban inequality. This fits well with Newton's sustainable urbanisation focus, as well as the economic development and social welfare theme, both priority areas for Brazil.

In terms of their relevance to economic development and poverty reduction needs, respondents contended that the thematic focus of the research is strongly aligned with the country's environmental education agenda. As mentioned, research participants were selected to include a **broad spectrum of socio-economic groups**. The aim is not only to understand how different groups of young people access (or fail to access) nexus resources, but also to influence policy so as to improve their understanding of and relationship with these resources.

Additionality of Newton Fund activities

There is considerable evidence that the **Newton Fund has had additionality**. In fact, this was the only funding mechanism the PIs applied to, as they were specifically drawn to ESRC's Nexus call, both in terms of its thematic focus, as well as thanks to their prior, successful collaboration under ESRC funding.

5.2.2 Effectiveness

Research Collaborations

The collaboration was perceived as very positive and as best practice in international research. It allowed for a new **multi-disciplinary approach through strong complementarity** of skills and areas of expertise. Although the team at UNESP was already conducting research on water, environment and energy – particularly, how to use waste as energy in innovative ways – according to respondents "*what was missing was the human element: understanding how to change behaviours*". This 'human element' was introduced by the UK research team based at Birmingham. Respondents from the University of Birmingham emphasised the importance, for their project and the institution more broadly, of having three international researchers stay at the UNESP campus in Guaratinguetá (SP) for an extended period of time (of various months per researcher). This was not only because of their technical expertise, but also the bringing of new ideas and ways of approaching research. According to the UNESP research team, this also helped put the University on the global map.

Data collection activities with private and public sector stakeholders have also captured the interest of several participating organisations, further raising the profile of this research. There are reports of respondents having become more interested in Education for Sustainability (EfS) and its applicability to their work. More broadly, it was highlighted that this project has already generated a lot of interesting findings and 'captured the imagination' of young people and stakeholders: in fact, the team managed to exceed their target of interviews due to the interest generated, interviewing 65 private sector stakeholders, compared to their target of 50.

Despite the project still being ongoing, the team has been prolific in the publication and dissemination of research papers, both in the UK and Brazil. During the first year of the project, one paper was presented at the 9th Forum of Brazilian Environmental Education (17th – 20th September 2017) and is set to be published in a special issue of the

Annals of the Brazilian Journal of Environmental Education.[37] An additional two papers are in progress, and one is awaiting publication in a leading geography journal, *Transactions of the Institute of British Geographers*.[38] Other dissemination activities occurred at the Royal Geographical Society Annual Conference (September 2016 and September 2017)[39], the National Centre of Natural Disaster Monitoring and Alerts (CEMADEN) and the University of São Paulo (March 2017)[40], and the University of Northampton (September 2016).[41] The team also participated in three workshops organised by the University of Birmingham.[42] This has raised the profile of the team and the research's emerging findings in several fora.

Capacity-building on the Brazilian side has been substantial. At the institutional level, it was highlighted that UNESP Guaratinguetá is a 'peripheral' campus, compared to larger UNESP campuses in other areas of São Paulo state. In this context, the collaboration has helped raise the campus' profile. Although UNESP has cooperation agreements with countries such as France and Germany, this is its largest collaboration with the UK.

Nonetheless, its high profile and size have also brought some challenges. The Brazilian counterparts reported that the amount of administrative and organisational work concentrated in the hands of the PI makes the project difficult to manage. There were also concerns about the time-consuming bureaucratic processes involved in working with FAPESP, which place a considerable burden on the research team and can cause delays.

Capacity-building of UK researchers and institutions

The UK side also provided positive feedback on the added value of the partnership, describing it as "*a fantastic experience working with Brazilian collaborators".* This initiative has reportedly created a **new multidisciplinary research agenda** for the University of Birmingham's Geography Department.

New international partnerships

The collaboration is already on the path to **creating long-term linkages between Brazilian and UK partners.** Both sides are already seeking further areas for cooperation, both within the Nexus project's future phases and in other research projects.

Although the activity remains on-going, respondents **already spoke of their interest in future collaboration**. The University of Birmingham seems committed to its cooperation with Brazilian institutions, and has already made steps towards strengthening these in the future. Namely, UNESP visited Birmingham in September, where they spoke about internationalisation and future potential for collaboration. Researchers spoke of plans for future phases of the project, which will use findings from the first phase to develop educational material to be distributed in schools. According to respondents, this is the first time that this kind of material will be developed in Brazil by drawing on young people's experiences in a bottom-up way.

In terms of **other partnerships**, UNESP respondents expressed their interest in starting new cooperation projects in the area of urban resilience to climate change, again using a multidisciplinary approach. They have identified

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[37] Delamaro, M., Walker, C., Zara, C., Perrella Balestrieri, J. A., Kraftl, P. (upcoming) '(Re)connect the nexus: young Brazilians' experiences with water, energy and food', *Annals of the Brazilian Journal of Environmental Education.*

[38] Upcoming: '(Re)thinking (Re)connection: Young people, 'natures' and the water-energy-food Nexus in Brazil', *Transactions of the Institute of British Geographers*; Coles, B., Walker, C. (upcoming), 'Flows that matter: realising the conceptual and political potential of nexus thinking'.

[39] Kraftl, P., Hadfield-Hill, S., Horton, J., Coles, B. (2016) 'Children, young people and Nexus thinking: food-water-energy and everyday geographies: thinking 'beyond' the nexus workshop'. Presented at the Royal Geographical Society Annual Conference (2nd September 2016). Coles, B., Walker, C. (upcoming), 'If the countryside doesn't plant, the city won't eat: rural livelihoods, young people and food-water-energy security in the Vale do Paraiba, Sao Paulo'. Presented at the Royal Geographical Society Annual Conference (30th August – 1st September 2017).

[40] Hadfield-Hill, S., Kraftl, P. (2017) '(Re)thinking nexus thinking: young Brazilians' connections with food-water-energy'. Presented at CEMADEN and Institute of Advanced Studies of the University of Sao Paulo (USP) (March 2017).

[41] Horton, J. (2016) 'Interdisciplinary research with children, young people and families, crossing boundaries, sharing stories'. Presented at Interdisciplinary research with children, young people and families conference, University of Northampton (September 2016).

[42] Kraftl, P., Walker, C. (2017) 'Sustainability Education in Brazil: Polycentrism, transition and uncertainty'. Presented at The Politics of Education in Societies in Transition: Interdisciplinary Perspectives, IAS Birmingham (July 2017).
Kraftl, P., Hadfield-Hill, S. (2016) 'Sustainable urban transformations in water and energy'. Presented to the Brazilian Association of Rectors of State and Municipal Universities (ABRUEM), University of Birmingham (8th June 2016).
Kraftl, P., Hadfield-Hill, S., Horton, J., Coles, B. (2018) 'Using mobile technologies to explore the food-water-energy nexus'. Presented at the Interdisciplinary methodologies: across scales and cultures workshop, School of Geography, Earth and Environmental Sciences, University of Birmingham (7th June 2016)

potential partners in Brazil and in other countries, such as Kenya, Lebanon and Nigeria and applied for GCRF funding, but have not yet received information on the outcome of their application.

Interestingly, the project has established **a partnership with CEMADEN**, which conducts a series of activities of community engagement and education at the federal level. For this project, CEMADEN has hosted dissemination activities, been involved in co-authoring papers, and has also participated in applications for further funding, including for the GCRF grant, for which it is a key partner. Respondents mentioned that this new partnership, though based on a previous familiarity between the Brazilian PI and the institution, was made possible by collaboration in the Nexus project.

5.2.3 Impact

Potential impact on poverty reduction and economic development

As the project is on-going, this section focuses on emerging signs of potential impact.

According to respondents, this research project is different from others in this field, thanks to its **bottom-up approach** – which begins with young people themselves. According to the project's interim report, "*there currently exists scant research about young people's attitudes to and practices within the 'food-water-energy' nexus in Brazil, or indeed globally. Similarly, we know little about how EfS and other forms of education in Brazil are supporting current and future generations in dealing with nexus threats".*[43] To fill these data gaps and lead to evidence-based policy, this project aims not only to understand existing behaviours surrounding nexus resources, but also to **encourage sustainable behaviours among respondents**. This initiative also seeks to contribute to public debate, stimulating the conversation on environmental and sustainability issues among participants and the general public.

While the project focuses on data collection and analysis, one of the main objectives of the project is to **ultimately use its bottom-up approach to inform policymaking**, and more specifically, **to impact education policy**. The project seeks to stimulate the debate, and place young people on the policy agenda, where they are not currently considered as a specific group. As highlighted in the project's interim report, "*the project aims to develop resources showing good practice examples of how various actors (including government departments, NGOs and civil society and industries) are working with young people to address the sustainability of food, water, and energy resources in this region. We hope that these resources might help and encourage industries in Brazil and beyond to involve young people in initiatives to manage food, water and energy in a sustainable way, taking into account young people's concerns about sustainability"*. As data is still being collected and analysed, it is too early to identify signs of impact in this area.

Another of the objectives of the project is to **give back to the participating schools:** "*we do not want to only write papers, but give back our findings to society".* Findings from the survey will be shared with participating schools, providing insight on young people's perception of and relationship with nexus resources. When research findings are available and analysed, the research team is also planning to generate communications products, such as podcasts and videos, to be sent to media agencies. For future phases of the project, UNESP professors are also planning to train teachers, as well as film and distribute an EfS training among educators. These components will help further spread the knowledge generated by the research at the broader societal level.

Change in perceptions of the UK

As for the institutional partners, unlike others included in these case studies, FAPESP has a very long history of collaboration with the UK – being the largest and most internationally connected of the Brazilian State funding agencies. It seems that Newton has had a smaller impact on FAPESP compared with smaller agencies.

At the level of UNESP, it was mentioned that working with UK partners helped the research team understand where there was room for improvement in their own institution – especially in terms of how to manage large grants.

[43] UNESP interim report for FAPESP.

5.2.4 Complementarity and coordination

Catalytic effects

There are some emerging signs of this action leading to a change in attitudes and behaviours on other organisations in this sector.

Respondents highlighted that the **project has generated unexpected levels of interest and responsiveness from stakeholders**, including private sector actors working in nexus sectors, as well as public institutions – namely, CEMADEN. Several of the interviewed stakeholders have also requested the research team's assistance in organising environmental education activities. This has led to new and potential partnerships, as well as interest in applying the EfS curriculum to institutions outside of the education sector. For example, one of the respondents spoke about a former farm which is now being converted into a community education facility. This organisation reached out to the research team to receive support to apply for funding for its community education activities.

There are also signs of **behavioural change within schools,** which reportedly exceeded expectations. The respondents mentioned that some schools began running campaigns to save water and food after participating in research activities. Findings from interviews also revealed that young people started to think more about their consumption patterns and to change their behaviour as a result. One respondent mentioned various examples of young people starting to question and alter their food choices to improve their health.

Leadership effects

In terms of policy influence, there has not yet been a change in the Brazilian curriculum or education policy.

5.3 Conclusions

- This multidisciplinary project was described as a very positive collaboration, especially in terms of the complementarity of skills and areas of research between the institutions in Brazil and the UK.
- The bottom-up approach used in their research is innovative, and can help inform both further research and government policy. There is a specific long-term objective to generate knowledge which can inform and influence education policy, especially in terms of the EfS agenda.
- Though the project is still on-going, it has already generated high levels of interest from participating institutions, especially public schools and private-sector organisations working in the nexus fields. Nine papers have been published and/or presented, with some research outputs – including the large-scale survey – in the process of being finalised.
- As the project is still ongoing, it is too early to observe changes in policy. However, the project is expected to produce evidence-based policy recommendations, with the anticipation that these could have an impact on policymaking and lead to broader societal impacts.
- There are some emerging impacts of behavioural change among students, which indicate that participation in the research has influenced their decision-making linked to nexus resources.

6 Conclusions

Main Findings

- The Brazilian context has changed since the beginning of Newton Fund activities in April 2014, with the country undergoing a deep political crisis and economic recession. In this setting, the Brazilian contribution to the Newton Fund has been important to offset budget cuts to science and research, especially at the federal level, and to foster the creation of new and innovative partnerships.
- Brazil has a long history of scientific cooperation with the UK. The BEIS/ FCO Science and Innovation Network (SIN) has been fostering bilateral science partnerships for almost 10 years. When the Newton Fund launched in April 2014, this SIN team already had strong long-standing partnerships and relationships with a vast array of Ministries, Directors of Research Foundations and Scientific Institutes, and University Rectors. This, in turn, allowed the Newton Fund in Brazil to quickly get up and running.
- Larger organisations such as the State Funding Agency of São Paulo (FAPESP) have a long-standing history of cooperation with British institutions, and a wide range of individual agreements with UK funding partners and Universities. FAPESP has over 30 agreements with UK partners, many of them outside of Newton collaboration. Newton Fund has added to the long-standing relationship with FAPESP and some other FAPs, but also extended to states where UK cooperation was not present before.
- Overall, the match funding for the programme has been successfully sustained, considering that the majority of funds have traditionally come from state, rather than federal budget pots. The exception lies in specific states with particularly acute funding constraints, which have been unable to deliver some commitments, leading to reputational damage for the involved FAPs, and, in some cases, exclusion from further funding rounds.
- There is evidence of the Newton Fund supporting high-quality, high-impact research. The work of the Newton in-country team (ICT) in fostering missions, scientific workshops and finding high quality delivery partners in Brazil has been crucial to this success. Their contextual knowledge, connections with local institutions, and understanding of the Brazilian funding landscape could be taken advantage of even more by UK partners.
- The Newton Fund has led to more systematic cooperation, as well as decentralisation of activity within Brazil. This is closely aligned with ODA and Brazilian government priorities, as it is fostering innovative research in smaller states with a more limited history of international cooperation.
    - Partners include states which have less international cooperation, and also campuses in smaller cities, rural areas, and recently founded universities, especially in the case of Researcher Connect and Researcher Links. For example, in Goiás these were very important in smaller and rural institutions to promote skills development and international cooperation.
    - Having been able to effectively decentralise, thus working with a pool of 26 funding agencies, allows the Newton Fund to reach research pockets of excellence across the country, and outside the traditional South-East and South triangle.
- As well as being ODA compliant, Newton research areas were found very relevant by Brazilian partners. Several UK counterparts launched workshops prior to announcing thematic calls, in which both UK and Brazilian experts participated. Including Brazilian institutions as equal partners was described by numerous respondents as a valuable and innovative way to lead call design and selection.
- Newton Fund is having very different impacts following pillar-specific activities and objectives:
    - The People pillar is improving research capacity and institutional ability to systematise and support international cooperation. This has entailed large administrative changes both at the University and funding agency levels. This is especially the case in smaller institutions with little or no history of international cooperation.

- Some of the research projects have already demonstrated impact in the research community, and in society more widely. The Fundação Oswaldo Cruz (Fiocruz) project included here is an example of 'best practice' which brought innovative findings, facilitated further research, and improved service delivery to the Brazilian population.
- The Newton Fund has also brought more visibility and more resources to participating institutions. There are several examples of new partnerships emerging thanks to participation in Newton activities. Having received Newton funding is seen by potential partners as a 'proof' of the participating institution's capacity and high research quality.

Lessons learned

- Match funding is the unique selling point of the Newton Fund, allowing for a partnership approach. Brazilian institutions are treated as equal partners, not recipients of funding. Brazilian partners were especially positive about the Newton Fund's desire for decentralisation in science and innovation, which corresponds both to the Brazilian government's priorities, and to the Newton Fund's objectives for Brazil. This was achieved by working through state institutions, and with the important coordinating role of CONFAP.
- The UK delivery partners and partner Universities were praised for their efficiency, rapidity, simple bureaucracy, and high trust given to researchers, both by PIs and funding partners. Though there were some administrative delays in releases of funds in a few cases, overall the UK was described as a very quick and efficient partner, which helped overcome some of the challenges linked to the decrease in funds at the federal level. This was deemed particularly relevant in the context of emergency response, such as that faced by the Fiocruz – University of Glasgow Zika virus mapping research collaboration (Section 2 of this report). Here, respondents highlighted that, without the UK partner's quick response when the epidemic outbreak occurred, it would have been impossible to have such influential results, which informed both other research projects, and Brazilian policy response.
- Participation in the fund has helped the institutions covered by this study become more international, in some cases helping them set up new partnerships outside of the Newton Fund. This was particularly important for smaller, previously less connected institutions, such as UFG, or peripheral campuses, such as UNESP. The reputation of the Fund and its challenging management requirements have helped especially previously less internationalised institutions 'be placed on the map' by displaying their infrastructure and research capacity.
- The Newton Fund stands out from other international funding sources in terms of the involvement of local partners, the length of projects supported, and its areas of thematic focus. Researchers both in the UK and Brazil felt that their project could not have happened in the absence of the Newton Fund. However, some highlighted that funding remains quite small, especially for highly technical, medical areas, where it is still difficult to compete with US-based researchers, as in the case of Fiocruz.
- High-level support for the Fund at the Brazilian government level has been important. In particular, UK partners spoke of the high level of interest from government partners, and particularly, the strength of the UK Embassy's partnership with the Ministry of Science, Technology, Innovation and Communication (MCTIC). This strong relationship helped overcome most of the challenges linked to the economic recession and subsequent reduction in federal funds. Cases of failed match funding have been limited, though there were reports of delays in disbursement from both Brazilian funding partners and some UK counterparts.
- The projects studied in this report, though not fully representative of Newton's activities in Brazil as a whole, show some very promising emerging findings. All have led to considerable institutional strengthening and long-term research partnerships. In the case of the Fiocruz – University of Glasgow collaboration, findings have been particularly influential both in the research and policymaking sphere. All projects were found to have increased the visibility of the participating Brazilian institution.
- UK researchers also spoke positively of the partnership with Brazil. Mostly, they focused on the access to new scholarship, realities and on-the-ground knowledge that projects awarded. The extensive time spent in

the field for two of the projects helped expand their networks to Brazilian institutions and further disseminate their research projects in the country.

Areas for improvement

- Despite efforts to promote greater decentralisation, there remains a trade-off between scientific excellence and regional spread. Perhaps more importantly, the capacity to match fund in a reliable way varies across FAPs. Although cases of failure to deliver match funding have been limited, they have led to some reputational damage. There remain states where the UK still finds it difficult to cooperate. Ultimately, there is still an over-representation of South-Eastern states, as many UK DPs have a preference to work with larger, better-funded FAPs. There are also some states which do not have a strong interest in participating and allocating resources to this type of project.
- In order to estimate impact, more efforts could be made to ensure that monitoring data is gathered and shared. Contact data of participants could also be better shared, to ensure that communications can happen more smoothly. Linked to this, communication efforts could be increased, so as to better showcase Newton's activities and achievements in the country. The UK Year of Science (2018) is clearly a step in this direction.
- More efforts could be made to ensure better complementarity with other UK ODA funds, such as the GCRF and Prosperity Fund. This will not be possible without the sharing of clear information on what activities are being funded and where.
- It is important for UK partners to understand how institutional and decision-making processes work in Brazil. Here, the in-country team (ICT) plays an important role in terms of helping them fully understand the Brazilian context, political and institutional challenges, and infrastructural constraints. The ICT's expertise could be further be taken advantage of in the case of some partners.
- The lack of support at the institutional level seems problematic for Brazilian researchers, who are faced with a demanding fund to manage, limited allocated time, and infrastructural challenges. All interviewed PIs highlighted the fact that participation in Newton places a considerable burden on them, as they have to lead all the administrative, logistical, financial tasks, as well as the research itself. This seems to have discouraged other researchers in the participating institutions from applying to Newton Fund calls. Brazilian Universities could be encouraged to provide more administrative support and to facilitate participation.
- There seems to be an unmet appetite for more translation projects in Brazil. Brazilian funding partners at the state and federal level highlighted that more could be done to foster entrepreneurship and private sector involvement in research, and that there is unmet demand for this type of project. Respondents also highlighted that more could be done to foster entrepreneurship and private sector involvement as a follow-up to the existing programmes. In the case of Zika research, University respondents pointed out that there remains a limitation in terms of Brazilian capacity to research and produce drugs for this type of disease, and that investment is still very limited. In turn, this limits the impact of this type of research collaboration in the long-run.
- The three projects included in this study all relied on pre-existing collaborations or contacts between the Brazilian and UK partner. Though this is not a representative sample of Newton Fund activities in Brazil, it indicates that some level of prior international connections has been leveraged to enable participation. BEIS should consider if this is in line with the goals of the fund, and provide guidance to partners if it would like to see a greater focus on new collaborations being formed as a result of the Fund.

Annex 1 – References

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Project reports

British Academy:

- Newton Fund Advanced Fellowship Application Form
- Newton Fund Advanced Fellowship Interim Report
- Newton Fund Advanced Fellowship Final Report

MRC – FACEPE:

- Interim Report

ESRC – FAPESP:

- Case for Support
- First year report
- Interim report

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Annex 2 – Theories of Change per Action

Figure 1. Theory of Change, Federal University of Goiás and University of Bristol

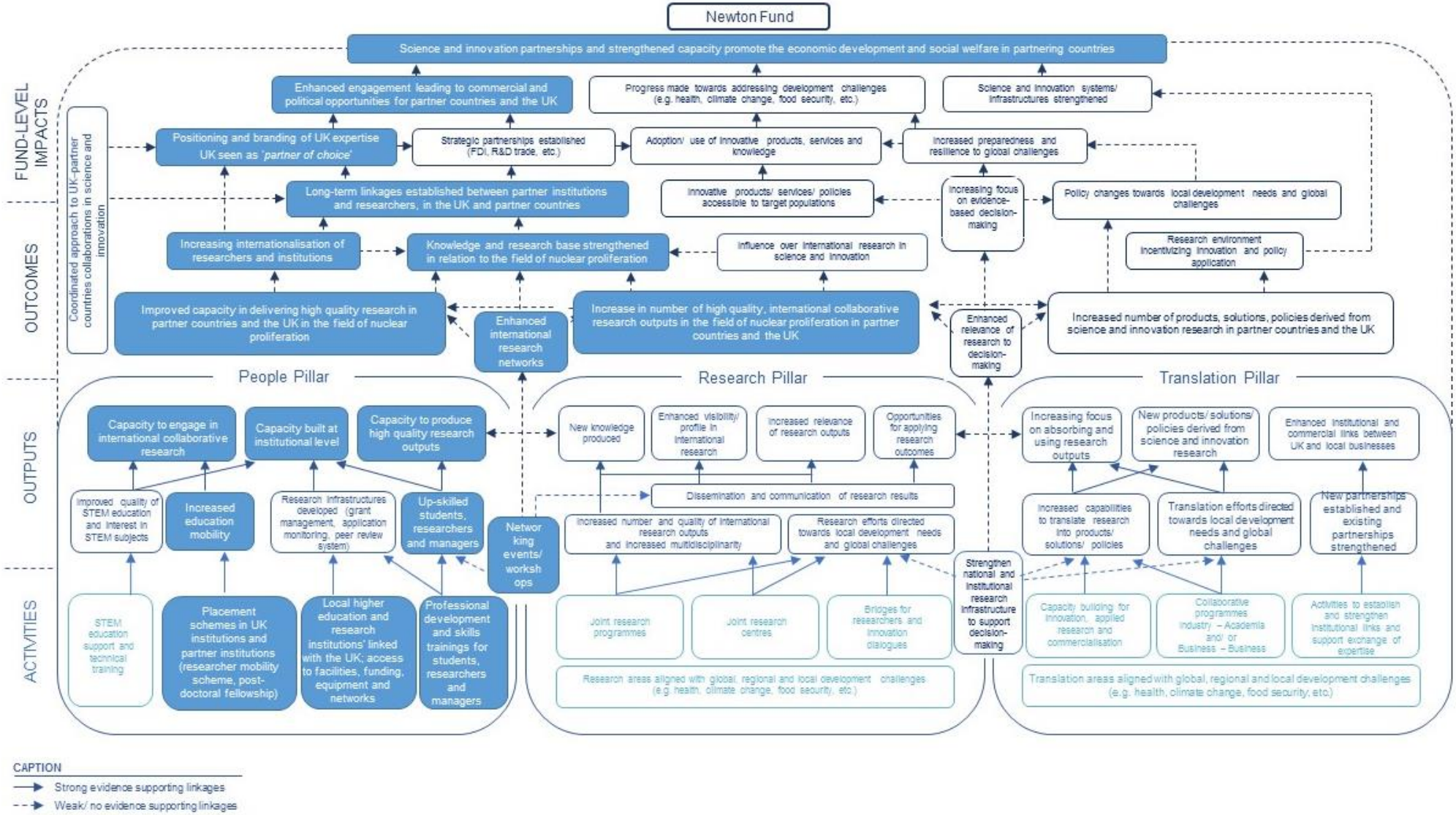

Figure 2. Theory of Change, Fundação Oswaldo Cruz and University of Glasgow

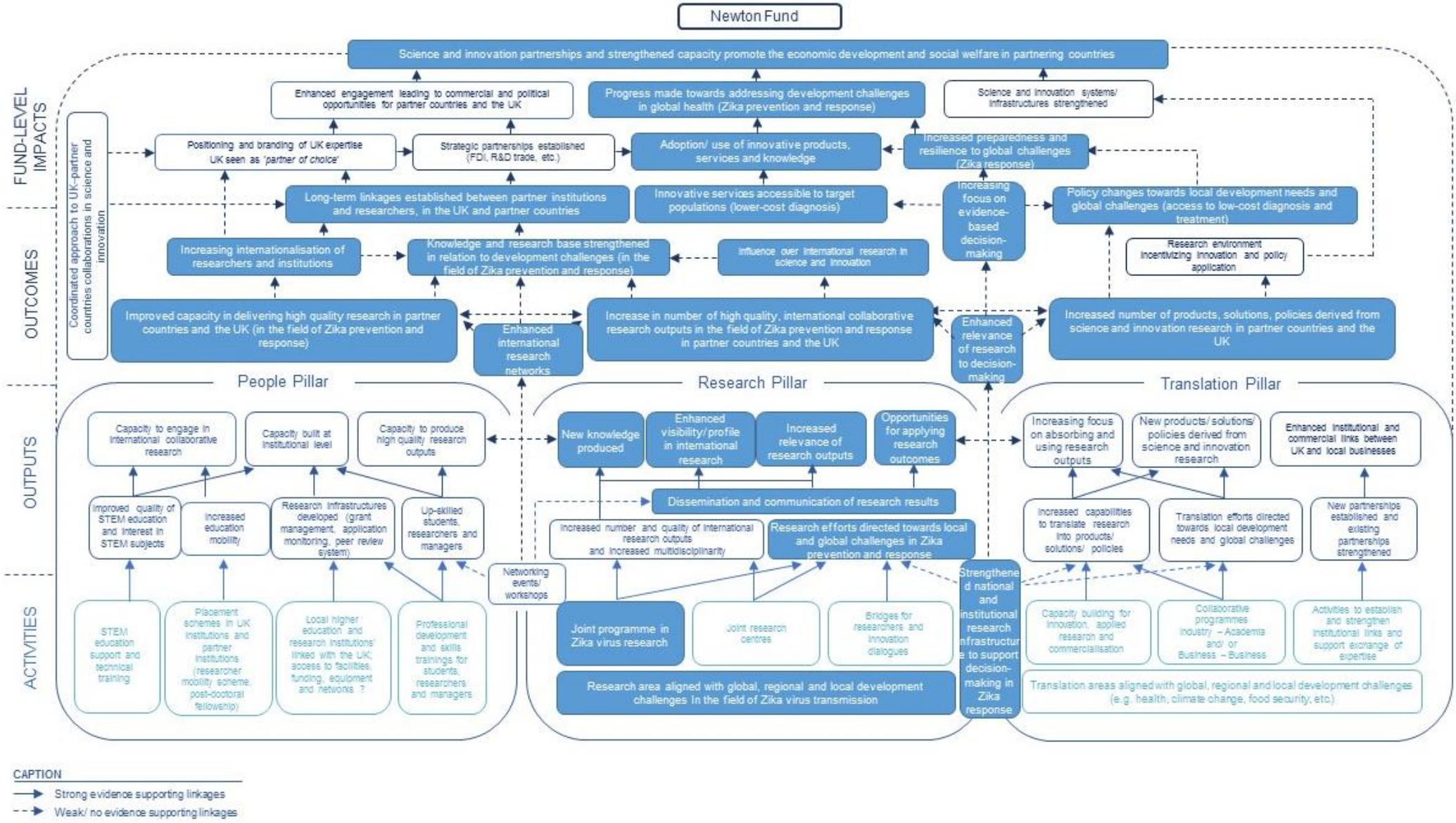

Figure 3: Theory of Change, State University of São Paulo and University of Birmingham