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Partner Country Case Study: Philippines

Final Evaluation of The Newton Fund

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Abbreviations

AANR	Agriculture, Aquatic and Natural Resources Sector
ADB	Asian Development Bank
AH	Award Holder
AHRC	Arts and Humanities Research Council
ASEAN	Association of Southeast Asian Nations
ASTI	Advanced Science and Technology Institute
BBSRC	Biotechnology and Biological Sciences Research Council
BEIS	Department for Business, Energy, and Industrial Strategy
BMKG	Meteorology, Climatology and Geophysical Agency
BPO	Business Process Outsourcing
BRI	Belt and Road Initiative
BSP	Balik Scientist Programme
CAD	Climatology and Agrometeorology Division
CHED	Commission on Higher Education
CRADLE	Collaborative Research and Development to Leverage Philippine Economy
CSSP	Climate Science for Service Partnership
DA	Department of Agriculture
DAAD	Deutsche Akademischer Austauschdienst
DAC	Development Aid Committee
DARA	Development in Africa with Radio Astronomy
DBT	Department for Biotechnology
DECS	Department of Education, Culture and Sports
DOST	Department of Science and Technology
DP	Delivery Partner
DRR CCA	Disaster Risk Reduction and Climate Change Adaption
EU	European Union
EPSRC	Engineering and Physical Sciences Research Council

ESRC	Economic and Social Research Council
FCDO	Foreign, Commonwealth and Development Office
FDI	Foreign Direct Investment
FPRDI	Forest Products Research and Development Institute
FNRI	Food and Nutrition Research Institute
FORTIS	Forecaster Training in Southeast Asia
GCRF	Global Challenges Research Fund
GDP	Gross Domestic Product
GWAS	Genome-Wide Association Studies
HEIs	Higher Education Institutions
HMD	Hydrometeorology Division
HNRDA	Harmonised National Research and Development Agenda
IAPP	Industry-Academia Partnerships Programme
IBF	Impact-Based Forecasting
ICT	Information and Communications Technology
IFI	International Funding Institution
IPR	Intellectual Property Rights
IRRI	International Rice Research Institute
ITCU	International Technology Co-operation Unit
ITDI	Industrial Technology and Development Institute
JICA	Japan International Cooperation Agency
LGUs	Local Government Units
LIF	Leaders in Innovation Fellowships Programme
LMIC	Low and Middle-Income Countries
LMU Munich	Ludwig Maximilians University Munich
LQ	Location Quotient
MEL	Monitoring, Evaluation, and Learning
MoU	Memorandum of Understanding
MH-TBFWS	Multi-Hazard Impact-Based Forecasting and Warning System
MIRDC	Metal Industry Research and Development Centre

MMDA	Metro Manila Development Authority
MMDRMC	Metro Manila Disaster Risk Reduction and Management Council
MRC	Medical Research Council
MTE	Mid-Term Evaluation
MSME	Micro, Small and Medium Enterprise
NADMA	National Disaster Management Agency
NAST	National Academy of Science and Technology
NCR	National Capital Region
NERC	Natural Environment Research Council
NF	Newton Fund
NIBRA	National Integrated Basic Research Agenda
NICER	Niche Centres in the Regions For R&D
NMHS	National Meteorological and Hydrological Services
NRCP	National Research Council of the Philippines
NSTP	National Science and Technology Plan 2002–2020
ODA	Official Development Assistance
PAGASA	Philippine Atmospheric, Geophysical and Astronomical Services Administration
PCAARRD	Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development
PCC	Philippine Carabao Centre
PCHRD	Philippine Council for Health Research and Development
PCIEERD	Philippine Council for Industry, Energy and Emerging Technology Research and Development
PDP 11-16	Philippine Development Plan 2011-2017
PDP 17-22	Philippine Development Plan 2017-2023
PI	Principal Investigator
PIDS	Philippine Institute for Development Studies
PNRI	Philippine Nuclear Research Institute
PSTC	Provincial Science and Technology Centres

PTRI	Philippine Textile Research Institute
QTLs	Quantitative Trait Loci
R&D	Research and Development
R&I	Research and Innovation
R&DLead	Research and Development Leadership Programme
RCUK	Research Council United Kingdom
RDTD	Research and Development and Training Division
S&T	Science and Technology
SIN	Science and Innovation Network
SE	Southeast
STEM	Science, Technology, Engineering and Mathematics
STFC	Science and Technology Facilities Council
STI	Science, Technology, and Innovation
STRIDE	The Science, Technology, Research, and Innovation for Development Programme
TOT	Training of Trainers
TÜBİTAK	The Scientific and Technological Research Council of Turkey
UCL	University College London
UK	United Kingdom
UKRI	United Kingdom Research and Innovation
UNESCO	United Nations Educational, Scientific, and Cultural Organisation
UNESCO UIS	UNESCO Institute for Statistics
US	United States
USA	United States of America
USAID	United States Agency for International Development
USD	United States Dollar
VfM	Value for money
WCSSP	Weather and Climate Science for Service Partnership
WD	Weather Division
WEF	World Economic Forum

WIPO World Intellectual Property Organization

WP Work Packages

Executive Summary

Newton Agham Programme Philippines at a glance

- The programme aims to increase capacity for future UK-Philippines research and innovation partnerships, support and strengthen local knowledge infrastructure, and generate high-quality research on priority areas for the Philippines.
- It spans five research priorities: health (specifically non-communicable diseases and tropical diseases); environment, climate variability and change (including disaster resilience and urbanisation dynamics); energy, water and food; and capacity building (specifically PhD programmes and exchange activities).
- It focusses on generating tangible, on-the-ground change and tackling areas seen as high-priority by both the UK and the Philippines.
- Annual UK Newton funding was £800,000 in 2014/15 and 2015/16, rising to £3 million in 2016/17. This is projected to remain constant at this level until 2021.¹

The case study

Tetra Tech International Development produced this Philippines Partner Country Case Study to inform the Final Evaluation Report of the Newton Fund.¹ It is one of 11 country case studies that investigates the Fund's implementation and its results. It serves as a deep dive into the development, relevance, additionality, and results of (a) the programme activities; and (b) their success factors and barriers that affected their implementation.

The case study sampled three calls under the Newton Agham Programme, and from each a project was selected for in-depth analysis:

- **Weather and Climate Science for Service Partnership (WCSSP) Southeast Asia**, jointly delivered with the UK Met Office, improves capacity to predict and respond to extreme weather events in the Philippines, Malaysia, and Indonesia. The case study focussed specifically on WCSSP's Work Package 3, which aims to translate scientific developments in weather modelling into applications and advice that can mitigate the effects of high-impact weather.
- **Researcher Links Travel Grant** stimulates initial links between UK senior mentors and Filipino junior researchers to build capacity of early career researchers. The case study looked into the collaboration between an Assistant Professor from the University of the Philippines Manila and University of Surrey's Faculty of Chronobiology on research in Filipino biological clock in night shift work.

¹ In this report, 'the Newton Agham Programme' refers to the joint UK-Philippines initiative through which funding calls were issued. 'The Newton Fund' refers to the broader UK programme financing activities in 17 countries, including the Philippines. The Newton Agham Programme was financed both by Newton Fund contributions and those from Philippine funding partners.

- **UK-China-Philippines-Thailand-Vietnam Call for Collaborative Research Proposals in Rice Research** supports collaborations on the sustainable production of rice through disease resistance, nutritional quality, waste reduction and climate adaptation. The case study focused on the Developing Rice Resources for Resilience to Climate Change and Mitigation of Carbon Emissions project.

The research for this report included desk-based review of project- and fund-level documents, and remote interviews with 33 Philippine and UK stakeholders, including Delivery Partners in both countries, Award Holders (AHs), senior staff from partner organisations as well as the programme team and UK Embassy staff.

The case study is a self-contained investigation and its findings are not intended to be generalised to the entire Newton Fund in country. Case studies were limited to three projects per case study, which were conducted remotely owing to the Covid pandemic. In some projects, the added logistical challenge of remote research limited the number and range of stakeholders consulted. The case study findings reflect the data provided by each project and available information online. The volume of documentation provided varied by project, thus limiting the possibility of triangulating findings. In terms of total Newton Fund expenditure, the projects selected represent a very small fraction of all expenditure across 5,400 projects. The case study is therefore not representative of all Newton Fund activities. Whereas it provides valuable depth and illustration of Newton Fund activities, the case study alone does not provide generalisable evidence.

Key Findings

Effectiveness

- **The programme has helped build the capacity of Filipino and UK researchers and promoted collaboration between institutions and researchers.** For early career Filipino researchers, the collaboration brought access to new networks in the UK, increased visibility in their field, and knowledge of new methods and technologies. For UK partners, working with the Philippines has brought access to local expertise through access to local research centres of excellence in areas of high relevance to UK research, such as tropical diseases, climate change and high-impact weather events. For example, the Met Office and participating UK universities improved their knowledge of tropical meteorology by working with the Philippines' meteorological agency.

Emerging impacts

- **The programme has laid the groundwork for future impacts but translation of research into tangible practical results take time and depend on wider factors.** Collaborations within the programme have plans for dissemination and practical application. Several projects pursued a regional approach, which provides a platform for knowledge sharing across the country thereby increasing the potential for impact. The programme has also importantly provided a structure for more systematic, scientific collaboration between the UK and the Philippines. This achievement is particularly important because the two countries do not have strong historical links and established ways of working together in research.

- **The programme has contributed to strengthening the Philippines and the UK's bilateral relationship.** Prior linkages and collaborations between Philippine and UK institutions were more ad hoc and based on personal connections and familiarity. Respondents described the programme as the main science and innovation partnership between the Philippines and the UK. A Memorandum of Understanding (MoU) between the UK and the Philippines was signed in July 2019 to continue and deepen bilateral work.

Sustainability

- **Projects have the right ambition and potential for sustainability, but it is not clear if they will translate to tangible results.** Discussions on the sustainability of specific partnerships have yet to take place. There is no evidence that sustainability and exit plans exist. The sampled projects have not yet led to any new collaboration or renewed partnership among the different institutions. The main challenges include different institutional priorities, established ways of working that take time to change and the postponement of activities due to COVID-19. In some cases, learning generated from the collaboration could lead to future partnerships with other – non-UK – stakeholders and continue to contribute to internationalisation and knowledge generation. Contacts established with UK institutions and communities of practice could also lead to further partnerships.
- **The Newton Fund's equitable partnership approach is deemed exemplary by other programmes.** This approach, combined with the match funding structure, has influenced the thinking of other international partners - for example, the French Embassy is launching a match funded scholarship scheme. There is, however, a recognition that the willingness and availability of resources from counterpart countries are necessary for match funding's success.

Complementarity and coordination

- **The projects collaborated with a range of stakeholders such as national agencies, local governments, and academia.** For example, WCSSP Southeast Asia has been collaborating closely with sub-national government units in two metropolitan areas to apply the new methodologies for disaster risk reduction. The Developing Rice Resources for Resilience to Climate Change and Mitigation of Carbon Emissions worked closely with PhilRice and Philippine Carabao Centre. Additional efforts are required to promote research uptake.
- **There are areas of natural overlap between the Newton Agham Programme and other UK programmes,** such as the Prosperity Fund and the Global Challenges Research Fund (GCRF). WCSSP Southeast Asia partner, PAGASA, is well positioned to get additional funding under GCRF to continue the Newton-funded work and collaboration.

Lessons learned

- **It takes time for different country partners to understand and adapt to one another's way of working.** A programme of this size, breadth and partnership style requires sufficient time to set up coordination and administrative mechanisms and identify mutual priorities that can ensure equal levels of commitment from both sides.
- **Match funding arrangements are not appropriate or feasible for all potential government partners in the Philippines.** There were partners that did not have the

required resources to participate in the arrangement, which led to a revised, smaller project scope than envisaged.

- **Increasing communication and outreach is particularly important to expand the Newton Fund's reach** beyond institutions and individuals that are already more internationally connected. Being relatively new to the Philippines context also means that the programme and the funding it can offer is not yet well-known.
- **Research uptake and behavioural change take time. Translation of research findings to more practical changes is challenging.** Researchers face institutional, cultural, and bureaucratic barriers in applying what they have learned when they return to their home institutions.
- **Commitment and interest of both parties within a partnership are necessary but not sufficient enough for sustainability.** Within the Philippine context, follow up activities and additional funding are required to build on the connections, networks, and systems that the Newton Fund achieved for a more sustained collaboration.

Considerations and recommendations for the Newton Agham Programme

- **Pursue match funding arrangements where there is sufficient interest and resource availability from counterparts.** With COVID-19's impact on available resources, future collaborations should identify partners who can commit to this arrangement to improve project effectiveness.
- **Complement research with project-specific communication and dissemination activities** to bridge the gap between research and practice. This should be included in project plans from the outset. For example, research findings need to be communicated effectively to end-users for societal change.
- **Strengthen coordination and dialogue between different UK programmes such as the Prosperity Fund and the Global Challenges Research Fund.** Although specific programmes have their unique characteristics, there is scope for different programmes to coordinate, share learning and align priorities.
- **Systematically collect monitoring information, particularly carrying out follow-ups with AHs over time, to better understand and communicate results of their research.** Strong monitoring, evaluation, and learning activities are key in defining future research funding priorities. Collecting and sharing stories of impact can also increase commitment from local counterparts – providing more evidence that the Newton Fund is a worthy investment.
- **Promote the Newton brand better in the UK and the Philippines.** The programme could do more to showcase its results and raise brand awareness to increase interest in further collaborations. The results of the Newton Prize, which highlights some of the ongoing research and its transformational impact, is one example of positive communication.
- **Establish an alumni network to further raise the programme's profile.** An alumni network could facilitate the sharing of practical lessons on how to make the most of available collaboration initiatives and encourage others to apply. It can also help maintain momentum, share experiences, and expand awareness of the programme and its opportunities.

1 Introduction

1.1 Aim and purpose of the case study

This report presents our findings for our country case study of Newton Fund activities under Newton Agham Programme in the Philippines. While these findings will inform the Newton Fund's final evaluation, they are specific to the country under investigation and not to be generalised to the broader Fund. The strength of evidence (Section 1.5) for this case study should guide the reading of the results set out in Sections 3- 6. Remote research in the Philippines was carried out in **July and August 2020**.

The purpose of the case study is to examine:

- the relevance of the country-level work to Newton Fund's theory of change, including the ways in which funded projects have supported the Newton Fund to achieve its stated outputs and outcomes.
- the effects of Newton funding in terms of the scale and type of results delivered by the sampled projects, and their potential impact on the socio-economic challenges identified in the country and more widely.
- the likely sustainability of the activities and results of the sampled projects and by the Newton Fund.

We also aim to better understand the overarching significance and impact of Newton Agham Programme in the Philippines, such as on the internationalisation of research institutions, the relationship between the partner country and the UK, and in the sharing of best practice between the two countries.

1.2 Research scope

This country case study focussed on the activities under the Newton Agham Programme. Specifically, it assessed the following:

- 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 the Philippines' development needs and to Newton Fund and Official Development Assistance (ODA) goals.
- the **additionality of each activity**.²
- the **results of each activity** in terms of the outputs, outcomes and impacts generated to strengthen the science and knowledge base, innovation capacity and policy influence in the Philippines and beyond.

² In the context of the Newton Fund, additionality aims to assess whether a given call or project could have happened in the absence of the Newton Fund (for example, through funding for similar activities provided by other programmes).

- the **success factors (and barriers) which affected each activity**, as well as the potential benefits from each activity that might be expected to arise in the future.

The case study included a mix of ongoing and completed activities. When assessing these activities’ results, we considered their ambitions as well as early signs of achieving impacts recognising that impacts of research and innovation take time.

To understand how sustainable solutions to economic development and poverty reduction have emerged from Newton Fund activities, our enquiry focussed on the factors that facilitate specific research activities, increase the quality of research outputs, enhance international collaboration for higher-level education and translate research into innovative practices.

1.3 Case study selection

As part of our sampling methodology for the Newton Fund country case studies, we shortlisted case study calls for each country based on three measures: size, pillar, and sector (see Annex 2 for details). Project selection considered thematic areas of focus, aiming to include priority areas for the Newton Fund in each country. We also sought to achieve a spread of Delivery Partners (DPs) and activity types across the countries in our sample. Following consultations with in-country teams, DPs and the Newton Fund Central Team, we selected **three calls per country**. This selection allowed us to include a call under each of the Newton Fund’s core activity pillars: People, Research, and Translation.

The next step to the case study selection is the sampling of one specific project from each of these three calls to ensure as broad geographical and partner coverage within the country case study's short timeframe. We also considered the relevance of their specific research areas to the Newton Fund’s priorities in the Philippines when the projects were selected.

In the Philippines, the sampled calls and projects analysed in depth in this report are:

Calls	Projects
Weather and Climate Science for Service Partnership (WCSSP) Southeast Asia	WCSSP Southeast Asia Work Package 3
Researcher Links Travel Grant	Assessment of Internal timing and sleep among Filipinos (an exchange between the University of the Philippines Manila and University of Surrey)
UK-China-Philippines-Thailand-Vietnam Call for Collaborative Research Proposals in Rice Research	Developing Rice Resources for Resilience to Climate Change and Mitigation of Carbon Emissions

1.4 Methodology

The research for the country case studies included desk-based review documentation and remote key informant interviews (see Annex 1). For the Philippine case study, we consulted 33

UK and Philippine stakeholders such as Delivery Partners in both countries, Award Holders (AHs), senior staff from partner organisations as well as the programme team and UK Embassy staff.

Due to COVID-19-related travel restrictions, we had to switch to a purely remote approach. We assured the quality of our interviews by building rapport with stakeholders by email prior to the interviews, reviewing documents thoroughly to identify the most important gaps to keep the sessions brief amongst other steps. Details of the limitations of this approach and our mitigation actions are set out further in Annex 1.

1.5 Strength of evidence assessment

Tetra Tech used a traffic light system to assess the case study’s strength of evidence ‘(see figure 1 below).³ The rating assesses the evidence supporting the conclusions reached given the methodological limitations outlined in Annex 1. Table 1 details the main sources of evidence used for this case study and the rating assigned to it.

Figure 1: Strength of evidence ratings

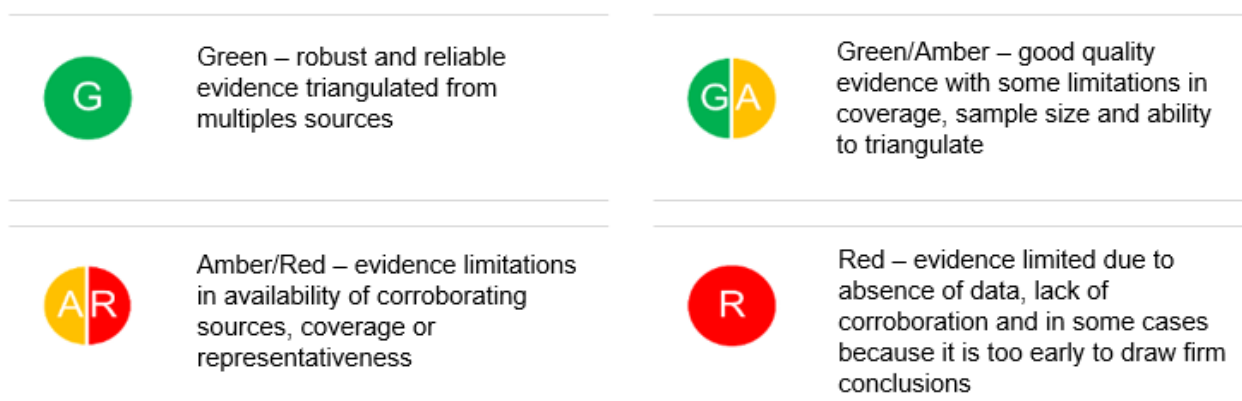



Table 1: Strength of Evidence for the Newton Agham Programme case study

Strength of Evidence	
Green/ Amber 	There are gaps in the evidence, which limited the assessment of relevance, effectiveness, emerging signs of impact and sustainability. This is due to the relatively small sample of interviews conducted which limits the extent to which it is possible to assess if the Newton Agham Programme has produced results and benefited its intended recipients. In addition, the extent, type and structure of monitoring data and documentation varied across DPs, limiting the extent to which outputs and outcomes can be reviewed and triangulated.

³ Our aim was to achieve a sufficient degree of confidence about the extent to which outcomes have occurred, Newton Fund’s level of contribution to the outcomes and our theory about how the Newton Fund has contributed or failed to contribute. Confidence is affected by the extent of triangulation across sources and the position, knowledge, analytical capacity, and potential biases of primary informants. The ratings are not designed to be a rigid framework, but rather a way to ensure evaluative judgements were made systematically across the Evaluation Questions.

1.6 Report structure

The report is structured as follows:

- **Section 2** introduces the context of the Philippines, including political and economic developments and trends in the R&I landscape.
- **Section 3** discusses high-level emerging results of the Newton Fund in the Philippines based on findings from the three sampled projects and broader consultations undertaken with the programme team.
- **Sections 4 to 6** analyse three specific projects more in-depth, providing an assessment of the relevance, effectiveness, emerging impact, and sustainability of the sampled activities.

2 Context

2.1 The Newton Agham Programme

The Newton Agham Programme aims to increase capacity for future UK-Philippines R&I partnerships, establish partnerships with Philippine institutions to support and strengthen local knowledge infrastructure, and focus on generating high-quality research tackling priority areas for the Philippines (such as disaster resilience). Annual UK Newton funding was £800,000 in 2014/15 and 2015/16, rising to £3 million in 2016/17. Annual funding is projected to remain consistent at this level until 2021.⁴

The research priorities for the Newton Agham Programme in the Philippines are⁵:

- health (specifically non-communicable diseases and tropical diseases).
- environment, climate variability and change (including disaster resilience and urbanisation dynamics).
- energy, water, and food.
- capacity building (specifically PhD programmes and exchange activities).
- digital innovation and creativity “*for inclusive development and for use in agriculture, healthcare and environmental resilience*”.⁶

Under the Department of Science and Technology (DOST), a central government department overseeing Science and technology policy in Philippines, several sectoral planning councils conduct most of the everyday coordination and planning for their relevant Newton projects; whereas central departmental staff are involved in commissioning and support. DOST is involved in the highest number of Newton Fund projects, either at a departmental level through one of its three sectoral planning councils or science and technology service institutes. Outside of DOST, the main Philippine government bodies involved in Newton Fund projects are the Department of Agriculture and the Commission on Higher Education.

A distinctive feature of the Newton Fund is the requirement for matched effort from partner countries, which usually equates to matched funding or in-kind contributions. Matched effort is expected to help jointly accelerate the impact of the Fund’s work through the joint agreement of funding priorities and mutual interests, which differentiates it from traditional bilateral development assistance.

2.2 Political and economic context

Since 2012, the Philippines has experienced a period of strong economic growth and declining poverty. This has been accompanied by an increased policy focus on research and innovation (R&I).

⁴ Department for Business, Energy and Industrial Strategy. Newton Fund: Philippines country strategy.

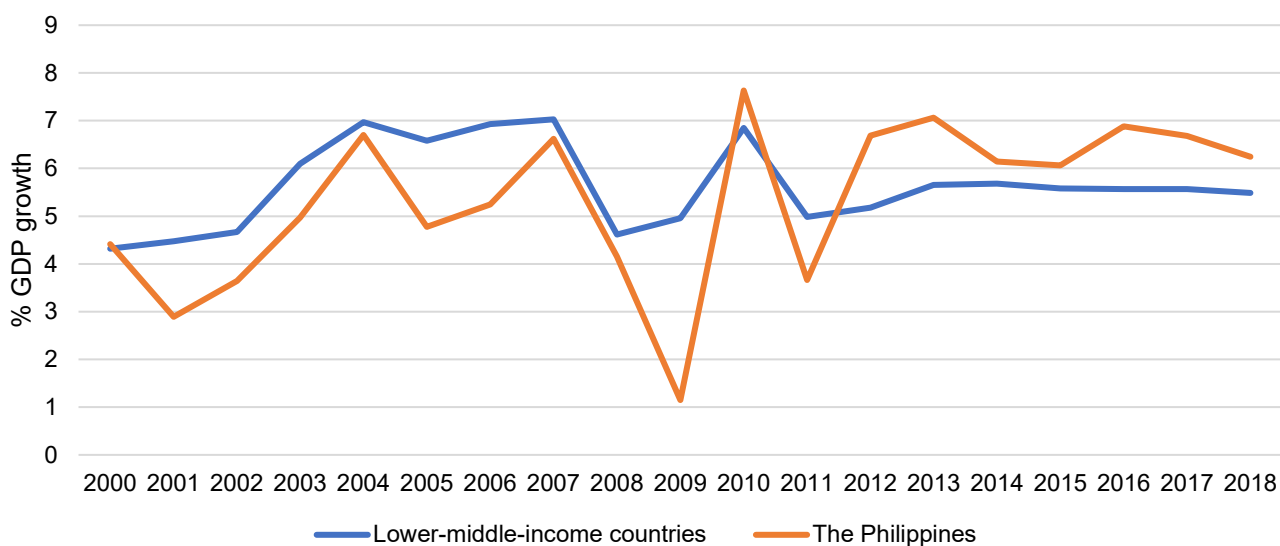
⁵ *ibid.*

⁶ *ibid.*

The Philippines comprises several thousand islands of varying sizes in south-east Asia, arranged in three geographic divisions: Luzon, Visayas and Mindanao. The Philippines is a constitutional Presidential Republic, for which the President (and head of Government) for the 2016-2022 term is Rodrigo Duterte. The official languages are Filipino and English, although many indigenous languages are spoken.

Economic growth in the Philippines has been consistently growing above the average for lower-middle-income countries (LMICs) since 2012. This has been accompanied by a decline in poverty (from 23.3% in 2015 to 16.6% in 2018⁷) and decreased inequality.⁸ The percentage of individuals in the Philippines who have used the internet in the previous three months rose from 5.97% in 2007 to 60.06% in 2017, almost double the average LMICs (34.72%).⁹

Figure 2: Annual GDP growth in the Philippines and lower-middle-income countries, 2000-2018



Source: World Bank¹⁰

The Philippines’ exports are dominated by electronic products, particularly integrated circuits (31.4% of exports in 2018), office machine parts (9.09%) and computers (5.08%).¹¹ Major export destinations for the Philippines are Hong Kong, China, Japan, and the USA (all comprising between 10-15% of exports). The UK receives just 0.86% of exports and provides 0.56% of the Philippines’ imports. As the Philippines is primarily a provider of electronic goods components (rather than finished products), UK consumers are likely to be the end-users of many electronic products for which the Philippines has provided materials through the value chain.

⁷ Philippine Statistics Authority (2019). Proportion of Poor Filipinos in 2015 was 23.3 Percent’. Press release [online] 05 December 2019. Available at: <https://psa.gov.ph/poverty-press-releases/nid/144733> ; Philippine Statistics Authority (2019). ‘Proportion of Poor Filipinos was Estimated at 16.6 Percent in 2018’. Press release [online] 06 December 2019. Available at: <https://psa.gov.ph/poverty-press-releases/nid/144752>

⁸ As captured by the Gini coefficient, a measure of inequality, which decreased from 47.2 in 2006 to 44.4 in 2015.

⁹ World Bank, indicator ‘Individuals using the Internet (% of population)’. Available at: <https://data.worldbank.org/indicator/IT.NET.USER.ZS?locations=PH-XN>

¹⁰ World Bank, indicator ‘GDP growth (annual %)’. Available at: <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=PH>

¹¹ Observatory of Economic Complexity (2020). ‘Philippines (PHL) Exports, Imports, And Trade Partners’ [online]. Available at: <https://oec.world/en/profile/country/phl>

The Philippine economy also includes a large services sector boosted by high remittances from Filipinos working abroad and high domestic consumption (reducing dependence on volatile trade).¹² Foreign direct investment (FDI) flows as a percentage of gross domestic product (GDP) have increased in the past four years, rising from at or below 2% of GDP from 2000 to 2013, below the LMIC average, to 2.97% in 2018. Although this is now above the LMIC average of 1.93%, it is still significantly below Vietnam (6.32%), a fellow Newton Fund country in the region. Informal sector employment is estimated at around 40%.¹³

The Philippines has been included in the Development Aid Committee (DAC) list of ODA recipients as an LMIC since it was created in 1996.¹⁴ Graduation from the DAC list in the next few years is unlikely and will certainly not occur before the end of the Newton Fund in 2021. Despite this, the Philippines receives some of the lowest rates of ODA in south-east Asia. In 2018, it had the lowest rate of ODA per capita (USD \$5.07) of all the region's lower-middle-income economies¹⁵ except for Indonesia (USD \$3.54) and less than a third of Vietnam's (USD \$17.10).¹⁶ As a percentage of central government expense, ODA has fallen from 4.21% in 2000 to 1.08% in 2018.¹⁷ Major bilateral donors include Japan, the United States, Australia, and Germany.¹⁸

Newton Fund activities in the Philippines have coincided with an increased policy emphasis on R&I, most notably since the change of government in 2016. There have been significant changes in government strategy under the new administration, set out in the publication of the 'Philippine Development Plan 2017-2022' (PDP 17-22), with the aim of graduating to an upper-middle income country by 2022 (the end of the current Presidential term).¹⁹ The PDP 17-22 is underpinned by three pillars:

- enhancing the social fabric (*Malasakit*).
- reducing inequality (*Pagbabago*).
- increasing growth potential (*Patuloy na pag-unlad*).

The 'increasing growth potential' pillar emphasises a drive for the Philippines to graduate to a knowledge economy and the promotion and acceleration of science, technology, and innovation (STI) in agriculture, industry, and service sectors, which aligns well with Newton Fund priorities. This replaces the PDP 2011-16, implemented under the previous administration, which included STI as an enabling aspect for specific economic development goals, rather than a goal in its

¹² Central Intelligence Agency (2020). 'World Factbook: The Philippines' [online]. Available at: <https://www.cia.gov/library/publications/the-world-factbook/geos/rp.html>

¹³ Ibid.

¹⁴ OECD (2020). 'DAC List of ODA Recipients (current and historic)' [online]. Available at: <http://www.oecd.org/dac/stats/historyofdaclistsofaidrecipientcountries.htm>

¹⁵ Including Vietnam, Cambodia, Myanmar, Lao PDR, Indonesia, Timor-Leste and the Philippines.

¹⁶ World Bank, indicator 'Net ODA received per capita (current US\$)'. Available at: <https://data.worldbank.org/indicator/DT.ODA.ODAT.PC.ZS?locations=PH-VN-ID-MM-LA-KH-TL>

¹⁷ World Bank, indicator 'Net ODA received (% of central government expense)'. Available at: <https://data.worldbank.org/indicator/DT.ODA.ODAT.XP.ZS?locations=PH-XN>

¹⁸ OECD (2020). 'Aid statistics by donor, recipient and sector' [online]. Available at: <https://www2.compareyourcountry.org/aid-statistics?cr=1000&cr1=oe&lg=en&page=1>

¹⁹ Central Intelligence Agency (2020). 'World Factbook: The Philippines' [online]. Available at: <https://www.cia.gov/library/publications/the-world-factbook/geos/rp.html>

own right, and contained few specific strategies for developing science and technological capacity.²⁰

The Philippines' long term 'Ambisyon Natin 2040' vision, adopted by the Philippine Government in June 2016, is also relevant to Newton Fund operations. It underpins much of what was contained in the PDP 17-22 and includes a vision statement which emphasises the need to foster a well-educated population through the teaching of foundational skills and competencies in areas such as collaboration, creativity, and initiative, as part of a drive to create an innovative, entrepreneurial culture.

The Philippines faces important socio-economic challenges, notably as a country at high risk of natural disasters (including typhoons, volcanoes, earthquakes and tsunamis) and tropical diseases.²¹ The Philippines also has high levels of emigration for work by both high- and low-skilled groups.²² It had a net migration rate of -0.6 per 1000 population from 2015 to 2020 (although this rate has decreased from -3.0 recorded from 2000 to 2005, -3.4 from 2005-2010 and -1.7 over the 2010 to 2015).²³ While this has provided remittances, it has also resulted in a 'brain drain' of skilled workers resulting from a mismatch between tertiary graduate supply and local demand.²⁴ While the country has experienced rapid urbanisation in recent years, poverty remains concentrated in rural areas²⁵ with 29.8% of people in rural areas living in poverty in 2015 compared to 10.6% in urban areas.²⁶

2.3 Research and innovation (R&I) landscape

The Philippines' science and technology governance institutions are long-standing and have not changed significantly in the evaluation period, although research goals have aligned with different development plans.

The Philippines government has implemented science and technology (S&T) strategy plans since the early 1990s.²⁷ Outside of changes to priority areas for spending, government bodies' funding structure has remained largely unchanged in the past decade, including since the 2016 change in government. Science and technology policy in the Philippines is overseen by the Department of Science and Technology (DOST), a central government department (in its present form since 1987). **At an operational level, DOST is comprised of a series of bodies with responsibility for different parts of the STI landscape. These are:**

- **three sectoral planning councils** which are generally responsible for formulating policies, programmes, and strategies for S&T development in their sector, and for allocating funding:

²⁰ Government of the Philippines (2010), *Philippine Development Plan 2011-2016*. Available at: <http://www.neda.gov.ph/philippine-development-plan-2011-2016/>

²¹ Department for Business, Energy and Industrial Strategy. *Newton Fund: Philippines country strategy*.

²² OECD (2017), "The Philippines' migration landscape", in *Interrelations between Public Policies, Migration and Development in the Philippines*, OECD Publishing, Paris, <https://doi.org/10.1787/9789264272286-6-en>.

²³ UN Department of Economic and Social Affairs, indicator 'Net migration rate (per 1,000 population)'. Available at: <https://population.un.org/wpp/DataQuery/>

²⁴ World Bank (2021) 'The World Bank in the Philippines: Overview' [online]. Available at: <https://www.worldbank.org/en/country/philippines/overview>

²⁵ Central Intelligence Agency (2020). 'World Factbook: The Philippines' [online]. Available at: <https://www.cia.gov/library/publications/the-world-factbook/geos/rp.html>

²⁶ World Bank (2018). *Making growth work for the poor: a poverty assessment for the Philippines*. Washington, D.C.: World Bank Group. Available at: <https://openknowledge.worldbank.org/handle/10986/29960>

²⁷ Quimba, F.M.A, Albert, J.R.G., Llanto, G.M. (2018). 'Innovation Policy in the Philippines'. In Ambashi, M. [ed.] *Innovation Policy in ASEAN*. Available at: https://www.eria.org/uploads/media/7.ERIA_Innovation_Policy_ASEAN_Chapter_6.pdf

the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD); the Philippine Council for Health Research and Development (PCHRD); and the Philippine Council for Industry, Energy and Emerging Technology Research and Development (PCIEERD).

- **seven research and development institutes** concerned with basic and applied research in various fields: the Advanced Science and Technology Institute (ASTI), the Food and Nutrition Research Institute (FNRI), the Forest Products Research and Development Institute (FPRDI), the Industrial Technology and Development Institute (ITDI), the Metal Industry Research and Development Centre (MIRDC), the Philippine Textile Research Institute (PTRI) and the Philippine Nuclear Research Institute (PNRI).
- **six S&T service institutes** overseeing different aspects of the science and technology landscape (such as meteorology and science education).
- **two collegial bodies:** the National Academy of Science and Technology (NAST), which promotes science within the Philippines and advises the government on science and technology policy,²⁸ and the National Research Council (NRC), which nurtures research capacity across 13 academic domains and builds scientific linkages domestically and internationally.²⁹
- **16 Regional Offices** and **80 Provincial S&T Centres (PSTCs)** which act as focal points for S&T programmes and policies at a regional level.

Within DOST, the International Technology Co-operation Unit (ITCU) provides the central machinery for the planning, delivery, monitoring and integration of the department's programmes on international S&T relations. It aims to strengthen and expand linkages in international co-operation in S&T research and development with foreign governments, international and regional organisations, private entities, and similar organisations.

The PDP 17-22 recognises some weaknesses in the Philippines' STI landscape, including a weak STI culture and low take-up of technologies, a 'brain drain' of graduates abroad and an inadequate STI infrastructure, characterised by limited R&D centres, laboratory space and research equipment.³⁰ A review of innovation policy by the Philippine Institute for Development Studies (PIDS), a national think tank, noted that STI policy "*has always been viewed as a supporting actor in the quest for economic and social development*", in relation to development goals, rather than as a goal in its own right. In addition, the review notes that limited resources have prevented the effectiveness of STI plans to date.³¹

To address these limitations, the PDP 17-22 sets out specific actions in four primary areas of STI development:³²

²⁸ National Academy of Science and Technology. 'Mandate' [online]. Available at:

<https://www.nast.ph/index.php/about-nast/mandate>

²⁹ National Research Council of the Philippines. 'VISION/MISSIONS/MANDATES' [online]. Available at:

<http://www.nrcp.dost.gov.ph/transparency/vision-missions-mandates>

³⁰ Other weaknesses identified include low government spending; inadequate human resources in science and technology; limitations in the intellectual property regime; weak links among actors in the STI landscape and restrictive regulation and procurement processes in the research and development space. Government of the Philippines (2017). *Philippine Development Plan, 2017-2022*. Available at: <http://pdp.neda.gov.ph/wp-content/uploads/2017/01/PDP-2017-2022-07-20-2017.pdf>

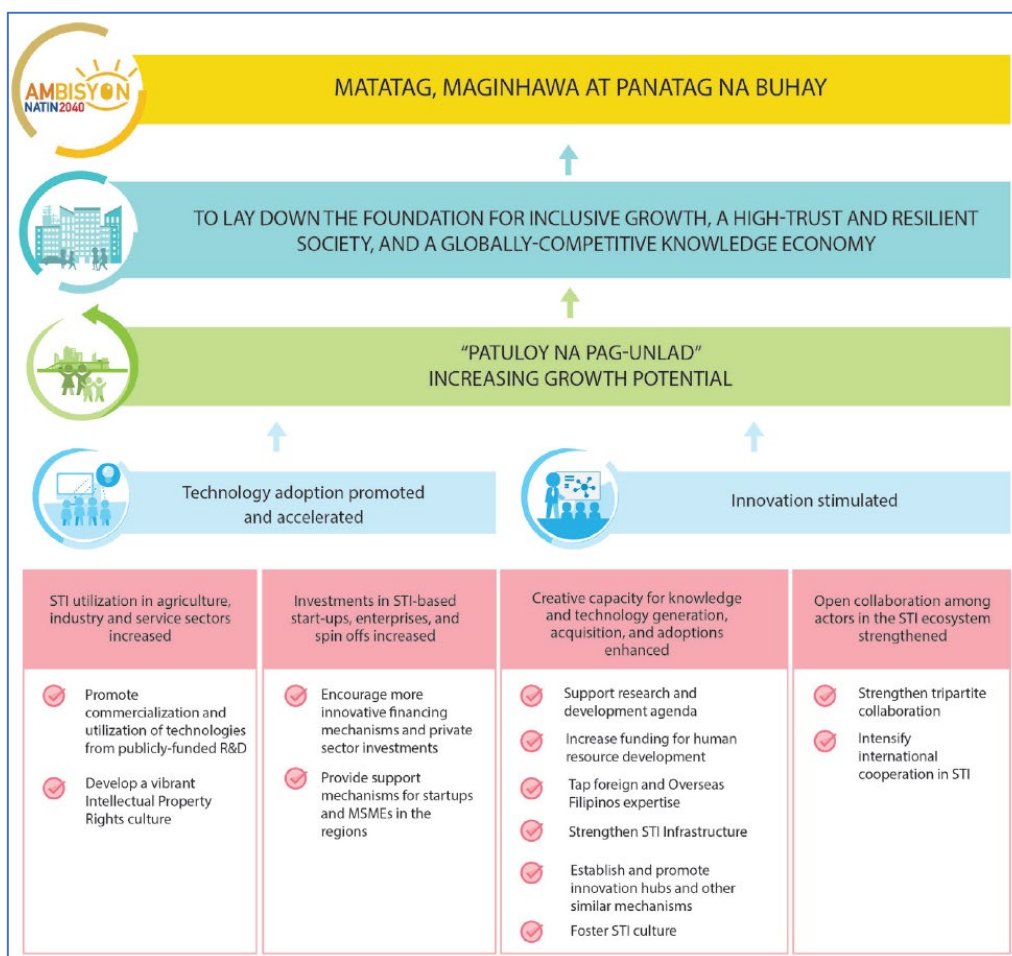
³¹ Quimba, F.M.A, Albert, J.R.G., LLamo, G.M. op. cit.

³² Government of the Philippines (2017). *Philippine Development Plan, 2017-2022* op. cit.

- to increase STI utilisation in the agricultural, industrial and services sectors, including “*promoting commercialisation and utilisation of technologies from publicly-funded R&D*” and developing an Intellectual Property Rights (IPR) culture.
- to increase investments in STI-based start-ups, enterprise, and spin-offs, including encouraging private sector investment, encouraging ‘innovative’ financing mechanisms, and to provide support for start-ups and Micro, Small and Medium-Sized Enterprises (MSMEs) at a regional level.
- to enhance the ‘creative capacity’ for knowledge and technology generation, acquisition, and adoption, including developing and promoting a research and development agenda, developing human resources, accessing expertise from the Filipino diaspora, developing an STI infrastructure promoting innovation hubs, and developing an STI culture.
- to strengthen open collaboration among actors in the STI ecosystem, including ‘intensifying international cooperation in STI’ and encouraging coordination between university, industry, and government.

The PDP 17-22 also includes a legislative agenda to set out specific steps in the areas where legislative approval is needed.

Figure 3: Philippine 2017-22 Development Plan: Increasing growth potential



Source: Philippine Development Plan 2017-22

DOST bodies (including the NRCP, sectoral councils and key service institutes) also set out priority research areas through a Harmonised National R&D Agenda (HNRDA). An HNRDA was issued from 2013 to 2020³³ and was replaced by a 2017 release to cover the period to 2022 (presumably to align research goals closely with the PDP 17-22 development strategy).³⁴ The 2017 plan sets out five areas of national priority to become a globally competitive knowledge economy, several of which are highly relevant to ongoing Newton Agham projects. These areas cover:

- a National Integrated Basic Research Agenda (NIBRA), which supports research linked to development priorities in the areas of water security, food and nutrition security, health sufficiency, clean energy, sustainable community, and inclusive nation-building.
- health, which focuses on specific diseases, health technologies and public health risks.
- the agriculture, aquatic and natural resources sector (AANR).
- industry, energy, and emerging technology.
- disaster risk reduction and climate change adaption (DRR CCA).

DOST also produced a National Science and Technology Plan 2002–2020 (NSTP), which set out 12 priority areas for science and technology development.³⁵ When this report was written, this plan was not available online, and references to it were minimal in the 2017 HNRDA, in favour of an emphasis on PDP 17-22.³⁶

A national innovation strategy – *Filipinnovation* – launched under the 2000 to 2010 Arroyo administration, implemented a number of programmes to address the private sector's needs (including MSMEs) and encourage commercialisation.³⁷ Innovation activities were subsequently included within the PDP 11-16 under the 2010-2016 Aquino III administration, with four main strategies: i) facilitating the access of MSMEs to technology; ii) developing facilities for domestic companies to encourage innovation activity; iii) leveraging Information and Communication Technologies (ICTs); and iv) strengthening networks and collaboration among scientists and engineers.³⁸

Many multinational companies have a base in the Philippines, including a cluster of R&D centres from US and Japanese engineering firms (although a 2014 innovation assessment by USAID noted that these generally remain disconnected from local industry).³⁹ The PDP 17-22

³³ Government of the Philippines. *Harmonized National R&D Agenda 2013-2020*. Available at: <http://www.dost.gov.ph/phocadownload/Downloads/Journals/Harmonized%20National%20R%20D%20Agenda%202013-2020.pdf>

³⁴ Government of the Philippines. *Harmonized National Research Agenda 2017-2022*. Available at: <http://dost.gov.ph/phocadownload/Downloads/Journals/Approved%20Harmonized%20National%20RD%20Agenda%20%202017-2022.pdf>

³⁵ The 12 areas are: agriculture, forestry and natural resources; health/ medical sciences; biotechnology; information and communications technology; microelectronics; materials science and engineering; earth and marine sciences; fisheries and aquaculture; environment; natural disaster mitigation; energy; and manufacturing and process engineering. SEA-EU-NET (2020). 'Philippines' [online]. Available at: <http://sea-eu.archiv.zsi.at/facts/sea/philippines.html>

³⁶ Government of the Philippines. *Harmonized National Research Agenda 2017-2022*. Op cit.

³⁷ Quimba, F.M.A, Albert, J.R.G., LLamo, G.M. op. cit.

³⁸ Quimba, F.M.A, Albert, J.R.G., LLamo, G.M. op. cit.

³⁹ USAID (2014). 'Science, Technology, Research and Innovation for Development (STRIDE): Philippines Innovation Ecosystem Assessment'. Available at: <http://www.stride.org.ph/wp-content/uploads/2016/07/Full-Report.pdf>

also includes support to wider STI development in the academic and private sectors, including strategies to build an investment environment that encourages more private sector participation in start-ups and innovation, such as through ‘angel investments’, venture capital and crowd-funding. Additional funding to commercialise would accompany R&D programmes that are further along the development process. These include existing programmes with similar aims: the Small Enterprise Technology Upgrading Programme (which aims to support and sustain the growth of micro, small and medium enterprises) and the Start-up Ecosystems Development Programme (which intends to foster start-up culture and innovation for small enterprises). Programmes have also been launched to develop research and innovation capacity.⁴⁰

There are over 1,000 colleges and universities in the Philippines, although as of 2019 none rank in the QS top 300 in the world (with the University of the Philippines ranking highest, at 384th place).⁴¹ Tertiary enrolment has increased since 2005, rising from 27.5% in 2005 to 35.5% in 2017 (above the LMIC average of 24.4%),⁴² including a considerable rise in the number of PhDs.⁴³ Despite this, a 2014 USAID assessment of the Philippines’ innovation system claimed that the supply of science, technology, engineering and mathematics (STEM) graduates exceeds local demand, which has driven underemployment and outward migration.⁴⁴ In addition, research and university funding structures have resulted in disincentives for universities to prioritise research over teaching activities in recent years. For example, as a result of teaching professors being ineligible for government grant funding, universities have to choose between ‘teaching’ and ‘research’ staff (with the former providing the main income source through university fees).⁴⁵

As shown in Table 2, the Philippines’ research output is specialised in ICT, materials, geosciences, social sciences, natural resources and conservation, and agricultural science. While specialisation in ICT has increased significantly during the evaluation period, the specialisation rate decreased for the latter three areas. Meanwhile, the Philippines publishes relatively fewer articles in maths, engineering, physics, health services and psychology, compared to the global average.

Table 2: Extent of specialisation of articles across selected research fields

	2013	2014	2015	2016	2017	2018
Agricultural Science	3.02	1.79	1.79	1.44	1.52	1.60
Astronomy	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

⁴⁰ Including the Niche Centres in the Regions For R&D (NICER) Programme to improve regional infrastructure for higher education in STI, the R&D Leadership Programme (RDLead) to improve research capacity in higher education institutions (HEIs) and research institutions, and the Business Innovation through S&T for Industry Programme, which provides financing for businesses to acquire high-technology equipment. Quimba, F.M.A., Albert, J.R.G., LLamo, G.M. op. cit.

⁴¹ Commission on Higher Education (2020). ‘2019 QS World University Rankings of Philippine HEIs’ [online]. Available at: <https://ched.gov.ph/2019-qs-world-university-rankings-of-philippine-heis/>

⁴² World Bank, indicator ‘School enrolment, tertiary (% gross)’. Available at: <https://data.worldbank.org/indicator/SE.TER.ENRR?locations=PH-XN>

⁴³ UNESCO Institute for Statistics (2020) ‘Philippines: Science, Technology and Innovation’. Available at: <http://uis.unesco.org/en/country/ph?theme=science-technology-and-innovation>

⁴⁴ USAID (2014) op. cit

⁴⁵ USAID (2014) op. cit.

Biology and Biomed	1.85	1.27	1.64	1.21	1.20	1.02
Chemistry	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Geosciences, Atmospheric, and Ocean Sciences	1.90	1.54	1.55	1.55	1.37	1.31
ICT	0.63	1.57	0.58	1.87	2.13	2.36
Engineering	0.56	0.52	1.11	0.87	0.59	0.59
Health Services	0.85	0.88	0.73	0.58	0.64	0.63
Materials	n.a.	n.a.	1.26	1.06	1.15	1.36
Maths	n.a.	n.a.	0.98	1.00	0.98	ne
Physics	n.a.	0.61	0.39	0.62	0.74	0.69
National Resources and Conservation	2.18	2.56	1.88	2.25	2.18	1.92
Psychology	n.a.	n.a.	1.39	n.a.	n.a.	n.a.
Social Sciences	3.52	2.89	2.27	2.18	2.03	2.04

Source: Scopus (data sourced from U.S. National Science Foundation). N.a. = not applicable / not eligible; fewer than 30 articles assigned to the country in this field.

Note: the figure represents a measure of concentration of a country's publications in a field, by dividing the fraction of publications in a country that are in a certain field by the equivalent global fraction. A score higher than 1 shows that the country is more specialised than the global average, and a score lower than 1 shows that the country is less specialised.

Among its research priorities, the Philippines retains an emphasis on disaster risk management, demonstrated by a dedicated DOST Undersecretary for Disaster Risk Reduction and Climate Change and a dedicated pillar in the HNRDA.⁴⁶ As part of the PDP 17-22, the government has announced plans to invest in product development centres and disaster risk reduction facilities, aiming for the Philippines to become the 'global hub for Disaster Risk Reduction and Climate

⁴⁶ Department of Science and Technology (n.d.). 'Organizational Structure' [online] Available at: <http://www.dost.gov.ph/10-transparency/about-dost.html?limitstart=0>

Change Adaption and Mitigation’. This has included investing in foreign technologies (such as sensor technologies) and developing local capacity to apply and produce them.⁴⁷

The Philippines has a large agriculture sector and developing its science and technological capabilities was a key priority of the PDP 11-16⁴⁸ and the current HNRDA. The Philippines hosts the International Rice Research Institute (IRRI) headquarters in Laguna province in Luzon.

Finally, the Philippines also has a space programme, which to date has been implemented as a series of activities run by DOST agencies. Following a 2019 legislative act, activities will be centralised under a new Philippine Space Agency.⁴⁹

2.4 Overview of research and innovation funding structure

Among the institutions responsible for administering public funding for research, the Newton Agham Programme funding partners include:

- DOST, which provides grant and scholarship funding both centrally and through its component sectoral councils and research institutes (including the NRCP). It also oversees specialist research institutes.⁵⁰
- the Commission on Higher Education (CHED), which heads the Philippine Higher Education System under the Office of the President. CHED provides direct grants for research and postgraduate projects.⁵¹
- the Department of Agriculture (DA), which provides research, development, and extension grants, with a particular focus on agriculture and fisheries.

In the PDP 17-22, the government recognised that “*investments in R&D are central to enhancing the country’s innovation ecosystem*”. It aimed to increase R&D expenditure as a proportion of GDP from 0.14% in the baseline year 2013 to 0.5% by 2023. The government also aims to increase researchers’ number from 270 per million inhabitants in 2013 to 300 by 2023.⁵² R&D has risen marginally in recent years, but remains low, at 0.16% of GDP in 2015, below regional Newton Fund neighbours Indonesia (0.24% in 2017) and Vietnam (0.53%).⁵³ The PDP 17-22 notes that R&D funding is predominantly used for agricultural and industrial production

⁴⁷ UNESCO (2015). *UNESCO science report: towards 2030*. Available at:

<https://unesdoc.unesco.org/ark:/48223/pf0000235406>

⁴⁸ Government of the Philippines (2010), *Philippine Development Plan 2011-2016*.

⁴⁹ De Guzman, C. (2018). ‘PH takes small steps, as it aims for giant leaps in space technology’. *CNN Philippines* [online], 24 March 2018. Available at: <https://cnnphilippines.com/news/2018/03/23/ph-space-program-development-DIWATA1-DIWATA2-philippine-space-act.html>;

Ronnicque, N. (2019). ‘Philippine Space Agency signed into law’. Republic of the Philippines Advanced Science and Technology Institute [online], 15 August 2019. Available at:

<https://asti.dost.gov.ph/communications/news-articles/philippine-space-agency-signed-into-law/>; Silver, A. (2019). ‘The Philippines creates its first space agency’. *Nature* [online], 19 August 2019. Available at:

<https://www.nature.com/articles/d41586-019-02485-9>

⁵⁰ Department of Science and Technology (2014). ‘S&T Scholarships’. Available at:

<http://www.dost.gov.ph/products-and-services/s-t-scholarships.html>; Department of Science and Technology (2020). ‘DOST CALL FOR PROPOSALS 2022’. Available at:

<http://webcache.googleusercontent.com/search?q=cache:PQiTVPve7i0J:www.dost.gov.ph/accessibility-features/23-announcements/1781-dost-call-for-proposals-2022.html+&cd=1&hl=en&ct=clnk&gl=uk>

⁵¹ Commission on Higher Education (2020). ‘Grants’ [online]. Available at: <https://ched.gov.ph/grants/>

⁵² Government of the Philippines (2017). *Philippine Development Plan, 2017-2022* op. cit., p. 220.

⁵³ World Bank, indicator ‘Research and development expenditure (% of GDP)’. Available at:

<https://data.worldbank.org/topic/science-and-technology?locations=PH-VN-ID>

and health and environment purposes, and is concentrated in the National Capital Region (NCR), Calabarzon and Central Luzon regions. The government's relative share in R&D funding has increased in recent years, rising from 26.74% in 2009 to 49.44% in 2015. During the same period, the relative share from business has decreased from 57.58% to 37.96%.⁵⁴ Expenditure on R&D from foreign sources was 1.80% in 2015 (compared, for example, to 4.49% in Vietnam in 2018, but above the 0.07% seen in Indonesia in 2018).

2.5 Monitoring, evaluation, and learning (MEL) systems

DOST hosts a central Planning and Evaluation department which undertakes a number of activities relating to the monitoring, evaluation and learning (MEL) of STI policy in the Philippines, including, performance monitoring of DOST agencies, overseeing the collation and distribution of STI and R&D statistics, and implementing surveys of R&D expenditure and human resources.⁵⁵ A previous review of innovation policy in the Philippines by PIDS noted that there has, however, been a lack of empirical studies on the effectiveness of STI strategies and plans to date.⁵⁶

Surveys on R&D spending and resources have been implemented periodically since the 1980s.⁵⁷ DOST has previously (2012 and 2015) released a compendium of STI indicators⁵⁸ and in 2017 released a variety of comparative science and technology competitiveness indicators⁵⁹, drawing from international sources (including the World Economic Forum Global Competitiveness Index).

Innovation surveys have previously been conducted by DOST in 2009 (pilot) and PIDS in 2015.⁶⁰ No more recent data appears to have been published since then.

2.6 International Collaboration

The UK-Philippine relationship has been marked by increased collaboration in a number of diplomatic and economic spheres.

In addition to representing a potential export market for the UK, the Philippines is a strategic partner in relation to promoting regional stability in the South China Sea.⁶¹ The British Embassy reports that the UK is one of the Philippines' largest investors (although China,

⁵⁴ UNESCO Institute for Statistics (2020) op. cit.

⁵⁵ Department of Science and Technology (n.d.). 'Organizational Structure' [online]. Available at: <http://www.dost.gov.ph/10-transparency/about-dost.html?limitstart=0>

⁵⁶ Quimba, F.M.A, Albert, J.R.G., LLamo, G.M. op. cit.

⁵⁷ Department of Science and Technology (2015). *Compendium of Science and Technology Statistics*. Available at: <http://dost.gov.ph/phocadownload/Downloads/Statistics/Compendium%20ST%20Statistics%20as%20of%20December%202015.pdf>

⁵⁸ Department of Science and Technology (n.d.). 'Statistics' [online] Available at: <http://dost.gov.ph/knowledge-resources/downloads/category/16-statistics>

⁵⁹ Department of Science and Technology (2017). *Science and Technology Competitiveness Rankings of the Philippines (2012 – 2018)*. Available at: http://dost.gov.ph/phocadownload/Downloads/Statistics/ST_Compelitiveness_Rankings_of_the_Philippines_2012-2018.pdf

⁶⁰ Albert, J.R.G. et al (n.d.). 'Measuring and Examining Innovation in Philippine Business and Industry: Results of the 2015 PIDS Survey of Innovation Activities'. Presentation. Available at: https://pidswebs.pids.gov.ph/CDN/EVENTS/dralbert_seminar_on_innovation_nov6.pdf

⁶¹ Department for Business, Energy and Industrial Strategy. *Newton Fund: Philippines country strategy*.

Singapore, Japan, Malaysia and the USA remain the largest investors⁶²).⁶³ In addition to the Newton Fund, the Prosperity Fund and the Global Challenges Research Fund are also active in the Philippines, and there are a number of UK-funded programmes that focus on economic development, human rights, disaster risk, and health.⁶⁴

The Philippines has various international research links and collaborations in science and technology fields, most notably with the USA. Being a former US colony, the Philippines and the USA have strong historical ties, reflected in the strength of collaboration and partnership between the two countries, including in R&I. Many Filipinos study in the USA (which is the second biggest destination for Filipino students after Australia⁶⁵), leading to both institutional and personal links. The USA also cooperates closely with the Philippine government and provides grants for research. The Science, Technology, Research, and Innovation for Development (STRIDE) Programme, financed by USAID, is an initiative similar to the Newton Agham Programme. It aims to stimulate inclusive economic growth by boosting science and technology research. It provides grants for university-industry research projects, exchanges, and scholarships. This 5-year programme began in 2013 with a budget of USD \$32 million and was extended in 2018 for a further three years.⁶⁶ It focuses on disciplines as diverse as electronics, chemical industries, alternative energy, translational medicine, agri-business, ICT, and mobile computing, which partly overlaps with Newton priorities (agri-tech, energy security, health, and digital, innovation and creativity).⁶⁷

France and the Philippines signed an agreement on scientific cooperation in 2019 (to update an existing 1978 agreement), promoting academic exchanges and co-financing joint research projects.⁶⁸ The Philippines also participates in the German Academic Exchange Service (DAAD) programme.⁶⁹ Other EU initiatives are implemented at the regional Association of Southeast Asian Nations (ASEAN) level: the EU-funded SEA-EU-NET and SEA-EU-NET II, which ran from 2008-2017, provided funding for STI and research collaboration activities between EU member states and ASEAN countries and encouraged ASEAN participation in EU research funding programmes.⁷⁰

⁶² Santander (2020). 'PHILIPPINES (THE): FOREIGN INVESTMENT' [online]. Available at: <https://santandertrade.com/en/portal/establish-overseas/philippines/foreign-investment>

⁶³ British Embassy Manila (n.d.). 'The British Embassy in Philippines maintains and develops relations between the UK and Philippines' [online]. Available at: <https://www.gov.uk/world/organisations/british-embassy-manila>

⁶⁴ Department for International Development (n.d.). Development Tracker: Philippines. Available at: <https://devtracker.dfid.gov.uk/countries/PH/projects>

⁶⁵ UNESCO Institute for Statistics (2020). 'Global Flow of Tertiary-Level Students' [online]. Available at: <http://uis.unesco.org/en/uis-student-flow>.

⁶⁶ Requejo, R.E. (2018). 'USAID allots P250 million for 3 more years of STRIDE project'. *Manila Standard* [online], 04 October 2018. Available at: <https://www.manilastandard.net/news/national/277174/usaaid-allots-p250-million-for-3-more-years-of-stride-project.html>

⁶⁷ USAID STRIDE (n.d.). 'About us' [online]. Available at: <http://www.stride.org.ph/about-us/>

⁶⁸ Embassy of the Philippines, Paris (2019). 'PHILIPPINES, FRANCE SIGN PROGRAM OF COOPERATION IN SCIENCE, TECHNOLOGY, AND INNOVATION' [online] Available at: <https://paris.pe.dfa.gov.ph/newsroom/embassy-updates/1058-philippines-france-sign-program-of-cooperation-in-science-technology-and-innovation> ; Ministry for Europe and Foreign Affairs (2020). '2019: a landmark year for French-Philippine scientific cooperation' [online] Available at: <https://ph.ambafrance.org/2019-a-landmark-year-for-French-Philippine-scientific-cooperation>

⁶⁹ German Embassy Manila (n.d.). 'Bilateral cultural relations' [online]. Available at: <https://manila.diplo.de/ph-en/topics/culture/cultural-relations/1891888>

⁷⁰ SEA-EU-NET (n.d.). 'Aims and results' [online]. Available at: http://sea-eu.archiv.zsi.at/about/aims_results.1.html; European Commission (n.d.). 'SEA-EU-NET 2 - EU-ASEAN S&T cooperation to jointly tackle societal challenges' [online]. Available at: <https://cordis.europa.eu/project/id/311784/reporting>

Other International Funding Institutions (IFIs) relevant to Newton Fund activities include the Asian Development Bank (ADB), which provides financing for development initiatives (including some relating to technology and innovation), and the Japan International Cooperation Agency (JICA), which has allocated funding for scholarships, grants, and technical assistance loans to support the government's emphasis on funding training and education in science and technology in the past. The Philippines has also received financing for infrastructure projects through China's Belt and Road Initiative (BRI)⁷¹ and signed a Memorandum of Understanding (MoU) with China for joint science and technology co-operation in 2019.⁷² Some joint calls for research with China have also been launched.⁷³

⁷¹ Tritto, A. And Camba, A. (2019). 'The Belt and Road: The Good, the Bad, and the Mixed'. *The Diplomat* [online], 15 April 2019. Available at: <https://thediplomat.com/2019/04/the-belt-and-road-the-good-the-bad-and-the-mixed/>

⁷² Arayata, M.A. (2019). 'PH, China to help future researchers, start-ups'. *Philippine News Agency* [online], 08 October 2019. Available at: <https://www.pna.gov.ph/articles/1082608>

⁷³ Department of Science and Technology (2020). '2020 JOINT RESEARCH PROJECT CALL FOR PROPOSALS PHILIPPINES-CHINA' [online]. Available at: <http://www.dost.gov.ph/23-announcements/1810-2020-joint-research-project-call-for-proposal-ph-china-2020-05-04.html>

3 Emerging results of the Newton Agham Programme in the Philippines

This section sets out the emerging results of the Newton Agham Programme. The findings are based on the three calls included as part of the case study as well as the broader consultations undertaken with the programme team (see Section 1.4 for details of the methodology).

3.1 Key findings

The Newton Agham Programme is closely aligned with Philippine government priorities. This alignment was an outcome of consultations during the programme's design phase, which included opportunities for discussion between the UK and the Philippines. Stakeholders from both sides characterised the partnership as equal and reflective of the Philippines' priorities. The match funding arrangements reinforced this partnership. Areas of alignment were especially strong in disaster risk reduction and health, and more broadly in the central role of R&I in promoting socio-economic development.

Establishing equal⁷⁴ partnerships enabled the programme to navigate and manage the sensitive contextual challenges around development aid in the country. A sign that the programme's efforts are recognised was the awarding of a Science and Innovation prize to the UK Embassy for its Newton Agham Programme work at the Business Mirror's Mission: PHL Envoys&Expats Awards.⁷⁵

The programme is building the capacity of Filipino researchers and internationalising Philippine institutions, which is key to the government's vision of transforming the Philippines into a knowledge economy and promoting R&I-led economic growth. Participants deemed that taking part in Newton has broadened their horizons. It was their first experience of UK research exchange and ways of working. It provided them access to specialised laboratories and facilities often unavailable in the country.

Several Newton Fund Delivery Partner programmes and research sectors have the potential to generate new knowledge, address socio-economic priorities, and translate research into actionable products, services, or policies. The Leaders in Innovation Fellowships (LIF) programme can generate tangible change in the future. In the health field, research done on infectious diseases applying molecular technology was seen as particularly relevant in the COVID-19 context.

Aside from individual researchers and academic institutions, the Newton Agham Programme has resulted in changes among participating funding institutions' understanding of UK partners and how they work. The opportunity for internationalisation and increasing the number of international partnerships and partners' diversity fits well with DOST and CHED priorities. Filipino funding partners also benefited from the opportunity of

⁷⁴ The partnership was frequently described as an 'equal' one from both sides of the collaboration, largely due to Filipino priorities being reflected within the programme.

⁷⁵ Business Mirror, UK, Jica recognized for STI work in PHL. Available at: <http://businessmirror.com.ph/2019/04/14/uk-jica-recognized-for-sti-work-in-phl/>

training to their staff, resulting in improved capacities for the management and administration of R&I activities.

There were teething issues in the early stages of the programme, but they were resolved as the Fund matured. The limited familiarity and working experience between DPs resulted in extensive ‘learning by doing’. It also posed challenges in identifying the right partners and how they should be working together. As of July 2020, there were eight UK DPs in the Philippines, of which six are still active. This was a considerable increase from the three active partners at the beginning of the Fund. Interviews noted that there has been increasing interest to strengthen collaboration between the UK and the Philippines from both parties. Since the start of the programme, DPs in the UK and the Philippines have built a solid relationship.

UK partners increased their awareness of the Philippines’ areas of excellence through access to local expertise and a better understanding of local challenges. For example, working closely with Philippine partners provided the UK access to a ‘natural laboratory’ to study tropical weather and tropical diseases. In turn, this helps the UK generate R&I that can help tackle high priority socio-economic areas in the Philippines to address global challenges.

The programme has contributed to strengthening the Philippines and the UK’s bilateral relationship and to increasing the UK’s visibility amongst Filipinos. At the heart of this improved relationship and positioning is science and innovation. Prior linkages and collaborations between Philippine and UK institutions were more *ad hoc* and based on personal connections and familiarity. The programme was described across the board as the main science and innovation partnership between the Philippines and the UK: ‘there is nothing else from the UK which is as substantial in science and innovation’. The two governments signed a Memorandum of Understanding (MoU) in July 2019 to continue and deepen bilateral work. The MoU identified potential areas of collaboration and thematic focus, including Newton and GCRF priorities. Some researchers supported by the Newton Fund have already received additional funding through GCRF.

3.2 Factors supporting the Newton Agham Programme’s performance

The match funding arrangement strengthened stakeholders’ programme buy-in and ownership. It fostered a sense of equal partnership. The match funding and match delivery arrangement has resulted in high commitment and investment levels from Philippine institutions, which would not have been possible using more traditional funding models. Having a financial stake in the programme increases commitment in the collaboration. The Newton Agham Programme was described as the only programme that used this arrangement at this scale and breadth of activities. Other donors are now showing interest in this model following the UK’s experience. For instance, the French Embassy is in the process of launching a match funded scholarship scheme.

The presence of in-country programme managers played a key role in facilitating dialogue with Philippine partners. They created a bridge between UK and Philippine partners by providing important contextual understanding. This ultimately helped strengthen and build new relationships in a short period of time. UK respondents highlighted that it would have been difficult to build relationships without the Newton Fund because the Philippines does not have its own Science and Innovation Network (SIN) officer in-country but relies on the SIN team in Singapore.

The programme's design and delivery are right for the Philippine context and meet the country's ambition to foster R&I partnerships. Launched at a time of economic expansion, Newton is aligned with the Philippine government's prioritisation of science and innovation, which saw large increases in funding for research activities. For example, DOST's budget almost doubled during the Fund's lifetime (prior to COVID-19).

In the Philippines, as across Southeast Asia, the Newton Agham Programme has demonstrated regional collaboration and cross-country learning. This is evidenced by two projects sampled in this study, which show how the regional nature of the research has provided good opportunities for regional capacity building, cross-country collaboration, and learning. For example, the collaboration between the Philippines, UK, and Vietnam on rice straw biorefining collaboration introduced different varieties of rice which led to cross-country learning.

There were initial challenges to the roll out of the match funding arrangement. The early collaborations struggled to secure matching funds, and ultimately resulted in AHs securing funds from their own organisations. This was especially the case for some government departments which were not accustomed to this type of arrangement. The match funding strategy needs to recognise the availability of funding, priorities, and appetite for this arrangement as different departments have varying levels of capacity or willingness to meet the requirement.

As such, **the programme could have invested more time at inception to identify suitable local institutions.** The programme could also have recognised which partners, being new to international collaboration, might require more support to set up a match funding arrangement.

Newton Delivery Partners faced challenges in navigating bureaucratic arrangements and different ways of working, particularly for those who were not used to working together. Due to most relationships' novelty, partners experienced a steep learning curve in terms of navigating each other's processes. Processes continue to be different such as the time required to evaluate proposals and differing financial years. They remain a challenge, and relationships could be further strengthened as partners continue to learn about each other's way of working.

The programme was necessary to lay the foundations of a stronger relationship between the UK and the Philippines, but it is not sufficient to grow and sustain this relationship. Historical ties and regional proximity continue to be important in shaping international collaboration. Some respondents raised questions on how partnerships and collaborations forged under the programme will continue and new ones built without other initiatives and additional funding. For instance, the number of Filipinos choosing to study in the UK has declined in the past decade.⁷⁶ This could be due to a number of reasons, such as visa challenges and limited investment from the UK government in attracting students from the Philippines. Overall, the relationship remains relatively new.⁷⁷ The Philippines is so historically and geographically distant from the UK that it will take more than just one significant programme to bridge the gap.

⁷⁶ Tetra Tech (2020) Philippines End line Update.

⁷⁷ The Philippines continue to have closer ties with other partners such as the US, Japan and Australia.

4 Project: Work Package 3

Summary

Project title		Work Package (WP) 3
Call title	Weather and Climate Science for Service Partnership (WCSSP) Southeast Asia	
Short description	<p>The WCSSP Southeast Asia aims to build capability for services that support weather-resilient economic development and social welfare.</p> <p>The project aims to develop and improve capability in global and regional weather forecasting through three inter-linked Work Packages: 1) Global-scale science and modelling; 2) Regional-scale science and modelling; and 3) Science to forecasting: improving high-impact weather advice.</p>	
Objective(s)	<p>The overall objective of Work Package 3 is to transform scientific developments in weather modelling into applications and advice that can help to mitigate the effects of high-impact weather⁷⁸ in Southeast Asia. In particular, it aims to bridge the gap between weather forecasts and stakeholder response. WP3 aims to:</p> <ul style="list-style-type: none"> • improve the understanding of the impact of large-scale atmospheric conditions that affect the weather and climate of south-east Asia and the Philippines. • assess, develop and improve convective scale models to make better forecasts of high-impact weather over south-east Asia, and in particular for the Philippines. • improve processes which translate weather forecast models into advice that can help mitigate against high-impact weather in the Philippines data range of lead times from days to months. 	

⁷⁸ Weather events, such as monsoons, tropical cyclones, and cold surges, which have the potential to lead to significant loss of life, injury, and economic costs.

	<ul style="list-style-type: none"> ensure that the requirements of the users of weather forecasts influence the science so that advances in weather forecasts meet the needs of users.⁷⁹
Pillar	Translation
Acton value (total budget allocated in country, in GBP)	UK: £1,507,000.00 PH: £254,028.71 (entire WCSSP programme)
Start/end date (Status: on-going or complete)	Ongoing: 2016 – present
DP UK and overseas	Met Office – DOST PCIEERD
Award holders/ grantees	<p>Partner countries: Department of Science and Technology Philippine Atmospheric, Geophysical and Astronomical Services Administration (DOST-PAGASA) (Philippines); National Disaster Management Agency (NADMA) (Malaysia); Meteorology, Climatology and Geophysical Agency (BMKG) (Indonesia).</p> <p>UK: University of Leeds (consortium lead) and University of Reading; University College London (UCL).</p>

Description of the project

The WCSSP Southeast Asia programme, jointly delivered by the Met Office and its partner meteorological agencies in Southeast Asia, seeks to improve capacity to predict and respond to extreme weather events in the Philippines, Malaysia, and Indonesia. It has three complementary Work Packages (WP). This case study focuses on WP3, specifically on the work carried out in collaboration with PAGASA, the Philippine meteorological agency – though it draws on regional findings where relevant. WP3 builds on elements of the other WPs by translating modelling improvements into applications that support services to protect lives and livelihoods in Southeast Asia.⁸⁰

Figure 4 shows how the three components of WCSSP build on and complement each other:

- WPs 1 and 2: seek to understand the key meteorology of the region and improve forecasting models.

⁷⁹ DOST PAGASA and Met Office (2020) 'Philippines country report on Impact-Based Forecasting (IBF) status'.

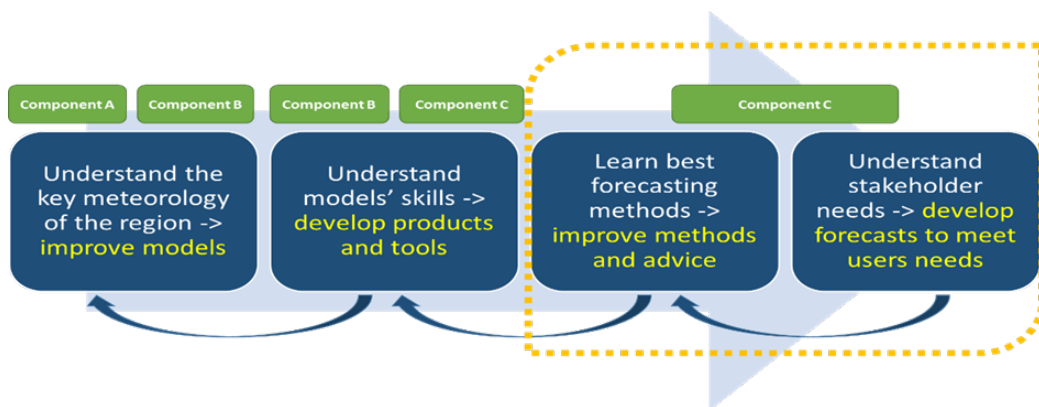
⁸⁰ Additional information available at the Met Office website, Work package 3:

<https://www.metoffice.gov.uk/research/approach/collaboration/newton/wcssp-se-asia/wp3>.

- WP2 and 3: seek to understand models and develop products and tools.
- WP3 seeks to apply forecasting models to improve methods and advice and understand stakeholder needs to develop forecasts that meet those needs.

Improved understanding of methods and models, and the resulting improvements in forecasting capacity, are achieved through several capacity building activities and workshops. These activities as well as the development and launch of several tools and platforms began in March 2018 and continued throughout 2019.

Figure 4: WCSSP Southeast Asia’s 3 Work Packages (or Components)



Source: PAGASA progress report (March 2020)

Main collaboration stakeholders

The UK’s Met Office partly delivers the activities under WP3. A consortium led by the University of Leeds (FORTIS training) and UCL (behavioural study) also delivers part of project.

The main partner in the Philippines is PAGASA, a Philippine government agency. As the National Meteorological and Hydrological Services (NMHS) agency, it is mandated to: 1) provide adequate up-to-date data, and timely information on atmospheric, astronomical and other weather-related phenomena; 2) provide science and technology-based assessments pertinent to decision-making; and 3) ensure that the country fulfils its commitments to international meteorological and climate change agreements.⁸¹

PAGASA created a Technical Working Group and a Focal Group in February 2019 for the purposes of the Newton Agham Programme collaboration. The groups are composed of members of different divisions, including the Research and Development and Training Division (RDTD), the Weather Division (WD), the Hydrometeorology Division (HMD), the Climatology and Agrometeorology Division (CAD) and representatives from the five regional services divisions nationwide.

To develop an impact-based forecasting weather system, PAGASA collaborates with stakeholders familiar with disaster management and weather vulnerability and exposure. These

⁸¹ DOST PAGASA and Met Office (2020) ‘Philippines country report on Impact-Based Forecasting (IBF) status’.

stakeholders include local authorities for disaster risk management and local government units.⁸² Piloting of the initiative with authorities in Metro Manila and Metro Cebu is underway.

Pathway to impact

Figure 6 (in Annex 4) illustrates how the WP3 collaboration relates to the theory of change for Newton Fund People and Translation Pillar activities. The partnership consists of the following:

Activities: WP3 includes several activities designed to improve impact-based forecasting (IBF) capacity and support the translation of that capacity into improved weather forecasting services. Supported activities include:

- IBF training delivered by the Met Office.
 - Met Office provided a two-day training to PAGASA in March 2018 introducing IBF methods, which covered 1) introduction to IBF; 2) understanding and drafting of impact tables for selected hydrometeorological hazards; and 3) the basics of probabilistic forecasting for IBF.
 - Met Office provided a four-day training to PAGASA in May 2018 on the use of convective scale models, including on 1) the Met Office Unified Modelling system; 2) forecasting localised convection, tropical cyclones and large-scale processes through the use of convective scale models; and 3) practices on probabilistic forecasting and communicating forecasting uncertainties.
- A consortium led by the University of Leeds delivered the Forecaster Training in Southeast Asia (FORTIS) to the Institute for Climate and Atmospheric Sciences, in May 2019.
 - This was an advanced tropical meteorology training, designed to improve familiarity with large-scale drivers of high-impact convective weather events.
- The Met Office shared UK best practice and standard operating procedures on IBF in November 2019.
 - The objective is to support PAGASA to develop a draft IBF warning protocol and standard operating procedures, following UK best practice, and improving capacity to produce case study reports to improve understanding of models and forecasting processes.

Expected outputs: The collaboration, training, and workshops will lead to an improvement in numerical modelling and weather prediction among partner organisations, including PAGASA.

Expected outcomes: Through improved capacities, PAGASA will deliver higher quality warning services, enabling local government stakeholders to appropriately act and respond to the imminent threat posed by specific hydrometeorological hazards. Developing links between scientists and forecasters will enable mutual learning and feedback to refine regional forecast interpretations and direct future model developments. This will lead to more accurate forecasts and advice, through country-relevant and user-friendly model development.

⁸² Additional information on the collaboration/inter-Agency involvement with local authorities and government units available at: <http://bagong.pagasa.dost.gov.ph/about-us>

Expected impact: Improved capacity to predict and respond to high-impact weather will help protect lives and livelihoods in Southeast Asia, supporting local stakeholders to limit the damage caused by harmful events, including tropical cyclones.

4.1 Emerging project results

Relevance of Newton Fund activities

ODA relevance

The collaboration fits well with Newton Fund priorities in the Philippines, particularly around environment, climate variability and change and disaster risk reduction. The collaboration aims to translate research to protecting the lives and livelihood of people vulnerable to extreme weather events by improving climate services in Southeast Asian partner countries. Improved climate information services have large potential impacts on socio-economic development, protecting human lives and mitigating the risks of climate change. This aligns well with the UK's climate change agenda and ODA priorities.

Relevance of the collaboration to the Philippines' socio-economic priorities

A key strength of the collaboration is that it includes country priorities. Consultations with in-country partners led to developing science plans and curricula tailored to each country's needs and priorities. For the Philippines, this resulted in the focus on tropical cyclones. Other partner countries expressed different preferences: in Malaysia, the programme's focus is on cold surges and their impact on river flooding, while Indonesia opted for a more diversified focus to meet regional needs.

This collaboration reflects the Philippines' ambition to shift towards IBF⁸³ and away from conventional weather forecasting. This shift was due to the impact of Typhoon Haiyan in 2013, when, despite timely and accurate forecasts, including on the occurrence and potential height of storm surges, massive loss of lives and properties was recorded. It was argued that if local government and the general population had understood the risks and potential impact of such an extreme weather event, more extensive evacuation plans and policies would have been put in place. Respondents suggested this was because the weather forecasts did not communicate the urgency of the typhoon.

Developing stronger weather forecasting capabilities and improving climate services is a high priority for the Philippine government. The country is highly vulnerable to extreme and high-impact weather events. Yet, the key climate players such as forecasters, meteorologists and other stakeholders in disaster risk management at the local level work in silo.⁸⁴ This project is a recognition that there is a need to work more closely with international and local partners, improve communication of risk and likely impact, and ultimately link meteorological forecasts with an improved response on the ground (through collaboration with local government units).

⁸³ Particularly, Multi-Hazard Impact-Based Forecasting and Warning System (MH-TBFWS)

⁸⁴ DOST PAGASA and Met Office (2020) 'Philippines country report on Impact-Based Forecasting (IBF) status'.

Origins and quality of the collaboration

Partners on both the UK and Philippine sides of the collaboration largely viewed the relationship as equitable. The partnership was described as demand-driven and not top-down or solely based on the Met Office's expertise. Country partners had the opportunity to identify its priorities for capacity building, and what lessons they wanted to apply from the UK. In defining those priorities, the first step consisted of assessing PAGASA's existing operational services and identifying gaps and concerns. PAGASA also identified the divisions which would be most relevant to take this initiative forward, and the local stakeholders who should be targeted through training, workshops, and outreach activities.

PAGASA and the Met Office started working together in Typhoon Haiyan's aftermath through a pilot project on improving heavy rainfall services through a training of trainers (TOT) intervention. They build on this collaboration to further improve response to extreme weather events such as Haiyan by bridging the weather forecast communications gap.

Additionality

Match funding and joint design and delivery were the main differentiators of the Newton Agham Programme. Respondents appreciated being able to participate in an initiative that promotes equitable lesson sharing and learning, which benefits both the UK and the partner countries. The Philippines have a strong interest in developing their own capacity and delivering their priorities, and that the Newton Fund offers the means to do that.

The programme strengthened the partnership between PAGASA and the Met Office. Respondents were not aware of any other funding that could bring such close levels of collaboration and a regional perspective and the possibility to share learning and outcomes between partners in the region.

4.2 Effectiveness of Newton Fund activities

Capacity building for individuals

The collaboration strongly focussed on building the capacity of forecasters and meteorologists through training on IBF methods, convective scale models and tropical meteorology. This approach recognised that IBF's effectiveness ultimately depends on the skills, capacity, and confidence of forecasters to use it. The trainings thus aim to improve the capacity of forecasters in partner organisations to deliver more accurate and more impactful weather forecasts.

The trainings have improved capacities among forecasters and meteorologists, particularly in methodologies that are new to them. By improving participants' understanding of fundamental science (in terms of weather forecasting and modelling), respondents highlighted that PAGASA forecasters now have improved capacity to accurately predict and communicate weather forecasts. This statement was further supported by the pre- and post-test surveys, which reported that attendees' technical capacities improved in the vast majority of topics covered. Participants scored the quality of the trainings very highly, highlighting

improvements in their technical knowledge and abilities in forecasting models. In particular, the course materials and topics were scored highly relevant or relevant by all respondents.⁸⁵

The project is in the process of producing a 'Forecasters' Handbook', which will allow individuals who have been trained to refresh their understanding of the topics covered.

Capacity building for institutions

Met Office provided PAGASA access to specialised tools, including modelling software and global and regional datasets on weather forecasting. This has the potential to improve PAGASA institutional capacity and service delivery. The UK's unified model for forecasting and standard operating procedures for issuing tropical cyclones and rain warnings were shared with partners in the Philippines and adapted for application in the local context. Materials from the trainings were shared across the organisation to allow knowledge diffusion across PAGASA. Additional trainings and workshops were also organised internally to further disseminate lessons from the trainings. PAGASA organised internal workshops to identify the appropriate stakeholders for outreach activities, suggesting templates for IBF warning, and drafting a protocol for the IBF warning system.⁸⁶

The Forecasters' Handbook that the Met Office is producing, can facilitate improvements across the organisation by providing guidance to forecasters who did not attend the training. PAGASA is also in the process of developing a 'Forecasters' Portal' (expected to be launched in 2021) applying knowledge on visualisation software and methods gained from the trainings.⁸⁷ This portal is currently being piloted with visualisations of the Metro Manila area.

Respondents reported that PAGASA's science administration capacities also improved through international collaboration. This progress was achieved by learning from the operational practices, working methods, and management systems used by international partners.

Translating capacity building into improved service delivery

Through its provision of capacity building for meteorologists and forecasters, the collaboration aims to strengthen weather services and ultimately improve societal outcomes in the form of better disaster risk mitigation. The project's end goal is to support climate- and weather resilient economic development and social welfare through strategic partnerships harnessing UK (and international) scientific expertise.

The collaboration is starting to contribute to institutional change needed to improve weather forecasting practice. The interactive, hands-on workshops delivered by PAGASA between July and September 2019 introduced IBF concepts to local government units (LGUs) and disaster risk reduction managers from the Metro Manila and Metro Cebu municipalities. This was reported to have increased local authorities' confidence and trust in the new IBF Warning System, which resulted in drafting the standard operating procedures on response

⁸⁵ Of the 39 respondents, 28 were completely confident and ten fairly confident that they would apply what they learned to their workplace. As reported in feedback forms distributed following the two Met Office trainings.

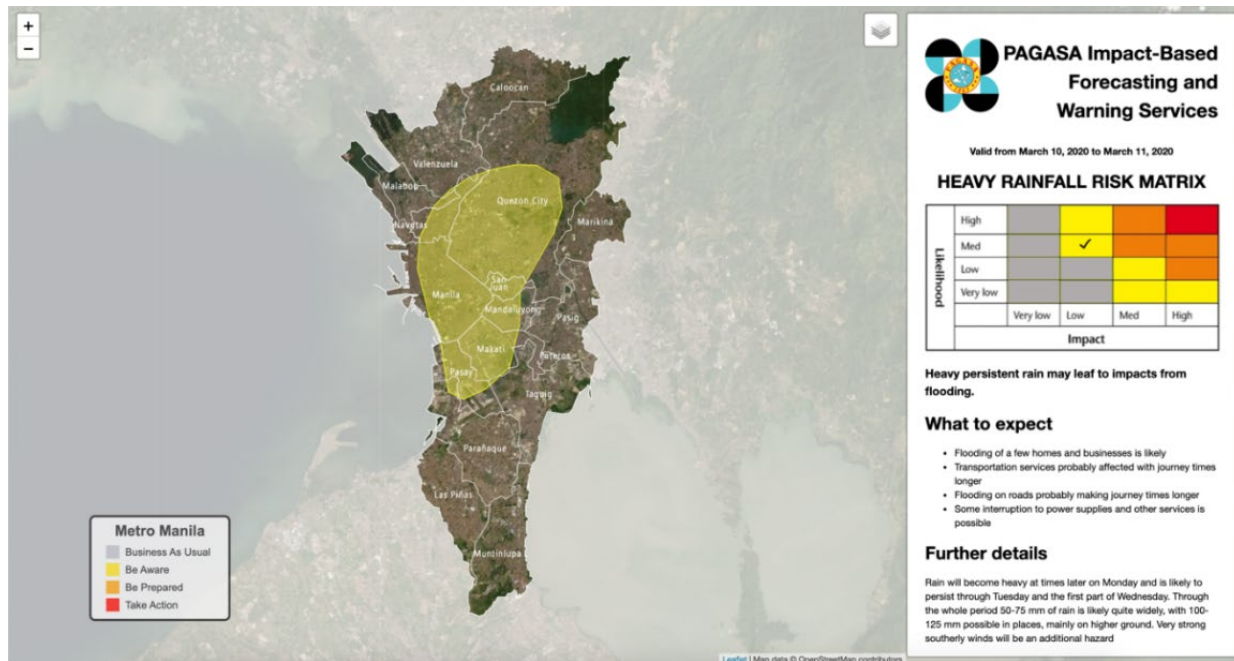
⁸⁶ DOST PAGASA and Met Office (2020) 'Philippines country report on Impact-Based Forecasting (IBF) status'.

⁸⁷ The portal will allow for map-based visualisation, utilising colour-coded warnings that can easily communicate likelihood and potential impact, updated every six hours.

protocols for Philippine local authorities and the improvement of the IBF Warning Issuance Template.

PAGASA has started developing and piloting a web-based visualisation platform, the Severe Wind Risk Map and Flood Hazard Map for Metro Manila, as an outcome of the training. The colour-coded map summarises information on hazard, exposure, and risk to weather events, and is a way to communicate weather warnings to the general public in an easily understandable way, as shown in Figure 5.

Figure 5: IBF visualisation tool being developed by PAGASA



Source: PAGASA progress report (March 2020)

Awarded in 2020, UCL’s Faculty of Experimental Psychology is currently carrying out additional work to translate research into behavioural change. The aim of the project is to improve communication and uptake of weather forecasts. Insights from this behavioural science component may be used to inform the work of WCSSP partners in the future.⁸⁸

Capacity building of UK researchers and institutions

Collaboration with partners in the region has improved the Met Office and UK university researchers’ capacities in tropical meteorology and model performance and observations. Weather events occurring in tropical regions affect global weather patterns and issues, including in the UK. Therefore, it is in the UK’s interest to develop capacity in this area. Learning generated from the collaboration can be applied to the UK context and the Met Office’s work.

Newton funding increased international profile especially of early career researchers. For researchers from UK institutions receiving grants as part of this collaboration, the collaboration offers the opportunity for on the ground experience, skill-building, and capacity improvement in technical areas.

⁸⁸ The Met Office, WCSSP Southeast Asia. Available at: <https://www.metoffice.gov.uk/research/approach/collaboration/newton/wcssp-southeast-asia>

Additional benefits

The WCSSP Southeast Asia partnership had increased the UK's presence in the region 'through science and technology diplomacy'. **The collaboration is strengthening the relationship between the Met Office and PAGASA.** Cooperation with the Met Office was more limited and smaller in size prior to the partnership. Partners in both the Philippines and the UK have increased their communication and exchange of observations, including meteorological data collected through satellites.

The collaboration has been continuing, albeit on a reduced scale, throughout COVID-19-related lockdowns, with online meetings, training (on probabilistic forecasting) and sharing of guidance materials and other documents taking place. **Both sides of the partnership expressed strong interest in continuing to collaborate in the future.** They were particularly interested in the opportunity to continue to apply and learn from UK expertise in IBF and other areas of work, such as flooding and river modelling, and small-scale tornadoes. Both partners plan to continue working on the Forecaster Handbook and the visualisation tool.

Respondents reported that the collaboration successfully positioned PAGASA and the Met Office for **an additional collaboration on multi-hazard impact-based early warning system forecasting**, supported through the GCRF programme, which was recently approved. It was reported that through the technical support and capacity building received through WCSSP, PAGASA were well-positioned to have their GCRF funding approved. As with WCSSP, this future initiative will involve government agencies and local stakeholders working in disaster risk management for wind, flood, storm surge and landslides, including the Office of Civil Defence, the Department of Interior and Local Government (DILG) and Local Government Units (LGUs) from four municipalities, among others.

WCSSP Southeast Asia also offers potential for regional capacity building and cross-country learning as a multi-country initiative. As highlighted below, there is potential to further expand on cross-country learning in the future.

Challenges in the collaboration

Many of the call challenges were related to different ways of working, funding years, and processes. It was highlighted that, in a large, multi-country, multi-year collaboration, adequate ability to plan ahead be valuable. However, the ability to make forward-looking plans was limited by the Philippine government's annual funding cycle.

There was some confusion on sustainability plans and the future of the collaboration. More could be done to set up exit or sustainability plans and confirm whether it will be possible to continue with more collaborations in the future.

4.3 Emerging signs of impact

Potential impact on poverty reduction and economic development

The WCSSP WP3 collaboration has strong potential to contribute to protecting people's lives and livelihoods in extreme weather occurrences. A shift to IBF will enable local government and disaster risk management agencies to act and respond appropriately to the threat posed by a climate hazard. This improved response can reduce loss of life, livelihoods, and property when extreme weather events occur.

However, there are challenges to the uptake and scaling up of new tools and methodologies at the national level. Meteorological information among all LGUs is highly complex and will require further engagement with PAGASA. Information will need to be translated to the relevant local language to ensure they can be understood in different parts of the country. There are also issues of connectivity that could limit engagement with remote rural areas.

Change in perception of the UK

The collaboration increased the familiarity of PAGASA and Met Office with each other's way of working. Among Philippine partners, it increased awareness of the UK's specialisation. The collaboration was viewed as positive and a best practice case, leading to further interest in working together. The UK side described PAGASA as a particularly committed partner. The project bridged the differences in context and the distance between the two countries, bringing the UK and the Philippines closer together in the field of tropical meteorology.

Signs of sustainability

Longer-term impacts

The project has been making efforts to engage with local authorities to bring about the desired change, with some successful examples of collaboration. However, the long-term results of the collaboration will mostly become apparent after the lifetime of the project. It remains to be seen whether LGUs more broadly will have the capacity and interest to take up the new technology and methods, particularly in light of the COVID-19 crisis and funding implications on scientific priorities.

Pre-conditions for sustainability

Additional funding is required to ensure continued collaboration and cooperation. Whilst there is strong interest in working together and bringing forward IBF development in the Philippines and across Southeast Asia, and PAGASA and Met Office are discussing further collaboration, they are uncertain on the partnership's exact nature going forward. It was suggested that there could be conversations around future access to Met Office's tools and applying these to areas outside of tropical typhoons. They noted this could be addressed in the final months of the collaboration.

Developing a sustainability and exit plan should be a priority. There is no evidence that such a plan exists. In fact, there were concerns on the Philippine side of the partnership of not having continued access to the methods, technology, and tools, which would mean reverting to the 'conventional' way of doing weather forecasting.

Complementarity and coordination

Catalytic effects

The PAGASA IBF working group is working closely with the Metro Manila Development Authority (MMDA) to establish and sustain partnerships with local stakeholders. In its work with local authorities, PAGASA presented the new forecasting approach as a way to improve the conventional forecasting system.

As of March 2020, "MMDA expressed its support in the implementation of IBF in Metro Manila. Further, to resolve certain issues and address the gaps and challenges, PAGASA IBF team was

invited to a meeting with the Metro Manila Disaster Risk Reduction and Management Council (MMDRMC) Technical Working Group.” According to the same report, IBF was seen as a priority agenda by the authorities. Despite their appreciation and support of the programme, government stakeholders did not yet confirm whether this would be taken past the Metro Manila pilot stage. The MMDRMC suggested setting up a body to pass a board resolution for implementation of IBF in Metro Manila, but there is no further information on whether this was approved, and it was suggested by respondents that there might be practical barriers to changing operations among local authorities, which would require further engagement, outreach, and training.

Leadership effects

There is no evidence that results from this collaboration have been taken up by others in the country or have led to policy changes. Piloting and discussion are underway, and there is some interest from the authorities. Whether this materialises and leads to policy change remains to be seen.

4.4 Conclusions

- **WCSSP Southeast Asia, including its WP3, is perceived across the board as a positive example of collaboration between the UK and the Philippines.** It was often identified as ‘best practice’ and as having high potential to lead to translation of science into societal benefits. Bridging UK expertise in IBF methods and Philippine (and other partner countries) contextual understanding, WCSSP has strengthened science collaborations and aligns closely with ODA and government priorities in the region.
- **WCSSP, while a regional partnership, was tailored to each country’s needs and preferences and was described as an equal partnership.** Partner countries had a say on the shape of the programme and how they will use UK expertise. The Philippines focussed on tropical cyclones. There is appetite for further capacity building in other areas, especially given the variety of extreme weather events in the country, which could be covered in future collaborations.
- **The collaboration has built capacity of individual forecasters and meteorologists.** PAGASA, the Philippine counterpart, has put in place mechanisms to share new knowledge and methods across the organisation, improving its institutional capacity to carry out IBF.
- **IBF techniques have a strong potential to improve the quality, relevance, and accuracy of weather forecasts.** If used appropriately by authorities responsible for disaster risk management, they have the potential to reduce loss of lives and livelihoods in the event of extreme weather. PAGASA has included outreach components in the intervention and has been piloting IBF techniques in two metropolitan areas. They are piloting a data visualisation tool and also engaging with local authorities to ensure their concerns and needs are understood and considered. Although the authorities have expressed an interest in these techniques, this has yet to result in concrete plans to take up the tool or scale-up the intervention. The project is ongoing, and this type of change will take time (and further engagement) to materialise.

Lessons learned and points to consider going forward

- **The collaboration has brought UK and Philippine partners together.** Given this is the first collaboration of its size and magnitude between the Met Office and PAGASA, there

were some initial challenges in differences in working style and coordination. There were bureaucratic challenges resulting from differences in budget cycles, which were difficult to mitigate. The strength of the scientific results and the positive nature of this partnership could help overcome these challenges and foster additional collaboration. Philippine partners may face fewer logistical challenges in collaborating with regional neighbours, in terms of the lesser time difference and more familiarity with each other's ways of working.

- **Sustainability and plans for the project going forward is a main challenge.** The results observed so far will require further funding and investment in relationship building and outreach, particularly if local authorities are to take up technical improvements and lead to on the ground change – a major ambition of the collaboration. It was suggested that sustainability and exit plans be drawn up and shared with all partners. Further thinking is required across all partners in terms of how technical improvements can be scaled-up and institutionalised within their organisations.
- **It is too early to say that uptake of new technology amongst the local governments will happen.** There could be some resistance in changing institutional practices and cultures. Individuals may prefer the status quo to investing in rolling out new methods – particularly in the context of limited resources and potentially changed priorities brought about by COVID-19.
- **COVID-19 has affected the delivery of trainings.** The partners have shown high commitment in continuing to work together through remote means, although some activities and trainings have had to be postponed. Further engagement with local authorities in particular should be carried out once the context allows for it, to ensure that attention on IBF is sustained.
- **The regional nature of this collaboration brings the potential for cross-country learning and lesson sharing.** However, more could be done in facilitating this and ensuring that countries with similar context and challenges learn from each other. Overall, the collaboration is largely seen as an opportunity to collaborate with the UK instead of with each other.

5 Project: Assessment of internal timing and sleep among Filipinos

Summary

Project title	Assessment of internal timing and sleep among Filipinos: validation of Philippine variants of the Munich Chronotype Questionnaire for evaluating the circadian rhythm
Call title	Researcher Links Travel Grant
Short description	The PhilSHIFT project aims to develop internal timing assessment methods for use among individual workers and corporate health providers, applying chronobiology measurement methods to the Philippines context.
Objective(s)	<p>Researcher Links Travel Grants aim to:</p> <ul style="list-style-type: none"> • offer opportunities for the mobility of early career researchers from the Philippines to the UK, and senior researchers from the UK to the Philippines, enabling them to forge relationships for future collaboration. • support capacity-building of early researchers, through bilateral workshops led by senior researchers which enable knowledge exchange and career development, as well as a broader appreciation of international opportunities. • support advancement in research areas that have a direct and long-term impact on the economic development and social welfare of the Philippines, or in areas with the potential to develop human capacity in-country. <p>For this specific project, the grant supported a 3-month visit of Assistant Professor at the University of the Philippines Manila to the University of Surrey’s Chronobiology Department.</p>
Pillar	People
Acton value (total budget allocated in country, in GBP)	<p>UK: £5,850</p> <p>PH: £2,000</p> <p>(Of which £1,585 unused)</p>

	DOST grant covers international travel costs, including one roundtrip in economy fare to and from the UK, visa fees, travel and insurance costs. Maximum budget: PhP 500,000 (approx. GBP 8,500)
Start / end date (Status: on-going or complete)	Completed: February 2019 – January 2020 (travel visit: July 1 2019 – September 30 2019)
DP UK and overseas	British Council – Department of Science and Technology (DOST PCHRD)
Award holders/ grantees	University of the Philippines Manila – Dr Gayline Manalang University of Surrey supervisor – Dr Malcolm von Schantz

Description of the project

Researcher Links Travel Grants are part of the wider Newton Fund Researcher Mobility programme, jointly run by British Council and UK National Academies. Specifically, this programme aims to “*stimulate initial links between UK senior mentors and junior researchers, supporting capacity building among early career researchers in the Philippines*”.⁸⁹

The idea for the collaboration emerged from Prof. Manalang’s PhD studies at the University of Munich. As part of the EU Clock programme, tools were developed to evaluate the body clock, focusing on its association with the sleep-wake cycle. During this work, the research group sought to apply a German questionnaire to the Filipino population and **set the stage for the exchange with Surrey**. The AH and her UK supervisor met during her stay in Germany in 2016 when they both took part in training in Sweden. Subsequently, Prof. Manalang and Prof. von Schantz responded to the Researcher Links Travel Grant call for proposals and were successful in their second attempt (2017/2018 round of funding).

The project is specifically to learn new tools and methods from the university’s Faculty of Chronobiology. In particular, she aimed to “*validate tools to evaluate internal timing, particularly the circadian rhythm, among Filipinos*”, applying existing tools to a previously under-explored field.

Prof. Manalang’s collaboration with the University of Surrey fits into her existing research as part of the PhilSHIFT Research Group, composed of staff from the University of the Philippines and the Ludwig Maximilians University Munich (LMU Munich).⁹⁰ This existing collaboration is studying the Filipino chronotype (biological clock) in the context of night shift work. The project has ambitions to apply research findings to workplace practices: “*PhilSHIFT hopes to work with*

⁸⁹ Researcher Links Travel Grant Application.

⁹⁰ Additional information available from PhilSHIFT. Available at: <http://philshift.upm.edu.ph/>

*industry towards strategies that promote health, productivity and sustainability of the local contact centre workforce”.*⁹¹

Pathway to impact

Figure 7 (Annex 4) shows how the project fits with the Theory of Change for Newton Fund People Pillar activities.

Activities: The collaboration consisted of a three-month exchange at the University of Surrey’s Faculty of Chronobiology (Sleep Research Centre), where Prof. Manalang received the supervision of Prof. Von Schantz.

Expected outputs: The collaboration will provide Prof. Manalang access to chronobiology tools and methods available at the University of Surrey’s chronobiology lab as well as specialists in the UK network of chronobiology specialists. It will enable her to attend international conferences.

Expected outcomes: Improved capacity of Prof. Manalang to conduct chronobiology-oriented research. Opportunities for further research collaboration between the University of Surrey and the University of the Philippines Manila identified.

Expected impact: Prof. Manalang’s research aims to create tools that can support public health instruments for the shift worker industry to improve employee health and wellbeing through improved understanding and measurement.

5.1 Emerging project results

Relevance of Newton Fund activities

Activity targeting and ODA relevance

This collaboration is relevant to Newton’s priorities in the Philippines. The Researcher Links Travel Grant initiative fits with priorities for the Newton Agham Programme, particularly Priority 4 on capacity building through PhD programmes and exchange.

While the research area is new, it is important to the already significant and still growing Business Process Outsourcing (BPO) in the Philippines. BPO is expected to provide two million direct and eight million indirect jobs by 2022. Attrition rates are high and health issues are increasingly cited among reasons for leaving a job. Besides high attrition, this sector is vulnerable as it is largely composed of young people and has inconsistent social protection available for the unemployed.⁹² The BPO industry is an employment source in the country and an alternative to emigration. Although this is an increasingly important source of employment, it also poses some health risks, which are under-researched in the Philippines.

The collaboration focussed health, safety, and wellbeing of BPO workers, a health area considered ‘niche’ in the Philippines. The research area is novel in the Philippine context and therefore building individual researchers’ capacity can help promote further uptake of this research area in the country. The uniqueness of the research proposal in the Philippine context attracted local partners’ interest and funding. Local funders confirmed the field’s novelty – Prof.

⁹¹ Department of Environmental and Occupational Health, Gayline F. Manalang Jr. Available at: <http://deoh.cph.upm.edu.ph/profile/gayline-f-manalang-jr>

⁹² Researcher Links Travel Grant Application.

Manalang is one of the few experts in the Philippines who focus on chronobiology and apply it to the Filipino context, with potential application to the BPO industry.

Additionality

While collaboration of this type could have happened in the absence of the programme, it would have been more challenging and time consuming. The Researcher Links programme offered an important funding source for junior academics, which is quite unusual in the international landscape. Funding for researchers in the Philippines is highly competitive, where being able to demonstrate a strong track record is essential. This means that, in the absence of the Newton Fund, it is the more established, experienced, and already connected researchers who can secure funding.

5.2 Effectiveness of Newton Fund activities

Capacity building for individuals

The collaboration with the University of Surrey resulted in improved capacities for the AH. Whilst at Surrey, Prof. Manalang built her experience and capacity in applying actimetry methods (that the Faculty of Chronobiology at Surrey specialises in) and had access to specialist devices to measure circadian rhythm.⁹³

The collaboration helped the AH establish contacts in the chronobiology field, particularly among UK networks, where she was not previously active. Prof. Manalang has continued to be in touch experts she met at Surrey, including through remote calls and conferences during lockdown. Her personal relationships with experts in the field have allowed her to keep up to date with conversations and developments happening in Europe and bridge the communications with researchers in the Philippines. This aligns well with her personal and professional goals.

Capacity building for institutions

The University of the Philippines Manila has taken up the idea of having a ‘Science of Sleep’ department, but chronobiology remains a relatively niche field of study. Prof. Manalang was able to borrow some equipment from the University of Surrey and apply it to her work at the university in Manila. This specialised equipment to measure the circadian rhythm is unavailable in the Philippines, so others at the institution have also had the opportunity to trial it and build their experience.

Capacity building for UK researchers and institutions

As a People Pillar intervention, the travel grant focused on building the capacity of Philippine AH through exposure to specific methodologies and research instruments in the UK. It was also ‘enriching’ to researchers from the University of Surrey who were exposed to a different topic of research and the context of BPO work in the Philippines. UK counterparts were not previously that aware of this area of work. The interaction with Prof. Manalang’s expertise in the field benefited the UK research base and contributed to the internationalisation of the UK institution.

⁹³ Actigraphy is a non-invasive method of monitoring human rest/activity cycles.

New international partnerships

While both AHs hoped the collaboration would lead to further work together, there has not been suitable funding opportunities to extend partnerships. Like many PhD scholarships and exchanges, it was hoped that this would be an *entry point* for further research partnerships.

The Philippine researcher was able to further advance her research and international collaborations. The collaboration offered Prof. Manalang an opportunity to complete and build upon her research in Germany. Her supervisor at the Ludwig Maximilians University Munich (LMU Munich) regarded her work with Surrey positively. The exchange with the University of Surrey is consistent with her pre-existing ideas for further research and research-industry collaborations and this helped her make more progress on her work.

Because of what she learned in Surrey, Prof. Manalang was able to take up a previous proposal to undertake a survey on shift workers in the Philippines. Together with her German partners, Prof. Manalang identified two potential companies, BPO company and an energy and manufacturing firm, willing to take part. The research already received ethical approval but has been put on hold due to COVID-19 and lockdown provisions.

Challenges in the collaboration

The collaboration faced some logistical challenges, which limited the AH's ability to maximise the opportunity. Issues in obtaining a UK visa led to a six-week delay in Prof. Manalang's arrival at Surrey. This delay then affected her ability to get a Schengen visa in time to take part in a conference in France (outside of the Researcher Links collaboration). It was a lost opportunity for networking with other European experts.

A slightly longer collaboration with a follow-up visit could have improved sustainability prospects and facilitated continued dialogue, follow-up, and application for more funds. Additionally, another potential improvement would be to include funding to facilitate the purchase of equipment on the partner country to continue applying the skills learned in the UK once back in-country.

5.3 Emerging signs of impact

Potential impact on poverty reduction and economic development

Prof. Manalang's research has ambitions for practical applications to the Filipino workforce. Where findings apply to the BPO industry, they could potentially improve the health and wellbeing of night-shift workers. At the moment, there are plans to put research findings and methods into practice through applied research in two industries in the Philippines. It remains to be seen whether if there is interest and capacity to take this work forward in the future.

Change in perceptions of the UK

The collaboration has increased the AHs' awareness of chronobiology-related research, methods, and tools in use in the UK. This has also increased her awareness of the UK's expertise in this area, introduced her to the UK community of practice, and raised the UK's profile in her own research interests.

Signs of sustainability

Signs of sustainability are unclear since this is a short-term project. The project had initial ambitions to lead to further work, but this has not materialised to date. There is limited appetite for this field of work in the AH's home institution, which may impact the sustainability of the collaboration and prospects for continuing work.

Nonetheless, the AHs are continuing to collaborate and communicate informally, and Prof. Manalang continues to communicate with contacts she made in the UK chronobiology community of practice. This has the potential to lead to further collaboration in the future.

Complementarity and coordination

There is no evidence of either leadership or catalytic effects at this stage, but there may be more evidence of tangible change once industry-level studies are carried out.

5.4 Conclusions

- **The collaboration has helped the AH increase her capacity in specific chronobiology techniques**, an area of specialisation of UK partner university. Being able to spend time in person in the UK supported the AH to access UK networks in the field of chronobiology.
- **Association with the Newton Agham Programme and British Council raised the AH's profile and increased internationalisation.** However, there are challenges in pursuing the work in her home institution as the field is not seen as a high priority and there is no strong community of practice in the Philippines.
- **Having access to the tools and methods used at Surrey helped the AH continue existing collaborations**, applying new knowledge gained and making plans to apply theoretical knowledge to research on the ground (through applications in two industries in the Philippines). The plans are on hold due to the COVID-19 pandemic.
- **Further work of AH with the University of Surrey has yet to materialise.** The networks established and capacity built do not seem to have been sufficient, for now, to lead to new collaboration opportunities with the UK or facilitate institutional change. The issue might lie with alignment with institutional priorities and other health areas of focus, particularly in the light of COVID-19. Something to also keep in mind is that the initiative is relatively recent and, as such, further benefits on the AH's career trajectory may yet materialise.

Lessons learned and points to consider going forward

- **The Researcher Links programme is a valuable initiative to increase internationalisation and promote research linkages**, particularly for those researchers who are less established and at earlier points of their career. Taking part in a collaboration of this type is seen across the board as facilitating future research partnerships.
- **While establishing links is important, it is not sufficient to ensure that researchers can continue to collaborate.** Funding availability, support from home faculties, and perceived relevance of the research areas are key to ensure the sustainability of this type of collaboration.

- **Logistical challenges related to obtaining a UK visa posed a challenge to the collaboration.** It ultimately limited the benefits obtained by the AH because of the impact on other activities. There would have been the potential for the in-country team to further support this challenge, but it was not escalated to them, which suggests that there could be further coordination and escalation of issues between the British Council and the Newton Agham Team in the UK Embassy.
- **Creating an alumni network, with frequent exchanges between cohorts, could help manage expectations, facilitate logistics, and foster community of practice.** It could also further raise the Researcher Links brand's profile. Tapping into an existing alumni network could be particularly valuable for early career researchers who may not have studied abroad previously, and who could benefit the most from this type of programme.

6 Project: Developing Rice Resources for Resilience to Climate Change & Mitigation of Carbon Emissions

Summary

Project title	Developing Rice Resources for Resilience to Climate Change and Mitigation of Carbon Emissions
Call title	UK-China-Philippines-Thailand-Vietnam Call for Collaborative Research Proposals in Rice Research'
Short description	<p>The project will identify process routes that add value in biofuel and bioenergy applications for rice straw and increase the digestibility of rice straw. It will contribute to reducing the damaging effects of biomass burning and potentially increase the income of rice farmers, reduce the costs of animal feed and displace the use of fossil resources for fuel and energy generation.</p> <p>The project's secondary emphasis is the development of rice varieties with greater resilience to temperature stress resulting from climate change. The project has partners from the UK, the Philippines and Vietnam.</p>
Objective(s)	<p>The project aims to improve rice straw quality for use as animal feed, biofuel production and bioenergy generation.</p> <p>The project aims to generate research and identify technologies that can reduce carbon emissions from biomass burning of excess rice straw. To do so, it aims to improve the quality of rice straw for use as animal feed and biomass and to develop rice variety with greater environmental resilience, especially to temperature stress and weather changes.</p> <p>The collaboration seeks to improve the quality of rice produced in the Philippines and Vietnam through genomics-based breeding methods, so that</p>

	it can be diverted from burning and instead used to produce sustainable biofuels and animal feed.
Pillar	Research
Acton value (total budget allocated in country, in GBP)	UK: £787,882.00 Philippines: £110,415.63 Vietnam: £120,000 Total: £1,018,297
Start/end date (Status: on-going or complete)	Completed: June 2016 – September 2019 (with collaboration with PhilRice ending early, in 2018).
DP UK and overseas	UK Biotechnology and Biological Sciences Research Council (BBSRC), Philippines Department of Agriculture – Philippine Rice Research Institute (PhilRice), Vietnam Ministry of Science and Technology.
Award holders/ grantees	PhilRice, University of York, Philippine Carabao Centre and Vietnam Field Crops Research Institute.

Description of the project

This project is part of the 'UK-China-Philippines-Thailand-Vietnam Call for Collaborative Research Proposals in Rice Research' call. The BBSRC supports collaborations between the five countries focusing on the sustainable production of rice crops within this call. It also considers disease resistance, nutritional quality, waste reduction and combatting climate change impacts. The Mid-Term Thematic Study Report for the Philippines (2018) previously included the Rice Resources for Resilience collaboration.⁹⁴ This section focuses on the results since the mid-term evaluation (MTE).

Pathway to impact

Figure 8 (Annex 4) shows how the collaboration in this project aligns with the theory of change for Newton Fund Research Pillar activities. The project is also relevant to the Translation pillar due to its emphasis on improving agricultural practices through research to encourage new uses and processes for rice straw.

Activities: The project consists of a joint research programme between the University of York, PhilRice and the Vietnam Field Crops Research Institute. Research teams from the three

⁹⁴ Coffey (2018) Thematic Impact Study Report – The Philippines. Report for the Newton Fund Evaluation. Available at: <https://www.newton-gcrf.org/resources/>

countries worked collaboratively to develop methods to improve straw quality in rice through crop breeding.⁹⁵ One PhilRice team member travelled to the UK, strengthening relations with the University of York, receiving training and briefing on research methods and tools relevant to the project, and increasing their international profile.

Expected outputs: The research group aimed to investigate the association between various characteristics of rice collected in the Philippines and Vietnam to identify rice varieties that could be used more sustainably.⁹⁶

Expected outcomes: The project aimed to reduce the burning of rice straw, transforming it from a waste product into a valuable resource that can be used in livestock production and fuel security. The project aimed to make farmers and other stakeholders aware of the potential benefits of using rice straw as animal feed or biofuel generation to improve their income, support local livelihoods and improve air quality. In the Philippines, the collaboration focused on rice straw's animal feed potential.

Expected impact: The project aims to improve health and incomes for farmers, lower the cost and improve the quality of animal feed, mitigate the effects of climate change, improve air quality, and reduce the use of fossil fuels for energy generation.

6.1 Emerging project results

Relevance of Newton Fund activities

Activity targeting and ODA relevance

This action aligns with Research Priority 3 of the Newton Agham Programme in the Philippines. It focusses on energy, water and food. It also feeds into Newton priorities on environment and climate variability and change.

The project seeks to make rice production more environmentally friendly, and reduce its harmful consequences on health, the environment and farmers' incomes. Therefore, the problem this collaboration seeks to address is at the intersection of climate change and agriculture. Rice is vulnerable to, and at the same time a contributor to greenhouse gas emissions. As a crop, rice is sensitive to temperature, with yields expected to fall as global temperatures rise. The disposal of rice straw and husks, a by-product of the rice production process, causes air pollution, which then leads to respiratory diseases. It also leads to decreased crop yields because of the toxic effects from burning.

Targeting of Philippine priorities

The project's focus on fostering economic growth and supporting social development through increased food security aligns with the Philippine government's priorities. The project aims to develop and distribute agricultural technologies to facilitate and incentivise farmers to switch to less environmentally harmful behaviours, while also supporting their own economic wellbeing. The project has a strong focus on tackling environmental issues and

⁹⁵ The UK team applied genomic approaches to identify the genetic basis of natural variation in straw digestibility, lignocellulose composition and silica content found in rice collected in the Philippines and Vietnam.

⁹⁶ Scientifically, the research aimed to identify associations of digestibility, composition and silica content in rice collected in the Philippines and Vietnam. The analysis aimed to identify molecular markers to use as proxies for improved straw quality; and for identifying rice varieties with low silica content and highly digestible straw.

supporting and improving farmers' livelihoods and on enterprise generation.⁹⁷ Burning rice straw releases air pollutants and decreases soil nutrients.⁹⁸ Despite being illegal, the practice is still common amongst farmers because it is cheaper and less time-consuming for farmers.

Agricultural R&D is a focus area of the Philippines' socio-economic development plans. The PDP 2017-22 outlines strategies to facilitate farmers' access to technology through increased investments in R&D for the agricultural sector.⁹⁹ Most relevant to the Rice Resilience project, one of these R&D priority areas is 'development of climate and disaster responsive technologies and innovations'.¹⁰⁰

Origins and quality of the collaboration

The collaboration brings together plant scientists and geneticists in the UK and rice breeders from Vietnam and the Philippines. The University of York and Vietnam counterparts had collaborated since 2010 on developing approaches to rice straw biorefining and the Vietnam rice diversity panel for Genome-Wide Association Studies (GWAS) (2018 Tetra Tech MTE case study on the Philippines). The Philippines joined this collaboration in 2015 when PhilRice was introduced to future partners in Bangkok.¹⁰¹ The Philippines' addition brought the potential for cross-country learning, as Philippine and Vietnamese rice varieties are different along with several characteristics of interest to this research.

The project complements research activities in the different countries. The research collaboration built on a previous research on environmental resilience this research, expanding it for straw characteristics, including digestibility, silica content, and composition.¹⁰² In Vietnam, the research was also designed to include testing on drought tolerance.

Additionality

Respondents deem that this collaboration could not have happened without the Newton Agham Programme. For the Philippine partners, the project linked PhilRice and the Philippine Carabao Centre (PCC) with the UK for the first time, bringing access to UK networks and expertise. Respondents were not aware of other avenues for collaboration with the UK outside of the Newton Agham Programme.

The partnership with UK and Vietnamese partners provided added value to PhilRice's work. It introduced methods previously unfamiliar with in the form of GWAS. For the PCC, the research could not have happened without the improved rice varieties that PhilRice provided, which were developed by applying learning from the Philippines, Vietnam, and the UK. For the Philippine partners, the research expanded their scope of work through new methods, tools,

⁹⁷ Rice Research Initiative Case for Support.

⁹⁸ Pollutants such as carbon dioxide, nitrogen oxide, carbon monoxide and sulphur dioxide, and soil nutrients like nitrogen, phosphorus, potassium, and sulphur content.

⁹⁹ PDP page 94

¹⁰⁰ PDP page 102

¹⁰¹ Coffey (2018) Thematic Impact Study Report – The Philippines. Report for the Newton Fund Evaluation.

¹⁰² Mainly to identify Quantitative trait locus in these traits. QTL analysis is a statistical method that links two types of information—phenotypic data (trait measurements) and genotypic data (usually molecular markers)—in an attempt to explain the genetic basis of variation in complex traits (Falconer & Mackay, 1996; Kearsey, 1998; Lynch & Walsh, 1998). QTL analysis allows researchers in fields as diverse as agriculture, evolution, and medicine to link certain complex phenotypes to specific regions of chromosomes. The goal of this process is to identify the action, interaction, number, and precise location of these regions. For further information, available at:

<https://www.nature.com/scitable/topicpage/quantitative-trait-locus-qtl-analysis-53904/>

and areas of investigation and access to laboratory facilities that are not available in the Philippines.

6.2 Effectiveness of Newton Fund activities

Research collaborations on topics relevant to economic development and poverty reduction

The collaboration's design included a two-part approach: 1) improvement of the raw material quality of the rice straw through genetic mapping; and 2) development and demonstration of the potential benefits of these applications to promote behavioural change among farmers and other stakeholders. The research aimed to identify rice varieties with higher digestibility and lower silica, and trial them as animal feed and biofuel production. This was to be achieved through complementary work packages (WPs), outlined in Box 1 below.

Box 1: Planned activities by work package

WP1 Growth of diversity panels (in partner countries)

Rice straw was produced in replicated field plots over two growth seasons and assessed for digestibility, composition and fermentability. In addition, the Vietnam diversity panel was grown to allow for identification of QTL for drought resistance. Straw grown in 3 different climatic zones was harvested and sent to York for digestion and compositional analysis, and for fermentation trials at IFR Norwich.

WP2 High Throughput Rice Straw Analysis (in the UK)

The University of York carried out digestibility tests of the key chemical components of biomass. This expanded understanding of the factors that impact digestibility, identify markers for breeding, and in the long-term, identify genes controlling biomass properties.

WP3 Refining QTL and identifying causative polymorphisms (in the UK)

Most of the analytical work on QTL analysis was carried out in the UK, with inputs by, and training of, visiting researchers.

WP4 Exploiting existing trait diversity

This component of the research collaboration sought to include demonstration to appropriate stakeholders: rice farmers in Vietnam and the Philippines. Demonstration activities aimed to show how alternative uses of straw can improve farmer income and the local environment, in both i) animal feed and ii) biorefining. However, due to limited funding, not all planned demonstration activities were carried out. To evaluate animal feed characteristics, in vitro digestibility trials were conducted at the PCC laboratory to evaluate the fermentable components of the different varieties of rice straw.

WP5 Dissemination activities

Outcomes were to be disseminated through government agricultural agencies' newsletters and web media, such as Department of Agriculture regional field offices and LGUs. It was expected that findings would be disseminated to farmers through agricultural extension workers. Dissemination activities have not been carried out in the Philippines to date.

Vietnam and the Philippines have existing capacity in straw research, but UK expertise brought molecular and genetic understanding of the subject to the table. The UK has world-leading knowledge and analytical expertise in generating value from a specific type of biomass (such as lignocellulosic biomass).

Overall, the research collaboration made good progress in carrying out genetic mapping and improving understanding of rice varieties along the desired traits. Less progress was made in trialling the varieties and carrying out behavioural change activities, as explained in the sections below. Research participants from the Philippines benefited from access to research equipment unavailable in the Philippines and training on research methods. **They reported that their international profile had improved due to this collaboration.**

The research resulted in a new diversity panel of rice varieties from the Philippines suitable for genome-wide association studies.¹⁰³ Straw sequencing from diversity panels sent by the partners was used to refine QTLs from earlier University of York studies. In addition, visiting researchers from the Philippines in York and Vietnam took part in research placements of six months each at York in 2017 and 2018. During the placements, junior staff members took part in the processing and genetic mapping of harvested rice straw for silicone content.

The UK partners produced eight publications on the digestibility in rice straw from the project.¹⁰⁴ PhilRice is also producing a joint publication with the University of York. PCC needs to undertake further trials of the rice feed with live animals, which was paused due to the inadequate rice straw for feeding trials.

The collaboration built the capacity of the PhilRice team in genetic mapping. This was achieved because the partnership made some important equipment available to Philippine researchers and through the introduction of new methods.

Translation of research into collaborative solutions to address development challenges

The research collaboration had a strong ambition to lead to practical changes through improved farming practices. These practices could improve incomes for farmers and reduce environmental damage. As stated by one research respondent: *“technology should not be left in*

¹⁰³ According to the data collected by UK Research and Innovation (UKRI) on research outputs from this collaboration

¹⁰⁴ i) McQueen-Mason, S. J., Gomez, L. (2018) 'Bringing down the wall one brick at a time', *New Phytologist*, 218(1), pp.5-7 ii) Whitehead, C., Ostos Garrido, F. J., Reymond, M., Simister, R., Distelfield, A., Atienza, S. G., Piston, F., Gomez, L. D., McQueen-Mason, S. J. (2018) 'A glycosyl transferase family 43 protein involved in xylan biosynthesis is associated with straw digestibility in *Brachypodium distachyon*', *New Phytologist*, 218(3), pp.974-985. iii) Hyde, L. S., Pellny, T. K., Freeman, J., Michaelson, L. V., Simister, R., McQueen-Mason, S. J., Michael, R. A. C. (2018) 'Response of cell-wall composition and RNA-seq transcriptome to methyl-jasmonate in *Brachypodium distachyon* callus', *Planta*, 248, pp.1213-1229. iv) Gomez, L. D., Amalfitano, C., Andolfi, A., Simister, R., Somma, S., Ercolano, M. R., Borrelli, C., McQueen-Mason, S. J., Frusciante, L., Cuciniello, A., Caruso, G. (2017) 'Valorising fava bean residual biomass: Effect of farming system and planting time on the potential for biofuel production', *Biomass and Bioenergy*, 107, pp.227-232. v) Ostos Garrido, F. J., Piston, F., Gomez, L. D., McQueen-Mason, S. J. (2018) 'Biomass recalcitrance in barley, wheat and triticale straw: Correlation of biomass quality with classic agronomical traits', *Plos one*, 13(11). vi) Amalfitano, C., Gomez, L. D., Frendo, P., De Pascale, S., Pepe, O., Simister, R., Ventorino, V., Agrelli, D., Borrelli, C., McQueen-Mason, S. J., Caruso, G. (2018) 'Plant-Rhizobium symbiosis, seed nutraceuticals, and waste quality for energy production of *Vicia faba* L. as affected by crop management', *Chemical and Biological Technologies in Agriculture*, 5(15). vii) Van der Weijde, T., Kamei, C. L. A., Severing, E. I., Torres, A. F., Gomez, L. D., Dolstra, O., Maliepaard, C. A., McQueen-Mason, S. J., Visser, R. G. F., Trindade, L. M. (2017) 'Genetic complexity of miscanthus cell wall composition and biomass quality for biofuels', *BMC Genomics*, 18(1), p.406. viii) McQueen-Mason, S. J., McLarnon, E., Lenk, I., Hartley, S. E. (2017) 'Evidence for Active Uptake and Deposition of Si-based Defences in Tall Fescue', *Frontiers in Plant Science*, 8(1199).

the laboratory or in the library.” The most important potential users of these improvements are farmers. However, additional trials would be necessary to assess whether the rice straw developed is suitable for animal feed and whether this could be of interest to farmers.

Further evidence is needed to disseminate new technologies to farmers and lead to a change in farming practices. However, dissemination work in the Philippines has largely not taken place. In fact, largely due to the funding challenges outlined below, plans for a live feeding trial and dissemination through extension workers (scheduled for the last quarter of 2019) had to be stopped. Additionally, private sector interest in using rice straw for biofuel production has been low in the Philippines, where rice husk is typically used and allows for greater economies of scale.

Capacity building of UK researchers and institutions

According to some respondents, the collaboration introduced genetic analysis of rice to UK researchers. Rice is considered a ‘model cereal’, and scientific findings related to rice can be applied to cereals more commonly produced in the UK such as barley and wheat. Knowledge generated from this research should be easily transferrable to other fields that the University of York and its UK partners are carrying out on UK-grown cereals.

The collaboration resulted in several scientific papers published by UK partners demonstrating increasing scientific expertise in this area. UK partners improved their scientific knowledge in plant cell wall biochemistry and identifying QTL for drought resistance.

The research partnership led to further collaboration between the UK and Vietnam on rice research. UK and Vietnamese partners were able to successfully apply for GCRF funding, with one new research collaboration on improving rice for animal feed applications, and one Royal Society collaboration on shortening life cycles in rice cultivation to improve productivity in the face of increasing extreme weather in Vietnam.¹⁰⁵

Additional or unexpected benefits

The UK’s collaboration with Vietnam on this project went beyond what was initially anticipated. In 2017, the UK partners established collaborations with a biotechnical company research institution with intensive rice-growing areas in Saigon and Kantou.

There is currently no continuing collaboration between the UK and the Philippines on this topic, or uptake of commercial ventures in the Philippines. However, the capacities gained in GWAS methodologies have been useful in fostering further research at PhilRice on other genomic traits, which are seen as more ‘eye-catching’ and likely to receive funding, for example, to improve yield or improve pest resistance.

The collaboration strengthened the partnership between the PCC and PhilRice. The two continue to exchange ideas about how to combine products for commercial services. For example, discussions on the potential for PhilRice to produce rice that PCC can use for animal feeding purposes, and how PCC can produce organic fertiliser to be used by PhilRice in production are underway. Collaborations of this type were ultimately seen as useful to improve outcomes for the end users, the small-scale farmers.

¹⁰⁵ As reported in UKRI Research Fish database (2020).

Challenges in the collaboration

A change in leadership at PhilRice resulted in a misunderstanding of the match funding requirements within the organisation. It was understood that the UK would provide the entirety of the funding. Issues in securing the level of match funding originally anticipated from the Department of Agriculture meant that PhilRice was required to secure the resources from its own institutional funding. PhilRice managed to shift some funding from other activities towards this collaboration.

The research demonstrated high levels of interest and commitment in working together with national and international partners. This is despite the project ending sooner than planned (2018) due to issues with the match funding that led to a lower than anticipated Philippine-funded amount.

6.3 Emerging signs of impact

The research topic has high potential to address environmental and socio-economic challenges in the Philippines and across the Southeast Asia region. The longer-term changes, however, will likely occur with a long time lag and through additional investment.

The research collaboration generated some promising findings in terms of the digestibility of the improved rice straw. However, further research and dissemination activities would be needed to lead to practical changes. For example, it is not known if the scientific findings from this project were to be taken up by other collaborations and further expanded to lead to behavioural change and improved practices.

Philippine partners were positive about the collaboration with UK partners. The project was PhilRice's first partnership with the UK. Although there were no immediate plans to continue applying for more joint funding, respondents highlighted that working with the UK increased their awareness of different ways of working and their knowledge of the UK. Philippine partners expressed interest in further collaboration opportunities. Respondents were impressed by the quality of the facilities available in the UK.

The collaboration was moved forward despite the challenges in obtaining match funding at PhilRice. This was due both to redistribution of funds within PhilRice and financial support provided by UK partners, which partly financed the UK's trips. This shows a strong commitment to working together despite practical challenges.

Collaboration continued through informal means even after the end of the project. Philippine counterparts appreciated being able to access results from laboratory testing carried out in Germany through the support of UK partners. This access would not have been possible in the absence of this collaboration.

Signs of sustainability

There is no evidence that a sustainability framework or exit plan is in place, and the next phases of the project (if any) have not been communicated across all partners. The testing and dissemination components were reduced due to funding challenges. Partners appear to be unclear about the next steps, particularly how to ensure that laboratory findings and scientific improvements can be expanded upon, tested and scaled-up. Without additional efforts, the results are likely to remain confined to the scientific community.

There is interest in continuing this research to better understand the technology, its potential impacts for farmers, and necessary conditions for behavioural change. No concrete plans exist as yet in the Philippines to continue the research. The knowledge generated has the potential to feed into future research which can ultimately benefit end-users by improving their socio-economic conditions. Further, the relationships created and strengthened through this partnership have the potential to continue, whether informally through knowledge exchange (as it continues to happen) or formally through additional funding, if available.

Complementarity and coordination

There are reports of increased interest in the integration between rice production and livestock farming in the Philippines. However, it is unclear what this project's contribution has been in influencing this, given the limited dissemination and communication activities carried out.

It remains to be seen whether this project's evidence can lead to behavioural change and offer practical alternatives to farmers. Importantly, despite interest in this policy field, respondents highlighted that the authorities tend to focus on – and provide more funding for – applied research rather than fundamental science collaborations of this type.

6.4 Conclusions

- **Despite facing practical challenges around match funding, the Rice Resources collaboration continued and generated scientific knowledge.** The collaboration was seen as fruitful, despite some confusion at the beginning around match funding. The ability to carry out most of the collaboration despite these challenges demonstrates a high degree of commitment from all partners and the high relevance of this research for all partners' priority areas. The collaboration has generated important lessons, linkages and data that partners hope to continue applying in the future.
- **Two important components were reduced due to funding challenges: i) live testing of the rice straw's digestibility through animal feeding trials led by the PCC and ii) dissemination of findings among government stakeholders and the farming community.** The PCC was able to carry out some laboratory testing. However, further research and live trials are required to move the technology forward.
- **Partners continue to collaborate on an informal basis – both internationally and locally.** There is interest from Philippine partners to continue working with UK partners. However, funding appears to be a challenge, with local funding partners prioritising applied research instead of scientific collaborations.

Lessons learned and points to consider going forward

- **Clear and comprehensive communication of the match funding arrangements' mechanics allow partners to plan better.** A signed MoU or MoA when the call was launched might have helped alleviate the funding problems and confusion which were observed later.
- **Identifying the partners that have the capacity and interest to take part in a match funding arrangement is needed for it to work.** Some institutions may be a better match for a grant-based programme or for match effort arrangements.

- **Dissemination of findings bridges the gap between scientific findings and the desired practical change.** Communication of findings in a way that is easy to understand and applicable to agricultural producers' contexts is critical to uptake of new technologies. Further research is necessary to better understand the barriers that farmers face to more sustainable rice production, and the economic incentives necessary to encourage improved farming practices.

Annex 1 – Methodology

Research methods and data collection approach

The thematic impact studies are central to our Final Evaluation approach and involved an intensive period of remote research by the evaluation team members.

Preparation for the research included a document review of country-specific documents on the Philippines' research and development context. Documents reviewed include the evaluations Philippines Baseline and End line Reports, Mid-Term Thematic Impact Report, and the updated Country Situation Note. We also conducted a literature review of additional documentation on the Philippines' science and innovation landscape, and existing UK-Philippines collaboration activities. Project-specific documentation, such as application forms, progress, 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 **remote research with respondents in the Philippines and the UK** in July and August 2020. Three main categories of stakeholders were interviewed: i) in-country UK representatives and Newton Fund in-country team; ii) UK and local funders; and iii) participating researchers. In some cases, additional university staff, such as university leadership or other research teams, were also interviewed.

Our data collection was complemented by an analysis of the pathway to impact for each action, which can be found in Annex 4. 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

Case studies were limited to three projects per case study, which were conducted remotely owing to the Covid pandemic. In some projects, the added logistical challenge of remote research limited the number and range of stakeholders consulted. The volume of documentation provided varied by project, thus limiting the possibility of triangulating findings. The case study findings reflect the data provided by each project and what is available online. The case study is not representative of all Newton Fund activities. Whereas it provides valuable depth and illustration of Newton Fund activities, the case study alone does not provide generalisable evidence.

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

Specifically, to the Philippines case study for the BBSRC-Phil Rice collaboration, it was unfortunately not possible to interview the UK and Vietnamese PIs, which has limited our ability to discuss results for the other two counterparts of the research partnership.

Additionally, the COVID-19 pandemic resulted in the need to revisit our data collection approach, particularly in terms of our 11 country case studies. The case study research was originally scheduled to take place in three waves of partner country visits between March and August 2020. The inability to travel internationally and the closure of offices, embassies, universities, and research centres required switching to a **remote-based approach**, as agreed with BEIS in March 2020.

In revising our case study approach, we recognised that switching to a remote-based approach would have likely implications on the quality of data collected, as outlined in our April 2020 Concept Note. The quality of interviews could have been affected for several reasons, including:

- problems with connectivity, technical issues and limited telephone or internet coverage, which posed the risk of lowering the quality of calls and cause loss of rapport, creating abrupt feelings in interviews, and affecting the depth and quality of our findings.
- the absence of visual or nonverbal cues, inability to observe behaviour and body language, with the risk of telephone interviews becoming mechanical and cold.
- having little opportunity to establish rapport with respondents and having potentially shorter times for interviews as respondents may more easily become fatigued by telephone compared to face-to-face interaction.
- limited engagement, low response rates and little interest in participating in our research, which might limit the breadth and depth of our findings.
- the inability to visit laboratories or facilities, and limited scope for unplanned interviews with additional staff members, researchers, or others in the same institution.
- fewer opportunities for check-ins and informal conversations with in-country teams, who are a rich source of data.

We mitigated these issues in several ways, where:

- we included additional time for document review prior to interviews so that conversations moved on to speaking about results, emerging impact, and challenges (to consider for shorter interview times and potentially lower quality interviews). However, it is important to consider that availability and quality of project data and information varied considerably across sampled interventions.
- we favoured video interviews wherever possible to limit the lack of nonverbal cues and to help establish rapport with respondents.
- we had several email exchanges prior to interviews to create an initial connection and rapport with participants, and to set out the objectives and areas covered in the interviews by sharing topic guides prior to our calls.
- we organised follow-up interviews wherever possible to fill any remaining information gaps brought about by having shorter interview times. We also gathered interviewee insights on additional respondents and carried out additional interviews which emerged from email exchanges and interviews.
- we organised regular check-ins with in-country team via email or telephone and delivered online presentations and validation sessions with each in-country team to share emerging

findings after having carried out all interviews. This allowed us to ensure we had accurately reflected the Newton Fund's experience in each country.

Annex 2 – Case Studies Sampling Overview

This Annex summarises the sampling approach used for the country case studies which inform the Final Evaluation of the Newton Fund. Detail on the approach and criteria used to develop the sample for the case studies is annexed to Tetra Tech’s Newton Fund Final Evaluation Report.

Final evaluation country sample

A total sample of 11 countries with three calls per country (totalling 33 calls) was agreed with the Department of Business, Energy, Innovation and Science (BEIS).

The countries selected for the country sample were China, Malaysia, Chile, Turkey, South Africa, Brazil, India, Philippines, Jordan, Peru, and Kenya. The sample includes three additional countries (Jordan, Kenya, and Peru)¹⁰⁶ due to the Newton Fund’s expanded scope. Six of these countries were included in the Mid-Term Evaluation (MTE)¹⁰⁷ of the Newton Fund case study research.¹⁰⁸

The criteria used for the country selection were:

- coverage of all regions covered by the Newton Fund.
- coverage of different levels of existing innovation and capacity of partner countries (as defined by the 2015 Global Innovation Index rankings and BEIS’ initial assessment of capacity).
- learning opportunities from new ways of working regionally in countries that either graduated from the DAC list or have ODA sensitivities; or operating in/ recovering from crises.
- the inclusion of Peru, Jordan, Kenya (countries that have not been explicitly included in the evaluation scope until now).

Non-selection of countries (or calls) does not reflect significance, quality, or importance.

¹⁰⁶Jordan, Kenya, and Peru were not included in the MTE data collection, as they had just joined the Newton Fund. BEIS agreed to carry out in-depth case studies in the three new countries to ensure coverage of activities there.

¹⁰⁷ Mid-Term Evaluation of Newton Fund (December 2018). Available at: <https://www.newton-gcrf.org/resources/>

¹⁰⁸ These were: China, Malaysia, South Africa, Brazil, India, and the Philippines. Mexico and Egypt, which were part of our MTE sample, have been replaced with Turkey and Chile respectively to increase opportunity for learning.

Proposed sample of calls and projects

Data from BEIS' Newton Fund Activity Tracker (January 2020)¹⁰⁹ enabled the evaluation to determine 'call' activity and identify three 'calls' per country, giving a total of 33 calls in the sample. The following criteria were used to develop the call sample:

- ensuring coverage of all DPs.
- ensuring coverage of the three different pillars.
- reflecting emphasis on spending/thematic priorities in each country.
- allowing for longitudinal analysis by including six projects analysed as part of the MTE.

The outcome of the call sampling approach allowed for the identification of specific projects under each selected call. This was achieved in consultation with DPs, BEIS ODA Research and Innovation and in-country team.

The project sample allows for coverage of all DPs and pillars within the Newton Fund portfolio. Six projects were analysed as part of the MTE and again at Final Evaluation to allow for longitudinal analysis. The sample list of 33 calls and projects is annexed to Tetra Tech's Newton Fund Final Evaluation Report.

¹⁰⁹ The BEIS 'Activity Tracker' is an Excel-based internal monitoring tool by BEIS and updated quarterly by the UK Delivery Partners.

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- Dr Jaime Montoya, Director, Department of Science and Technology Philippine Council for Health Research and Development (DOST-PCHRD)
- Paula Jane de Leon, Department of Science and Technology Philippine Council for Health Research and Development (DOST-PCHRD)
- Prof. Gayline Manalang, Assistant Professor, University of the Philippines Manila
- Prof. Malcolm von Schantz, Professor of Chronobiology, University of Surrey

Rice Research

- Ioanna Kostaki, International Portfolio Manager for the Newton Fund, BBSRC
- Kirsty Dougal, Head of International Development, BBSRC
- Tim Willis, Associate Director International, BBSRC
- Dr. Reynante Ordonio, Researcher, PhilRice
- Dr Jimmy Quilang, Deputy Executive Director for Research and Development, PhilRice
- Dr Jennifer T. Niones, Researcher, PhilRice

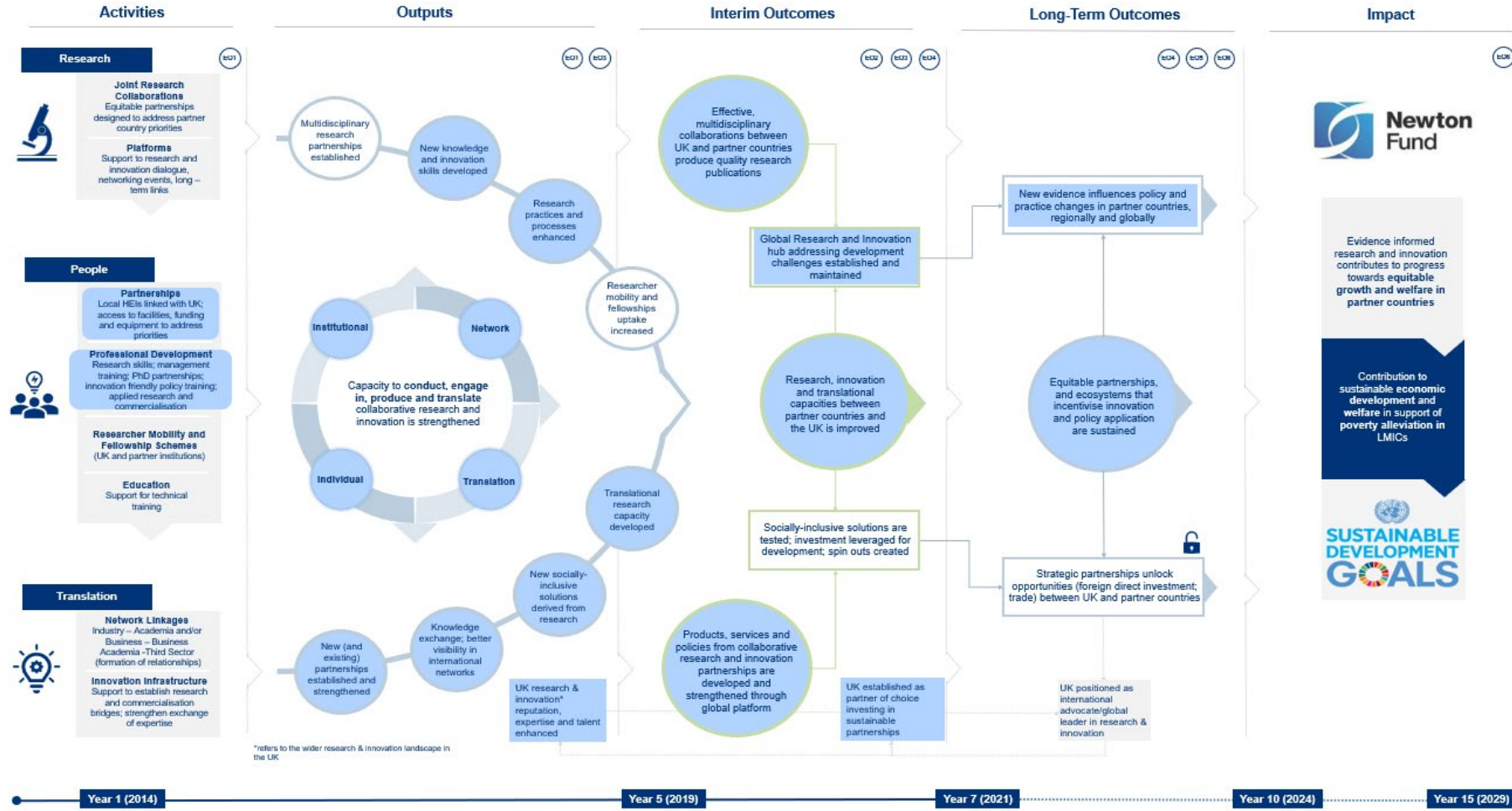
- Mr Xavier Greg I. Caguiat, Researcher, PhilRice

Others

- Daniel Pruce, UK Ambassador to the Philippines
- Karen Hipol, Newton Agham Programme Strategic Manager
- Sarah Esguerra, Newton Agham Programme Officer
- Ute Lynch, South-East Asia Regional Lead, BEIS
- Nicola Willey, SIN Director, FCO
- Rebecca Shah, Head of Prosperity, FCO
- Dr Leah Buendia, Assistant Secretary for International Cooperation, DOST
- Dr Rowena Guevara, Undersecretary for Research and Development, DOST
- Albert Mariño, Director, DOST Science Education Institute
- Peter Gavina, Senior Science Research Specialist, DOST Science Education Institute
- Dr Lily Freida Mila, OIC Deputy Executive Director, Philippine Commission on Higher Education (CHED)

Annex 4 – Theories of Change per Action¹¹⁰

Figure 6: WCSSP Southeast Asia



¹¹⁰ The figures present the pathways to impact for the three projects reviewed in this case study, set within the overall Newton Fund theory of change. Specific pathways to impact for each project are indicated by the blue shaded shapes in each figure.

Figure 7: Researcher Links Travel Grant

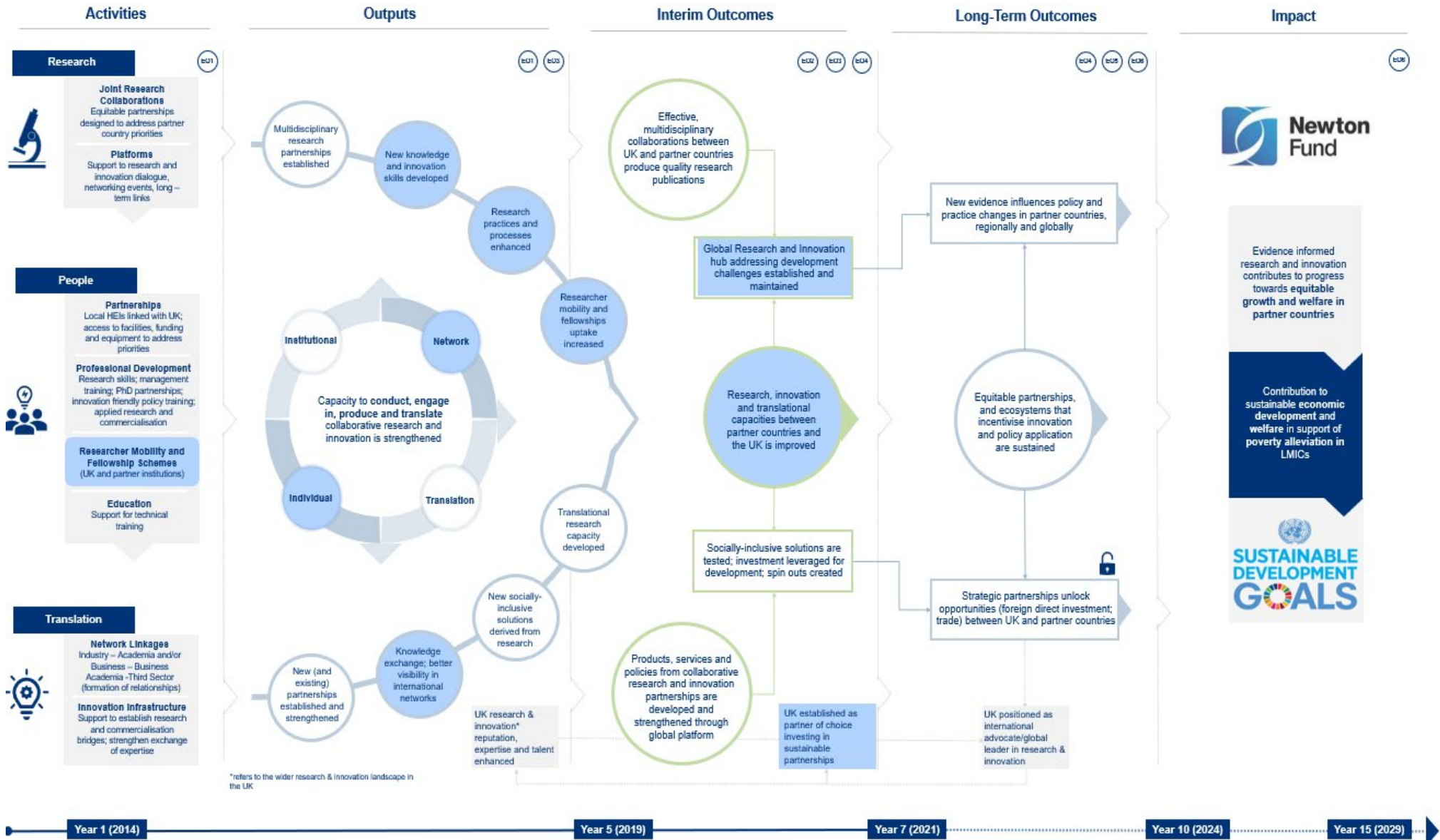
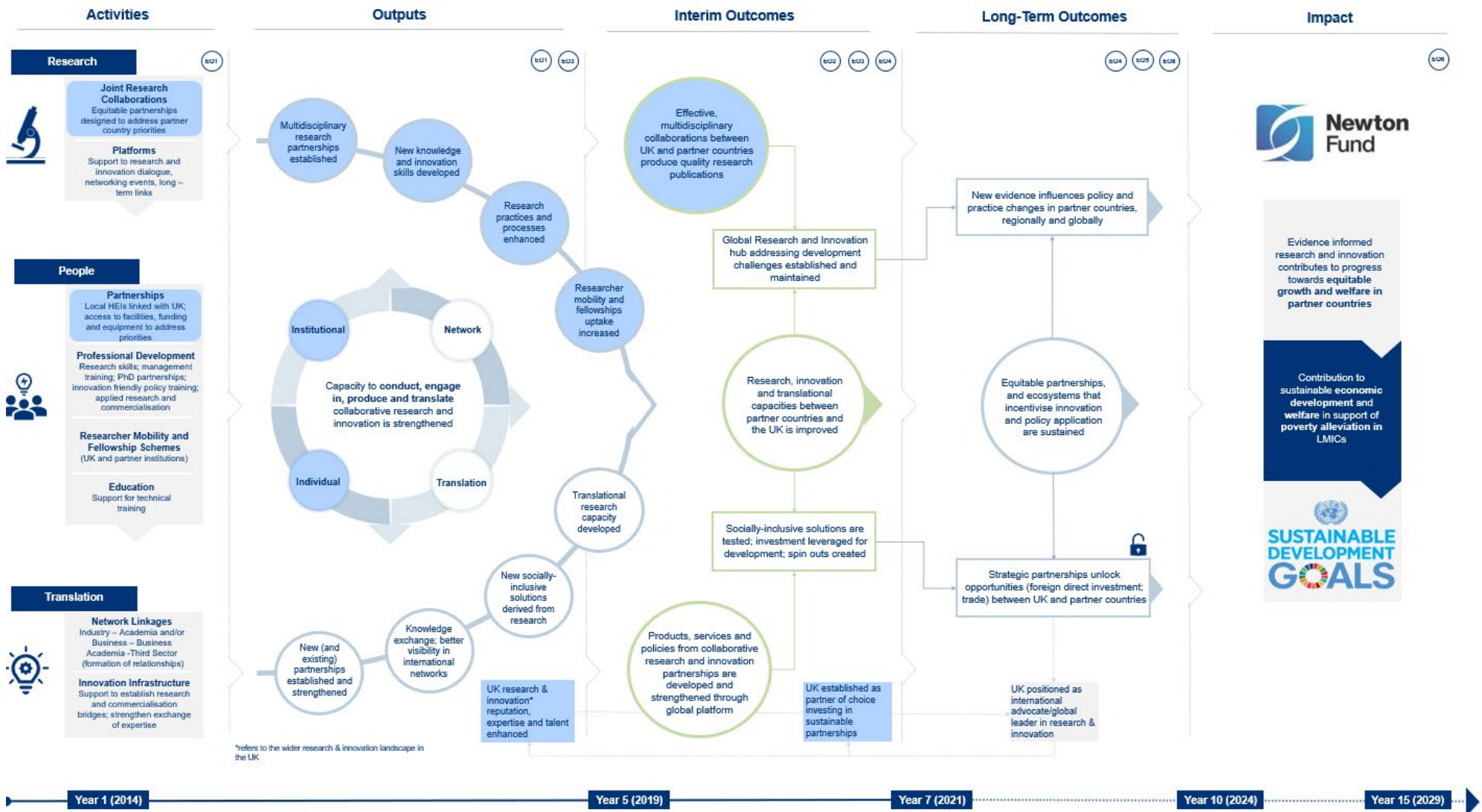


Figure 8: Rice Research



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