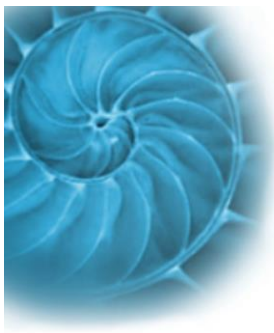

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Global Challenges Research Fund Growing Research Capability (GROW) Programme

Impact Evaluation

Final Report: February 2025

Margaret Macadam, Ruth Townsley and Sarah-Jane Marriott

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Executive summary

The Growing Research Capability (GROW) programme was delivered by UK Research and Innovation (UKRI) as part of the Global Challenges Research Fund (GCRF). GROW was one of GCRF's 'signature' investments and aimed to increase the engagement and capability of the UK research community and Least Developed, Low-Income, Lower-Middle Income, and Upper-Middle Income Country (LLMIC) partners to better address global development challenges and produce real-world outcomes. GROW provided £225m funding over four years (2017-2021) to 37 collaborative projects between institutions in 69 partner countries and the UK. Project awards ranged in value from around £3 million to just over £8 million.

UKRI commissioned Helix Research and Evaluation Limited to undertake an impact evaluation of the GROW programme over 14 months from September 2023 to October 2024. The evaluation used a theory-based, mixed methods approach including documentary review of programme-level documentation, focusing on secondary analysis of Gateway to Research (GtR) records and Researchfish annual reporting[1] from GROW awards (submitted by awardees in March 2024). We also collected additional primary data directly through an online impact survey of GROW projects, interviews with UKRI staff, and interviews with UK and LLMIC-based PIs, Co-Is and research partners of awards selected for case study purposes. Impact case studies of nine GROW awards were produced, excerpts from which are included throughout the main report and presented in full in Annex C.

1. Key findings of the impact evaluation

Growing research capacity

GROW was successful in building and strengthening people-based research capacity, for individuals and institutions, across career stages, in both the UK and LLMICs and, to a more limited extent at a research ecosystem level.

- ➔ For individuals, the 'learning-by-doing' nature of being involved in GROW led to capacity strengthening outcomes for researchers at all levels of seniority from both LLMICs and the UK. Individuals reported increased levels of knowledge, skills, commitment, motivation and confidence in relation to challenge-led research and innovation (R&I). GROW also enhanced their research productivity (publications and grants), professional reputations, and opportunities for career progression and continuation in research-active roles.

[1] The annual submission of research outcomes to UKRI via the online Researchfish system.

- For UK and LLMIC institutions, GROW enhanced their reputations, research achievements and workforces. Benefits were stronger for LLMIC than UK institutions in the areas of enhanced leadership, enhanced strategic/financial support, enhanced systems, and enhanced gender equality, and significantly stronger in terms of enhanced infrastructure.
- For the wider research ecosystem, outcomes for LLMICs (but not the UK) included wider training, creation of data infrastructures, and increased strategic/financial support for challenge-led R&I.

Building research partnerships

- GROW project teams built, strengthened and sustained diverse and equitable relationships between UK and LLMIC organisations, including civil society, researchers, academia, public sector, and private sector/businesses.
- Diverse interdisciplinary research teams were created - Each GROW project was led by a UK research institution and delivered with LLMIC-based partners (56%) and from elsewhere including other UK partners (44%) - the average number of partners per project was 23.
- Delivery partnerships were strengthened and sustained - 88% of LLMIC and UK respondents to the impact evaluation's online survey felt their partnerships had been strengthened and 81% reported some form of continued collaborative work post-programme. LLMICs also said their relationships had been strengthened in-country (88%) and with other LLMICs (79%), showing the impact of GROW on knowledge exchange between countries in the Global South.
- 1,531 other collaborations and networks for knowledge exchange were built - 93% of these had been established during the programme (rather than pre-dating it) and 85% were still active in March 2024 (two years after the end of programme). This indicates that UK and LLMIC project teams had not relied on pre-existing relationships for the duration of their awards and had used the opportunities provided by the programme to develop and nurture new relationships.
- Most projects (70%) reported measures for equitable partnerships through governance/financial processes, co-creating research and training, and access/ownerships of data and outputs.
- Relationships were sustained through new research funding. GROW project teams reported £420m+ over 506 new grants, mostly for research projects (72%). 204 grants over 33 projects (41% of total new funding) had continued since March 2022, showing that almost all GROW projects (89%) had sustained research and/or capacity building activities at institutional level, beyond the end of the programme.

Delivering impact-focused research

- GROW successfully delivered impact-focused research which increased global-level data to tackle development challenges.
- GROW-linked publications are highly cited, accessible to research users and have potential for on-going and sustained impact - GROW projects published over 4,200 formal outputs, half of which are available as open access, 52% of which have been cited by others and 5% of which already show potential for policy impact (in terms of citation and use in policy documents). GROW

publications have been cited nine times more frequently in relation to average citations for publications in the same fields of research and of the same age.

- ➔ GROW non-formal, artistic and creative outputs enabled engagement with research users, with potential for impact on the welfare and economic development of LLMICs - the production of over 4,500 new research tools, technical products, clinical trials, patents, spinouts, and artistic outputs shows that the needs of stakeholders have been considered in sharing the results and benefits of projects.

Contributing to real-world outcomes

- ➔ GROW directly facilitated increased contributions from the UK research community towards dealing with development challenges and delivering real-world outcomes for LLMICs
- ➔ GROW projects have made significant steps in addressing the GCRF challenge areas, particularly in the areas of equitable access to sustainable development, sustainable economies and societies, and human rights, good governance and social justice.
- ➔ Through GROW, the UK research community increased its engagement with international development challenges, contributing to real-world outcomes for LLMICs in the following areas:
  - Secure and resilient food systems supported by sustainable marine resources and agriculture - GROW awards have influenced the development of new practices, products and policies to support the development of sustainable marine resources and agriculture including: the introduction of biosecurity measures by seaweed farmers that protect and increase their crops; water efficiency practices by farmers that have saved billions of litres of water and reduced pressure on groundwater levels; temperature resilient seaweed breeds to withstand warming seas; enhanced weather forecasting products that have reduced crop failures and increased yields; introduction and increased farming of drought resistant grain variety (millet); the introduction of biosecurity measures for the seaweed industry at national and international levels; the adoption of new water management policies by local and state governments; introduction of millets into State nutrition schemes; development of a new national soybean strategy.
  - Sustainable health and wellbeing - GROW awards have contributed to improved health outcomes and influenced new practices, products and policies to support early impacts in sustainable health and wellbeing including: reduced incidence of malaria due to introduction of next-generation bednets; early detection and treatment of diabetic retinopathy (DR) before sight loss occurs enabled through DR screening; enhanced weather forecasts that support responses to meningitis outbreaks; new community interventions to control dengue; production of the world's first full health sector model, simulating an entire health system to inform health policy decisions, budgets and initiatives; new training for health professionals to identify and treat diabetic retinopathy; portable biosensors to predict sight threatening diabetic retinopathy; software to ascertain the gestational age of the foetus; Ministerial support for enhanced dengue surveillance; informing WHO malaria guidelines; directly

informing Health Sector Strategic Plans and the associated Health Benefits Packages; informing the development of a national dementia plan in India; introduction of new tobacco control legislation and enhanced government communication campaigns for smoking reduction.

- Inclusive and equitable education - GROW awards have contributed to improved educational outcomes through supporting the development of school children and creating new education initiatives for marginalised women including: increased empowerment amongst school children to take positive steps against child marriage; improved self-esteem, assertiveness and performance amongst school children; increased empowerment of marginalised women to become culinary health educators and microentrepreneurs; improved curricular content to embed violence prevention in schools.
- Clean water and sanitation - GROW awards improved the lives of communities through the development and provision of clean water systems, influencing policy support and leveraging funding for sustained initiatives in clean water and sanitation, including: improved bacteriological water quality and a decrease in the reported incidence of diarrhoea in the communities; better physical and mental health and reduced workload; leveraging funding for further clean water and sanitation projects; advising national government on the development of community-based water management.
- Affordable, reliable, sustainable energy - GROW awards have directly contributed to increased use of sustainable energy and reduced reliance on fossil fuels and contributed to developments in energy policy including: electricity generating company maximising use of hydropower through improved access to rainfall forecasts; increased use of solar power through development of innovative solar energy technology; use of biogas generated by innovative waste-to-energy technology (anaerobic digestion), leading to reduced reliance on external gas and electricity supplies; advising national government on development of sustainable energy policy.
- Sustainable livelihoods supported by strong foundations for inclusive economic growth and innovation - GROW awards have contributed to inclusive economic growth and sustainable livelihoods by informing the implementation of sustainable and inclusive development initiatives and supporting the livelihoods of vulnerable coastal communities, through developing new practice and tools, influencing policy and leveraging continuing support for inclusive economic growth. Contributions include: testing and roll-out of an inclusive green growth tool; leveraging funding for further work on trade, development and the environment; informing UN guidance on sustainable infrastructure; securing the inclusion of provisions to protect fishing livelihoods in a UN treaty on marine conservation.
- Responses to humanitarian crises, forced displacement, conflict, poverty and inequality - GROW awards have contributed to the GCRF challenge area of human rights, good governance and social justice through the development and implementation of in-country and cross-region responses including: the use of real time data to improve health service provision for Rohingya refugees; the use of a comprehensive directory of available support

improved access to mental health and psychosocial support services in the West Bank of the occupied Palestinian territory; real-time weather forecasting (nowcasting) products that provide early warnings of locust storms, flooding and treacherous sea conditions, and support the Red Cross in its disaster management work.

GROW leaves a strong legacy with reference to its Theory of Change (see Annex B)

- Increased capacity and capability within UK and LLMICs to address global development challenges.
- Development of innovative approaches to dealing with international cross-disciplinary development challenges.
- Increased contribution towards achieving UK Aid Strategy and UN Sustainable Development Goals.
- Increased global understanding, knowledge and cooperation to respond to and address interdisciplinary development challenges faced by LLMICs.
- Welfare and economic benefits for LLMICs, with further impacts in pipeline.
- Strengthened profile and reputation of individual UK researchers and their institutions, and by association, global recognition of UK capability and contribution towards dealing with cross-disciplinary development challenges and achieving the UN SDGs (but little evidence of this at research ecosystem level).

Design and delivery features of GROW that supported its successes and early impacts

- Building equitable relationships between project partners.
- Establishing relationships and networks with research partners, users and communities.
- Involving partner organisations/users and communities at all stages of the project.
- A focus on challenge-led research with potential welfare and economic development impacts.
- Understanding the context, through working in collaboration with partner organisations, research users and communities.
- Interdisciplinary approach to the research.
- Strengthening research capacity, to address identified gaps in skills and know-how including effective knowledge exchange mechanisms, to support impact generation.

2. Factors that hindered GROW's successes and early impacts

- Covid-19 affected the abilities of some GROW project teams to complete their programmes of work, both within the UK and partner countries. Pandemic restrictions prevented both travel and face-to-face work, impacting delivery timescales and the extent to which all goals could be met.
- The evaluation also found evidence of the demoralising and disruptive effects of the 2021 ODA budget reductions, even where funding was eventually restored. The reductions affected GROW

awards' ability to maximise the impacts from their projects and in some cases, had led to a loss of trust - between project partners, between project staff and stakeholders/participants, and between grantees and UKRI.

- ➔ Despite these externally imposed challenges and setbacks, projects had made huge efforts to minimise negative effects, to keep the work on track, to maintain collaborations, and to maximise the impact of their work in the longer-term.

3. Recommendations for UKRI and funders of similar programmes

- ➔ Embed research capacity strengthening initiatives within challenge-focused research activity - to provide opportunities for experiential learning and support research autonomy, whilst addressing global development challenges and producing real-world outcomes.
- ➔ Promote organisationally diverse teams and interdisciplinarity - to provide opportunities for new learning, skills, networking and research collaborations.
- ➔ Include programme-wide networking in future programmes, to provide opportunities for peer learning and support, networking and collaboration, both within project cohorts and between institutions.
- ➔ Encourage partnerships with non-academic stakeholders and other research users - to maximise opportunities for real-world outcomes and ensure outputs are accessible and positioned for impact.
- ➔ Consider funding which allows for a longer-term, multi-year approach - with protected time for inception (to promote fairness and equity) and follow-on work (to maximise impacts and sustainability of programme benefits).
- ➔ Continue to promote equitable partnerships, co-creation and opportunities for LLMIC ownership and leadership - consider direct funding to LLMIC-based institutions and monitoring of partnership arrangements to ensure fairness.
- ➔ Build in evaluation processes from the start of the programme - measurable objectives and evaluation questions, linked to structured project reporting will provide clearer evidence of programme learning and achievements.

4. Concluding comments

The GROW programme was a large-scale, multi-faceted and ambitious set of projects which individually, and together, achieved significant outcomes and early impacts for LLMICs and the UK, both in terms of building research capacity and in delivering impact-focused research and real-world outcomes. GROW participants at all levels reported increased research capacity through learning-by-doing, collaborative working with partners, trying out new and innovative methods, and crucially, witnessing the real-life and tangible impacts that effective interdisciplinary research can have on knowledge, health, practice and policy. They acknowledged that the GROW programme was a rare and unique opportunity and advocated for future funding initiatives to maximise the impact of their awards and sustain the valuable collaborations developed.

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Abbreviations and acronyms

AFQ	Additional Funder Question
AFRICAP	Agricultural and Food-system Resilience: Increasing Capacity and Advising Policy
AFRICAN SWIFT	African Science for Weather Information and Forecasting Techniques
BBSRC	Biotechnology and Biological Sciences Research Council
BGS PRIME	British Geological Survey Proactive Infrastructure Monitoring and Evaluation
BMGF	Bill and Melinda Gates Foundation
BMJ	British Medical Journal
BRECcIA	Building Research Capacity for sustainable water and food security in drylands of sub-Saharan Africa
CA	Conservation Agriculture
CABANA	Capacity building for bioinformatics in Latin America
CASP	Climate Change Adaptation and Agribusiness Support Programme
CCR	Centre for Capacity Research
CEPHaS	Strengthening Capacity in Environmental Physics, Hydrology and Statistics for Conservation Agriculture Research
Co-I	Co-Investigator
COP	Conference of the Parties
CONAGUA	Comision National del Agua
CTA	Centro de Ciencia y Tecnología de Antioquia
DAC	Development Assistance Committee of the OECD
DCP	Development Corridors Partnership
Defra	Department for Environment, Food & Rural Affairs
ECR	Early career researcher
ECSA	East, Central and Southern Africa
EMBL-EBI	European Molecular Biology Laboratory's European Bioinformatics Institute
EQ	Evaluation Question
ERT	Electrical Resistivity Tomography
EU	European Union
ECMWF	European Centre for Medium-Range Weather Forecasts
FASTA	Forecasting African STorms Application
FCDO	Foreign, Commonwealth and Development Office
FCR	Field Citation Ratio
FDA	Food and Drugs Administration

GEF	Global Environment Facility
GBV	Gender-based violence
GCRF	Global Challenges Research Fund
GEF	Global Environment Facility
GlobalGRACE	Global Gender and Cultures of Equality
GMet	Ghana Meteorological Agency
GROW	Growing Research Capability
GSSTAR	Global Seaweed STAR - Safeguarding the future of seaweed aquaculture in developing countries
GtR	Gateway to Research
HAC	Humanitarian Action for Children
HEPU	Health Economics & Policy Unit
HORN	One Health Regional Network for the Horn of Africa
HSSP III	Malawi's Health Sector Strategic Plan III
HWTS	Household Water Treatment and Safe Storage
IIT Bombay	Indian Institute of Technology Bombay
ILRI	International Livestock Research Institute
IPCC	International Panel for Climate Change
ISTVS	IGAD Sheikh Technical Veterinary School
KCL	Kings College London
KenGen	Kenya Electricity Generating Company
KMD	Kenya Meteorological Department
KNUST	Kwame Nkrumah University of Science and Technology
KUHeS	Kamuzu University of Health Sciences
LIMS	Laboratory Information Management System
LLMIC	Least Developed, Low-Income, Lower-Middle Income, and Upper-Middle Income Countries
LSTM	Liverpool School of Tropical Medicine
NCAS	National Centre for Atmospheric Science
MakSPH	Makerere School of Public Health
MoU	Memorandum of Understanding
MSF	Médecins Sans Frontiers
MSSRF	M S Swaminathan Research Foundation
MTK	Mobile Teaching Kitchens
NCD	Noncommunicable diseases
NGO	Non-Governmental Organisation

Ni3	None in Three- A Centre for the Development, Application, Research and Evaluation of Prosocial Games for the Prevention of Gender-Based Violence
NIHR	National Institute for Health Research
NiMet	Nigerian Meteorological Agency
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
OH	One Health
OMM	Odisha Millets Mission
ORNATE	Increasing eye research capacity and capabilities to tackle the burden of blindness in India: a research-based UK-India Collaboration
PCV2	Porcine circovirus
PDRAs	Post-doctoral Research Assistants
PEAK	Building capacity for the future city in developing countries
PI	Principal Investigator
PIIVeC	Partnership for Increasing the Impact of Vector Control
PO	Partner organisation
PRECISE	Pregnancy Care Integrating Translational Science, Everywhere Network: a sub-Saharan network for placental disorders
PV	Photo Voltaic
R&I	Research and Innovation
RA	Research Assistant
RCDF	Research Career Development Fellows
RECAP	Research capacity building and knowledge generation to support preparedness and response to humanitarian crises and epidemics
RECIRCULATE	Driving eco-innovation in Africa: capacity-building for a safe circular water economy
RF	Researchfish
R4HC-MENA	Research for Health in Conflict: developing capability, partnerships and research in the Middle and Near East
SAFEWATER	Low-cost technologies for safe drinking water in developing regions
SAGCOT	Southern Agricultural Growth Corridor of Tanzania
SANBI	South African National Bioinformatics Institute
SBB	Spatial Borderline Biographies
STRiDE	Strengthening responses to dementia in developing countries
SUNRISE	Strategic University Network to Revolutionise Indian Solar Energy
TCCP	Tobacco Control Capacity Programme

TIGR2ESS	Transforming India's Green Revolution by Research and Empowerment for Sustainable food Supplies
TLO	Thanzi la Onse (Health of All): Frameworks and analysis to ensure value for money health care - developing theory, changing practice
ToC	Theory of Change
TRADE	Trade, Development and the Environment
TVCAG	Technical Vector Control Advisory Group
UKCDR	UK Collaborative for Development Research
UKRI	United Kingdom Research and Innovation
UN FAO	United Nations Food and Agriculture Organization
UNEA	UN Environment Assembly
UNEP	United Nations Environment Programme
UNEP-WCMC	UN Environment World Conservation Monitoring Centre
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	UN Framework Convention on Climate Change
UNICEF	United Nations Children's Fund
US	United States
USAID	United States Agency for International Development
USP	University of Sao Paulo
UNSDGs	United Nations Sustainable Development Goals
WHO	World Health Organisation
WISER/EWSA	Weather and Climate Information Services/Early Warnings for Southern Africa
WMO	World Meteorological Organisation
WWF	World Wildlife Fund

1. GROW programme impact evaluation

1.1. GROW programme: background and context

The Growing Research Capability (GROW) programme was delivered by UK Research and Innovation (UKRI) as part of the Global Challenges Research Fund (GCRF). GCRF was launched by the UK Government and overseen by the Department for Science, Innovation and Technology (DSIT) (formerly the Department for Business, Energy and Industrial Strategy or BEIS), as a £1.5 billion fund designed to support pioneering research and innovation to address the challenges faced by developing countries.

The GROW programme was one of GCRF's 'signature' investments and aimed to:

1. Grow people-based research capacity and capability, building skills across career stages in both the UK and developing countries, to enable the very best research to address challenges faced by developing countries.[2]
2. Build stronger and lasting relationships between UK research organisations and research organisations and other partners (e.g., NGOs, governments and business) in developing countries.
3. Deliver research outcomes with the potential for significant impact on the welfare and economic development of developing countries in line with Official Development Assistance (ODA) criteria.
4. Increase the engagement of the UK research community with international development challenges, nurturing environments in which UK research can better address global development challenges and produce real-world outcomes in developing countries. This included the enhancement of existing international development-focused expertise and the reorientation of UK-focused expertise towards the challenges faced by developing countries.

The GROW programme provided £225m funding over four years (2017-2021) to 37 collaborative projects (see Annex A) between institutions in 69 partner countries and the UK. Project awards ranged in value from around £3 million to just over £8 million. Several awards received a three-

[2]The 'developing countries' involved in the GROW programme included those listed by the Development Assistance Committee (DAC) as recipients of ODA assistance during the time period 2014-2017 across four categories of income: least developed countries, other low-income countries, lower middle-income countries and territories, and upper middle-income countries and territories. Countries from all four categories were included as partners in GROW. For the purposes of this report, these are referred to as 'LLMICs'. https://www.oecd.org/en/topics/sub-issues/oda-eligibility-and-conditions/dac-list-of-oda-recipients.html

month no-cost extension until March 2022 to compensate for delays due to Covid-19. All GROW projects have now come to an end. In 2021 the UK Government's Official Development Assistance (ODA) allocation to UKRI was significantly reduced, leading to budget reductions affecting all GCRF investments including GROW.[3]

Collaborations between institutions from across LLMICs and the UK focused on development challenge areas informed by the UK Aid Strategy and/or the UN Sustainable Development Goals (UNSDGs). In line with good practice, the programme developed a theory of change (see Annex B) that outlined the expected contributions of the programme's inputs and activities to its anticipated outputs, outcomes and impacts.

1.2. Impact evaluation aim and objectives

Informed by the GROW programme theory of change (ToC), this impact evaluation aimed to document, map and understand the outcomes and early longer-term impacts of the GROW programme in order to assess the extent to which the programme delivered against its four core goals as set out above. In doing so, the impact evaluation contributes to the learning on research capacity strengthening and builds upon the findings of the GROW process evaluation[4] as well as other relevant findings reported as part of the wider GCRF fund-level evaluation.[5]

The specific objectives were to:

- Provide evidence of the outcomes and early longer-term impacts achieved by GROW
- Understand the extent to which GROW has delivered against its objectives and expected impacts, for whom and in what contexts, taking into account operating within the Covid-19 pandemic and following the ODA budget reductions, and how these circumstances may/may not have affected progress
- Identify the factors which supported or inhibited the emergence of planned impacts, as well as identify any emerging unplanned impacts
- Provide learning on 'what works' for ODA research and innovation (ODA R&I)
- Offer an approach for reviewing capacity strengthening activities going forward and add to the evidence base on 'what works' for capacity strengthening.

[3] Vogel, I., Guthrie, S and Hepworth, C. (2022) Evaluation of the Global Challenges Research Fund: Stage 1b Synthesis report - https://assets.publishing.service.gov.uk/media/65b24937f2718c000dfb1d4f/evaluation_of_the_gcrf_stage_1b_synthesis_report_annex.pdf

[4] Izzi, V., Sullivan, C., and Wawire, S. (2024) GCRF Process Evaluation Report, Stage 1b. GROW Process Evaluation.

[5] See footnote 3

In addition, the evaluation sought to answer the following evaluation questions (EQs):

1. To what extent (and how) has the GROW programme met its original objectives?
2. What successes and early impacts have the GROW projects realised to date, and what will the likely legacy and/or long-term impacts of the GROW programme be?
3. What can we learn about capacity strengthening and how/if it works, within the context of GROW?

1.3. Impact evaluation approach and methodology

The impact evaluation was conducted over 13 months, from August 2023 to September 2024. Our evaluation approach has focused on the contributions of research and development funding to capacity strengthening at different levels: for individuals and institutions as well as for the wider research and policy environment, and the connections between these levels. Drawing on insights from the research capacity strengthening (RCS) literature,[6 & 7] and a conceptual framework developed as part of the ESRC's impact evaluation programme,[8] we created an outcomes typology, including capacity strengthening, attitudinal, connectivity, conceptual and real-world outcomes, that reflected the broad range of evidence needed to address the impact evaluation questions. Using this typology as a starting point, we have adopted a theory-based, mixed methods approach to gather quantitative and qualitative evidence of reported outcomes and impacts and explore the contexts and mechanisms that have acted as enablers (and barriers) for impact. The methodology included the following elements:

- Documentary review - We drew heavily on the extensive, existing evidence of GROW awards' achievements within their monitoring and reporting processes, as well as referencing findings from the DSIT-commissioned GROW process evaluation.[9] The documentary review included:
  - Qualitative and quantitative analysis of programme-level documentation, focusing on Gateway to Research (GtR) records for each of the 37 GROW awards and

[6] Chadwick El-Ali, A., Padilla, A., Bucher, A., Kirkland, J., Heintz, M., and Kunaratnam, Y. (2022) Research capacity strengthening: Lessons from UK-funded initiatives in low- and middle- income countries. UK Collaborative for Development Research.

[7] Pulford, J., Price, N, Amegee Quach, J., and Bates, I. (2020) Measuring the outcome and impact of research capacity strengthening initiatives: A review of indicators used or described in the published and grey literature. F1000Res. 2020 Jun 4;9:517. doi: 10.12688/f1000research.24144.1. PMID: 32595961; PMCID: PMC7312283.

[8] ESRC (2013) Cultivating Connections – innovation and consolidation in the ESRC's impact evaluation programme https://webarchive.nationalarchives.gov.uk/ukgwa/20210901105136/https:/esrc.ukri.org/research/research-and-impact-evaluation/analysis-and-scoping/

[9] See footnote 4

Researchfish annual reporting[10] from GROW awards (submitted by awardees in March 2024) - referenced in the report as GtR records and Researchfish data.

- Qualitative, constant comparative thematic analysis of award-level documentation, focusing on GROW project reporting (via final reports and evaluation reports, where available), GtR impact summaries and responses to the Additional Funder Questions (AFQs) as part of their Researchfish data - referenced as project reporting, GtR records and Researchfish data.

- Primary data collection and analysis - We also gathered further primary data directly from key informants, including representatives of UKRI, award holders (Principal Investigators/PIs and Co-Investigators/Co-Is) and partner organisations to explore projects' contributions to subsequent and potential future impacts, and to develop an understanding of the impact pathways that have underpinned these contributions. Primary data sources included:
  - Informant interviews with UKRI staff to gather their insights on programme-level learning (n=9 individuals interviewed)
  - Online impact survey of GROW project PIs, Co-Is and project partners to explore the impacts of projects since completion as well as in-progress and potential future impacts (n=153 survey responses from 19 PIs, 109 Co-Is and 25 partners across all 37 projects; of which 45% of responses were from LLMIC-based respondents across 28 separate countries/territories, and 55% from UK-based respondent; 2% of respondents described themselves as early-career, 21% as mid-career and 77% as senior level; 78% of total responses were from those working in universities or HEIs)
  - Informant interviews with UK and LLMIC-based PIs, Co-Is and project partners selected for case study purposes, to explore their survey responses in more detail (n=20 PIs/Co-Is/partners interviewed across ten projects)
  - Impact case studies of nine GROW awards, drawing on analysis of all the associated documentary and primary data noted above, and any available existing case studies (e.g. from project websites). Available evidence was synthesised to provide high-level summaries of key contributions of the selected GROW awards. Excerpts from case studies are included throughout the report and presented in full in Annex C.

[10] The annual submission of research outcomes to UKRI via the online Researchfish system.

1.4. Limitations of this impact evaluation

There are a number of limitations relating to the data collected and synthesised for this impact evaluation, as summarised below:

- Timescale for survey responses - The collection of data via the online impact survey was limited by its timescale. The survey was open for five weeks in June/July 2024. All non-responders received up to three reminders. By the close of the survey, a total of 153 responses were received, 26% of the overall sample of 584 viable contacts provided by UKRI. The response rate overall may have been higher with further reminders and a longer timescale, but this was not possible due to resource and time constraints. Despite this, the quality and coverage of responses was good, including a high proportion of fully completed surveys, 45% of which were from LLMIC-based respondents, with at least one response from each of the 37 GROW awards.
- Comparability and specificity within project reporting - Our analysis of award-level final reports was limited by differences in reporting structure and style across the programme, and the absence of requirement for awards to report against programme objectives in systematic ways. This meant there was low specificity against programme aims and research questions making comparability of documentary evidence challenging for some areas of inquiry. As a result, it was not possible to disaggregate data in key areas such as gender, career stage, and geography as specified by the EQs. Few award-level evaluation reports were available for analysis. This meant that at programme-level there was limited direct evidence of outcomes for individuals participating in capacity-strengthening activities.
- UK and senior-level bias in Researchfish reporting - Researchfish was a key data source for this evaluation. However, the analysis of RF data was limited by the fact that UK PIs are responsible for annual data returns, with the likelihood that records will not fully represent the outcomes achieved and experiences of LLMIC partners/Co-Is, nor UK team members with less seniority. This was mitigated by the high proportion of responses to the impact survey from both UK and LLMIC Co-Is, and by inclusion of LMIC perspectives through informant interviews for the impact case studies.
- Timestamp for Researchfish dataset - Our analysis of Researchfish data was based on the dataset of return made to UKRI in February-March 2024 so any outcomes or impacts achieved past this date would not have been included in the dataset, including publications. However, we were able to mitigate this to limited extent by the later date of the online impact survey and subsequent informant interviews with PIs and Co-Is which captured some later data on outcomes achieved.

1.5. About this report

This report is structured to respond to each of the three main evaluation questions (EQs), their sub-questions and the related GROW objectives:

- Chapter 2 explores how GROW built research capacity for individuals, institutions and the wider research ecosystem
- Chapter 3 focuses on the nature, extent, distribution and sustainability of research partnerships and collaborations developed through GROW
- Chapter 4 examines the research outcomes of GROW and their potential for impact
- Chapter 5 considers the nature, extent, distribution and sustainability of real-world outcomes which address global development challenges
- Chapter 6 reflects on the learning from GROW
- Chapter 7 provides an overall summary of findings against the EQs including recommendations for UKRI on the future commissioning of similar programmes.

2. Growing and strengthening research capacity

This chapter explores to what extent, and how, the GROW programme met its objective 'to grow people-based research capacity and capability, building skills across career stages in both the UK and developing countries' (EQ1/GROW objective 1). In doing so, we also consider how capacity strengthening outcomes have been distributed and whether there were any specific beneficiary groups. We also examine at what levels (individual, institutional, research ecosystem) GROW had most success in building capacity.

2.1. Capacity strengthening for individuals

Key points

- ➔ Although most specific capacity strengthening activities (e.g. training, mentoring, fellowships) targeted early career researchers, the 'learning-by-doing' nature of being involved in the programme meant that capacity strengthening outcomes were reported by researchers at all levels of seniority from both LLMICs and the UK.
- ➔ Outcomes of capacity strengthening activities for individuals, based on respondents' self-assessment pre- and post-GROW, included:
  - Increased knowledge of challenge-led R&I for development impact - an increase from 14% to 43% of survey respondents rating themselves as 'extremely knowledgeable'
  - Increased skills to deliver challenge-led R&I for development impact - an increase from 13% to 42% of survey respondents rating themselves as 'extremely skilled'
  - Increased appreciation of the value of challenge-led R&I for development impact - an increase from 24% to 61% of respondents rating such research as 'extremely important'
  - Increased partnership development skills - an increase from 15% to 45% of impact survey respondents rating themselves as 'extremely skilled'
  - Increased levels of motivation and confidence to facilitate challenge-led R&I - an increase from 31% to 56% for motivation, and from 8% to 39% for confidence
  - Enhanced research productivity outcomes - nearly two-thirds of awards reported research productivity outcomes for individuals from LLMICs and one-third of awards noted these outcomes for UK-based individuals. 53% of LLMIC respondents to the GROW impact survey and 57% of UK-based respondents felt involvement in the programme had helped them to secure further funding, the most commonly cited funding type being research grants.

- Career progression and continuation in research-active roles - nineteen awards provided examples of LLMIC GROW participants taking up more senior university positions in-country or elsewhere or moving into industry or policy positions. Post-programme, most UK and LLMIC individuals connected with GROW projects remained in research-active roles (80%), with two-thirds (61%) being academic/university-based roles.
- Enhanced professional reputations - Researchfish reporting captured details of awards made to GROW employees and participants in recognition of research excellence. Of the 521 outcomes recorded, 26% were linked to individuals from LLMICs, and 63% to individuals from the UK.

Focus and nature of capacity strengthening activities for individuals

In LLMICs most (33 awards) noted capacity strengthening for early career researchers (ECRs). Nearly half (17 awards) also focused on mid-career/senior researchers, and 10 awards discussed the inclusion of administrative and/or technical staff in their capacity strengthening approaches (project reporting and Researchfish data). The majority of awards sought to strengthen capacity through developing participants' underpinning knowledge and skills for challenge-led research, and their understanding of award-relevant research areas. Underpinning knowledge and skill development focused mainly on research methods, statistics and data analysis, research leadership and management, proposals/research papers and research communication/translation and stakeholder engagement.

Fewer awards referred to the focus of their capacity strengthening approaches in the UK, but where this was discussed, a similar pattern emerged, with 16 awards referring to capacity strengthening for ECRs, five awards discussing mid and senior career stages and three awards mentioning non-research staff. The focus of capacity strengthening in the UK was mainly on developing underpinning knowledge and skills for challenge-led R&I, predominantly addressing research methods, statistics and data analysis, research leadership and management, and research communication/translation and stakeholder engagement (project reporting and Researchfish data).

In LLMICs, capacity strengthening was approached through a combination of specific training activities (34 awards) and 'learning-by-doing' (33 awards) through direct involvement in all stages of research. Around half (n=18) of the awards also noted the use of individual mentoring approaches, and eight awards gave examples of individuals developing skills through delivering training to others. Similar patterns were evident in the UK, albeit amongst fewer awards.

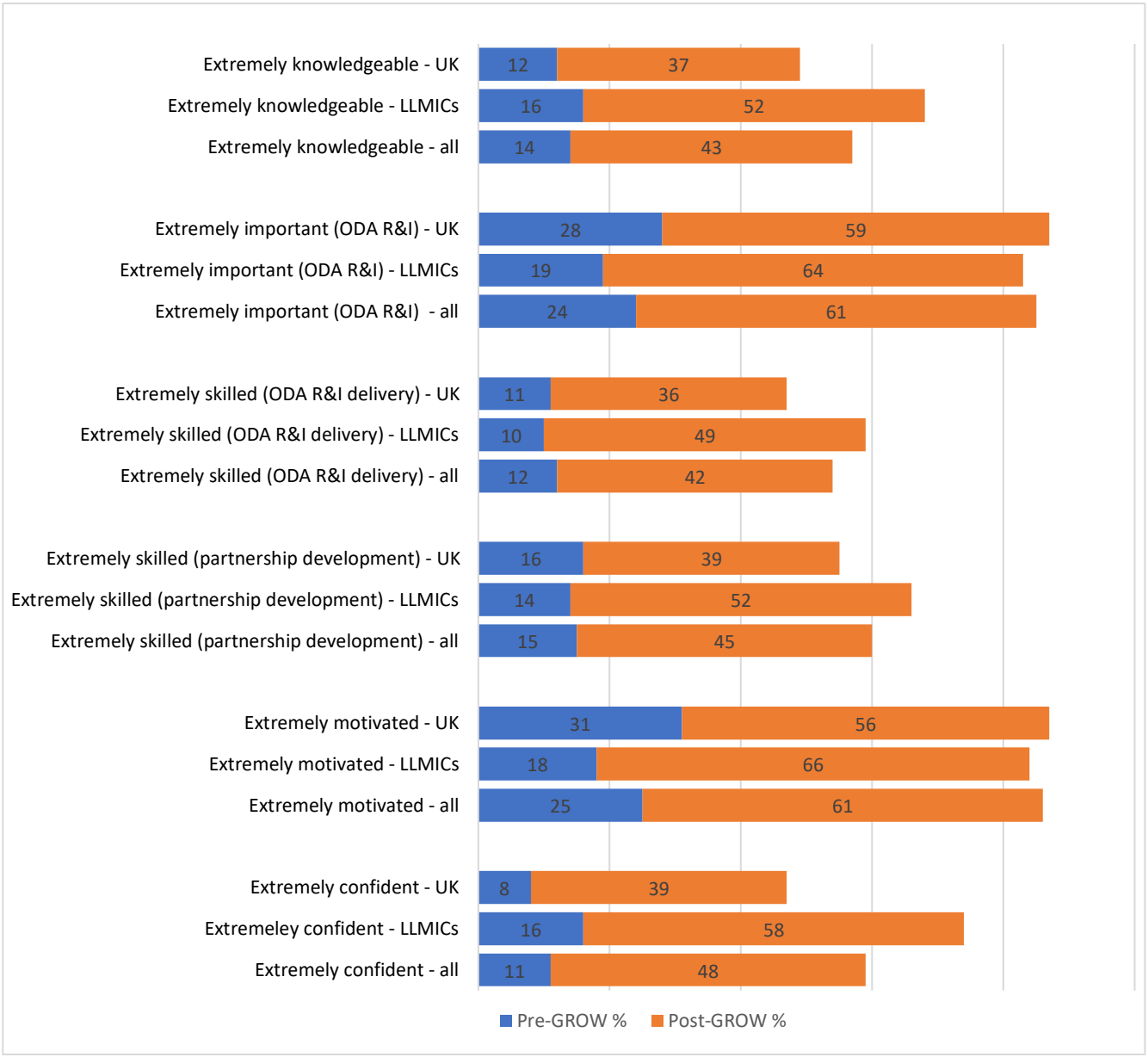
Just over half of the awards (n=20) noted specific capacity strengthening training activities and 23 awards provided evidence of learning-by-doing for UK team members. Mentoring approaches were used within UK teams (noted by 11 awards), and UK researchers also gained experience through delivering training to team members in LLMICs (12 awards). Whilst specific training

activities were predominantly aimed at ECRs, the widespread adoption of experiential approaches provided opportunities for capacity strengthening at all career stages, as evidenced in the discussion below.

Overview of outcomes of capacity strengthening activities for individuals

The evaluation found evidence of a range of important capacity strengthening outcomes for individuals from both LLMICs and the UK (project reporting, Researchfish data and GROW impact survey), as summarised in Figure 1.

Figure 1: Capacity strengthening outcomes for individuals involved in GROW (GROW impact survey: UK respondents n=84; LLMIC respondents n=69)



The learning-by-doing nature of being involved meant that these outcomes were reported by researchers at all levels of seniority and included:

- Increased knowledge and understanding of challenge-led research.
- Increased appreciation of the value of challenge-led research.
- Increased skills to deliver challenge-led research.
- Increased partnership development skills.
- Increased levels of motivation and confidence to facilitate challenge-led research.
- Enhanced research productivity outcomes.
- Career progression and continuation in research-active roles.
- Enhanced professional reputations.

Increased knowledge and understanding of challenge-led research

The impact evaluation found increased knowledge of challenge-led R&I for development impact. Pre-GROW, 14% of survey respondents rated themselves as 'extremely knowledgeable',[11] whereas post-GROW, 43% did so, with the overall mean average rating[12] for knowledge increasing from 5.9 to 8 (GROW impact survey). For LLMIC researchers, increased knowledge was mainly focused on their understanding of the theory and practice of interdisciplinarity and its role in delivering impact-focused work.[13] LLMIC researchers also highlighted sharing of learning between researchers and research stakeholders, and the importance of fostering a learning culture within universities which values and encourages interdisciplinary research.

> *I increased my skills in interdisciplinary research. I learned about the need for a dialogue of knowledge with other cultures, between researchers of different areas, between rural communities and researchers. (Impact survey respondent 120 - LLMIC)*

UK researchers (most of whom were in senior-level roles), highlighted increased understanding of the planning and implementation of large-scale, challenge-focused, interdisciplinary research, where knowledge was gained primarily through practical 'hands-on' involvement. Many UK researchers highlighted how the GROW programme was itself an opportunity to transfer knowledge and learning between people, disciplines and geographic areas; and that direct engagement with LLMIC partners provided many personal, and inspirational, learning opportunities.

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[11] Rating of 9-10, on a scale where 0 equated to 'not at all knowledgeable' and 10 to 'extremely knowledgeable'

[12] Mean average of the sum of all ratings submitted by respondents

[13] The GROW process evaluation found that the programme encouraged award holders to embrace interdisciplinary ways of working and many researchers felt their 'interdisciplinary learning journey' was one of the most unique and valuable aspects of the programme.

> *Being a Co-I on a GROW project gave me a great insight into regions of the world where I had not worked before. I also had the opportunity to lead two of the four work packages of the project and whilst I had already had considerable leadership experience, this was different, and it enabled me to develop my skills in relation to working with a wide range of people of different ages and a huge insight into how our work could potentially improve livelihoods. I found that inspirational and have gone on to be PI on two further projects and now Co-I on a third. This has meant that the work that started through the GROW project is continuing and making a real difference on the ground. (Impact survey respondent 259 - UK)*

Other areas of increased knowledge and learning mentioned by UK researchers included specific areas of methodological knowledge; co-creation and knowledge exchange with partners and stakeholders; conceptual aspects of ODA R&I; training on capacity strengthening; and better understanding of the UN SDGs.

Increased appreciation of the value of challenge-led research

Increased appreciation of the value of challenge-led R&I was also an outcome of involvement in GROW. Pre-GROW, 24% of impact survey respondents rated this as 'extremely important', whereas post-GROW, 61% did so, with an increase in the overall mean average rating for importance from 7 to 8.5 (GROW impact survey). Both LLMIC and UK researchers highlighted their increased appreciation of research which is clearly focused on UN SDGs and real-world issues as a means for achieving development impact. UK researchers reported more appreciation of the value of direct visits and first-hand collaborations with LLMIC partners as a means to achieve development impact. UK researchers highlighted how this direct engagement had enabled them to gain fuller insight into the nature and extent of challenges faced by partners and the central importance of co-producing research and knowledge with partners in the Global South, alongside capacity strengthening initiatives both in the UK and in LLMICs.

> *My journey through this project has transformed my view of the importance of challenge-led, interdisciplinary research for development impact. I now recognize it as essential for addressing complex global health challenges and achieving sustainable development outcomes. Ultimately, this approach ensures that scientific endeavours lead to meaningful improvements in the lives of those affected by neglected tropical diseases. (Impact survey respondent 272 - LLMIC)*

> *Working closely with our international partners, I gained insight into the societal and human challenges related to tackling gender-based violence. Hearing first-hand accounts through our research of the traumatising and often devastating experience of some of the participants, made a deep impact on me in terms of realising the urgent need for a) the research itself, and b) application of findings to improve people's lives, and to prevent violence. (Impact survey respondent 144 - UK)*

As we have seen, experiential learning, through direct engagement with others, was a strong and significant theme, especially so for senior and mid-career individuals. Impact survey respondents reflected their increased appreciation of the importance of direct visits and first-hand collaborations

with project partners as a means to fully achieve development impact. UK researchers also highlighted how this direct engagement had enabled them to gain fuller insight into the nature and extent of challenges faced by LLMIC partners and the central importance of co-planning and co-production of research and knowledge with partners in the Global South.

> *Working with the [project] partners and seeing how much they're managing to achieve with so few resources, was humbling and made me realise how immensely important it is to knowledge-share across international boundaries. My understanding of how horrifically underrepresented the Global South is in biological databases also increased. There's an urgent need to democratise biodata science. (Impact survey respondent 151 – UK)*

Increased skills to deliver challenge-led research

GROW participants reported increased skills to deliver challenge-led R&I, including both award-relevant research areas and underpinning/transferable knowledge and skills, such as communication, research leadership and management. Pre-GROW, 13% of impact survey respondents rated themselves as 'extremely skilled', whereas post-GROW, 42% did so, with the overall mean average rating for delivery skills increasing from 6.2 to 7.9 (GROW impact survey). LLMIC researchers described a range of enhanced research and transferable skills in areas such as communication, budgeting, leadership/management skills, and implementing specialised equipment and new methodologies. They appreciated the opportunities brought about through the GROW programme for experiential learning, and through engagement with other partners, so building their skills and experience to deliver challenge-led interdisciplinary research in the future.

> *My project management skills have improved significantly. I've learned to effectively plan, execute, and monitor projects, ensuring they stay on track and meet their objectives. I've been exposed to new career paths and opportunities that I hadn't considered before. The interdisciplinary nature of the GROW programme has highlighted various ways in which I can apply my skills and knowledge. (Impact survey respondent 168 - LLMIC)*

Similarly to LLMIC researchers, UK participants reflected that 'learning-by-doing' had enabled them to develop the necessary communication, management and leadership skills to successfully deliver the type of challenge-led interdisciplinary research required by the GROW programme. Some UK PIs and Co-Is highlighted how involvement in GROW had helped them to push beyond the boundaries of their existing skills and knowledge, sometimes in ways that felt 'uncomfortable', but which ultimately led to significant and potentially 'life-changing' impacts for themselves, other stakeholders and the research itself. A key message from UK researchers was the central importance of learning through direct engagement with members of their team. There was a strong sense that the expectations of the GROW programme, to collaborate equitably with partners to deliver challenge-focused and interdisciplinary research, provided unique opportunities for skills development

> *The project offered everyone the opportunity to contribute to the research and professional development of colleagues, as well as receive the benefits of the contributions from those*

colleagues - this included the research project staff along with the academic staff. To me, the involvement of everyone and the distribution of power have become significant elements of research design, and I promote these to researchers, academic leads and among the sector whenever possible. (Impact survey respondent 237 - UK)

Enhanced partnership development skills

Enhanced partnership development was another notable capacity building outcome for individuals. Pre-GROW, 15% of impact survey respondents rated themselves as 'extremely skilled', whereas post-GROW, 45% did so, with an increase in the overall mean average rating for partnership skills from 6.1 to 8 (GROW impact survey).

Both LLMIC and UK researchers reported increased skills in areas such as cross-cultural communication, building equitable and ethical relationships, accessing and mobilising technical and financial resources, understanding the motivations, strengths and capacities of different partners, more knowledge about how to set up interdisciplinary research/teams, stakeholder engagement including with policy makers and public/non-research communities, and better access to new networks and potential partners with whom to collaborate.

Once again, experiential learning was highlighted as key to partnership skills development, including the importance of learning from challenges and through exposure to a range of international partners.

Collaborating with colleagues from various countries has enabled me to better understand local needs and develop interdisciplinary research tailored to those needs, which differ from those in my own country… I have acquired additional skills necessary to lead and execute these projects, including expanding my network to include colleagues from diverse fields. For instance, I have learned to integrate scientists from social studies into my projects, an area I had not previously explored. (Impact survey respondent 177 - LLMIC)

As mentioned earlier, having an extensive network of colleagues from different countries allows me to select research partners from various parts of the world. For example, this project provided me with the opportunity to collaborate closely with partners from Africa, which was a first for me. (Impact survey respondent 177 - LLMIC)

I learned so much, about cultural and disciplinary differences, about what really matters and how to work together despite a range of challenges, to make truly impactful research happen. (Impact survey respondent 188 - UK)

Increased motivation and confidence

The impact evaluation also found evidence of increased levels of motivation and confidence to facilitate challenge-led R&I, for individuals at senior, mid and ECR levels. Pre-GROW, 25% of impact survey respondents rated themselves as 'extremely motivated', whereas post-GROW, 61% did so, with an increase in the overall mean average rating for motivation from 6.9 to 8.4 (GROW

impact survey). Similarly, respondents reported an increase in feeling 'extremely confident' from 11% pre--GROW to 48% post-GROW, with the average rating for confidence increasing from 5.9 to 8.1.

GROW participants said their motivation and confidence had increased through learning-by-doing, through collaborative working with inspirational partners, by trying out new and innovative methods, and crucially, through witnessing the real-life and tangible impacts that effective interdisciplinary research can have on knowledge, health, practice and policy.

> *Seeing the direct impact of our research on communities and development outcomes has been immensely rewarding. Witnessing positive changes and knowing that our work is making a difference has provided a profound sense of fulfilment. This tangible evidence of the project's value has further fuelled my motivation and commitment. Also, the support and encouragement from project leaders and team members have played a crucial role in this motivational shift. Their dedication, enthusiasm, and belief in the project's mission have been contagious. Regular feedback, recognition of achievements, and a collaborative working environment have all contributed to my increased motivation. (Impact survey respondent 168 - LLMIC)*

Researchers also reported that through GROW they had engaged with challenges and complexities, learnt from partners through interaction and feedback and now felt more confident, skilled, and knowledgeable to lead and facilitate similar research in the future. Indeed, many people were already doing so since the end of the programme. Other research leadership roles since GROW included building consortia for new projects, bidding for multi-partner funding, establishing and managing new research units, and some cases, applying for and gaining high-level promotions.

> *My confidence increased a lot to the point where although mainly a geneticist working on malaria vectors, I formed a consortium to work on mathematical modelling for effective vector control in Africa and was successful in obtaining a $3 million grant from Gates Foundation. (Impact survey respondent 75 - LLMIC)*

> *The project allowed me to build a wide network of academic and non-academic contacts, which will be essential to continue work with interdisciplinary research. Furthermore, the results obtained in the project allowed me to generate the necessary indicators for my academic promotion to the position of full professor. (Impact survey respondent 163 - LLMIC)*

> *The experience I gained though the GROW project and the wide range of tangible outputs increased my confidence. It was possible to see that the approach we were taking in the project was beginning to show real results. Seeing the early career researchers on the project publishing their work and gaining jobs gave me confidence that the approach we were taking was having a positive impact. (Impact survey respondent 259 - UK)*

However, many researchers (mainly from the UK) referenced frustrations and a degree of 'dampened enthusiasm' due to difficulties in continuing to access the type of funding opportunities

afforded by the GROW programme, particularly in the light of the 2021 ODA budget reductions. The belief that the GROW programme was a rare and unique opportunity to address barriers and cross regional, operational and academic boundaries was highlighted.

> *My optimism that programmes like GROW will continue to have an impact was dimmed by the premature cuts in ODA funding. (Impact survey respondent 71 - UK)*

> *I am now much more committed to operational work, supporting the live delivery of services in Africa. The success of the project underlined the need for funding to cross existing barriers and boundaries, between UK and African research, between research and development, and between operational and academic sectors. The GROW programme was almost unique in allowing this. It is frustrating that comparable funding does not exist to allow this kind of boundary-crossing work to continue. (Impact survey respondent 219 - UK)*

Enhanced research productivity outcomes

Nearly two-thirds of awards (n=23) reported research productivity outcomes for individuals from LLMICs and one-third of awards (n=12) noted these outcomes for UK-based individuals. These outcomes included obtaining higher qualifications, developing research proposals, securing further funding, and contributing solely or jointly to project outputs such as conference presentations and publications (project reporting, Researchfish data and GROW impact survey). Increasing the academic writing skills of early career researchers, both for grant proposals, and for publications, was a key focus for capacity strengthening activities.

Enhancing research outcomes and creating a cohort of LLMIC research leaders

The Tobacco Control Capacity Project (TCCP) noted that all the LLMIC research fellows involved in the award had published journal articles, many had secured grants for follow-on work, and others had taken on editorial positions, senior-level posts, and presented at national and international conferences. Several fellows had also been commissioned by government agencies to conduct tobacco control research and to join national tobacco control advisory committees. Together, these developments supported the creation of a strong cohort of research leaders with capacity to sustain on-going LLMIC research on tobacco control and non-communicable diseases.

In terms of registering for, or obtaining higher qualifications (predominantly doctorates), 14 awards provided evidence of LLMIC team members doing so, and eight awards noted this outcome for some of their UK team members. This shows that many early career individuals had successfully drawn on recently acquired learning and skills, built on data and methodological issues encountered during GROW, and had begun to develop independence as researchers and scientists.

The GROW impact survey also found that 53% of LLMIC respondents and 57% of UK-based respondents felt involvement in the programme had helped them to secure further funding, the

most commonly cited funding type being research grants. Key sources of funding included charitable foundations (LLMIC respondents 32% of all funding sources; UK respondents 21% of all funding sources), public sector/research councils (LLMICs 31%; UK 45%) and universities (LLMIC 29%; UK 31%). For both LLMIC and UK researchers, new grants leveraged through involvement in GROW enabled them to sustain partnerships, continue to work on data collected through GROW, and develop and extend collaborations and networks to explore new areas of scientific inquiry.

> *My skills have also significantly increased as evidenced by a successful application to a UNITAID call of >$15M that I am leading with several partner thanks to the skills also obtained throughout the 4 years of PIIVEC. (Impact survey respondent 75 - LLMIC)*

> *Having never previously worked in Africa, I went on to raise two grants (with BBSRC and the Gates Foundation) for further work in Africa -- as well as a sabbatical fellowship to work there for 5 months. (Impact survey respondent 248 - UK)*

Researchfish data indicates that for 36 projects, involvement in the programme had contributed to further funding of over £420 million for ODA R&I, demonstrating GROW's additionality in contributing to research capacity at institutional level and to the sector more broadly. This is discussed further in section 2.2.

Career progress and continuation in research-active roles

Involvement in GROW enhanced career progression for many LLMIC and UK individuals, enabling most to remain in research-active roles. Nineteen awards provided examples of LLMIC GROW participants taking up more senior university positions in-country or elsewhere or moving into industry or policy positions (project reporting and Researchfish data). Some survey respondents also gave examples of the 'life-changing' nature of involvement in the programme, such as significant (professorial-level) promotions and enhanced professional reputations.

> *When I started this project as the case study lead (2017), I was a senior lecturer in my university and during the implementation of this project, I was promoted to associate professor (2020) and I have recently been promoted to full professor (2024) which I must thank the programme for providing me the opportunity to become more mature and capable in leading interdisciplinary project for development impact. (Impact survey respondent 181 - LLMIC)*

In one project (Establishment of biopharmaceutical and animal vaccine production capacity in Thailand and neighbouring South East Asian countries) three of the LLMIC research assistants moved on to positions in the Thai Biotechnology industry, demonstrating knowledge and capacity transfer to industry, essential in this case for ensuring economic impact through strengthening the biotechnology sector in Thailand. The PEAK project also cited an example of knowledge transfer through career progression, whereby the LLMIC Co-I was invited to serve as Transport Secretary in the Colombian city of Medellin, providing an opportunity for the remaining project team to connect theory with practice and collaborate with citizens and stakeholders.

Regarding UK GROW participants, nine awards mentioned examples of career progression. For example, a UK researcher involved in the None in Three (Ni3) project was mentored by the PI to take on her first Co-I role on an international grant. In doing so she gained confidence to lead the publication strategy for her work package, contribute to grant writing for further projects and obtain promotion to Deputy Head of Department.

Post-programme, most UK and LLMIC individuals leaving employment on GROW projects remained in research-active roles (80%), with two-thirds (61%) being academic/university-based roles. Although these data are not disaggregated by home country of leavers, they show that of those who stayed in research-active roles, 32% remained in, or moved to, a LLMIC. For the 67% whose next destination was a non-LLMIC, 44% remained in, or moved to the UK, 10% to the United States, and 12% elsewhere.

Enhanced professional reputations

Involvement in GROW enhanced professional reputations for individuals through external markers of professional esteem such as journal editorships, keynote presentations, prizes, medals, advisory positions, and so on. Researchfish data captured details of awards made to GROW employees and participants in recognition of research excellence. Of the 521 outcomes recorded, 133 (26%) were linked to individuals from LLMICs. The majority of reported outcomes related to individuals from the UK (63%; n=330). Figures 2 and 3 show the distribution of types of external markers of professional esteem by individuals from both LLMICs and the UK.

The two most commonly cited areas of recognition were being asked as a keynote speaker to a conference and being appointed to an external body in a prestigious, honorary or advisory position. We can see that in both of these areas, significantly fewer individuals (both numerically and proportionately) from LLMICs were recognised. There is no baseline for comparison of LLMIC markers of recognition, either pre-GROW, or when measured against other similar programmes. Moreover, it may be that Researchfish indicators are biased towards the experiences and expectations of countries in the Global North and that other markers may be used by LLMICs and therefore not accounted for. Equally, the dataset may also be skewed towards UK partners as PIs (all of whom were UK-based) are expected to complete Researchfish on behalf of their project partners. Nonetheless, there remains a discrepancy between outcomes for individuals from LLMICs and the UK in terms of enhanced professional reputations. It is important to seek to address this discrepancy in future programmes in terms of recording, definition and access to opportunity.

Figure 2: Markers of professional esteem linked to individuals from LLMICs (Researchfish: Awards and Recognition dataset, March 2024, n=133)

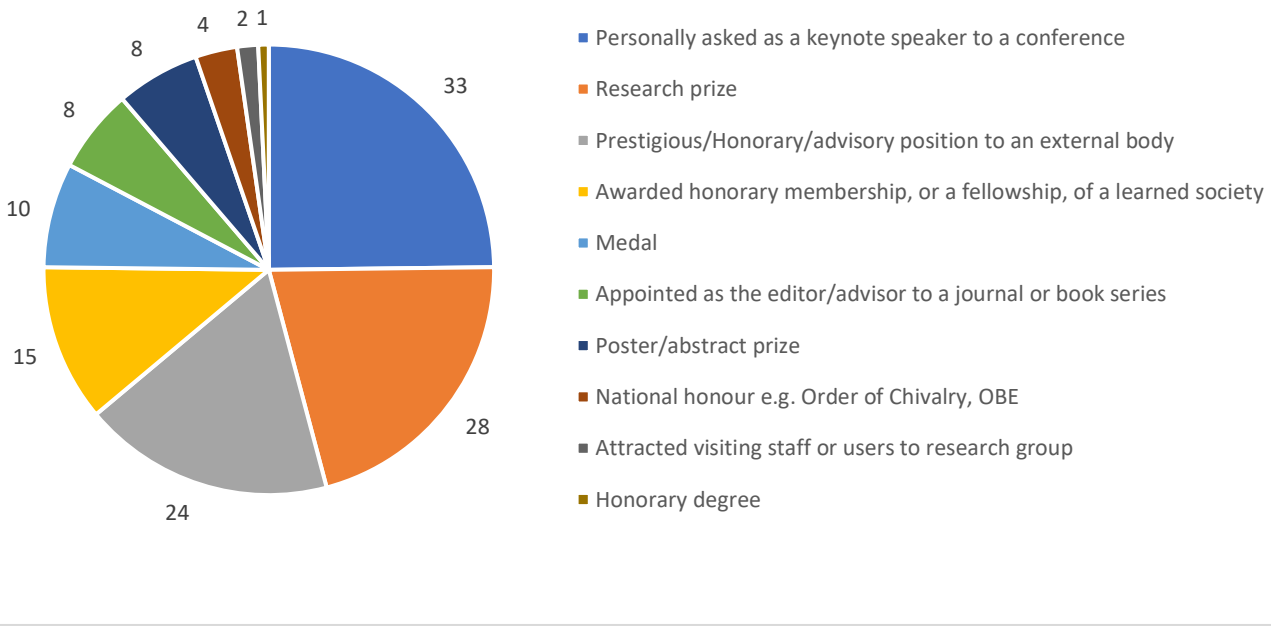
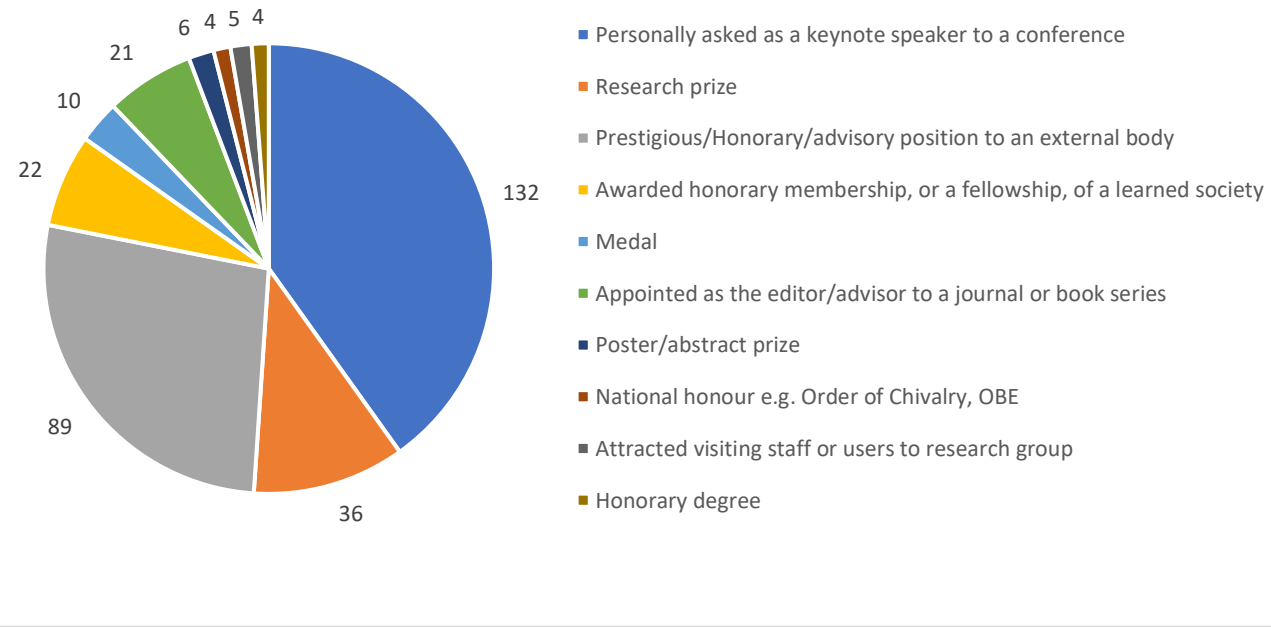


Figure 3: Markers of professional esteem linked to individuals from the UK (Researchfish: Awards and Recognition dataset, March 2024, n=330)



2.2. Capacity strengthening for institutions

Key points

- ➔ In addition to strengthening the research capacity of individuals, the GROW programme built capacity and capability at institutional level and, to a more limited extent, at a research ecosystem level.
- ➔ At institutional level, the evaluation found more evidence of capacity and capability strengthening outcomes for LLMICs than for UK-based institutions. The strongest benefits for institutions were:
  - Enhanced reputation - 86% of LLMIC respondents to the impact survey and 67% of UK respondents said that their organisations' reputations had increased moderately or greatly
  - Enhanced research achievements - 85% of LLMIC respondents to the impact survey and 68% of UK respondents said organisational achievements had increased moderately or greatly
  - Enhanced workforce - 84% of LLMIC respondents to the impact survey and 63% of UK respondents said that their organisations' workforce had been moderately or greatly enhanced.

Overview of capacity strengthening outcomes for institutions

Involvement in GROW led to some significant research capacity strengthening outcomes for both LLMIC and UK institutions (project reporting, GROW impact survey). Figure 4 summarises the outcomes in this area and shows that the strongest benefits were:

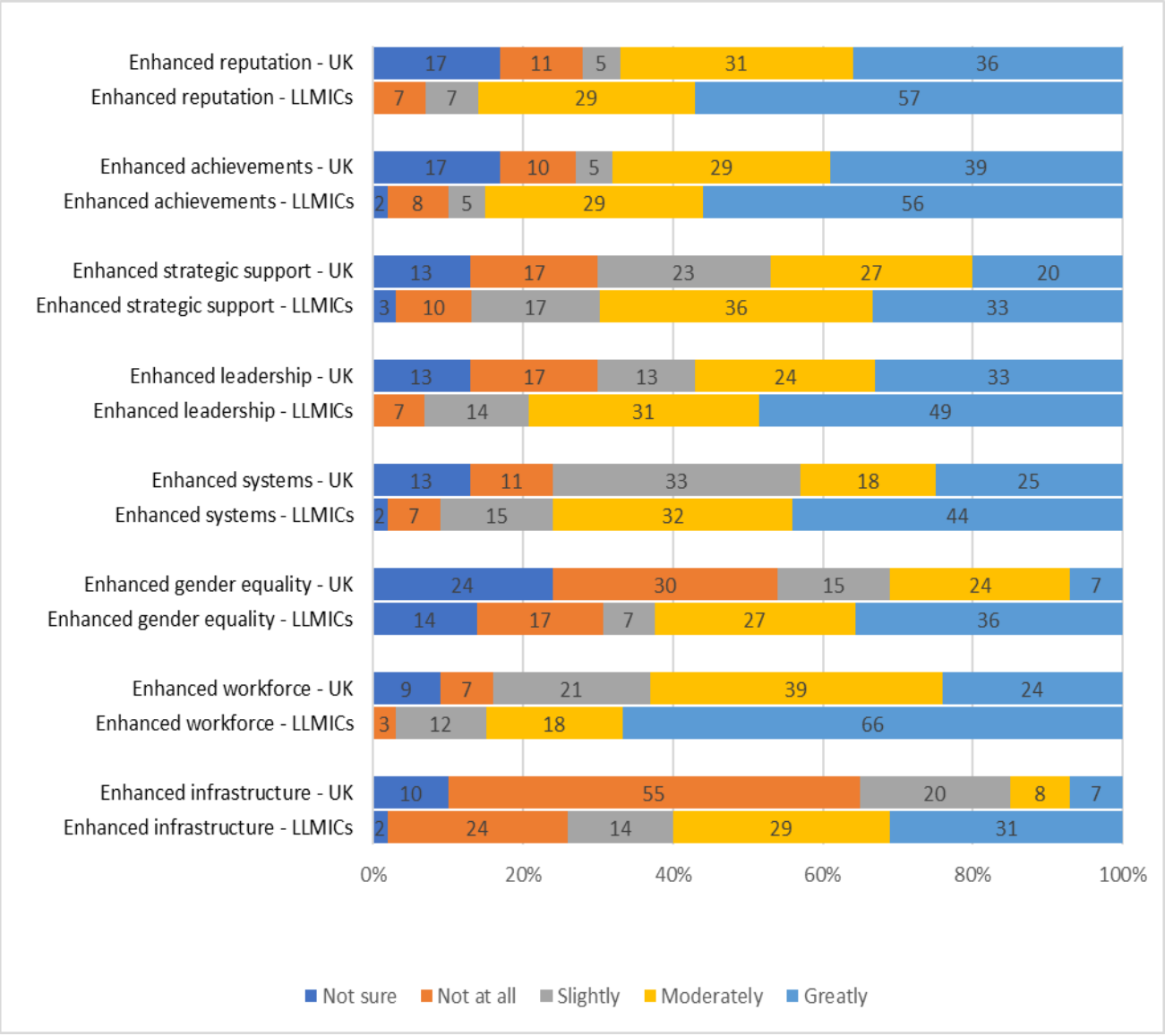
- Enhanced reputation
- Enhanced research achievements
- Enhanced workforce.

Other areas where GROW had contributed, greatly or moderately, to LLMIC and UK institutional-level capacity strengthening included:

- Enhanced leadership
- Enhanced strategic/financial support
- Enhanced systems
- Enhanced research infrastructure (LLMICs only)
- Increased gender equality (LLMICs only).

The extent and nature of institutional capacity outcomes appear to differ from those documented by the wider GCRF evaluation[14] of its signature investments (including GROW) which found little evidence of institutional capacity strengthening, whilst the GROW process evaluation[15] found 'some interesting examples of projects building capacities of Southern institutions in specific areas'. The differences may be indicative of the longer timescales needed for such outcomes to emerge.

Figure 4: Extent to which GROW made a difference to UK and LLMIC partner organisations (GROW impact survey, UK respondents n=84, LLMIC respondents n=69)



[14] See footnote 3

[15] See footnote 4

Enhanced institutional reputations

Of LLMIC respondents to the GROW impact survey, 86% felt that involvement in GROW had enhanced the reputation of their institution or organisation, with only 7% feeling there had been no difference reputationally. For UK respondents, 67% felt that GROW had brought great/moderate reputational benefits at institutional level, with just 11% saying it had made no difference. Reputational impact was described in terms of other more easily quantifiable factors, such as increased research productivity through grants and publications, and the development of new partnerships.

Enhancing institutional reputations through markers of external recognition

- TIGR2ESS was awarded the University of Cambridge Vice-Chancellor's Collaboration Award for Research Impact and Engagement for 2021-22. A summary of TIGR2ESS outputs was highlighted at the 2024 UKIBC (India Business Council) annual meeting in November 2024 at the India High Commission.
- SUNRISE received awards from Times Higher Education (International Collaboration of the Year) and from The Engineer (Collaborate to Innovate 'Future Thinking' Award), helping establish the UK as a hub for international collaboration in solar energy research.
- CABANA has been used repeatedly at EMBL-EBI[B1] (UK/institutional level), and sometimes in an EMBL-wide (European level) context, as a good model for challenge-led capacity strengthening. It played a role in EMBL's MoU with UNESCO and is being used as an illustrative model to secure strategic funds for global, open biodata science.

[B1] European Molecular Biology Laboratory's European Bioinformatics Institute, based at the Wellcome Sanger Institute, UK

Some projects highlighted national or international awards and markers of external recognition, which helped to solidify and raise awareness of institutional reputations for world-class ODA R&I. In some cases, involvement in GROW had made a significant difference to the reputation of embryonic LLMIC institutions, enabling them to build strong foundations for research leadership scientifically and geographically, as evidenced by new funding, new research collaborations and increased engagement with inter/national stakeholders and policy makers.

Building reputations of early-stage LLMIC institutions

- The Kachinland Research Centre (KRC) in Myanmar was founded just before its involvement in GROW and has already built a strong local reputation. This was reflected in its recent appointment as the Kachin State coordinator for a major USAID project on drugs and HIV/AIDS.
- The Centre for Research in Infectious Diseases (CRID) in Cameroon was newly established at the start of the GROW programme. It built its reputation through involvement in GROW, has gained several large grants as lead partner, has one of the highest concentrations of Wellcome Trust fellows in Central Africa and is now hosting a research unit from the Liverpool School of Tropical Medicine, enabling continued collaboration with UK researchers.

Enhanced institutional-level research achievements

Enhanced institutional-level research achievements as an outcome of GROW was noted by 85% of LLMIC survey respondents and 68% of UK respondents and specifically mentioned by 17 awards in their project reporting. Involvement in GROW has contributed to increased institutional capacity to publish and to secure grant funding, through greater levels of skills and confidence in academic writing by individuals and project teams. Many projects created publication opportunities for ECRs and LLMIC partners, for example through journal special issues, monographs or report series. There were also examples of specially convened national and international conferences to showcase project findings and provide opportunities for researchers to present/publish their work as proceedings. For example, members of the COMPASS research team participated in over 40 virtual conferences and workshops, 20 expert meetings, and organised over 50 talks and presentations. COMPASS organised 'signature' conferences at partner universities; and developed five journal special issues.

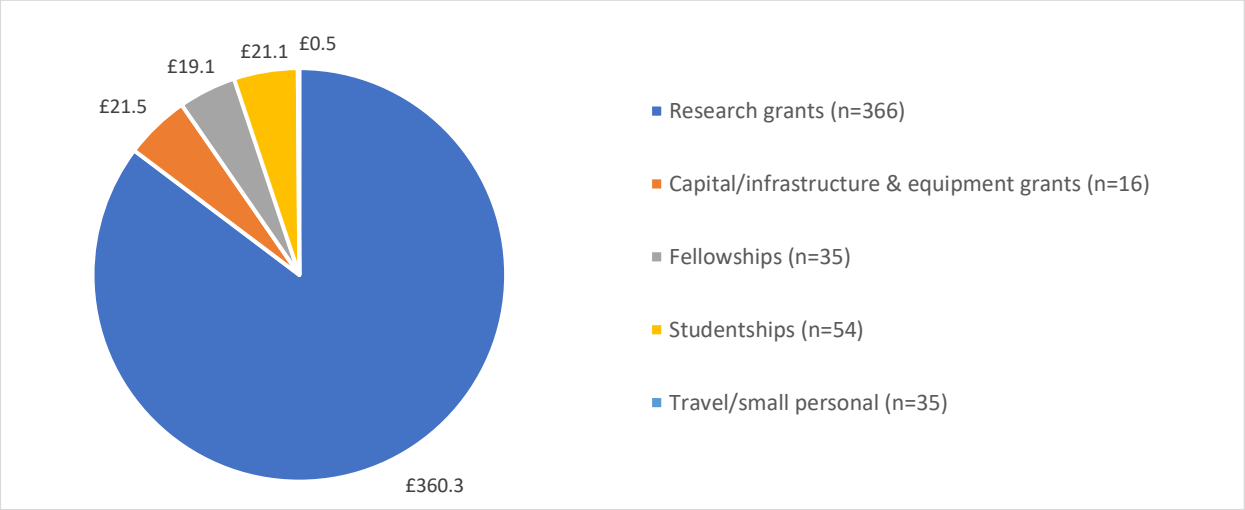
Across the portfolio, the 37 projects recorded 4,287 separate published outputs linked to the GROW programme.[16] Publications by project ranged from 9 to 378, with a mean average of 116 publications per project. As might be expected, the most frequent form of publication was journal articles (n=2,828), with at least nine or more articles produced by each of the 37 GROW awards and a mean average of 76 journal articles per project. One project recorded the publication of 377 journal articles. Outputs rose steadily from the start of the programme in 2017 (45 publications by 15 projects), peaking in 2021 when all 37 projects produced a combined annual total of 1,167 publications.

Researchfish data recorded 506 new grants across 36 awards by March 2024[17], amounting to a sterling equivalent of over £420 million of funding leveraged through the GROW programme. Most of the further funding was for research grants (72%; n=366), with at least two or more research grants secured by each of the 36 GROW projects who submitted data. Figure 5 shows the distribution of further funding by type. The mean average number of grants per project across all funding types was 14, and the mean average total funding was £11.7 million per project. The range was from two to 43 grants per project and the mode was nine.

[16] Researchfish reporting for March 2024 – this number could have increased significantly since that date.

[17] As above, data is based on Researchfish data from March 2024.

Figure 5: Distribution of further funding by type and value in £millions (Researchfish: Further Funding dataset, March 2024, n=504)



Just over half (53%; n=269) of the new grants reported were for work undertaken during the lifetime of the programme (up until March 2022), with 41% of funding (204 grants over 33 projects) continuing beyond the end of the programme (6% of grants supplied no data on end dates). Over 20 grants were not due to complete until at least five years post-programme, with five continuing beyond 2029. These findings show that almost all GROW projects (89%) have continued some form of sustained research and/or capacity building activities at institutional level well beyond the end of the programme. Further examples of sustained research and/or capacity building activities at institutional level can be found in the case studies in Annex C.

Sustaining research and/or capacity building post-GROW

- GROW partners the University of Kent and BIOTEC (the National Center for Generic Engineering and Biotechnology) in Thailand jointly secured two new collaborative grants (Newton Advanced Fellowship and a Royal Society International Collaborations Award). The PI reported that these projects were working well and were a 'direct consequence' of the partners' involvement in the GROW project.
- UK and LLMIC partners involved together in TCCP were awarded a £2 million NIHR Global Health Research Group grant to establish a consortium focusing on smokeless tobacco use in South Asia (ASTRA). ASTRA expands TCCP and both programmes have benefitted from each other.
- The BRECcIA team have continued activity that began with the GROW programme and led to an institutional level practice sharing event (2023) and a week-long international event (2024) funded through a Global Partnership Award (a collaborative application by the Universities of Southampton and Ghana) positioning the UK and LLMIC partners to apply for upcoming research management capacity strengthening funding.

Enhanced workforce

Through their involvement in GROW, LLMIC and UK institutions strengthened the capacity of their workforce to better address global development challenges. Eighty-four per cent of LLMIC respondents to the impact survey and 63% of UK respondents said GROW had contributed to workforce benefits, and 17 awards made specific reference to enhanced workforce capacity in their project reporting.

Areas of increased and strengthened capability included studentships and fellowships, recruitment of new staff, retention of existing staff, increased interdisciplinary connections across and within research teams, and the development of a workforce better trained to manage and deliver challenge-led research and to cascade their training to others. Thirteen projects mentioned the importance of building institutional capacity in the administration and financial management of ODA R&I, alongside building the research and engagement skills needed to respond to international development challenges. A university in India is using the SUNRISE programme to inform teaching, enabling undergraduates to critically consider issues regarding energising rural communities and equipping them with the skills to tackle such challenges. Universities in Latin America have drawn on tutorials developed by CABANA in their undergraduate and postgraduate courses on computational biology and bioinformatics

Other institutional-level capacity building outcomes of GROW included enhanced leadership, improved strategic and financial support and enhanced systems for managing ODA R&I projects. Other projects described how the GROW funding had enabled LLMIC institutions to recruit and crucially to retain, key staff and in some cases to support the return of researchers previously lost to institutions in the Global North. These examples show how workforce capacity building has already helped to change culture and to leave a legacy beyond the GROW programme.

Enhancing skills for managing large-scale grants

- Two of the LLMIC institutions involved in CEPHaS attributed positive changes in financial management of large-scale grants (such as the introduction of pre-and post-award finance systems) to their involvement in GROW and their learning helped to sustain two further funded projects with their GROW partners.
- GlobalSeaweedSTAR reported that capacity building in administration and financial management had enabled LLMIC partners to gain confidence to apply and be successful in securing further funding from UK and EU funders, meaning continued and sustained collaboration between the international partners.

Recruiting and retaining a skilled workforce

- The GCRF-Crick African Network explained how involvement in GROW had helped LLMIC partner institutions to retain staff in the career pipeline, and in the case of four researchers, catalysed their return to the African continent following international training.
- BRECcIA enabled an institution in Kenya to undertake a research management bench marking exercise with a research-intensive institution in South Africa, which led to continued dialogue around research management, processes and structures. The project also enabled the first ever postdoctoral researchers to be recruited in two institutions.

There were examples from the UK too. The TCCP project funded three new posts at UK universities, providing new international engagement opportunities for individuals whilst also strengthening institutional and UK capacity to undertake research into global health and tobacco control. Similarly, R4HC-MENA recruited eight new UK-based postdoctoral fellows into the area of conflict and health and appointed several visiting fellows from LLMICs to bring new capacity to the UK in a range of areas, including radiotherapy research for conflict settings. In another project, UK partner universities gained considerable experience in liaising with their Thai counterparts, enabling them to develop systems for financial reporting that were used in developing new GCRF and Newton grant applications.

These examples show how the programme helped train, recruit and retain a critical mass of skilled researchers in key areas, themselves able to cascade their learning to others. Thus, capacity was increased, interest catalysed, and a legacy built, both in LLMIC and UK institutions, to develop new projects to respond to development challenges and to continue to address UN SDGs. One UK survey respondent summarised this impact as follows:

> *Not only has GROW yielded benefits to local communities, regional and national governments, but it brings benefits to the institutions and a whole range of individuals involved. I am enormously proud of the fact that through the research we have created a new generation of researchers who can approach research in an inclusive and interdisciplinary way, and who also appreciate that impact for development is a central component of what they do - and not just 'a nice to have' after they have published papers! (Impact survey respondent 237 - UK)*

Enhanced investment in infrastructure

Investment in infrastructure was also a capacity building outcome for around half of the LLMIC institutions involved in GROW. Sixty per cent of LLMIC respondents to the GROW impact survey agreed that this had been a great/moderate benefit for their institutions, and 15 awards referenced enhanced infrastructure in their reporting. Figure 5 shows that in addition to investment provided through GROW, £21.5 million was leveraged by projects for capital projects and equipment, providing an infrastructure capacity legacy beyond the programme. New resources included small

equipment (computers, software, databases, etc) and some larger additions including biobanking facilities, upgraded microscope and imaging facilities, commissioning of new laboratories, expansion of biopharmaceutical production and other fabrication/processing facilities, and in a few cases, the creation of new centres for research and scientific enquiry. Examples where GROW has contributed to institution-level investment in infrastructure are numerous and include:

- Upgraded microscope facilities and expansion/digitisation of the seaweed collection in the University of Dar es Salaam's herbarium (GlobalSeaweedSTAR)
- Commissiong and completion of the University of Nairobi's One Health field laboratory in Oloitoktok, Kenya (HORN)
- Provision of bespoke spatial photocurrent mapping facilities and creation of a hub for fabrication processes at the Jawaharlal Nehru Centre for Advanced Scientific Research; photo-deflection spectroscopy and integrated glovebox-cluster tool set up for tandem cells at the Indian Institute of Technology (IIT) Bombay); large-area spray deposition chamber for safely depositing perovskite solar energy materials at IIT Delhi; and creation of a Centre for Energy Research delivering a Masters programme and short-course for academics at IIT Kanpur (SUNRISE)
- Provision of tools and equipment (databases, retinal cameras and lasers) to support LLMIC partners to undertake research into blindness in India. (ORNATE India)
- Provision of resources for partners to buy equipment and software, such as NVivo and GIS licenses, laptops/mobiles for fieldwork data collection, and server capacity for storing and analysing data. (Drugs and (dis)order)
- Creation of a new centre for palliative care for conflict and refugees at the King Hussein Cancer Centre in Jordan (R4HC-MENA)
- Creation of the first national centre for research on suicide prevention in Pakistan (SASHI).

2.3. Capacity strengthening outcomes at research ecosystem level

Key points

➔ At a research ecosystem level, the main outcomes for LLMICs included development of wider training, creation of data infrastructures, and increased strategic/financial support for ODA R&I.

➔ There was little evidence of research system level outcomes in the UK, but this is to be expected as GROW was designed to grow capacity in LLMICs but increase the ability of UK participants to support this.

Research ecosystem-level outcomes for LLMICs

The evaluation found some interesting examples of research ecosystem level capacity building outcomes mainly for LLMICs (examples were given by 32 of the 37 projects). For LLMICs these benefits included:

- Access and interpretation benefits including improved access to data and skills:
  - Knowledge and skills transferred to wider sector (e.g. via trainers and e-learning platforms)
  - Enhanced regional/national access to GROW project data (e.g. creation of open access data, sample repositories, evidence banks, etc)
- Strategic and financial outcomes - enhanced regional/national support for ODA R&I.

In terms of access and interpretation, knowledge, skills and training gained through GROW awards have been cascaded across the research base in LLMICs and direct engagement between LLMIC and UK partners provided many key learning opportunities. For instance, CABANA reported that of LLMIC researchers seconded to the UK-based EMBL-EBI, more than 75% had participated in train-the-trainer activities and more than half had subsequently been invited to train on in-country bioinformatics courses, with minimal reliance on EMBL-EBI.

Evidence of on-going training beyond LLMIC partner institutions and award teams was provided by 27 awards, including in-person training as well as development of online learning platforms such as massive open online courses (MOOCS) and semantic web AI analyses. For example:

- TIGR2ESS offered training to marginalised women to become microentrepreneurs and culinary health educators. TIGR2ESS partners extended the programme to the nutritional benefits and potential for millets as fermented foodstuffs in Ethiopia and The Gambia.
- AFRICAN SWIFT provided training platforms for operational staff at African Meteorological Agencies.
- RECAP developed a training course which aimed to strengthen the use of key public health information to improve decision-making by humanitarian agencies. Participants were operational and programming staff from MSF, Save the Children and other humanitarian NGOs
- Thanzi la Onse (TLO) developed an online Global Health Economics Hub and East, Central and Southern Africa region health economics community workshops, to offer free training resources to facilitate health economics learning and knowledge exchange. Both initiatives have continued post GCRF with funding from the Global Institute for Disease Elimination (GLIDE), Abu Dhabi. This has included support for 16 African students to follow a MSc health economics distance learning, funded as match-funding by the University of York.

- The HORN eLearning platform is still available and provides over 15 hours of learning through 45 interactive lectures, covering One Health (OH) concepts and generic and transferrable skills. Currently 2,116 members on the HORN website, from institutions across 65 countries, have access to the content. (HORN)
- Blue Communities trained government staff, NGOs and members of local communities on different methods used in conducting research and in visualizing research outputs in the areas of tourism, park conservation, health and wellbeing.

Enhancing the research ecosystem through a massive open online course (MOOC)

Drawing on its own research findings, and those of other national and international projects, SOLTICE-WIO launched its first MOOC in 2020. The four-week course features over 30 video lectures, including footage of fieldwork, numerical ocean model animations, and visualisations of the remote sensing data and unique footage of local coastal communities and fisheries. The MOOC was created for continuous professional development for stakeholders within marine-related industries and has attracted more than 2,000 participants from 110 countries.

Creation of data infrastructures that will enable wider national and international LLMIC research communities to access and build on GROW research in the longer term was also reported by 22 awards, including biorepositories and online information systems and datasets. GROW also contributed to enhanced LLMIC regional and national support for ODA R&I, through increased strategic and financial support for research and innovation more broadly. This included influencing research-related policy and knowledge systems in-country and across regions through networks, policy work and stakeholder engagement. For instance, the health prioritisation model developed through TLO is being expanded to other African countries with funding from Wellcome. Work by R4HC-MENA has strengthened mental health policy within Lebanon, and developed capacity for cancer and palliative care policy, research and treatment in Jordan, through the creation of a new Centre at King Hussein Cancer Centre.

Creating data infrastructures to enable wider access to research

- PRECISE UK and LLMIC partners established the Baobab Laboratory Information Management System (LIMS) enabling African researchers to access biorepository data to develop hypotheses, funding applications and research careers. The data enables in-depth research across the scientific themes of PRECISE including discovery science, epidemiology, clinical innovation, health systems, and broader environmental enquiry.
- AFRICAP researchers have developed an online platform providing access to research results on crop modelling, extreme weather/climate modelling and the future implications of crop choices. The platform is designed for use by stakeholders in the agriculture-food and environmental sectors to help them address in-country challenges.
- CAPABLE built Bangladesh's capacity to control non-communicable diseases (NCDs) through the creation of a population-level NCD cohort to support cross-disciplinary research. The cohort recorded information on multiple risk factors, enabling a multi-dimensional, systems approach to NCD understanding and control. The cohort platform facilitated proof-of-concept studies on tobacco control, arsenic mitigation, air quality and female empowerment, and supported training for over 80 Bangladesh researchers in cross-disciplinary research.

Enhancing LLMIC regional and national support for ODA R&I

- A £2 million grant from the FCDO leveraged by AFRICAN SWIFT partners has helped to improve access to early weather warning systems in Southern Africa. This new project makes direct use of methods developed in SWIFT, including software and Standard Operating Procedures, to develop new early warning systems for vulnerable urban groups across Southern Africa.
- The BRECcIA team created a Research Management network (ReMNet) which has extended connections built through the project to include other institutions in Africa and the West Indies. The aim of this network is to bring together academic and professional service staff to address the issues that international research projects commonly encounter.
- One of the CABANA's secondees from the University of Costa Rica, secured a grant from the Chan Zuckerberg Foundation to establish a research network - CABANAnet - led by Latin American scientists for Latin American scientists. The award continues the activities of CABANA with workshops, secondments train-the-trainer activities, a seminar series and research innovation awards.

Research ecosystem-level outcomes for the UK

The impact evaluation found little evidence of research ecosystem level capacity strengthening outcomes in the UK as a result of participation in the GROW programme. This is understandable as the programme was designed to grow capacity in LLMICs whilst increasing the capability of the UK

to support this. Nonetheless, some UK free text responses to our survey of PIs and Co-Is concurred with the findings of the GROW process evaluation[18] which reported, for instance, evidence of new ways of working, a move away from academic publications as the primary measure of success, and the inclusion of indicators for capacity development, partnerships and outreach. Some researchers also highlighted the need for structural improvements in the UK, to create inclusive and respectful global mindsets and to improve the management systems and processes for supporting international research partnerships and the research outputs and outcomes they generate. GROW had raised awareness of and goodwill towards these issues within the UK research community, but there remains more to develop and build on to create UK system level change for better support of ODA R&I.

[18] See footnote 4.

3. Growing and sustaining research partnerships and collaborations

This chapter examines the extent to which and how GROW has met its objective to 'build stronger and lasting relationships between UK research organisations and research organisations and other partners (e.g., NGOs, governments and business) in developing countries' (EQ1/GROW objective 2). We also examine to what extent, and how, research partnerships and collaborations developed through GROW have been sustained.

3.1. Partnerships involved in delivering GROW awards

Key points

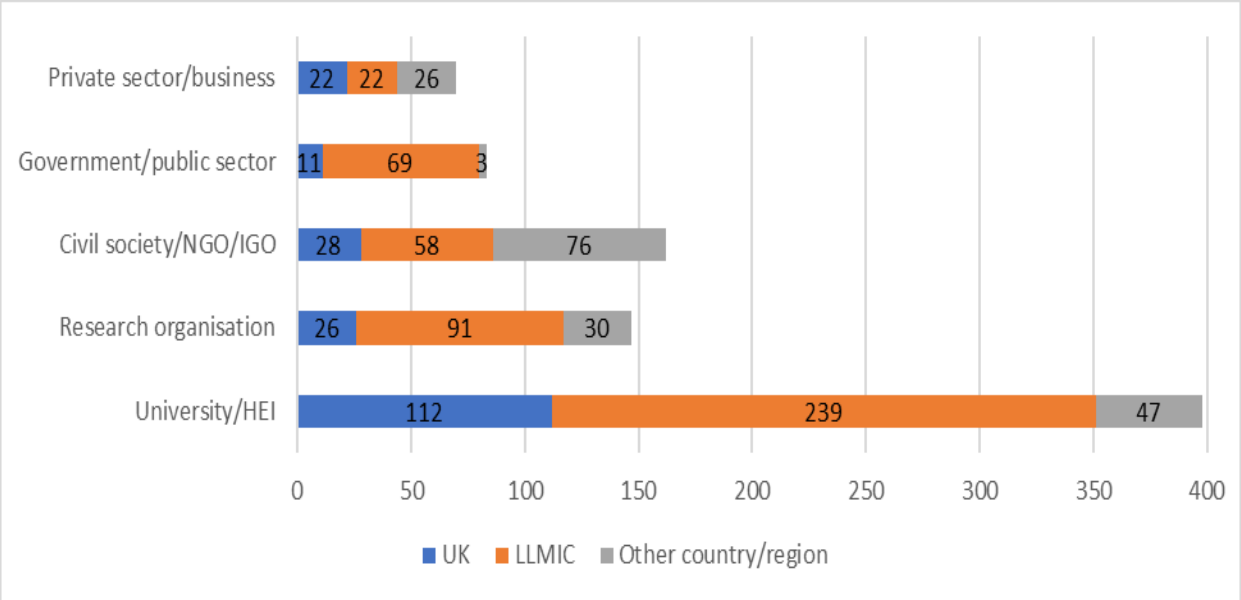
- The development of strong, lasting and equitable research partnerships and collaborations was an explicit focus of GROW and provided the foundation for the programme's aim to grow capacity for challenge-led interdisciplinary research. GROW helped project teams to build, strengthen and sustain diverse and multiple relationships between UK and LLMIC organisations (including civil society, researchers, academia, public sector, and private sector/businesses). Relationships were facilitated both at project partnership/delivery level, and in terms of new research collaborations developed through the programme.
- Each of the 37 GROW awards was led by a UK research institution working to deliver the project with several other organisational partners. The mean average number of partners per project was 23. In terms of delivery partner organisation type, 46% were universities or HEIs; 17% were autonomous research organisations; 19% represented civil society organisations; 10% included government departments; governmental organisations and public sector bodies; and 8% were private sector organisations.
- 90% of LLMIC-based respondents to the GROW impact survey felt their partnerships with UK-based organisations had been greatly/moderately strengthened through involvement in GROW. Similarly significant proportions of LLMIC respondents thought their in-country relationships had also been greatly/moderately strengthened (88%) as had their collaborations with other LLMICs (79%), showing the impact of GROW on knowledge exchange between countries in the Global South.
- Survey results for UK-based respondents were largely, and positively, similar: 86% agreed their relationships with LLMIC-based organisations had been greatly/moderately strengthened; and 74% said new and existing relationships with UK-based organisations had also been significantly strengthened through involvement in GROW. A few UK respondents did refer to existing personal contacts as a foundation for creating stronger relationships but also

acknowledged that their GROW awards catalysed pre-existing links to develop and expand in new and different ways.

➔ A high proportion of project delivery partnerships have been sustained in some form in the longer-term, despite the challenges presented by the Covid-19 pandemic and the 2021 ODA budget reductions.

At project partnership level, each of the 37 GROW awards was led by a UK research institution, working in collaboration with several other organisational partners, ranging from 5 to 76 partners per project. The mean average number of partners per project was 23 and one-third (n=13) of awards had 11 to 20 collaborating partners. Of the 860 partners listed (in addition to the 37 lead UK research organisations), just over half (56%, n=479) were from LLMICs. Of the other partners, 23% (n=199) were from UK-based organisations and 21% (n=182) were from other countries/regions.

Figure 6: Number of project delivery partners by geography and organisation type



In terms of delivery partner organisation type:

- 46% (n=398) were universities or HEIs (including medical schools and privately and publicly funded institutions); of which 239 were from LLMICs.
- 17% (n=147) were autonomous research organisations (laboratories, policy think-tanks, funding bodies, research observatories/watchdogs, independent research groups, etc); of which 91 were from LLMICs.
- 19% (n=162) represented civil society organisations, NGOs and inter-governmental organisations, including charitably funded organisations (for example some hospitals and

health centres), UN-affiliated groups, and organisations with a global remit; with 58 from LLMICs.

- 10% (n=83) included government departments, governmental organisations and public sector bodies such as NHS Trusts, hospitals, national services (meteorological, broadcasting, etc) and local/regional government offices and agencies; with 69 from LLMICs.
- 8% (n=70) were private sector organisations including small businesses and university spin-out companies, of which 22 were from LLMICs.

Regarding the geographical location of delivery sites for GROW awards:

- Four projects focused on one LLMIC each - of these, two focused on India, one on Colombia and one on Bangladesh
- Most awards (n=24) worked with between two and five focus LLMICs
- Six awards focused on six to nine LLMICs.
- Three GROW awards worked with 10 focus LLMICs each.

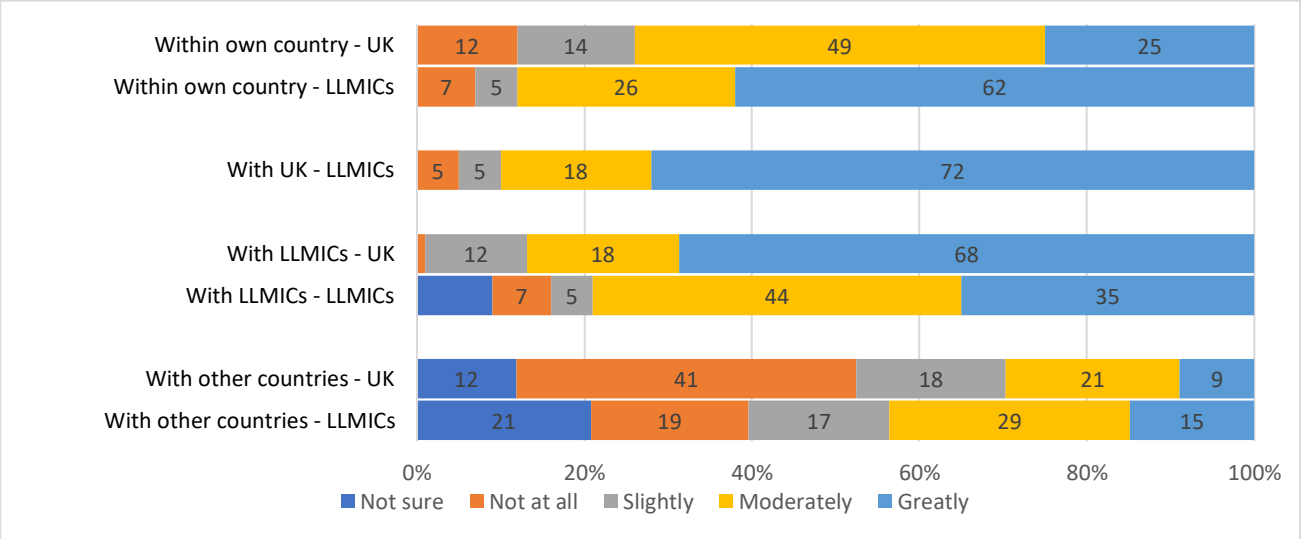
Involvement in GROW greatly strengthened relationships of delivery partnerships both between, and within, LLMICs and the UKs. Evidence from the GROW impact survey showed that 90% of LLMIC-based respondents felt their partnerships with UK-based organisations had been greatly/moderately strengthened through involvement in GROW, leading to new opportunities, for instance, to access facilities, engage in study visits and collaborate on publications. Similarly significant proportions of LLMIC respondents thought their in-country relationships had also been greatly/moderately strengthened (88%) as had their collaborations with other LLMICs (79%), showing the impact of GROW on knowledge exchange between countries in the Global South. For many LLMIC respondents, these were completely new links, which provided fruitful opportunities for learning and working together to address global concerns, for instance through fresh insights, novel methodologies, development of new consortia and on-going co-authorship of publications.

Survey results for UK-based respondents were largely, and positively, similar: 86% agreed their relationships with LLMIC-based organisations had been greatly/moderately strengthened; and 74% said new and existing relationships with UK-based organisations had also been significantly strengthened through involvement in GROW. A few UK respondents did refer to existing personal contacts as a foundation for creating stronger relationships but also acknowledged that their GROW awards catalysed pre-existing links to develop and expand in new and different ways.

Several UK respondents highlighted that the nature and longevity of the GROW programme had enabled collaborations with countries in regions that had previously been hard to engage (such as

the Horn of Africa) facilitating the UK's first ever research partnerships with LLMICs such as Eritrea and Somalia. They also referenced invitations for policy engagement and opportunities for 'soft diplomacy' that would never have arisen without involvement in GROW. For instance, one UK PI described their recent attendance (in July 2024) at a meeting of nine ministers of health in Southern and East Africa; the PI was one of just two non-Africa-based individuals invited to the event. The meeting provided opportunities for focused engagement and agreement of MoUs with policy makers from African Union institutions with responsibility for delivering development impacts. The PI felt sure that these opportunities would not have arisen without the GROW award and their involvement as an academic had facilitated a level of trust, access and potential for diplomacy not possible for UK government employees.

Figure 7: Extent to which delivery partnerships were strengthened through involvement in GROW (GROW impact survey: UK respondents n=84; LLMIC respondents n=69)



Evidence from the GROW impact survey suggests a high proportion of project delivery partnerships have been sustained in some form in the longer-term, despite the challenges presented by the Covid-19 pandemic and the 2021 ODA budget reductions. A mean average of 86% of LLMIC respondents reported that they were continuing to collaborate (slightly, moderately or greatly) with UK partners (92%), in-country partners (88%), other LLMIC partners (89%) and other country partners (78%). Similarly, on average 77% of UK respondents reported some form of continued collaborations with LLMIC partners (88%), in-country partners (83%) and other country partners (60%) since the end of the programme.

There was acknowledgement of externally imposed challenges and setbacks, but overall, projects had made huge efforts to minimise the negative effects of these. There was evidence of adaptability, innovation and resilience, and of making the most of available resources to continue collaborative efforts built through GROW. In a few cases, the challenges were felt to have brought partners closer together and to enable deeper understanding of the breadth of challenges especially faced by LLMIC partners.

Survey respondents described how these close and sustained working partnerships were contributing to further impacts post-programme, in terms of continuing to build research capacity (study visits, secondments, training, joint funding bids), deliver impact-focused research (new funding, projects and publications) and enable enhanced co-operation to address cross-disciplinary challenges (evidence of real-world impacts). Some projects were continuing to collect data together from GROW programme sites for other projects and academic purposes. Others have secured new funding for follow-on work or new projects. In other cases, impacts are being seen from continued and mutual engagement between researchers and stakeholders. One PI described how the project had catalysed an ongoing and sustainable relationship between academic and operational organisations in Africa, whereby weather centres are continuing to deliver new forecasting methods developed by the project, and this work continues to be supported by innovation and a supply of students/practitioners trained by the academic sector (African Science for Weather Information and Forecasting Techniques - AFRICAN SWIFT).

3.2. New research collaborations developed through the GROW programme

Key points

- In addition to delivery-level partnerships, GROW awards built numerous other collaborations and networks for knowledge exchange through their projects. Researchfish data recorded a total of 1,531 collaborative research activities across the GROW portfolio, of which 48% had formal agreements in place.
- Almost all of these additional collaborations had been established during the lifetime of the programme (93%) and 85% were still active in March 2024 (most awards had ended by March 2022). This indicates that UK and LLMIC project teams had not relied on pre-existing relationships for the duration of their awards and had used the opportunities provided by the programme to develop and nurture new relationships.

In addition to delivery-level partnerships, GROW awards built numerous other collaborations and networks for knowledge exchange through their projects. Researchfish data recorded a total of 1,531 collaborative research activities across the GROW portfolio, of which 48% had formal agreements in place. Almost all of the collaborations had been established during the lifetime of the programme (93%) and 85% were still active in March 2024 (two years after the end of the programme). This indicates that UK and LLMIC project teams had not relied on pre-existing relationships for the duration of their awards and had used the opportunities provided by the programme to develop and nurture new relationships.

Outputs and outcomes of collaborations included research networks, policy networks, webinars, conferences, study visits, social media strategies, seminars, publications, case studies, research trials, research projects, resources for schools, training, joint grant applications, and more.

Collaborations and networks for knowledge exchange

- The Drugs and (dis)order project was involved in setting up the Network of Studies on Drugs in Latin America (RESESDAL) which led to website, blog series and conferences in Mexico and Colombia in 2020.
- Centre for Sustainable, Healthy, and Learning Cities and Neighbourhoods (CSHLC) gained an award from the Royal Institute of British Architects (RIBA) and architecture company Scott Brownrigg. This was used to support field work and guest lectures in Rwanda by members of the UK-based project team.
- The CEPHaS platforms in all LLMIC partner countries were involved, with UK CEPHaS partners, in a project funded by the BBSRC/European Joint Programme for Soils which examined the impact of conservation agriculture practices on greenhouse gas emissions from the soil, alongside monitoring the soil water content with CEPHaS capacity. This proposal involved all partners in collaboration with the University of the Free State (South Africa) which delivered training on field measurement of greenhouse gases, an opportunity for a student from Malawi to extend work on the CEPHaS platform site into a PhD project registered with UFS on the Malawi platform and opportunities to interact with fellow scientists from institutions in Poland and Ireland as well as UK CEPHaS partners.
- Preserving, Restoring and Managing Colombian Biodiversity Through Responsible Innovation established a collaboration with United Way leading to the take-up by schools in Colombia of the Outdoor Classroom Day, a global campaign encouraging children to learn about biodiversity and its importance. The project team worked with United Way to engage with school children and their teachers about the GROW programme research.

Around one-third of collaborations (37%; n=570 across 32 projects) had recorded societal, policy, cultural or economic impacts of their work (although many of these are more accurately described/defined as outputs or outcomes). Of these, most cited several types of outcome/impact as a result of their work, including policy-related (37% of all impacts cited), societal (30%), cultural (17%) and economic (16%). The longer-term outcomes and early impacts of GROW projects are discussed more fully in Chapter 5.

Outcomes and early impacts of research collaborations established through GROW

- SAFEWATER helped to establish the Water Coalition, a multisectoral group of NGOs, civil society, government and industry. Its mission is to contribute to the long-term water security of ecosystems, people and the economy, strengthening water governance through public-private partnerships. As a result, three SAFEWATER systems have been installed in rural schools in the Antioquia region of Colombia, with installation plans in progress for two more schools.
- SASHI established a MoU between the Centre for Mental Health and Society at Bangor University and JSS Hospital in Mysore, India, to enable staff and knowledge exchange activities. This has led to the setting up of a self-harm register at JSS Hospital, the development of a joint project on self-harm and mental health in student populations in Mysore, and three post-graduate degree registrations in areas of self-harm research for members of hospital staff.

3.3. Equity and fairness in partnerships and collaborations

Key points

- ➔ Seventy per cent of GROW awards had built equitable and inclusive working partnerships between and within their research teams and other collaborators, according to at least one of the definitions of equitable and inclusive offered by the GROW process evaluation.[19]
- ➔ These included establishing equitable governance and financial processes (documented by 70% of awards; n=26), agreeing equitable approaches for co-creating research and training activities (70%; n=26), and agreements being in place regarding equitable access to data and ownership and publications/IP rights for project outputs (41%; n=15).

The development of equitable partnerships and collaborations was an explicit requirement of the GROW programme. With reference to UKRI's definition,[20] these are partnerships which are transparent, based on mutual respect, and have clearly articulated mutual benefits in terms of equitable distribution of resources, responsibilities, efforts and benefits.

Most GROW awards had successfully built equitable and inclusive organisational partnerships between and within their research teams and other collaborators. The GROW process evaluation[21] has already commented on the fairness inherent in commissioning of delivery partnerships, finding

[19] See footnote 4

[20] https://www.ukri.org/manage-your-award/good-research-resource-hub/research-co-production/

[21] See footnote 4

that fairness during the commissioning process could have been hindered by the reliance on pre-existing networks and partners, and recommending adequate commissioning time in future programmes to allow for the development of new partnerships. The impact evaluation has focused on implementation of partnerships in the context of project delivery and found that a key underpinning factor for establishing equitable partnerships mentioned by most projects was open and transparent communication processes. Regular, effective communication across a range of appropriate and accessible channels was crucial to ensuring colleagues across all countries and project roles were kept involved, informed and up to date as projects progressed.

More specific actions included establishing equitable governance and financial processes (documented by 70% of awards; n=26), agreeing equitable approaches for co-creating research and training activities (70%; n=26), and agreements being in place regarding equitable ownership and IP rights for project outputs (41%; n=15). Our analysis was based on free text Researchfish data, with no apparent specific questions on formal agreements, and missing responses from three awards. Thus, it is possible that these figures are an underestimate. However, they do reflect the findings of the GROW process evaluation which noted that most awards (65%) had successfully strived to ensure fairness and equity in the dimensions of opportunity, process and benefits.[22]

Equitable governance and financial processes

In terms of ensuring equitable governance and financial processes, measures developed by projects included:

- Development of the proposal, project management and governance strategies with equal input from all partners
- Consultation and consent for management structure, staff roles and lines of responsibility
- Allocating financial resources in an equitable way, with funds being allocated for the work agreed with partners in advance
- Leaders of LLMIC teams to have Co-I status
- Involvement of senior management from all partner organisations in all decision making and research leadership, including representation on project boards/executive groups and the expectation of regular involvement in advisory boards and scientific meetings
- All core decisions taken collectively and in full consultation with all partners and on advice of advisory boards where relevant

[22] Defined in the GROW process evaluation as: who has a say in designing, planning and implementing the research project; clear and transparent procedures for accountability and for everyone to have a voice; how the expected benefits of the partnership will be distributed.

- Agendas for key meetings and events, including executive, scientific and advisory board meetings, developed collaboratively with partners
- Partners to host executive/advisory board/scientific meetings on a rota basis to ensure mutual responsibility in governance
- Management of own budgets, staff recruitment and supervision, with freedom to deploy these to best achieve the project aims (within a clear framework of monitoring)
- Any significant changes in project plans or management to be approved by all parties
- Where working groups are established, all of these to include representative from all partners
- Project events to include all partners and be held in as many of the partner countries as possible, with at least one cross-project event
- Ensuring that equal numbers of research positions are provided to all partners.

Creating equitable governance and financial processes

- The launch meeting for the PRECISE Network provided an opportunity for co-creation of project governance, objective setting and planning key activities. Held in Nairobi, the meeting was organised by the central UK team in collaboration with Kenyan team. All Co-Is, researchers, data and finance managers and coordinators from partner institutions came together for two days to discuss project set-up. Issues covered included data collection, biobanking, monitoring and evaluation, team training/skills development, and developing short, medium and long-term research objectives across the thematic working groups.
- CEPHaS aimed to achieve equity in governance through the structure of the project board which included seven UK-based board members (including the UKRI observer) and nine members from LLMICs. Although the project management team comprised three UK members (the PI and two project members) and one from Zimbabwe (a senior member of the research team), each of the operational working groups had a leadership structure with a co-lead from the UK and at least one co-lead from Zambia, Zimbabwe or Malawi to ensure equal partnership in the scientific leadership of the project.

Equitable approaches for co-creating research and training activities

Projects also agreed a number of equitable approaches for co-creating research and training activities, which included:

- Ensuring equal representation of all partners in working groups, work packages or work streams
- Regular operational meetings (weekly, bi-weekly, monthly) to discuss data, analysis, emerging findings and future directions so that all partners can provide input into research and training activities, project design, and raise any concerns

- Careful consideration of how best to deliver research and training activities: in some cases, it was felt most equitable for all partners to have representation in leading and delivering project activities; in other cases, specific activities were led and delivered by in-country partners to increase inclusivity and ensure activities were refined and adapted to address the needs and interests of partner LLMICs and local stakeholders.

Several projects had developed conceptual frameworks for understanding best practice in ensuring fairness and equity. For example, for the RECIRCULATE project, the process of continuous 'discussion, reflection and responsiveness' was at the heart of their approach to equitable partnerships. Another project (RECAP) produced a good practice guide for using co-production approaches to help generate more equitable and impactful research. For another (URBAN KNOW), the principle of 'partnerships with equivalence' was central to the formulation and implementation of the project team's work.

Equitable co-creation of research and training activities

- CABANA explained that teaching in workshops, train the trainer activities and virtual courses was led by in-country partners, to increase inclusivity to more remote regions not only by the virtual format of activities but also by the delivery of many activities in the local languages.
- Establishment of biopharmaceutical and animal vaccine production capacity in Thailand and neighbouring South East Asian countries described how all consortium members, including PIs and research staff, participated in quarterly group meetings, where data was presented and discussed, and future research directions were decided. To ensure there were forums for discussion at all levels, Postdoctoral Researchers and Research Assistants also met via video conference every month to discuss plans and progress.
- One Health Regional Network for the Horn of Africa (HORN) explained how training materials were developed by all Co-Is across the consortium, building upon individual research and technical experience, and ensuring that local contextual factors were incorporated. This provided opportunities for bi-directional learning, between UK and LLMIC partner whilst promoting ownership and long-term sustainability of teaching resources.

Equitable access and ownership of project data, publications and IP rights

Equitable access and ownership of data, publications and IP rights, were less frequently mentioned by projects, but nonetheless some key themes emerged, summarised as follows:

- Agreements on data sharing and recognition/attribution in project outputs should be discussed and documented during set-up and project inception
- The principle of joint ownership of samples and data generated through the project will ensure mutual benefits for partners for analysis, publications and future research

- Principles of equitable partnership in publishing should recognise the diversity in disciplines, academic and non-academic researchers, experience and language
- Arrangements for how partners would be involved in leading and co-authoring outputs were approached in different ways depending on the principles above and the nature and extent of individual and partner involvement.

One project (GlobalSeaweedSTAR) instigated continued use of the Laboratory Information Management System (LIMS) enabling all project data (samples, images, molecular data, etc) to be available to all project partners for ongoing analysis and paper writing. Another, CEPHaS, adopted a project data policy, including the key principle that LLMIC leads had responsibility for data generated in-country, and that this was respected by all project staff. Data collected in a particular country therefore could not be used, or passed to a third party, without approval of the relevant country lead, under the terms of the data policy and the project collaboration agreement. The project's publication policy also required that any publications were viewed and approved by the country leads whose sites were involved. The Drugs and (dis)order project reported that all LLMIC partners had been and would continue to be, involved in all aspects of research analysis, writing, and dissemination. The project stated its commitment to co-authorship and providing opportunities for LLMIC researchers, some of whom had not yet published in academic journals. In a special issue of the International Journal of Drug Policy over half the project submissions were sole or co-authored by LLMIC partners.

Developing equitable partnerships: learning from SENTINEL

Through its evaluation activities, the SENTINEL project collected data on the dimensions of transparency, joint ownership, mutual responsibility and benefits. These findings led to a helpful summary of the measures the project team put in place to develop equitable partnerships:

- Co-development of key project frameworks (starting with the proposal), to ensure inputs from different disciplines and experiences, and for equity
- Equitable access to information for project staff, irrespective of seniority, organisational affiliation, or location
- Shared responsibilities - with all work packages and research clusters structured for co-leadership by partners in the UK and Africa
- Equitable opportunities to represent the project in conferences, workshops etc.
- High levels of autonomy for partners (within project management and governance framework)
- Equitable allocation of the project budget, with a 60:40 split between the six UK partners and four African partners (at 100% FEC; the split of actual income received was 55:45)
- Neutral branding of project communications displaying logos of all partners equally
- Agreement (by all partners) on authorship guidelines, deciding who would be lead or co-authors of publications based on level and value of contributions.

4. Research outcomes and their potential for impact

The GROW programme not only supported the development of partnerships and research capacity but also drew on that capability to deliver impact-focused research outcomes. These conceptual outcomes of GROW overlap with many of the programme's capacity-building and connectivity outcomes already explored in this report. This chapter now examines the extent to which, and how GROW projects delivered 'research outcomes with the potential for significant impact on the welfare and economic development of LLMICs' (EQ1/GROW objective 3).

4.1. High-quality publications with evidence of use and citation

Key points

- Bibliometric analysis shows that GROW-linked publications are highly cited, accessible, already being used by policy makers and other stakeholders, and have potential for on-going and sustained impact.
- The GROW programme led to the production of over 4,200 publications, half of which are available as open access, 52% of which have been cited by others and 5% of which already show potential for policy impact (in terms of citation and use in policy documents).
- GROW publications have been cited nine times more frequently in relation to average citations for publications in the same fields of research and of the same age.

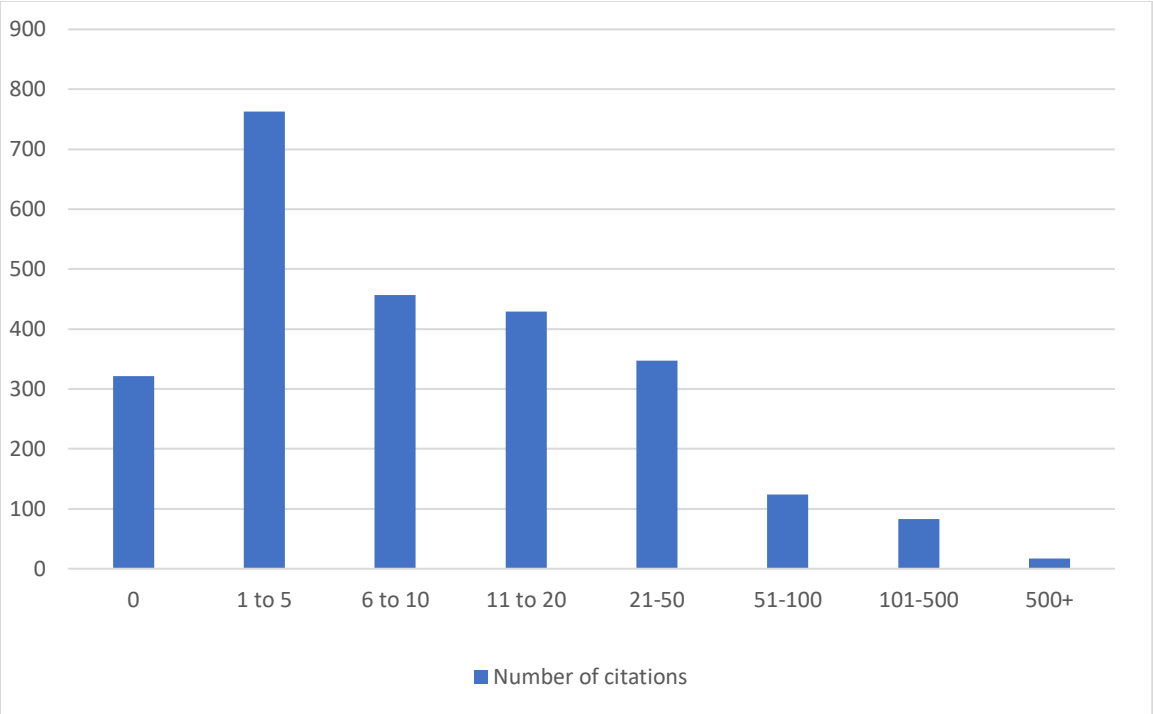
Evidence of use and citation of peer-reviewed publications

Evidence of high-quality peer-reviewed work being used and cited by others is an indicator that research outputs have potential for impact. Bibliometric analysis shows that GROW-linked publications are highly cited, accessible, already being used by policy makers and other stakeholders, and have potential for on-going and sustained impact.

Projects recorded 4,287[23] separate published outputs linked to the GROW programme with all projects having published at least nine outputs between 2017 and March 2024. The mean average was 116 publications per project. Half of all GROW publications were open access (via Open Aire licensing) in March 2024; this may have since increased.

[23] Researchfish reporting for March 2024 – this number could have increased significantly since that date.

Figure 8: Citation count by number of GROW publications



Data provided by Digital Science[24], using its Dimensions[25] database, found 66,533 individual citations for 2,541 unique publications (321 of these unique publications were uncited). This indicates that 52% of all GROW outputs recorded as publications in Researchfish had been cited by other publications in Dimensions. Citations refer to the number of times that a publication has been cited by other publications in the Dimensions database, which includes research articles, books/chapter, conference proceedings, monographs and pre-prints.

The total number of citations for each GROW-related unique publication in Dimensions ranged from zero to 2,323, with most publications having been cited one to five times, and 9% of all unique publications each having 50 or more citations in Dimensions. Twenty-three projects had more than 500 citations for their total unique publications output in Dimensions, with seven projects having more than 2,000 citations each, and one project having nearly 15,000 citations of its GROW-linked publications.

[24] Based on metadata as of May 2024 from Digital Science's Dimensions platform, available at https://app.dimensions.ai. Access was granted under license agreement with UKRI

[25]© 2024 Digital Science & Research Solutions Inc.

Evidence of engagement and potential for impact

Dimensions also tracked online engagement with GROW publications through Altmetric[26]. Altmetric measures activity around academic research outputs drawing on policy documents, mainstream media outlets, blogs, social media, Wikipedia, and more. Digital Science found 644 policy citations for 212 unique publications, indicating that 1% of all citations in Dimensions related to policy documents (as opposed to other research outputs) and 5% of all GROW outputs recorded as publications in Researchfish already had potential for policy impact (in terms of citation and use).

Dimensions calculated the 'Field Citation Ratio' (FCR)[27] for the programme as a whole to be 9.38. This indicates that GROW-linked publications have received more than nine times as many citations relative to the average citations for publications in the same fields of research and of the same age. The mean FCR by project ranged from 2.57 to 44.17, with seven projects having FCRs of 10 or higher, indicating significantly higher than average citations for their published portfolio of work. 422 publications had FCRs ranging from 10.0 to 702.14, almost all of which (n=419) were published in open-access sources, showing that 10% of all GROW publications had exceptional engagement, with easy access for on-going use and potential impact.

4.2. New research tools, methods and other non-formal research outputs

Key points

- ➔ The GROW programme contributed to the development of innovative approaches and new methodologies to address international cross-disciplinary development challenges. These included new research tools and methods, software and technical products, clinical trials, patents, spinouts, and over 4,500 non-formal, artistic and creative outputs.
- ➔ The production and dissemination of non-formal research outputs shows that the needs of stakeholders have been considered in sharing the results and benefits of projects, so creating greater potential for impact on the welfare and economic development of LLMICs.

New research tools and methods

GROW recorded 153 examples in Researchfish data (across 24 awards) of new research tools and methods, the majority relating to improvements to research infrastructure (81%; n=124). Overall,

[26]https://www.altmetric.com/

[27]The FCR is a citation-based measure of scientific influence; a value greater than 1 indicates a publication has been cited more than average for its field of research. FCR metrics are calculated for publications which are at least two years old, and which must be classified in a 4-digit Field of Research code that contains at least 500 publications from the same publication year. More information on how an FCR is calculated can be found here: https://dimensions.freshdesk.com/support/solutions/articles/23000018848-what-is-the-fcr-how-is-it-calculated-

84% (n=128) of these outcomes had already contributed to further development impacts, and 50% (n=76) were reported as being published and/or shared with others.

New research tools and methods

- For instance, CABANA used DNA sequencing methods to analyse DNA sequences of microbiolites primarily found in high Andea lakes in Argentina and Peru. The research has improved knowledge of metabolic pathways for the breakdown of arsenic in microbiolites and may have future commercial and public health applications. The research has also enabled international research collaboration in Latin America between Argentina, Peru and the UK.
- AFRICAP developed a toolkit containing templates for research management professionals to use throughout the programme life cycle. This has created a central resource for research managers across the globe and shares best practice learning from a range of global challenges programmes, including AFRICAP.

New software and technical products

There were also 48 recorded examples in Researchfish data (from 13 GROW awards) of new software and technical products, the majority of which related to the development of webtools or applications (n=23) and software (n=19). Of these, 32 had already led to further challenge-related impacts.

New software and technical products

- The Dioptra tool, web-based software developed by RECAP has already enabled several NGOs to rapidly estimate the cost-efficiency of their programmes, using existing accounting and monitoring data. Having cost-efficiency data, and comparative efficiency data from similar projects can help staff identify opportunities to reach more people and have greater impact with limited resources.
- Work by CEPHaS has contributed to the development of a new lightning protection module for the British Geological Survey Proactive Infrastructure Monitoring and Evaluation (BGS PRIME) system. The new module will allow the BGS PRIME system to be operated effectively in areas subject to intense electrical storms and will reduce costs associated with system repair due to lightning strikes. Teaching materials in geophysics developed for CEPHaS have been used to deliver training to other partners in the Indian Subcontinent. Software to fit water retention functions to data, and to support robust inference about treatments have been made available online via the GitHub platform.
- FutureDAMS developed WaterStrategy - a free online collaboration platform for water resource system analysis and planning. WaterStrategy simulations can explore options and support decision-making for water initiatives ranging from local water supply systems to complex international river basins.

Product interventions and clinical trials

Five examples of product interventions and clinical trials were recorded by Researchfish data (from three GROW awards), showing some significant development impacts within the target regions and focus geographies in terms of preventative interventions, therapeutic interventions (vaccines), therapeutic interventions (drugs), and products with applications outside of medicine.

Product interventions and clinical trials

- UK and Thai partners worked together to design a new PCV2 vaccine for pigs in Thailand. The vaccine was expressed and purified at small scale in the UK, and then produced at large scale in Thailand, with testing in controlled facilities at Iowa State University. The trials were successful, and a major Thai veterinary products company agreed to produce and distribute the vaccine once it has been approved by the Thai FDA. Once this process is underway, it will enable Thailand to produce its own veterinary vaccines (and biopharmaceuticals) and for the vaccine to be distributed in South East Asia, reducing costs and widening access.
- The Global Network for Neglected Tropical Diseases facilitated strong interactions between scientists in Brazil, Uruguay and Argentina and the UK to progress the identification, characterisation, and validation of drug targets in the causative pathogens of leishmaniasis and Chagas disease. The projects were close to basic science and very early in the drug discovery process, providing the basis for future studies, future funding and further development of the partnerships established.

IP and spinouts

Five GROW awards submitted data to Researchfish on the Intellectual Property (IP) outcomes of their funded work, including seven patent applications/protection granted and nine GROW spinout companies.

IP and spinouts

- ORNATE India was granted patent protection in 2022 for their discovery that a squaramine-boronic acid derivative can be used for the electrochemical sensor for glycated haemoglobin (HbA1c). The research team is continuing research in this area is to develop a cheap point of care HbA1c sensor that can be used by diabetics to monitor blood glucose.
- SUNRISE established a spin-out company which plans to offer advanced testing and diagnostics services for the domestic market to improve the quality and reliability of PV modules.
- A University of Manchester spinout company, Nexsys Analytics, was created to maintain the software tools created by the FutureDAMS project. The company is using FutureDAMS approaches and software tools on international projects, funded by the World Bank and other UK and international organisations to inform the assessment and design of water resource infrastructure investments.

Non-formal, artistic and creative outputs

Across the programme, all 37 projects recorded a total of 4,603 examples of non-formal, artistic and creative outputs designed for research engagement, use and impact, and contributing to 3,311 impacts as described by grantees. Outcome types and their impacts for stakeholders highlighted the sheer range of artistic and creative material developed across the GROW programme including:

- Artistic and creative outputs such as artworks, creative writing and films/videos (n=177 outputs)
- Broadcasts including TV, radio and podcasts (n=143)
- Articles in magazines, newsletters or online publications (n=150)
- Press releases, press conferences and responses to media enquiries or interviews (n=183)
- Talks or presentations (n=1,357)
- Engagement focused website, blog, or social media channel (n=436)
- Formal working groups, expert panels or dialogues (n-=603)
- Workshops and open days (n=1,554).

Non-formal outputs were designed for a wide variety of different audiences, with outputs most frequently aimed at professionals/practitioners (30%), policy makers/politicians (n=17%), and public groups (14%). Other audience groups included industry/business, media as a channel to the public, patients and carers, schools, study participants, postgraduate and undergraduate students, and third sector organisations.

Increasing research engagement through non-formal outputs

CSHLH created a range of artistic and creative outputs to share findings and increase engagement in the benefits and outcomes of their work. They co-produced a zine (booklet) with residents from a building occupation in South Africa which enabled residents to present their histories, aspirations, challenges and vision for a more just and inclusive city. The zine has been welcomed by public groups and practitioners for its contributions in countering discourses of occupiers as criminals. CSHLH also worked with artists in Bangladesh to create a national-level exhibition where narratives of artworks were developed from research findings. The exhibition aimed to promote intellectual and creative thinking around urban sustainability issues. Another co-created output from the project was a board game - SDG Ludo - designed to enable children and families in Bangladesh to learn about three of the UN SDGs and how local communities can support implementation and sustainability.

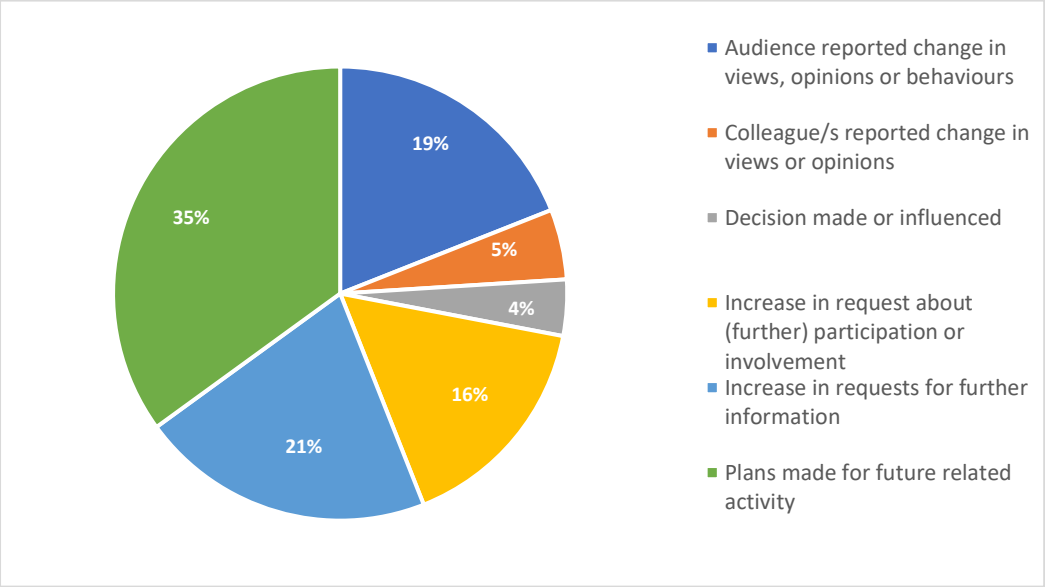
Most outputs were described as having international reach (62% of all outputs), with reach described as national for 20%, regional (8%) or local (10%) for the remaining outputs. The most frequently cited output types with international reach were talks or presentations (n=869) and workshops (n=837), showing the success of the programme in engaging with global stakeholders.

Achieving global reach and impact through non-formal outputs

- GlobalGRACE collaborated with the Sex Workers Theatre Group in Cape Town, South Africa to script and perform their original work 'Intando Yam: My Choice', broadcast on WhatsApp, in a popular South African format known as a 'soapie'. The 'soapie' was broadcast internationally and enabled the group to form networks with similar groups and NGOs beyond their borders.
- Drugs and (dis)order drew on its interactive database to create a multimedia report detailing incidences of violence by military forces against farming communities during forced eradication of illicit crops in Colombia. The project team shared the report and database with policy makers and stakeholders, including COCCAM (National Coordinator of Coca, Marijuana and Poppy Growers) who have used and shared them more widely. Future plans include progressing this topic via a working group convened by the Colombian Special Jurisdiction for Peace.

Many of the creative and non-formal research-based outputs recorded by GROW awards had already resulted in some form of on-going use or impact. Nearly three-quarters (72%) of the 4,603 creative/non-formal research outputs listed in Researchfish had recorded 'impacts', as defined by the grant-holders completing the data entry and in analysis many of these may more accurately be defined at outputs or outcomes. Figure 9 gives an overview of the types of impacts recorded by projects and shows that the most common area of impact was plans being made for future activity with potential for change and further benefits. The use and impact of non-formal and creative research-based outputs by GROW project teams shows strong connections with stakeholders and understanding of the societal and political context for their work. Evidence from the impact evaluation shows how, through these sorts of outputs, the awards were connecting with the varied audiences and potential users of their research in formats that met stakeholders' information needs accessibly and effectively.

Figure 9: Impacts of creative and non-formal research-based outputs of the GROW programme as defined by awardees *(Researchfish: Engagement dataset, March 2024)*



5. Challenge-focused outcomes and early impacts

This chapter considers the extent to which and how the GROW programme has met its objective to 'address global development challenges and produce real-world outcomes in developing countries' (EQ1/ GROW objective 4). In doing so we examine the successes and early impacts of GROW projects to date (EQ2), the distribution of these and the extent to which benefits established through GROW are being sustained.

We draw on evidence from project final reporting and Researchfish data, combined with primary data from the impact survey and interviews with UK and LLMIC-based PIs and Co-Is. We also reference nine GROW case studies which were developed through a synthesis of all available relevant evidence to provide high-level summaries of key contributions of the selected awards. Presented in full in Annex C, these case studies illustrate the interconnected nature of the different outcome and impact types, and also discuss the role of capacity strengthening initiatives and collaborative partnerships in facilitating impacts, providing evidence of sustainability and on-going collaborations. Although it is too soon to fully assess the longer-term and more global impacts of the programme, the examples presented in this chapter, and in Annex C, are illustrative of the broad and extensive range of significant early impacts and impacts-in-progress already achieved by some awards.

The three GCRF challenge areas were developed in consultation with the UK Department for International Development, with reference to the UK Aid Strategy and the UN SDGs[28] and include: equitable access to sustainable development; sustainable economies and societies; and human rights, good governance and social justice. GROW has made significant contributions towards addressing all three of these challenges and their associated sub-areas, through the development and introduction of new practices, products, and policies, leading to positive real-world environmental, health, educational and economic outcomes.

[28] UKRI (2020): Growing research capability to meet the challenges faced by developing countries - p3. Available at https://www.ukri.org/publications/growing-research-capability-funded-projects-summaries/ - developed in consultation with the UK Department for International Development, with reference to the UK Aid Strategy and the UN Global Goals for Sustainable Development (SDGs).

5.1. Secure and resilient food systems supported by sustainable marine resources and agriculture (SDG 2: Zero hunger)

Key points

- ➔ GROW awards have influenced the development of new practices, products and policies to support the development of sustainable marine resources and agriculture
- ➔ New practices introduced include: the introduction of biosecurity measures by seaweed farmers that protect and increase their crops; water efficiency practices by farmers that have saved billions of litres of water and reduced pressure on groundwater levels.
- ➔ New products developed include: temperature resilient seaweed breeds to withstand warming seas; enhanced weather forecasting products that have reduced crop failures and increased yields; introduction and increased farming of drought resistant grain variety (millet).
- ➔ Policy influence includes: the introduction of biosecurity measures for the seaweed industry at national and international levels; the adoption of new water management policies by local and state governments; introduction of millets into State nutrition schemes; development of a new national soybean strategy.

GlobalSeaweedSTAR - Safeguarding the future of seaweed aquaculture in developing countries (BB/P027806/1) - see case study, Annex C

New practices and products introduced: GlobalSeaweedSTAR (GSSTAR) developed new knowledge about seaweed aquaculture to address threats from warming oceans and the spread of disease, to improve the resilience and sustainability of the industry. GSSTAR research has helped seaweed farmers to protect their crops from disease and pest infestation and increase their productivity by introducing new biosecurity measures and farm management processes, with potential for greater crop yields. The team have since been awarded three grants worth £1.25 million from Defra-funded Global Centre on Biodiversity for Climate. The latest project, Global Seaweed SUPERSTAR, is breeding more temperature resilience into tropical seaweeds and building on understanding about seaweed pests and diseases developed during the GSSTAR project.

Policy influence: National governments in partner countries (Philippines, Malaysia and Tanzania) have adopted GSSTAR standard operating procedures for seaweed biosecurity into their national standards and policies. GSSTAR researchers' direct engagement with the UN Food and Agriculture Organisation (UN FAO) resulted in the inclusion of biosecurity measures specifically for the seaweed industry in its mandate for the first time. GSSTAR researchers also helped to establish the Safe Seaweed Coalition (now known as the Global Seaweed Coalition), a global partnership supporting the sustainability of the seaweed industry.

African SWIFT - African Science for Weather Information and Forecasting Techniques (NE/P021077/1) - see case study, Annex C

New practices and products introduced: African SWIFT worked with academic and meteorological service partners to strengthen operational forecasting practice in Africa. SWIFT supported the Nigerian Meteorological Agency (NiMet) to develop sub-seasonal forecast products leading to improved decision-making for farmers and supporting national food security goals. The Nigerian government worked with NiMet to provide forecasts to 663 village areas and 104 local governments across seven states, reaching an average of 56,000 farmers annually, with positive effects on crop yield.

> *For the first time since 2017, every village in the CASP area got access to information about the onset date, dry spell periods, length of the growing season, volume of rain expected, and cessation date. Farmers were able to make informed decisions about what to plant and when, as well as what actions to take to ensure their crops didn't fail. We started seeing benefits in the very first year of working with NiMet. (SWIFT website: Richard Nzewku, Climate Change Adaptation and Agribusiness Support Programme (CASP))*

TIGR2ESS - Transforming India's Green Revolution by Research and Empowerment for Sustainable food Supplies (BB/P027970/1) - see case study, Annex C

New practices and products introduced: TIGR2ESS worked to increase food security by promoting efficient water usage and sustainable farming practices. TIGR2ESS introduced water efficiency practices to around two million farmers in the state of Punjab, reducing pressure on groundwater levels, and trained over 9000 farmers in Punjab to use new irrigation practices, saving over 80 billion litres of water.

Policy influence: TIGR2ESS partners engaged with academic collaborators in Pakistan and India, and policy makers in East Punjab, India. Successful outputs include their analysis of how best to structure and develop Farmer Producer Organisations and model their outputs. The goals were to use more sustainable (and alternative) cropping systems and more effective groundwater water use for irrigation, across a region for which a crisis in groundwater availability will arise in the near future.

Policy influence: TIGR2ESS partners supported the Government of Tamil Nadu to implement a Comprehensive Water Resources Management Plan, and local government in Punjab to clear village ponds to enable monsoon rainwater collection for agriculture, fisheries and recharging groundwater. TIGR2ESS research evidence led to the adoption of new water management policies by the Punjab Government.

Policy influence: TIGR2ESS partners analysed the nutritional intake of the indigenous Santal tribe which aligned with some aspects of global dietary guidelines, with some deviations from universal

(EAT-Lancet Commission) recommendations. The findings emphasise the need for culturally sensitive dietary recommendations that respect traditional diets while promoting sustainability.

New practices and products introduced: TIGR2ESS identified and encouraged the use of drought resistant crops and supported greater inclusion of drought resistant grains in diets. TIGR2ESS partners worked with the Government of Odisha in India to change farmers' attitudes to millet and reverse the decline in the use of this nutritious and drought tolerant but previously unpopular grain. TIGR2ESS partners' work with the Odisha Millet Mission (OMM) led to a doubling of millet output in the first year and trebling of additional value. The Programme expanded from 8,030 farmers cultivating millets in 3,399 hectares in year one to 118,561 farmers cultivating millets in 54,496 hectares in year five.

Policy influence: OMM successfully introduced millets into the Public Distribution System and other State nutrition schemes. The World Food Programme entered into an agreement with the Government of Odisha to share learning from the Mission, as part of UN General Assembly's designated International Year of Millets in 2023.

AFRICAP - Agricultural and Food-system Resilience: Increasing Capacity and Advising Policy (BB/P027784/1)

Policy influence: AFRICAP developed solutions to food and nutrition security problems on the African continent, identifying trade-offs between food and nutrition security and environmental sustainability in a changing climate. The AFRICAP team worked closely in Zambia with the Ministry of Agriculture to devise a new national soybean strategy. In Malawi, the project worked with the National Planning Commission and Department of Disaster Management Affairs to implement a National Resilience Strategy in the district of Balaka.

5.2. Sustainable health and wellbeing (SDG 3: Good health and well-being)

Key points

- ➔ GROW awards have contributed to improved health outcomes and influenced new practices, products and policies to support early impacts in sustainable health and wellbeing.
- ➔ Improved health outcomes include: reduced incidence of malaria due to introduction of next-generation bed nets; early detection and treatment of diabetic retinopathy (DR) before sight loss occurs enabled through DR screening.
- ➔ New practices introduced include: enhanced weather forecasts that support responses to meningitis outbreaks; new community interventions to control dengue; production of the world's first full health sector model, simulating an entire health system to inform health policy decisions, budgets and initiatives; new training for health professionals to identify and treat diabetic retinopathy.

- New products developed include: portable biosensors to predict sight threatening diabetic retinopathy; software to ascertain the gestational age of the foetus.
- Policy influence includes: Ministerial support for enhanced dengue surveillance; informing WHO malaria guidelines; directly informing Health Sector Strategic Plans and the associated Health Benefits Packages; informing the development of a national dementia plan in India; introduction of new tobacco control legislation and enhanced government communication campaigns for smoking reduction.

African SWIFT - African Science for Weather Information and Forecasting Techniques (NE/P021077/1)

New practices and products introduced: The risk of meningitis outbreaks in Sub-Saharan Africa increases during the dry season, with around 30,000 cases per year in Africa each year. African SWIFT produced a sub-seasonal forecast warning system for meningitis outbreaks which is used by the World Health Organisation (WHO) to support preparedness and response planning.

> *Being able to predict the likelihood that atmospheric conditions will cause a meningitis outbreak is a powerful tool that helps countries to strengthen meningitis surveillance. It will also help to make decisions about how best to target resources when an outbreak occurs. (SWIFT website: Dr Ado Mpia Bwaka, from the WHO Regional Office for Africa)*

PIIVeC - Partnership for Increasing the Impact of Vector Control (MR/P027873/1) - see case study, Annex C

Improving health outcomes: PIIVeC supported scientists in Burkina Faso, Cameroon and Malawi to help governments tackle diseases caused by bites from insects, including sleeping sickness, dengue, and malaria. Technical Vector Control Advisory Groups (TVCAGs) in Burkina Faso used PIIVeC research to successfully advocate for the introduction of 'next generation' bednets, leading to the country's selection as one of the first pilot sites for the improved nets with co-funding from Unitaid and the Global Fund. Preliminary data from health facilities indicated a reduction in malaria incidence of 16-25% in districts with next generation nets compared to districts where standard bednets were used. PIIVeC research in Burkina Faso led the TVCAG to commission operational community-based interventions to control dengue.

Policy influence: Project outputs and subsequent TVCAG discussions with Ministry officials successfully persuaded the Ministry to support dengue surveillance efforts after several years of outbreaks (with finance from the World Bank). Several PIIVeC fellows have been recognised as global experts in their fields through membership of WHO technical advisory teams, bringing real world insight into decision making. An evidence review authored by an RCDF has been cited in WHO's malaria guidelines.

Thanzi la Onse (Health of All) - Frameworks and analysis to ensure value for money health care - developing theory, changing practice (MR/P028004/1) - see case study, Annex C

New practices and products introduced: Thanzi la Onse (TLO) produced the world's first full health sector model, simulating Malawi's entire health system and generating scenarios and analysis to inform health policy decisions, national health budgets and public health initiatives. With funding from Wellcome, the TLO model is being introduced in Eastern and Central Africa through a new project, Thanzi La Mawa (Health of Tomorrow), to improve population health through data-informed resource allocation and strategic planning.

Policy influence: TLO's research into health resource prioritisation directly informed the development of Malawi's Health Sector Strategic Plan III (HSSP III), and the associated Health Benefits Package. TLO produced methods to guide the ministries of health on resource allocation through health benefits package design, geographic allocation formulae and other major budgeting decisions. In Uganda, TLO research informed the design of the Ministry of Health's community health package of care and its prioritised national health budget. TLO research also influenced resolutions from East, Central and Southern Africa (ECSA) region ministers of health to strengthen health resource prioritisation and health financing. ECSA ministers of health also made a commitment in 2024 to strengthen health economics capacity in the region, following experiences with the TLO programme.

ORNATE INDIA: Increasing eye research capacity and capabilities to tackle the burden of blindness in India: a research-based UK-India Collaboration (MR/P027881/1)

New practices and products introduced: ORNATE researchers developed cheap portable biosensors for Cystatin C (shown in the biomarker study to predict sight threatening diabetic retinopathy) and a HbA1c-a patent is being filed for the HbAa1c biosensor. ORNATE trained nurses in family health centres to take retinal images using smartphone retinal cameras, and trained ophthalmologists in how to undertake laser surgery to treat diabetic retinopathy.

Improved health outcomes: ORNATE's diabetic retinopathy (DR) care pathway pilot, developed in conjunction with the government of Kerala, showed that using DR screening leads to early detection and treatment before visual loss occurs. ORNATE's findings informed the Keralan government's decision to upscale its diabetic retinopathy (DR) care pathway across the state.

STRiDE - Strengthening responses to dementia in developing countries (ES/P010938/1)

Policy influence: STRiDE helped the Kenyan Ministry of Health to develop a national dementia plan, and worked with health officials in India, leading to a public commitment by the Indian Minister for Health to launch the development of a national dementia plan in India.

The PRECISE (PREgnancy Care Integrating translational Science, Everywhere) Network - a sub-Saharan network for placental disorders (MR/P027938/1)

New practices and products introduced: PRECISE researchers have developed software that uses ultra sound video loops to automatically measure the trans-cerebellar diameter in the foetal brain to ascertain the gestational age of the foetus. This software was tested in the PRECISE study to validate its use in clinical settings to inform clinical care in pregnancy.

TCCP - Tobacco control capacity programme (MR/P027946/2)

Policy influence: TCCP research on exposure to second-hand smoke influenced a decision by the Ministry of Health in the Gambia to strengthen its sensitisation campaign regarding smoke free regulations. The results from the TCCP research influenced a government decision to move forward with the signing of the Illicit Trade in Tobacco Protocol for Ghana, seen by the Food and Drugs Authority as significant milestone in the history of tobacco control.

5.3. Inclusive and equitable education (SDG 4: Quality education)

Key points

- ➔ GROW awards have contributed to improved educational outcomes through supporting the development of school children and creating new education initiatives for marginalised women.
- ➔ Improved educational outcomes include: increased empowerment amongst school children to take positive steps against child marriage; improved self-esteem, assertiveness and performance amongst school children; increased empowerment of marginalised women to become culinary health educators and microentrepreneurs.
- ➔ New products and practices introduced include: improved curricular content to embed violence prevention in schools.

None in Three (Ni3) - Centre for the Development, Application, Research and Evaluation of Prosocial Games for the Prevention of Gender-Based Violence - see case study, Annex C

New practices and products introduced: Ni3 created games designed to reduce gender bias and various forms of gender-based violence (GBV), and to help school children to change negative gender attitudes and become more empathic. Ni3 worked with educators to embed curricular content on violence prevention within school curricula.

Improving educational outcomes: In Uganda, Ni3's randomised control trial found evidence that children who played the games were less likely to favour under-age marriage and were empowered to take positive steps against the threat of child-marriage. Ni3 led to additional funded research in Uganda which provided further evidence that the games had inspired participating children, improving their self-esteem, assertiveness and performance. The Uganda team secured government funding from its University Research and Innovation Fund program to develop a pilot

'school-based social work' concept, building on the GROW project work and working with the Ministry of Education and local government.

TIGR2ESS - Transforming India's Green Revolution by Research and Empowerment for Sustainable food Supplies (BB/P027970/1)

Improving educational outcomes: TIGR2ESS created Mobile Teaching Kitchens (MTKs) to provide access to low-cost, healthy food and associated nutritional education on adopting healthier diets. Researchers worked in partnership with stakeholders to empower marginalised women in Kolkata, India, training women to become microentrepreneurs and culinary health educators. The MTK model has been extended to other locations in India and is currently also being developed in Mexico and further worldwide, to create self-sustaining community-led nutrition education initiatives.

Improving educational outcomes: TIGR2ESS partners at Panjab University (Chandigarh) developed training units for women in villages of Punjab and women were trained in technical skills, entrepreneurship and social media marketing strategies.

Improving educational outcomes: TIGR2ESS partners at UEA developed a 4 credit MOOC (in English and Hindi) on sustainable food systems in partnership with the Indira Gandhi National Open University (IGNOU), the largest open university in the world. The MOOC can be accessed free of cost on the Government of India's Swayam platform.

Improving educational outcomes: TIGR2ESS partners at NIPGR New Delhi developed a semantic web AI system for climate resilience and food security, with training workshops for administrators, postgraduates and school children, with an emphasis on female engagement and equality. The approaches were adopted by the UN Department of Global Communications and the WHO and led to engagement with policy makers in a variety of countries and a major presentation in Geneva.

5.4. Clean water and sanitation (SDG 6: Clean water and sanitation)

Key points

- ➔ GROW awards improved the lives of communities through the development and provision of clean water systems, influencing policy support and leveraging funding for sustained initiatives in clean water and sanitation.
- ➔ Improved health and quality of life outcomes include: improved bacteriological water quality and a decrease in the reported incidence of diarrhoea in the communities, better physical and mental health and reduced workload.
- ➔ Sustained support for improved water and sanitation includes: leveraging funding for further clean water and sanitation projects.

➔ Policy influence includes: advising national government on the development of community-based water management.

SAFEWATER: Low-cost technologies for safe drinking water in developing regions (EP/P032427/1) - see case study, Annex C

New practices and products introduced: SAFEWATER partners designed and installed low-cost household water treatment and safe storage (HWTS) in Colombia and Mexico which successfully provided safe drinking water to marginalized communities, rural schools, health clinics and refugee settlements.

Improving health and quality of life outcomes: SAFEWATER systems resulted in improved bacteriological water quality for participating households and a decrease in the reported incidence of diarrhoea in the communities. Women reported improved quality of life, including better physical and mental health and reduced workload. Communities reported less reliance on untreated water sources, and greater awareness of negative health effects of drinking untreated water. The project trained community technicians, enabling communities to maintain and take ownership of the water treatment systems.

Sustaining support for improved water and sanitation: Participation in the SAFEWATER project allowed the NGO Cantaro Azul to leverage $2.3 million funding from the Kellogg Foundation for a water and sanitation project in Mexico. SAFEWATER partners at the University of Sao Paulo are continuing to work on low-cost technologies for drinking water in Brazilian rural communities with funding from the Royal Society and from Brazil's National Council for Scientific and Technological Development.

Policy influence: The CEO of SAFEWATER partner, Cantaro Azul, was appointed as an adviser to the National Water Commission (CONAGUA) in the new government in Mexico, to develop partnerships to strengthen community-based water management in the country. Cantaro Azul also received a Good Practices Award at the World Water Forum in Brazilia in 2018 for its use of the SAFEWATER model in schools, recognising the good practices and experiences in water and sanitation as the most successful in the Americas.

PRECISE (PREgnancy Care Integrating translational Science, Everywhere) Network - a sub-Saharan network for placental disorders (MR/P027938/1)

Improving health outcomes: PRECISE provided hospitals in Kenya with funds for boreholes to be dug to give the facilities access to clean water at all times, contributing to likely improved outcomes of those visiting or being admitted to the hospital.

URBAN KNOW - Knowledge in Action for Urban Equality (ES/P011225/1)

Sustaining support for improved water and sanitation: Based on their KNOW research findings, KNOW City Partners worked with water utility company DAWASA to scale up a simplified sewerage system for Vingunguti settlement, funded by DAWASA.

5.5. Affordable, reliable, sustainable energy (SDG 7: Affordable and clean energy)

Key points

- ➔ GROW awards have directly contributed to increased use of sustainable energy and reduced reliance on fossil fuels and contributed to developments in energy policy.
- ➔ Increased access to sustainable energy, reduced reliance on fossil fuels includes: electricity generating company maximising use of hydropower through improved access to rainfall forecasts; increased use of solar power through development of innovative solar energy technology; use of biogas generated by innovative waste-to-energy technology (anaerobic digestion), leading to reduced reliance on external gas and electricity supplies.
- ➔ Policy influence includes: advising national government on development of sustainable energy policy.

African SWIFT - African Science for Weather Information and Forecasting Techniques (NE/P021077/1)

Increased access to sustainable energy, reducing reliance on fossil fuels: Rainfall forecasts provided by the Kenya Meteorological Department (KMD) based on SWIFT's sub-seasonal forecast products have allowed the Kenya Electricity Generating Company (KenGen) to maximise its use of hydropower, reducing reliance on fossil fuels.

> *Because the forecasts help us go through dry periods without losing adequate hydropower generation, we've been able to eliminate emergency diesel generators from the national electricity grid entirely. We're now eliminating thermal power plants, moving closer to 100% renewable energy in Kenya (Patricia Nying'uro, Principal Meteorologist at KMD).*

SUNRISE - Strategic University Network to Revolutionise Indian Solar Energy (EP/P032591/1)

Increasing access to sustainable energy, reducing reliance on fossil fuels: SUNRISE created a sustainable energy facility in rural India, using new solar energy technologies to generate and store clean, reliable, off-grid electricity for the community. The SUNRISE facility provided lighting, clean water, sanitation, agricultural activities, reducing the need to burn fuels.

Policy influence: SUNRISE has gained representation on 'task forces' to advise the Indian government on the role that emerging technologies that can play in the delivery of its energy policy of 57% renewables by 2027

RECIRCULATE - Driving eco-innovation in Africa: capacity-building for a safe circular water economy (ES/P010857/1)

Increasing access to sustainable energy, reducing reliance on fossil fuels: RECIRCULATE informed the development, construction and operation of two Anaerobic Digesters in Ghana and Nigeria to show positive, working examples of anaerobic digestion as a sustainable waste to energy technology. In a school in Ghana, the demonstrator used food and other organic wastes including faecal sludge to produce biogas and biofertilizer. The supply of biogas has led to environmental and economic benefits through reduced reliance on external supplies of electricity and gas and an associated reduction in power bills. The anaerobic digester is now a demonstration model for communities and other schools to come see its operation and learn its benefits.

5.6. Sustainable livelihoods supported by strong foundations for inclusive economic growth and innovation (SDG 8: Decent work and economic growth)

Key points

- ➔ GROW awards have contributed to inclusive economic growth and sustainable livelihoods by informing the implementation of sustainable and inclusive development initiatives and supporting the livelihoods of vulnerable coastal communities, through developing new practice and tools, influencing policy and leveraging continuing support for inclusive economic growth.
- ➔ New products and practices introduced include: testing and roll-out of an inclusive green growth tool.
- ➔ Continued support for inclusive economic growth includes: leveraging funding for further work on trade, development and the environment.
- ➔ Policy influence includes: informing UN guidance on sustainable infrastructure; securing the inclusion of provisions to protect fishing livelihoods in a UN treaty on marine conservation.

DCP - The Development Corridors Partnership (ES/P011500/1) - See case study, Annex C

New practice and tools introduced: DCP built the capacity of partner organisations in Tanzania and Kenya to plan and implement sustainable, resilient, and inclusive development corridors. DCP worked with the Southern Agricultural Growth Corridor of Tanzania (SAGCOT) to improve the planning and implementation of agricultural corridors and infrastructure development. This involved supporting SAGCOT with on-the-ground testing and roll-out of its Inclusive Green Growth tool that tracks environmental, social and business sustainability.

Continuing support for inclusive economic growth: The work of the DCP project led to £19m funding for a UKRI GCRF Global Interdisciplinary Research Hub on Trade, Development and the Environment (TRADE), with continuing involvement of DCP partners in Tanzania and Kenya. DCP's research also led to a proposal to the Global Environment Facility (GEF-8 impact project on

infrastructure), together with UNEP, government agencies in developing countries, WWF US, and regional development banks. This project was ratified by the GEF council in February 2024, with a $23 million core allocation and around $400 million in co-financing.

Policy influence: DCP's work informed (and is cited in) the UN Environment Programme (UNEP) International Good Practice Principles for Sustainable Infrastructure, developed as part of the implementation of UN Environment Assembly (UNEA) Resolution 4/5 on sustainable infrastructure, approved by all countries. DCP members also led the writing of a UNEP Global Environmental Outlook Business Brief for the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment on Future Proofing Infrastructure to Address the Climate, Biodiversity and Pollution Crises.

SOLSTICE-WIO - Sustainable Oceans, Livelihoods and food Security Through Increased Capacity in Ecosystem Research in the Western Ocean (NE/P021050/1)

Policy influence: SOLSTICE research influenced UN negotiations for a treaty on conservation of marine biological diversity in Areas Beyond National Jurisdiction (ABNJ). As a result of advocacy from SOLSTICE, the draft wording of the legally binding instrument was updated to include provisions to protect the fishing livelihoods of East African coastal countries which are highly vulnerable to negative impacts of the ABNJ.

5.7. Promoting resilience and action on environmental change (SDG 13: Climate action)

Examples of the work of GROW awards to promote resilience and action on environmental change can be found in the section on Equitable access to sustainable development above (see TIGR2ESS, African SWIFT, GlobalSeaweedSTAR, RECIRCULATE and SUNRISE).

5.8. Human rights, good governance and social justice (SDG 16: Peace, justice and strong institutions)

Key points

- ➔ Key areas of GROW impact relating to the GCRF challenge area of human rights, good governance and social justice included the development and implementation of in-country and cross-region responses to humanitarian crises, forced displacement, conflict, poverty and inequality, through the introduction of new practices and tools.
- ➔ New products and practices introduced include: the use of real time data to improve health service provision for Rohingya refugees; the use of a comprehensive directory of available support improved access to mental health and psychosocial support services in the West Bank of the occupied Palestinian territory; real-time weather forecasting (nowcasting) products that

provide early warnings of locust storms, flooding and treacherous sea conditions, and support the Red Cross in its disaster management work.

RECAP - Research capacity building and knowledge generation to support preparedness and response to humanitarian crises and epidemics (ES/P010873/1)

New products and practices introduced: RECAP's partnerships with international NGOs helped to improve policies and responses to humanitarian crises, including the Covid-19 pandemic, in Yemen, Sudan and Somalia. RECAP provided real time data to Médecins Sans Frontières (MSF) on the Diphtheria outbreak in Rohingya refugees in Bangladesh. MSF used this data to support their health service provision and bed allocation in their activities for the Rohingya refugees in Bangladesh. This allowed for more appropriate and efficient responses by MSF to patients with diphtheria.

RESEARCH FOR HEALTH IN CONFLICT (R4HC-MENA): developing capability, partnerships and research in the Middle and Near East (ES/P010962/1)

New products and practices introduced: R4HC MENA supported improved access to mental health and psychosocial support services in the West Bank of the occupied Palestinian territory. The Mental Health and Psychosocial Directory (MHPSS) provides up-to-date information about governmental and non-governmental organisations providing these services including contact information, service location, types of services and activities, beneficiaries and MHPSS staffing. This MHPSS Directory can be used to aid in referrals, for facilitating cooperation and partnerships between organisations engaged in similar work

African SWIFT - African Science for Weather Information and Forecasting Techniques (NE/P021077/1)

New products and practices: SWIFT enabled its partner meteorological services to develop real-time forecasting (nowcasting) products, supporting improved disaster. At the Kenyan Meteorological Department (KMD), SWIFT products provided early warnings for locust swarms in 2020 and Kenyan floods in 2019, allowing authorities to take more coordinated action. A Met Office-commissioned report found that the Highway project on Lake Victoria, in which SWIFT nowcasting products were used, had saved 300 lives per year.

New products and practices: The Ghana Meteorological Agency (GMet) has used SWIFT products to provide early warnings of treacherous sea conditions to the fishing community. With further GCRF funding, the SWIFT team built a new app, FASTA (Forecasting African STorms Application), allowing users to see current storm activity and providing early warning of approaching severe weather. The nowcasting app is now freely available for download across most of Africa. Kenya Red Cross have been using the app to support their disaster management.

> *The app has proven to be an invaluable resource for our operations. It provided timely and accurate information that enabled us to make informed decisions and take proactive*

measures to mitigate the impacts of these weather events. ... The app's user-friendly interface and real-time updates were especially useful in coordinating our response efforts and ensuring the safety of the communities we serve. (FASTA website -Summary presentation: Zachary Mwambi Misiani, Kenya Red Cross)

5.9. The design and delivery features of GROW that have supported its successes and early impacts

Key points

The design and delivery features of GROW which facilitated its ability to deliver against its objectives and achieve successes and early impacts were:

- ➔ Building equitable relationships between project partners
- ➔ Establishing relationships and networks with research partners, users and communities
- ➔ Involving partner organisations/users and communities at all stages of the project
- ➔ A focus on challenge-led research with potential welfare and economic development impacts
- ➔ Understanding the context, through working in collaboration with partner organisations, research users and communities
- ➔ Interdisciplinary approach to the research
- ➔ Strengthening research capacity, to address identified gaps in skills and know-how including effective knowledge exchange mechanisms, to support impact generation.

Respondents to our impact survey of GROW PIs and Co-Is were asked about the extent to which specific features of GROW had supported the emergence of the planned and unplanned impacts of their GROW awards. Drawing on existing knowledge about key determinants of impact we created a list of factors of that reflected design and delivery features of the GROW programme (see Figure 10). Survey respondents were asked to indicate the extent to which the impacts of their projects had been facilitated by any of these factors (they could choose as many as they wished).

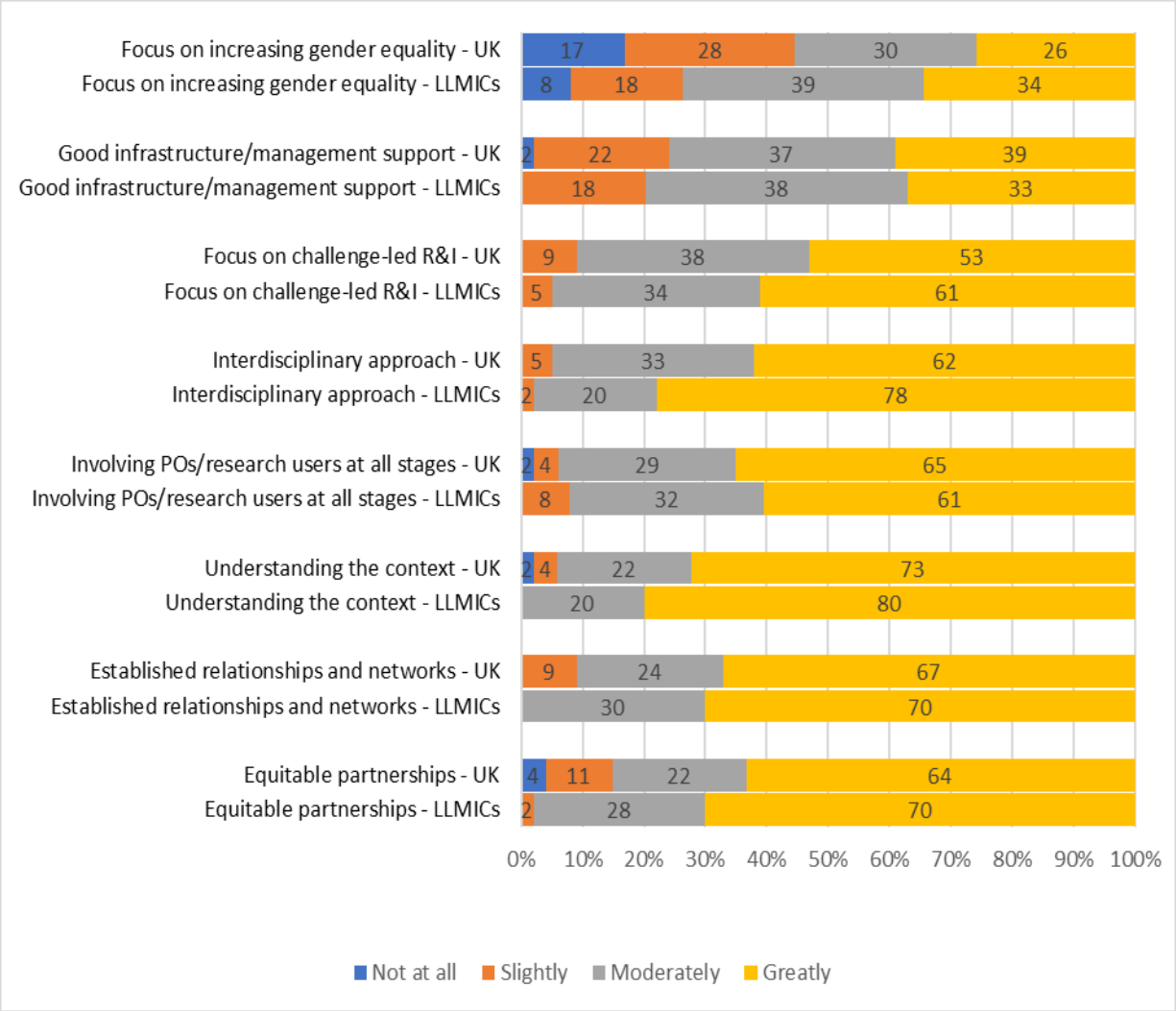
According to LLMIC and UK survey respondents the most commonly cited factors which had greatly or moderately facilitated the impacts of their awards were:

- Understanding the context, through working in collaboration with partner organisations, research users and communities (95% of impact respondents from the UK and 100% of respondents from LLMICs cited this as moderately or greatly facilitating impact)
- Established relationships and networks with research partners, users and communities (91% of respondents from the UK and 100% of respondents from LLMICs cited this as moderately or greatly facilitating impact)

- Equitable relationships between project partners (86% of respondents from the UK and 98% of respondents from LLMICs cited this as moderately or greatly facilitating impact)
- Interdisciplinary approach to the research (95% of respondents from the UK and 98% of respondents from LLMICs cited this as moderately or greatly facilitating impact)
- Involving partner organisations/users and communities at all stages of the project (94% of respondents from the UK and 93% of respondents from LLMICs cited this as moderately or greatly facilitating impact)
- A focus on challenge-led research with potential welfare and economic development impacts (91% of respondents from the UK and 95% of respondents from LLMICs cited this as moderately or greatly facilitating impact)
- Good infrastructure and management support (76% of respondents from the UK and 71% of respondents from LLMICs cited this as moderately or greatly facilitating impact)
- The focus on increasing gender equality (56% of respondents from the UK and 75% of respondents from LLMICs cited this as moderately or greatly facilitating impact).

It is worth noting that the relationships and networks with research partners, users and communities referred to above and below include those established during the delivery of the awards. There is key learning here for UKRI in the acknowledgement of the key role that partnership building plays as a determinant of impact.

Figure 10: Extent to which impacts were facilitated by the following factors (source: GROW impact survey, UK respondents n=84, LLMIC respondents n=69)



A thematic analysis of interviews conducted for the case studies included throughout this chapter provided further evidence of pathways to impact, and the key GROW-related design and delivery features that have supported these. Respondents highlighted the importance ofthe following as facilitating factors:

- Strengthened research capacity, addressing identified gaps in skills/know-how
- Established relationships and networks
- Focus on challenge-led research with potential welfare and economic development impacts
- Interdisciplinary approach to the research
- Working collaboratively through academic/operational/policy/community partnerships
- Effective knowledge exchange mechanisms.

Some of the impact facilitators noted above are also reported in the wider GCRF evaluation of its signature investments,[29] in particular the importance of stakeholder engagement for early uptake and use of research.

5.10. Barriers to impact

Key points

- ➔ The key factors which hindered GROW's ability to deliver against its objectives and achieve real-world successes and early impacts were Covid-19 related challenges and the changing landscape of research programme, notably the 2021 ODA budget reductions.
- ➔ Despite these externally imposed challenges and set-backs, projects had made huge efforts, to minimise negative effects, to keep the work on track, to maintain collaborations, and to maximise the impact of their work in the longer-term.
- ➔ Other potential barriers, such as staffing issues, risk levels, difficulties in accessing data/participants, regulatory issues, methodological/technical issues, and unrealistic initial objectives, were not perceived as particularly detrimental to projects' abilities to achieve impacts.

Respondents to our survey of GROW PIs and Co-Is also reported on the extent to which specific factors had hindered the emergence of planned and unplanned impacts of their GROW projects. As shown in Figure 11, the factors most commonly cited by both LLMIC and UK survey respondents as having greatly or moderately hindered the impacts of their awards were:

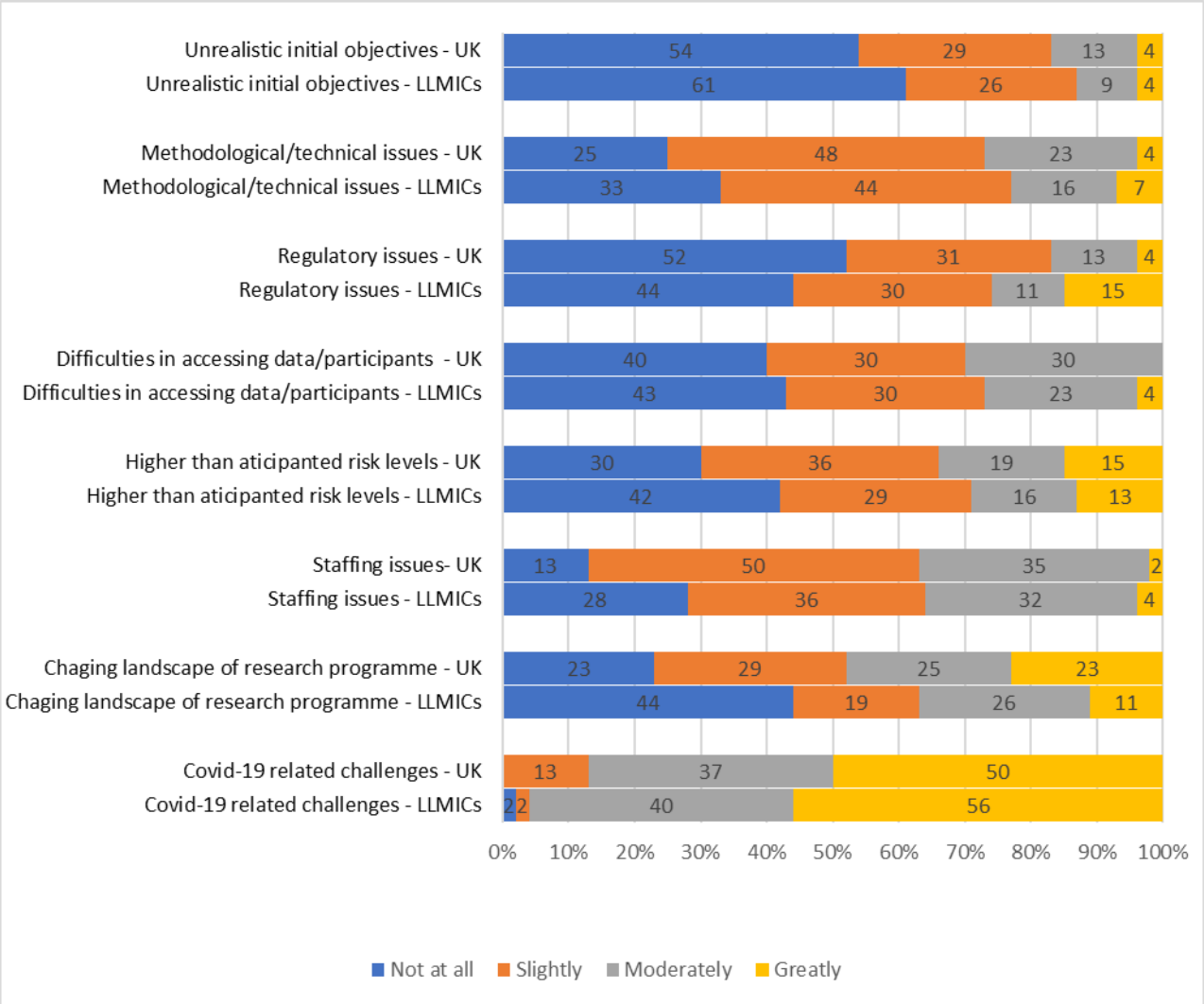
- Covid-19 related challenges (96% of DAC-list and 87% of UK respondents cited this factor)
- Changing landscape of research programme (37% of DAC-list and 48% of UK respondents cited this factor).

Figure 11 shows that other potential barriers, such as staffing issues, risk levels, difficulties in accessing data/participants, regulatory issues, methodological/technical issues, and unrealistic initial objectives, were not perceived as particularly detrimental to projects' abilities to achieve impacts. Our evaluation findings on impact barriers also align with those reported in the wider GCRF evaluation of its signature investments,[30] notably the challenges of Covid-19 and the 2021 ODA budget reductions.

[29] See footnote 3

[30] See footnote 3

Figure 11: Extent to which impacts were hindered by the following factors (source: GROW impact survey, UK respondents n=84, LLMIC respondents n=69)



Case study informant interviewees echoed these views and helped to highlight the key themes associated with these barriers. Unsurprisingly, Covid-19 affected the abilities of some GROW project teams to complete their programmes of work, with similar themes discussed by LLMICs and UK impact survey respondents. Pandemic restrictions prevented both travel (within/between countries, such as site visits and staff exchanges) and face-to-face work (including fieldwork, networking and lab work), impacting delivery timescales and the extent to which all goals could be met.

Feedback on the changing landscape of the GROW programme came predominantly from UK survey and interview respondents and related primarily to the 2021 ODA budget reductions. UK respondents highlighted the demoralising and disruptive effects of these reductions including concerns about reputational damage to UK R&I in a global sense. Some people mentioned the reductions had led to a loss of trust - between project partners, between project staff and

stakeholders/participants, and between grantees and UKRI. UK respondents also commented on the effects of the reductions on their ability to maximise impacts from their awards.

> *The cessation of the GROW programme (and similar activities) was tragic in my view and that of my colleagues. The influence facilitated is now leading to real world impacts. A fully funded Network 2.0 would be invaluable to pushing these through. (Impact survey respondent 213 - UK)*

> *I think we lost a lot of trust in the community, when it did change. I think that was a big erosion of trust. We were lucky in our case, but in some of the GCRF projects, relationships have been seriously damaged, and trust has been damaged. And that takes a long, long time to build. (Interview respondent 016 - UK)*

Despite these externally imposed challenges and set-backs, projects had made huge efforts, sometimes at great personal cost to individual staff (in terms of time and resource), to minimise the negative effects of Covid-19 and the 2021 ODA budget reductions, to keep the work on track, to maintain collaborations, and to maximise the impact of their work in the longer-term.

5.11. Potential legacy of the GROW programme with reference to the Theory of Change

Key points

➔ The expected impacts anticipated by the GROW Theory of Change (see Annex B) were very broad. There is robust and plentiful evidence that most of these have been achieved, partly achieved or are in progress, indicating a strong legacy for GROW in terms of:

- Increased capacity and capability within UK and LLMICs to address global development challenges
- Development of innovative approaches to dealing with international cross-disciplinary development challenges
- Increased contribution towards achieving UK Aid Strategy and UN SDGs
- Increased global understanding, knowledge and cooperation to respond to and address interdisciplinary development challenges faced by LLMICs.
- Documented welfare and economic benefits for LLMICs, with further impacts in the pipeline.
- Strengthened profile and reputation of individual UK researchers and their institutions, and by association, global recognition of the UK's capability and contribution towards dealing with cross-disciplinary development challenges and achieving the UN SDGs.

➔ There is little evidence, however, to indicate that, at a research ecosystem level, the profile and reputation of the UK's research and innovation community has been strengthened. In fact,

there is some evidence to suggest the opposite, due to the 2021 ODA budget reductions and the impact of this on the delivery of GROW projects and those involved.

➔ Overall, the GROW Theory of Change holds true, although its broad interpretation of outcomes and impacts, leaves room for more specificity if future programmes wished to take a more measurable and nuanced approach.

The GROW Theory of Change (ToC) specified a broad range of expected outputs, outcomes and impacts, with much overlap and repetition in the wording of these (see Annex B). Our interpretation of the key expected outcomes (i.e. those changes that could realistically be achieved within the lifetime of the programme) and an assessment of the extent to which these have been achieved is set out below:[31]

- Increased capacity and capability within UK and LLMICs to address global development challenges - *achieved (see Chapter 2)*
- Development of a more conducive environment for UK researchers to conduct challenge-led research - *partly achieved (see 2.2 and 2.3)*
- Development of a more agile and responsive UK research base which can contribute towards addressing global development challenges - *partly achieved (see Chapter 2)*
- Development of innovative approaches to dealing with international cross-disciplinary development challenges - *achieved (see Chapters 4 and 5)*
- Increased contribution towards achieving the UK Aid Strategy and UN SDGs - *achieved (see Chapter 5).*

The ToC also listed a number of impacts, many with expected changes at global level. Impacts such as these take many years to achieve, and attribution is therefore difficult. But at this point, two years post-programme, we have already seen some early evidence of contributions by GROW projects towards some of the following longer-term impacts:

- Globally integrated and inclusive approach towards research and development (listed as an outcome in the ToC) - *partly achieved and still in progress (see Chapter 3, Chapter 4 and Chapter 5)*

[31] We have only included in this list, outcomes that were truly achievable within the lifetime of the programme. There were several outcomes listed in the Theory of Change that should be more accurately defined as impacts, as they refer to 'global level' changes that could not realistically be expected to occur withing the GROW programme timescale.

- Globally increased appetite for collaborative research and development to tackle international development challenges (listed as an outcome in the ToC) - *partly achieved at individual level (see section 2.1)*
- Globally increased understanding and knowledge about dealing with development challenges faced by LLMICs - *achieved (see Chapters 2 and 4)*
- Enhanced global cooperation to address interdisciplinary development challenges faced by LLMICs - *partly achieved and still in progress (see Chapter 3 and Chapter 5)*
- Welfare and economic development of LLMICs - achieved in some key challenge areas (see Chapter 5)
- Strengthened profile of UK research and innovation community (this might have been better placed as an outcome) - *achieved (see Chapter 2)*
- Global recognition of UK's capability and contribution towards dealing with cross-disciplinary development challenges and achieving the UN SDGs - *partly achieved and on-going (see Chapters 2 and 4)*.

Overall, the GROW ToC largely holds true, although its broad interpretation of outcomes and impacts, leaves room for more clarity and specificity. In addition to being difficult to measure from an evaluation perspective, the multiple expected outcomes set out in the ToC, including those relating to RCS, research excellence and real-world impact, had the potential to be challenging for project teams to implement. However, data from the impact survey suggests that PIs and Co-Is did not feel that 'unrealistic initial objectives' had hindered achievement of impact (see Figure 11) indicating that project teams had made significant efforts to respond to both external challenges and the expectations of the Programme's ToC.

The 'assumptions' listed by the ToC appear to hold true for future programmes of this nature, with the obvious exception (due to the 2021 ODA budget reductions) of 'continued commitment and interest of all partners including government'. If future programmes wished to take a more measurable approach, the following areas of outcomes and impact could be considered for inclusion:

- Connectivity outcomes
  - Diverse, equitable delivery partnerships are sustained beyond the end of the programme
  - Development of new research collaborations which are diverse, equitable and sustained beyond the end of the programme
- Capacity strengthening outcomes for individuals
  - Increased knowledge of award-relevant research areas

- Increased knowledge and underpinning skills to deliver challenge-led research, such as project management, interdisciplinarity and partnership development
- Increased appreciation of the value of challenge-led research for development impact
- Increased levels of motivation and confidence to facilitate challenge-led research
- Enhanced research productivity outcomes in terms of obtaining higher qualifications, developing research proposals, securing further funding, and contributing solely or jointly to project outputs
- Enhanced career progression and ability to stay in a research-active role
- Enhanced professional reputation through external markers of professional esteem

- Capacity strengthening outcomes for institutions
  - Enhanced reputation
  - Enhanced research achievements
  - Enhanced workforce
  - Enhanced leadership
  - Enhanced strategic/financial support
  - Enhanced systems
  - Enhanced research infrastructure
  - Increased equity, diversity and inclusion
- Capacity strengthening outcomes at research ecosystem level
  - Access and interpretation benefits including transfer of knowledge and skills to wider sector and enhanced regional/national access to data
  - Strategic and financial outcomes - enhanced regional/national support for challenge-led research for development impact
- Conceptual outcomes
  - Formal publications are highly cited, accessible, used by policy makers and other stakeholders, and have potential for on-going and sustained impact
  - Non-formal and creative research outputs are produced, disseminated, used by stakeholders and have potential for on-going and sustained impact
- Instrumental outcomes
  - Contributions are made towards addressing key global challenges including the UN SDGs and the three GCRF challenge areas:
    - Equitable access to sustainable development

- Sustainable economies and societies
- Human rights, good governance and social justice

- Longer-term impacts
  - Real-world outcomes are delivered for LLMICs which reflect strong connections with stakeholders and understanding of the social, economic and political context for delivery.

6. Learning from GROW: delivering capacity strengthening within a challenge-focused research programme

This chapter draws on evidence from the impact evaluation and from projects' own award-level evaluations (where available) to summarise learning from GROW. In doing so we respond to EQ3: what can we learn about capacity strengthening and how/if it works, within the context of GROW?

6.1. How was capacity strengthening defined as part of GROW?

The GROW Call document[32] stipulated the requirement that research capacity strengthening (RCS) activity was to be delivered within the context of challenge-focused research projects with specific focus on partnership and interdisciplinarity. This context was expected to offer valuable opportunities for learning-by-doing whilst enabling global development challenges to be addressed, and real-world outcomes for in-country partners to be delivered.

As reflected in the Call document, and in the GROW Theory of Change (see Annex B), the UKRI architects of the GROW programme did not seek to limit definitions of research capacity strengthening, advocating instead for a broad and flexible approach. UKRI specified that funding could be used to support bespoke training to develop capacity and capability at all career levels; for development of professional and transferable skills as well as technical and core skills; and towards the hiring and retention of key staff in the UK and overseas, and including research leaders in LLMICs as Co-Is.

Equally, the Theory of Change listed a range of loosely defined outcomes that were anticipated to be achieved by the end of the programme including: increased capacity within the UK and LLMICS to address global challenges; a more conducive, agile and responsive UK research base to contribute to and conduct challenge-led research; development of innovative approaches to dealing with international cross-disciplinary development challenges; and increased contributions towards achieving the UK Aid Strategy and UN SDGs.

The lack of a specific definition of research capacity strengthening had positive outcomes in that it enabled GROW projects to work together with UK and LLMIC partners to design a huge range of

[32] GCRF RCUK Collective Fund: GROW GC - Call Document Research Councils UK

different approaches and activities to meet in-country needs and contexts, leading to benefits for individuals, institutions, and wider research ecosystems (as detailed in Chapter 2). As one UKRI-based interview respondent commented:

> *There were so many different interpretations of what capacity is. So, the PRECISE project - that was focused upon building up a biobank to strengthen future capacities, it was more about the resource that was being developed, as well as the careers aspects of it. And then for the Tobacco Control Capacity Programme, there was quite a bit about capacity to bring research into policy, which again, was about the capacity of the overall policy system rather than just for careers. So, I thought we have quite a broad definition of capacity strengthening, which I think was really good. I do think it's a helpful approach. (Interview respondent 003 - UKRI stakeholder)*

It is worth noting, however, that the lack of a specific definition of research capacity strengthening and the resulting wide range of RCS approaches also makes it very challenging to measure and to compare and contrast between awards, limiting the opportunities for learning.

6.2. Delivering capacity strengthening within a challenge-focused research programme: learning from GROW

Building on the GROW programme approach and drawing on insights gained from the research capacity strengthening (RCS) literature,[33] [34] [35] the impact evaluation has focused on assessing capacity strengthening outcomes at three different levels: for individuals, institutions, and more widely for research ecosystems.

In Chapter 2 we discussed in detail the ways in which GROW awards implemented RCS and the outcomes at the three different levels, both within LLMICs and the UK. In Chapter 3 we documented how GROW teams had built and sustained the necessary research collaborations and partnerships which provided the people, resources and infrastructure to develop and instigate their RCS activity. In Chapters 4 and 5 we examined the ways in which GROW projects delivered impact-focused research and the nature and extent of the real-world outcomes their work achieved. We also considered the distinct features of GROW that supported its successes and

[33] Khisa, A., Gitau, E., Pulford, J. and Bates, I (2019) A framework and indicators to improve research capacity strengthening evaluation practice. African Population and Health Research Center, Nairobi, Kenya and Centre for Capacity Research, Liverpool School of Tropical Medicine, UK.

[34] Chadwick El-Ali, A., Padilla, A., Bucher, A., Kirkland, J., Heintz, M., and Kunaratnam, Y. (2022) Research capacity strengthening: Lessons from UK-funded initiatives in low- and middle- income countries. UK Collaborative for Development Research.

[35] Pulford, J., Price, N, Amegee Quach, J., and Bates, I. (2020) Measuring the outcome and impact of research capacity strengthening initiatives: A review of indicators used or described in the published and grey literature. F1000Res. 2020 Jun 4;9:517. doi: 10.12688/f1000research.24144.1. PMID: 32595961; PMCID: PMC7312283.

early research-focused and capacity-building impacts, and the factors which had hindered projects' achievements.

With reference to the evidence presented in these preceding chapters, we summarise some of the key learning relating to delivering research capacity strengthening within the context of the GROW programme as follows:

- Building a diverse team of multiple collaborators both with researchers and with non-academic stakeholders (including research organisations, public communities, civil society, public sector organisations and business) can provide platforms and opportunities for RCS activities, learning-by-doing, and new/on-going links and networks.
- Ensure collaborations are based on fair, equitable and inclusive working partnerships between and within research teams and other partners. This includes agreeing, establishing, and documenting, equitable governance and financial processes; equitable approaches for co-creating research, training and other RCS activities; and equitable access and ownership of project data, publications and IP rights.
- At the individual level, offering a broad range of RCS activities for all career stages, including targeted training, mentoring and focused opportunities for learning-by-doing. Although RCS activities may be primarily focused on early career researchers, mid-career and senior staff also greatly appreciate and benefit from the chance to learn new skills, particularly through experiential learning and active engagement with researchers and stakeholders from different geographical locations to themselves.
- At the individual level, RCS activities should seek to increase transferable and underpinning knowledge and skills (including partnership development) as well as enhance understanding in research-specific areas. RCS activities should also consider how to enhance, and appropriately record, research productivity outcomes, career progression and opportunities for enhanced professional reputation. Enhancing the academic writing skills of early career researchers, both for grant proposals, and for publications, should be a key focus for capacity strengthening activities as it provides a strong foundation for career progression and continuation in research-active roles. Indicators for enhanced professional reputation should be carefully designed to ensure they do not disadvantage researchers from the Global South.
- RCS activities should also consider how to increase motivation and confidence in different aspects of research for individuals at senior, mid and early career levels. Researchers involved in GROW reported increased motivation and confidence largely through learning-by-doing, collaborative working with partners, trying out new and innovative methods, and crucially, witnessing the real-life and tangible impacts that effective interdisciplinary research can have on knowledge, health, practice and policy. But they also acknowledged that the GROW programme was a rare and unique opportunity in this respect.

- Programme-wide networking should be included in future programme specifications, to provide opportunities for peer learning and support, networking and collaboration, both within project cohorts and between institutions. This was identified in the learning from GROW award-level evaluation reports, which highlighted the importance of peer and programme-level learning opportunities (see below). The GROW process evaluation[36] also highlighted the potential need for and interest in programme-wide networking by project teams.
- At the institutional level, RCS activities may most usefully focus on achieving enhancements in organisational reputation; research achievements; workforce capacity; and investment in infrastructure. Other areas for potential input include: enhanced leadership; enhanced gender equality; improved strategic and financial support; and enhanced systems for research management.
- At the research ecosystem level, RCS activities may provide best outcomes through the transfer of knowledge, skills and training to wider sectors including non-academic stakeholders and policy makers; creating data infrastructures and information systems to enable wider access to samples, evidence and research findings; and finding ways to increase strategic and financial support for research more broadly, for instance by influencing research-related policy and knowledge systems in-country and across regions through networks, policy work and stakeholder engagement.
- Whilst the GROW programme focused largely on RCS for individuals, a requirement for a greater emphasis on institutional and research ecosystem strengthening could enhance the impact of future similar programmes. This could be supported by associated specific guidance for strengthening institutions and research ecosystems in future schemes, drawing on the lessons for effective individual-level RCS highlighted above.

Award-level learning from three formal project evaluations (CEPHaS,[37] PIIVeC[38] and BRECcIA[39]) echoes the above recommendations for the delivery of future RCS initiatives, suggesting they should include the following elements:

[36] See footnote 4

[37] Duda K, D'Artibale A, Moombe M et al. (2023) A mixed-methods evaluation of capacity strengthening within an international conservation agriculture research consortium [version 1; peer review: 2 approved] F1000Research 2023, 12:1119 https://doi.org/10.12688/f1000research.139715.1

[38] Amegee Quach J, Valea I, Bates I, et al. (2023) Factors affecting African postdoctoral researcher capacity development within 'learn-by-doing' international research partnerships: findings from the 'Partnership for Increasing the Impact of Vector Control (PIIVeC)'. BMJ Glob Health 2023;8:e012626. doi:10.1136/ bmjgh-2023-012626)

[39] Vitae: The Careers Research and Advisory Centre (CRAC) Limited (2022) Building Research Capacity for sustainable water and food security in drylands of sub-Saharan Africa (BRECcIA) - Assessing the difference BRECcIA has made. Unpublished evaluation report

- Inclusive leadership and management - including practices that facilitate capacity sharing, ensure equity of opportunity and reward engagement.
- Capacity building at all staffing levels to create cultural change.
- Embedding of RCS initiatives within research activity - including learning-by-doing, integration of methodological skills development, and opportunities for supported research autonomy, e.g. in designing/conducting research and taking on leadership roles.
- Opportunities for peer learning and support - networking and collaboration, within project teams, between institutions and at programme-level.
- Exposure to diverse and multi-disciplinary work and training - to improve understanding of the skills needed for career development.
- Strengthened and diverse networking and collaboration opportunities - in particular for ECRs.
- Support for institutional capacity strengthening - including provision of resources, equipment and laboratories, and investment in research management staff.

Evaluation and award-level learning aligns with learning from other similar programmes. These include UKCDR's 2022 review[40] of UK-funded RCS initiatives in LLMICs, and ESSENCE for Health Research/LSTM Centre for Capacity Research's 2023 evidence review[41] on RCS and the experiences of RCS funders. These reviews recommended the following cross-cutting enablers for successful RCS programmes:

- LLMIC ownership - support LLMIC leadership, agenda setting, design and implementation of RCS.
- Long-term approach - ensure funding and evaluation frameworks prioritise sustainability in RCS, including commitment to developing individuals and meeting institutions' RCS needs.
- Coordination - enhance coordination of RCS approaches across funders at the individual, institutional and environment level.
- Partnerships and collaboration - promote equitable partnerships and co-creation within funding calls and funded programmes.

[40] UKCDR (2022) Research Capacity Strengthening: Lessons from UK-funded initiatives in low- and middle-income countries. Available at https://ukcdr.org.uk/resource/research-capacity-strengthening-lessons-from-uk-funded-initiatives-in-low-and-middle-income-countries/

[41] ESSENCE on Health Research and CCR (2023) Effective Research Capacity Strengthening: A Quick Guide for Funders. Available at https://tdr.who.int/publications/m/item/effective-research-capacity-strengthening-programmes

- Understand and assess programme and project impacts - invest in understanding what works where to guide future funding decisions and programme design.

6.3. Lessons to inform future funding programmes

As part of this impact evaluation, we also gathered feedback from UKRI stakeholders involved in the design and management of GROW which highlighted additional learning for future RCS investments summarised as follows:

- A broad definition of capacity strengthening allows project partnerships to design approaches in response to in-country needs and contexts, thus enabling potential benefits at individual, institutional and research ecosystem levels.
- The integration of capacity strengthening initiatives with a challenge-focused approach to research will provide opportunities for learning-by-doing whilst addressing global development challenges and producing real-world outcomes.
- Interdisciplinary approaches will support and enhance challenge-focused projects.
- Sufficient time is needed at the commissioning stage to facilitate the development of partnerships and networks.
- Evaluation processes built in from the start of programmes will help to provide evidence of the programme's achievements.
- Direct funding to institutions in partner countries should be considered to promote local ownership and leadership of capacity strengthening initiatives.
- Multi-year projects are important to provide sufficient time to develop impacts.
- Availability of funding for follow-on work would maximise the impact and promote the sustainability of programme benefits.

These findings align with three key conclusions of the GROW process evaluation[42] which recommended that:

- Size, scale, length and flexibility of funding matter - funding should be proportionate the scope and ambition of RCS programmes. There should be protected time for both inception (to promote fairness and support new and equitable partnership building) and follow-on work relating to dissemination and maximising impacts.

[42] See footnote 4

- Ensure adequate commissioning time in future programmes to allow for development of new partnerships - contextual fairness during the commissioning process could have been hindered by the reliance on pre-existing networks and partners.
- Interdisciplinarity should continue to be promoted in programmes which promote challenge-led research - GROW demonstrated that the transformative value of interdisciplinary research for many of those involved in the programme.

7. Conclusions and recommendations

The GROW programme was a large-scale, multi-faceted and ambitious set of projects which individually, and together, achieved significant outcomes and early impacts for LLMICs and the UK, both in terms of building research capacity and in delivering impact-focused research and real-world outcomes. GROW participants at all levels reported increased research capacity through learning-by-doing, collaborative working with inspirational partners, trying out new and innovative methods, and crucially, witnessing the real-life and tangible impacts that effective interdisciplinary research can have on knowledge, health, practice and policy. They acknowledged that the GROW programme was a rare and unique opportunity and advocated for future funding initiatives to maximise the impacts of their awards and sustain the valuable collaborations developed.

> *It was a genuine privilege to be part of the GROW Programme. The holistic approach of GROW and the wider benefits it brought in addition to traditional research outputs and notions of impact serve as a model for other funding schemes. Whilst the ODA cuts were damaging and the opportunities for capacity strengthening have shrunk, we continued to find ways to build on the relationships and ideas in this area. I would like to recommend that every research project has a research capacity element built into it … so that the benefits of the research can have development impact not just in the research area but also for the researchers involved and their institutions. This would, further enhance the UK's global reputation, and build a legacy for future generations of researchers to build on. (Impact survey respondent 237 - UK)*

7.1. Conclusions of the impact evaluation

GROW built people-based research capacity for individuals and institutions, across career stages, in both the UK and LLMICs and, to a more limited extent at research ecosystem levels

- GROW built capacity for individuals - the learning-by-doing nature of being involved in GROW led to capacity strengthening outcomes for researchers at all levels of seniority from both LLMICs and the UK. Individuals reported increased levels of knowledge, skills, commitment, motivation and confidence in relation to challenge-led research and innovation (R&I). GROW also enhanced their research productivity, professional reputations, and opportunities for career progression and continuation in research-active roles.
- GROW built capacity for institutions - the evaluation enhanced the reputations, research achievements and workforces of LLMIC and UK- based institutions. Benefits were stronger for LLMIC institutions in the areas of enhanced leadership, enhanced strategic/financial support, enhanced systems, and enhanced gender equality; and were significantly stronger in terms of enhanced infrastructure.

➔ GROW built capacity for the wider research ecosystem - outcomes for LLMICs (but not the UK) included wider training, creation of data infrastructures, and increased strategic/financial support for challenge-led R&I.

GROW enabled project teams to build, strengthen and sustain diverse and equitable relationships between UK and LLMIC organisations (including civil society, researchers, academia, public sector, and private sector/businesses)

➔ GROW enabled diverse interdisciplinary research teams to be created, strengthened and sustained - Each GROW project was led by a UK research institution working to deliver the project with LLMIC-based partners (56%) and partners from the UK and elsewhere (44%) - the average number of partners per project was 23.

➔ GROW helped project delivery partners strengthen and sustain their relationships - 88% of LLMIC and UK respondents to the impact evaluation's online survey felt their partnerships had been strengthened and 81% reported some form of continued collaborative work post-programme. LLMICs also said their relationships had been strengthened in-country (88%) and with other LLMICs (79%), showing the impact of GROW on knowledge exchange between countries in the Global South.

➔ GROW awards built 1,531 other collaborations and networks for knowledge exchange - 93% of these had been established during the programme (rather than pre-dating it) and 85% were still active in March 2024 (two years after the end of programme). This indicates that UK and LLMIC project teams had not relied on pre-existing relationships for the duration of their awards and had used the opportunities provided by the programme to develop and nurture new relationships.

➔ Most GROW awards (70%) had made focused efforts to build and sustain equitable and inclusive working partnerships between and within research teams and other collaborators, including establishing equitable governance and financial processes, agreeing equitable approaches for co-creating research and training activities, and having agreements about access to data and ownership and publications/IP rights for project outputs.

➔ GROW project teams leveraged a sterling equivalent of over £420 million over 506 new grants, most of which was for research projects (72%). 204 grants over 33 projects (41% of total new funding) had continued since March 2022, showing that almost all GROW projects (89%) have sustained some form of research and/or capacity building activities at institutional level well beyond the end of the programme.

GROW delivered significantly increased global-level data about tackling development challenges faced by LLMICs, as evidenced by the production of over 4,200 formal publications and over 4,500 new research tools, methods, and non-formal outputs

➔ GROW-linked publications are highly cited, accessible to research users and have potential for on-going and sustained impact - GROW projects published over 4,200 formal outputs, half of

which are available as open access, 52% of which have been cited by others, and 5% of which already show potential for policy impact (in terms of citation and use in policy documents). GROW publications have been cited nine times more frequently in relation to average citations for publications in the same fields of research and of the same age.

➔ GROW non-formal, artistic and creative outputs provide a means for on-going engagement with research users and potential for impact on the welfare and economic development of LLMICs - the production of over 4,500 new research tools, methods, software, technical products, clinical trials, patents, spinouts, and artistic and creative outputs show that the needs of stakeholders have been considered in sharing the results and benefits of projects.

GROW directly facilitated increased contributions from the UK research community towards dealing with development challenges and delivering real-world outcomes for LLMICs

➔ GROW projects have made significant steps in addressing the GCRF challenge areas, particularly in the areas of equitable access to sustainable development, sustainable economies and societies, and human rights, good governance and social justice.

➔ Through involvement in GROW, the UK research community has had significant and increased engagement with international development challenges, contributing to real-world outcomes for LLMICs:

- Secure and resilient food systems supported by sustainable marine resources and agriculture.
- Sustainable health and wellbeing.
- Inclusive and equitable education.
- Clean water and sanitation.
- Affordable, reliable, sustainable energy.
- Sustainable livelihoods supported by strong foundations for inclusive economic growth and innovation.
- Responses to humanitarian crises, forced displacement, conflict, poverty and inequality.

7.2. Recommendations for UKRI and funders of similar programmes

Learning from GROW has contributed to the following recommendations about research capacity building and its role in the design of future challenge-focused research programmes

➔ Embedding of research capacity strengthening initiatives within challenge-focused research activity will provide opportunities for learning-by-doing and support research autonomy, whilst addressing global development challenges and producing real-world outcomes. Exposure to diverse and multi-disciplinary work and training will improve understanding of the skills needed

for career development and provide opportunities for strengthened and diverse networking and collaboration opportunities for researchers at all career levels.

- ➔ Interdisciplinarity should continue to be promoted in capacity building programmes which promote challenge-led research. Interdisciplinary approaches will support and enhance challenge-focused projects. The GROW programme was itself an opportunity to transfer knowledge, skills and training between people, disciplines and geographic areas, and direct engagement between LLMIC and UK partners provided many personal, and inspirational, learning opportunities.
- ➔ Funding which allows for a longer-term, multi-year approach will give space and time for research collaborations and networks to be nurtured and developed. Funding should be proportionate to the scope and ambition of programmes. There should be protected time for both inception (to promote fairness and support new and equitable partnership building) and follow-on work relating to dissemination, maximising impacts and promoting the sustainability of programme benefits.
- ➔ Partnerships with non-academic stakeholders and other research users should be encouraged and supported - they will help to maximise the real-world impacts of funded projects. There is key learning for UKRI in the acknowledgement of the important role that partnership building plays as a determinant of impact, and the importance supporting this within future programmes, both during commissioning and delivery phases.
- ➔ Promoting equitable partnerships, co-creation and opportunities for LLMIC ownership and leadership will facilitate capacity sharing, ensure equity of opportunity and reward engagement. Direct funding to institutions in partner countries should be considered to promote LLMIC ownership and leadership of capacity strengthening initiatives. There should be requirements, and monitoring, to ensure that collaborations are based on fair, equitable and inclusive working partnerships between and within research teams and other partners.
- ➔ Programme-wide networking should be included in future programme specifications, to provide opportunities for peer learning and support, networking and collaboration, both within project cohorts and between institutions.
- ➔ Investing in understanding and assessing programme and project impacts will help to guide future funding decisions and programme design. Evaluation processes built in from the start of programmes - including a clearly documented Theory of Change, linked to specific and measurable objectives and evaluation questions - will structure monitoring and reporting so helping to provide clear evidence of the programme's achievements.

Annex A: List of the 37 GROW projects[43]

Project reference	Project title	Project website (where available)	Value of award	Focal countries
AH/P014232/1	GlobalGRACE: Global Gender and Cultures of Equality	https://www.globalgrace.net/	£3,287,886	Brazil, Bangladesh, South Africa, Philippines
AH/P014240/1	None in Three (Ni3): A Centre for the Development, Application, Research and Evaluation of Prosocial Games for the Prevention of Gender-Based Violence	http://www.noneinthree.org/impact/	£4,303,664	Uganda, Pakistan, Jamaica
BB/P02789X/1	Establishment of biopharmaceutical and animal vaccine production capacity in Thailand and neighbouring South East Asian countries	https://research.kent.ac.uk/gcrfbiopharma/	£4,090,258	Thailand, Vietnam, Cambodia, Lao People's Democratic Republic, Malaysia
BB/P027784/1	AFRICAP: Agricultural and Food-system Resilience: Increasing Capacity and Advising Policy	https://africap.info/category/news/	£8,038,779	Zambia, South Africa, Tanzania, Malawi
BB/P027806/1	GlobalSeaweedSTAR: Safeguarding the future of seaweed aquaculture in developing countries	http://www.globalseaweed.org/	£5,419,058	Philippines, Malaysia, Tanzania
BB/P027849/1	CABANA: Capacity building for bioinformatics in Latin America	https://cabana.network/	£3,862,824	Brazil, Colombia, Mexico, Peru, Costa Rica, Argentina
BB/P027954/1	HORN: One Health Regional Network for the Horn of Africa	http://onehealthhorn.net/	£7,898,299	Kenya, Eritrea, Ethiopia, Somalia
BB/P027970/1	TIGR2ESS: Transforming India's Green Revolution by Research and Empowerment for Sustainable food Supplies	https://tigr2ess.globalfood.cam.ac.uk/final-outcomes	£7,035,021	Pakistan, India

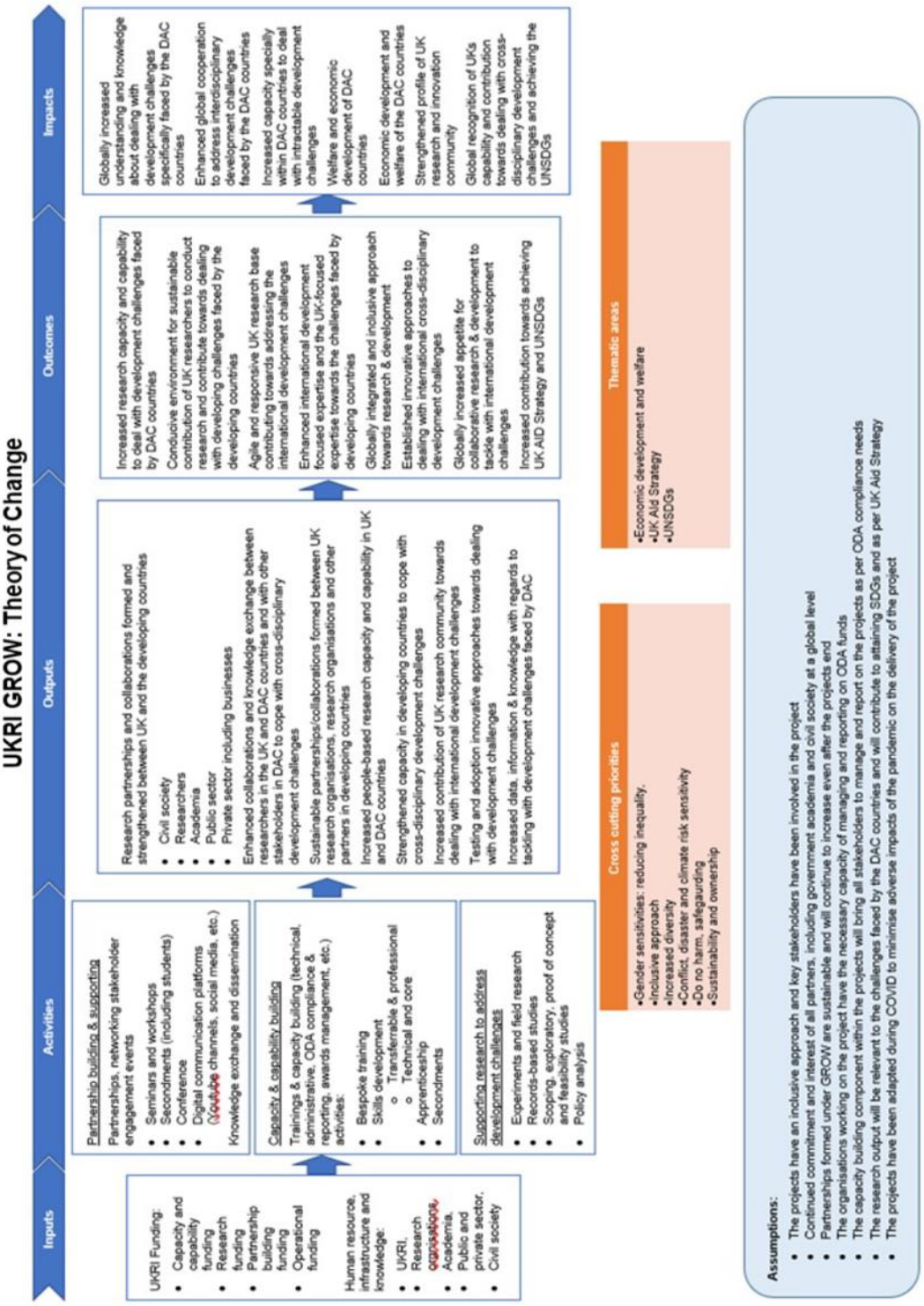
[43] Data taken from Gateway to Research, accessed March 2024

Project reference	Project title	Project website (where available)	Value of award	Focal countries
BB/P028098/1	Preserving, Restoring and Managing Colombian Biodiversity Through Responsible Innovation	https://www.growcolombia.org/	£5,332,079	Colombia
EP/P032427/1	SAFEWATER: Low-cost technologies for safe drinking water in developing regions	https://www.safewater-research.com/	£4,889,812	Colombia, Mexico, Brazil
EP/P032591/1	SUNRISE: Strategic University Network to Revolutionise Indian Solar Energy	http://www.sunrisenetwork.org/category/news/	£6,580,123	India
ES/P010849/1	COMPASS: Capacity-building in Eastern Neighbourhood and Central Asia: research integration, impact governance and sustainable communities	https://research.kent.ac.uk/gcrf-compass/outputs/research-outputs/	£2,929,747	Azerbaijan, Tajikistan, Belarus, Uzbekistan
ES/P010857/1	RECIRCULATE: Driving eco-innovation in Africa: capacity-building for a safe circular water economy	http://recirculate.global/	£5,926,058	Ghana, Nigeria
ES/P010873/1	RECAP: Research capacity building and knowledge generation to support preparedness and response to humanitarian crises and epidemics	https://www.lshtm.ac.uk/research/centres-projects-groups/recap	£7,859,268	Myanmar, Democratic Republic of the Congo, South Sudan, Sierra Leone, Uganda, Lebanon
ES/P010938/1	STRiDE: Strengthening responses to dementia in developing countries (GCRF)	https://stride-dementia.org/library/guidance-and-resources/	£7,075,027	India, Jamaica, Mexico, Kenya, Indonesia, South Africa, Brazil
ES/P010962/1	GCRF RESEARCH FOR HEALTH IN CONFLICT (R4HC-MENA): developing capability, partnerships and research in the Middle and Near East	https://r4hc-mena.org/	£5,978,505	Lebanon, State of Palestine, Jordan, Turkey
ES/P011020/1	Centre for Sustainable, Healthy, and Learning Cities and Neighbourhoods	http://www.centreforsustainablecities.ac.uk/	£7,105,262	South Africa, Tanzania, China, Rwanda, Bangladesh, India, Philippines, Botswana
ES/P011055/1	PEAK: Building capacity for the future city in developing countries	https://www.peak-urban.org/	£7,249,665	China, India, Colombia, South Africa
ES/P011225/1	URBAN KNOW: Knowledge in Action for Urban Equality	https://www.urban-know.com/	£6,319,228	India, Costa Rica, Colombia, Peru, Uganda,

Project reference	Project title	Project website (where available)	Value of award	Focal countries
				Cuba, Sierra Leone, Sri Lanka, Tanzania, Thailand
ES/P011306/1	SENTINEL: Social and Environmental Trade-offs in African Agriculture	https://www.sentinel-gcrf.org/	£5,630,400	Ghana, Zambia, Ethiopia
ES/P011373/1	FutureDAMS: Design and assessment of resilient and sustainable interventions in water-energy-food-environment Mega-Systems	https://www.futuredams.org/	£8,162,095	Turkey, China, India, Uganda, Syrian Arab Republic, Jordan, Iran, Myanmar, Iraq, Burkina Faso
ES/P011500/1	DCP: Development Corridors Partnership	https://developmentcorridors.org/	£4,218,553	Tanzania, Kenya, China
ES/P011543/1	Drugs and (dis)order: Building sustainable peacetime economies in the aftermath of war	https://drugs-disorder.soas.ac.uk/	£7,328,791	Afghanistan, Colombia and Myanmar
MR/P02811X/1	CAPABLE: Cambridge Alliance to Protect Bangladesh from Long-term Environmental Hazards	https://gtr.ukri.org/projects?ref=MR%2FP02811X%2F1	£8,134,239	Bangladesh
MR/P027873/1	PIIVeC: Partnership for Increasing the Impact of Vector Control	https://www.piivec.org/	£6,325,569	Burkina Faso, Cameroon, Malawi
MR/P027881/1	ORNATE INDIA: Increasing eye research capacity and capabilities to tackle the burden of blindness in India: a research-based UK-India Collaboration	http://ornateindia.net/	£6,336,970	India
MR/P027938/1	PRECISE (PREgnancy Care Integrating translational Science, Everywhere) Network: a sub-Saharan network for placental disorders	https://precisenetwork.org/	£7,921,897	Kenya, Senegal, Mozambique, Gambia
MR/P027946/1	TCCP: Tobacco control capacity programme	https://www.ed.ac.uk/usher/tobacco-control-capacity-programme	£3,359,693	Gambia, Ethiopia, India, Bangladesh, Ghana, Sri Lanka, South Africa, Uganda
MR/P027989/1	A Global Network for Neglected Tropical Diseases	https://ntd-network.org/	£6,764,938	India, Brazil
MR/P028004/1	Thanzi la Onse (Health of All): Frameworks and analysis to ensure value for money health care - developing theory, changing practice	https://thanzi.org/resources/publications/	£5,520,059	Malawi, Uganda, Southern and East Africa

Project reference	Project title	Project website (where available)	Value of award	Focal countries
MR/P028071/1	GCRF-Crick African Network	https://www.crick.ac.uk/research/research-partnerships/strategic-partnerships/crick-africa-network	£6,336,135	Ghana, Senegal, Gambia, Uganda, South Africa
	SASHI: South Asia Self Harm research capability building initiative	http://sashi.bangor.ac.uk/	£4,487,566	India, Pakistan
NE/P02095X/1	CEPHaS: Strengthening Capacity in Environmental Physics, Hydrology and Statistics for Conservation Agriculture Research	https://www2.bgs.ac.uk/CEPHaS/publications.html	£5,141,662	Zambia, Zimbabwe and Malawi
NE/P021050/1	SOLSTICE-WIO: Sustainable Oceans, Livelihoods and food Security Through Increased Capacity in Ecosystem Research in the Western Ocean	https://www.sciencedirect.com/science/article/pii/S0308597X19300764#appsec1	£6,934,488	Seychelles, Mozambique, Comoros, Madagascar, Mauritius, Tanzania, South Africa, Somalia, Kenya
NE/P021077/1	AFRICAN SWIFT: African Science for Weather Information and Forecasting Techniques	https://africanswift.org/	£7,971,410	Kenya, Nigeria, Ghana Senegal
NE/P021093/1	BRECcIA: Building Research Capacity for sustainable water and food security in drylands of sub-Saharan Africa	https://www.gcrf-breccia.com/	£5,481,342	Kenya, Ghana and Malawi
NE/P021107/1	Building capacity for sustainable interactions with marine ecosystems for health, wellbeing, food and livelihoods of coastal communities	https://www.blue-communities.org/	£5,847,901	China, Indonesia, Malaysia, Vietnam, Philippines

Annex B: GROW programme theory of change



Annex C: GROW impact case studies

Impact case study number and award name	Focal countries	GCRF Challenge areas
1. BB/P027806/1: GlobalSeaweedSTAR - Safeguarding the future of seaweed aquaculture in developing countries	• Philippines • Malaysia • Tanzania	Equitable Access to Sustainable Development: • Secure and resilient food systems supported by sustainable marine resources and agriculture Sustainable economies and societies: • Sustainable livelihoods • Resilience and action on environmental change
2. BB/P027970/1: TIGR2ESS - Transforming India's Green Revolution by Research and Empowerment for Sustainable food Supplies	• Pakistan • India	Equitable Access to Sustainable Development: • Secure and resilient food systems supported by sustainable marine resources and agriculture
3. NE/P021077/1: AFRICAN SWIFT - African Science for Weather Information and Forecasting Techniques	• Kenya • Nigeria • Ghana • Senegal	Equitable Access to Sustainable Development: • Secure and resilient food systems supported by sustainable marine resources and agriculture Sustainable economies and societies: • Resilience and action on environmental change Human rights, good governance and social justice: • Understand and respond effectively to forced displacement and multiple refugee crises
4. NE/P02095X/1: CEPHaS - Strengthening Capacity in Environmental Physics, Hydrology and Statistics for Conservation Agriculture Research	• Zambia • Zimbabwe • Malawi	Equitable Access to Sustainable Development: • Secure and resilient food systems supported by sustainable marine resources and agriculture • Clean air, water and sanitation. Sustainable economies and societies: • Resilience and action on environmental change
5. ES/P011500/1: DCP - Development Corridors Partnership	• Tanzania • Kenya • China	Sustainable economies and societies: • Sustainable livelihoods • Resilience and action on environmental change
6. MR/P028004/1: Thanzi La Onse (Health of All) - Frameworks and analysis to ensure value for money health care - developing theory, changing practice	• Malawi • Uganda • Southern and East Africa	Equitable access to sustainable development: • Sustainable health and wellbeing Sustainable economies and societies: • Sustainable livelihoods

Impact case study number and award name	Focal countries	GCRF Challenge areas
7. MR/P027873/1: PIIVeC - Partnership for Increasing the Impact of Vector Control	• Burkina Faso • Cameroon • Malawi	Equitable access to sustainable development: • Sustainable health and wellbeing
8. EP/P032427/1: SAFEWATER - Low-cost technologies for safe drinking water in developing regions	• Colombia • Mexico • Brazil	Equitable Access to Sustainable Development: • Clean air, water and sanitation
9. AH/P014240/1: None in Three (Ni3) - A Centre for the Development, Application, Research and Evaluation of Prosocial Games for the Prevention of Gender-based Violence	• Uganda • Pakistan • Jamaica	Equitable access to sustainable development: • Sustainable health and wellbeing • Inclusive and equitable quality education

GROW Impact Case Study 1: GlobalSeaweedSTAR - Safeguarding the Future of Seaweed Aquaculture in Developing Countries

GlobalSeaweedSTAR (GSSTAR) worked with partners in the Philippines, Malaysia and Tanzania to generate new knowledge about seaweed aquaculture to address threats from warming oceans and the spread of disease, to improve the resilience and sustainability of the industry. GSSTAR research has helped seaweed farmers to protect their crops and increase their productivity:

> *Seaweed farmers are now more aware of the causes and consequences of disease and pest infestation, biosecurity measures and farm management. (Impact survey respondent 102 - LLMIC)*

> *Biosecurity measures introduced into the seaweed farms have resulted in greater crop yields which in turn would have increased the economic return. (Impact survey respondent 259 - UK)*

National governments in partner countries (Philippines, Malaysia and Tanzania) have adopted GSSTAR standard operating procedures for seaweed biosecurity into their national standards and policies. For example, a GSSTAR LLMIC partner Co-I is working as a consultant to the Philippines Government to implement GSSTAR recommendations, developing capacity to develop disease and pest-free seaweed cultivars, and enhance biosecurity measures and farm management.

GSSTAR researchers' direct engagement with the UN Food and Agriculture Organisation (UN FAO) resulted in the inclusion of biosecurity measures specifically for the seaweed industry in its mandate for the first time. The GSSTAR PI is leading a subchapter for the third United Nations World Ocean Assessment and contributed to the International Panel for Climate Change (IPCC)

Seventh Assessment. GSSTAR research supported the establishment of the Safe Seaweed Coalition (now known as the Global Seaweed Coalition), a global partnership established to support the sustainability of the seaweed industry, founded by the UN Global Compact and Lloyd's Register Foundation, in partnership with France's Centre National de la Recherche Scientifique. The GSSTAR PI and Co-Is from Tanzania and Malaysia are members of the Scientific Council of the Safe (Global) Seaweed Coalition, and helped to shape its founding Seaweed Manifesto.

Most of the early career researchers (ECRs) from partner LLMICs trained by GSSTAR obtained positions at universities in their own countries. All the ECRs had at least one first author paper in a high impact international journal from the project. A GSSTAR LLMIC partner Co-I delivered a paper at the UN Framework Convention on Climate Change (UNFCCC) Resilience Day at COP26, discussing how climate change is affecting seaweed farming in Tanzania along with potential solutions. GSSTAR's capacity building in administration and financial management provided the LLMIC partners with the confidence to apply and successfully secure further funding from the UK and the EU. More widely, GSSTAR also developed a training module for an Erasmus Mundus joint master's degree in Aquaculture, Environment and Society (www.emm-aces.org), which has trained over 55 students from 20 countries globally to date. Research material from GSSTAR has also informed the development of a new Seaweed Academy at the Scottish Association for Marine Science (SAMS), a leading training centre for the seaweed industry.

GSSTAR partners have since been awarded three grants worth £1.25 million from Defra-funded Global Centre on Biodiversity for Climate to continue their work on seaweed biosecurity and conservation in Southeast Asia. The latest project, Global Seaweed SUPERSTAR, is breeding more temperature resilience into tropical seaweeds and building on understanding about seaweed pests and diseases developed during the GSSTAR project. GSSTAR partners have also recently been successful in a further £3 million bid to UKRI to undertake work on the Progressive Management Pathway in Southeast Asia (developed with UN FAO in GSSTAR), including Indonesia and Thailand, as well, as key GSSTAR partners, Malaysia and Philippines. A £3 million application to Defra's Ocean Grants scheme is also planned in 2026, which will include GSSTAR partners in Tanzania and new partners in the Caribbean.

GROW Impact Case Study 2: TIGR2ESS - Transforming India's Green Revolution by Research and Empowerment for Sustainable food Supplies

TIGR2ESS worked in partnership with academic, policy and community partners in India to increase food security by promoting efficient water usage and sustainable farming practices, identifying and encouraging the use of drought resistant crops, and supporting greater inclusion of drought resistant grains in diets. TIGR2ESS introduced water efficiency practices to around two million farmers in the state of Punjab, reducing pressure on groundwater levels, and trained over 9000 farmers in Punjab to use new irrigation practices, saving over 80 billion litres of water.

TIGR2ESS research evidence from this work led to the adoption of new water management policies by the Punjab Government, including an associated Memorandum of Understanding with TIGR2ESS partner, Centers for International Project Trusts, to develop synergy for sustainable water and energy use.

TIGR2ESS research also resulted in the adoption of action plans in Punjab, with the Department of Rural Development and Panchayats funding the clearing of village ponds to enable monsoon rainwater collection for agriculture, fisheries and recharging groundwater. TIGR2ESS partner, M S Swaminathan Research Foundation (MSSRF) implemented a Comprehensive Water Resources Management Plan in partnership with the Department of Rural Development, Government of Tamil Nadu. TIGR2ESS researchers worked with the Odisha Millets Mission (OMM), a flagship programme launched by the Government of Odisha in India to change farmers' attitudes to millet and reverse the decline in the use of this nutritious and drought tolerant but previously unpopular grain. TIGR2ESS partners' work with OMM led to a doubling of millet output in the first year and trebling of additional value. The Programme expanded from 8,030 farmers cultivating millets in 3,399 hectares in year one to 118,561 farmers cultivating millets in 54,496 hectares in year five. OMM successfully introduced millets into the Public Distribution System and other State nutrition schemes. The World Food Programme entered into an agreement with the Government of Odisha to share learning from the Mission, as part of UN General Assembly's designated International Year of Millets in 2023.

TIGR2ESS partners introduced Mobile Teaching Kitchens (MTKs) to provide access to low-cost, healthy food and associated nutritional education on adopting healthier diets. Researchers worked in partnership with stakeholders to empower marginalised women in Kolkata, India, training women to become microentrepreneurs and culinary health educators. The MTK model has been extended to other locations in India and is currently also being developed in Mexico and further worldwide, to create self-sustaining community-led nutrition education initiatives.

The work of TIGR2ESS was recognised by the University of Cambridge Vice Chancellor's Award for Research Impact and Engagement in 2021. TIGR2ESS Early Career Researchers obtained lectureships and fellowships in the UK, Greece and India or moved on to positions in industry and NGOs. TIGR2ESS leveraged £1.8 million for a partner GCRF project (MillNETi: Millets and Nutritional Enhancement Traits for iron bioavailability) which worked with biofortified millets bred in India for consumption in Sub-Saharan Africa, and over £300,000 at UEA for a GCRF Global Research Translation Award. TIGR2ESS partnerships have been sustained with work continuing partly through GCNA/ODA Award G118358, which extended and developed novel approaches, particularly in collaboration with Pakistan.

> *We continue to collaborate with MSSRF. And we are now actually seeking support to, in fact, take some of the learnings from TIGR2ESS and apply them to coastal communities in Tamil Nadu. (Interview respondent 12 - UK)*

So, the work with the Odisha Millets Mission, that is continuing. The work with the farmer producer organization in the Punjab, that is continuing, the work looking at the historical use of water supplies, that's continuing, connections with the IIT Bombay, that's continuing. So, it's all ongoing (Interview respondent 20 - UK)

GROW Impact Case Study 3a: African SWIFT - African Science for Weather Information and Forecasting Techniques - Real World Outcomes

African SWIFT worked with academic and meteorological service partners in Ghana, Kenya, Niger, Nigeria, Senegal and the UK, to strengthen operational forecasting practice in Africa, leading to improvements in health outcomes, sustainable energy use, food security and disaster management. The risk of meningitis outbreaks in Sub-Saharan Africa increases during the dry season, with around 30,000 cases per year in Africa each year. African SWIFT produced a sub-seasonal forecast warning system for meningitis outbreaks which is used by the World Health Organisation (WHO) to support preparedness and response planning.

Being able to predict the likelihood that atmospheric conditions will cause a meningitis outbreak is a powerful tool that helps countries to strengthen meningitis surveillance. It will also help to make decisions about how best to target resources when an outbreak occurs. (SWIFT website: Dr Ado Mpia Bwaka, from the WHO Regional Office for Africa)

Rainfall forecasts provided by the Kenya Meteorological Department (KMD) based on SWIFT's sub-seasonal forecast products have allowed the Kenya Electricity Generating Company (KenGen) to maximise its use of hydropower, reducing reliance on fossil fuels.

Because the forecasts help us go through dry periods without losing adequate hydropower generation, we've been able to eliminate emergency diesel generators from the national electricity grid entirely. We're now eliminating thermal power plants, moving closer to 100% renewable energy in Kenya. (SWIFT website: Willis Ochieng, Chief Energy Planner at KenGen)

SWIFT supported the Nigerian Meteorological Agency (NiMet) to develop sub-seasonal forecast products leading to improved decision-making for farmers and supporting national food security goals. The Nigerian government worked with NiMet to provide forecasts to 663 village areas and 104 local governments across seven states, reaching an average of 56,000 farmers annually.

For the first time since 2017, every village in the CASP area got access to information about the onset date, dry spell periods, length of the growing season, volume of rain expected, and cessation date. Farmers were able to make informed decisions about what to plant and when, as well as what actions to take to ensure their crops didn't fail. We started seeing benefits in the very first year of working with NiMet. (SWIFT website: Richard Nzewku, Climate Change Adaptation and Agribusiness Support Programme (CASP))

SWIFT enabled its partner meteorological services to develop real-time forecasting (nowcasting) products, supporting improved disaster management. At KMD, SWIFT products provided early warnings for locust swarms in 2020 and Kenyan floods in 2019, allowing authorities to take more

coordinated action. A Met Office-commissioned report found that the Highway project on Lake Victoria, in which SWIFT nowcasting products were used, had saved 300 lives per year. The Ghana Meteorological Agency (GMet) has used SWIFT products to provide early warnings of treacherous sea conditions to the fishing community. With further GCRF funding, the SWIFT team built a new app, FASTA (Forecasting African STorms Application), allowing users to see current storm activity and providing early warning of approaching severe weather. The nowcasting app is now freely available for download across most of Africa. Kenya Red Cross have been using the app to support their disaster management.

> *The app has proven to be an invaluable resource for our operations. It provided timely and accurate information that enabled us to make informed decisions and take proactive measures to mitigate the impacts of these weather events. … The app's user-friendly interface and real-time updates were especially useful in coordinating our response efforts and ensuring the safety of the communities we serve. (FASTA website -Summary presentation: Zachary Mwambi Misiani, Kenya Red Cross)*

GROW Impact Case Study 3b: African SWIFT African Science for Weather Information and Forecasting Techniques - Building and Sustaining Research Capacity and Collaborations

African SWIFT's support for existing and new collaborations between research and operational communities in partner countries has led to improved capacity for forecaster training, by delivering shared training resources and curriculum design, and providing foundations for local independent development of practice. The Kwame Nkrumah University of Science and Technology (KNUST) in Ghana has incorporated improved teaching materials and new modules into curricula, developing a new undergraduate module using SWIFT software, to train 80 undergraduate students per year in the practical use of Numerical Weather Prediction outputs. The module has become part of the formal ongoing syllabus for the course. Since SWIFT ended, KNUST continues to collaborate with the Ghana Meteorological Agency (GMeT) through a joint operational-academic seminar scheme.

At the World Meteorological Organisation (WMO) Regional Training Centre for the Nigerian Meteorological Agency (NiMet) in Lagos, the training framework developed through SWIFT has been integrated into their meteorological practical course, taught to 70-100 trainee forecasters and BSc students in their Basic Instructional Package each year. The Kenya Meteorological Department (KMD) has incorporated learning from SWIFT's research and development into their forecasting operations to help facilitate responses to severe weather.

> *For the longest time users have asked for forecast products tailored to their needs, but we didn't have the capacity or data to do it. … As part of the GCRF African SWIFT programme, we developed skills in Python programming through a hackathon and got access to ECMWF [European Centre for Medium-Range Weather Forecasts] data. Now we can finally develop new products and forecasts, specifically designed to support decision-*

making for users like KenGen. (SWIFT website: Patricia Nying'uro, Principal Meteorologist at KMD)

The operational weather centres are continuing to deliver the new forecasting methods developed by SWIFT, and academic partners are continuing to teach relevant forecasting skills in their own and neighbouring countries. Forecasting capacity is being maintained through on-going academic-operational and inter-country collaboration.

SWIFT left a legacy … because the forecasting still exists. The platforms we have formed for the Ghana Meteorological Agency [still exist] And if you go to other countries, their platforms also exist, our collaborations with our colleagues in African countries still exist. So I can call on my colleague in Nigeria to do some work for me in climate science, and he could also call on me, so they have left a legacy as well. (Interview respondent 13 - LLMIC)

In Ghana, SWIFT has led to the development of a critical mass of climate meteorologists, enabling institutions there to win external funding, including $250,000 USD from the Clean Air Fund to provide training on monitoring air quality and environmental pollution for early career researchers and staff from the Ghana Meteorological Agency, and subsequently expanding the capacity building training across the whole of West Africa. KNUST has also won new funding to apply AI methods to SWIFT's nowcasting research.

It's developed a life of its own beyond the project, and they're taking an independent research direction on this, using artificial intelligence. So clearly, at the cutting edge, making use of the satellite downloads. So, they're getting the satellite data locally, processing it locally, using it for teaching 100 students a year, but also driving a new research activity. And that research activity directly benefits, in the longer term, this nowcasting capability. (Interview respondent 10 - UK)

Building on their nowcasting work, SWIFT researchers from NCAS and the University of Leeds have received a £2 million grant from FCDO for the WISER-EWSA project which aims to improve access to early weather warning systems for urban communities in South Africa, Zambia and Mozambique.

GROW Impact Case Study 4: CEPHaS - Strengthening Capacity in Environmental Physics, Hydrology and Statistics for Conservation Agriculture Research

Sustainable agriculture practices are in widespread use to combat the pressures of climate change, population growth and associated demand for food. Conservation Agriculture (CA) aims to improve the sustainability of crop production, using minimum till approaches, mulching and crop rotation to enhance water retention, reduce soil erosion and minimise disease. CEPHaS worked with partners in Malawi, Zambia and Zimbabwe to improve understanding of the wider environmental impacts of CA, assessing how it affects the soil's capacity to store water and whether it impacts on the recharge of groundwater resources, on which many rural communities depend. CEPHaS conducted CA experiments in Zambia, Zimbabwe and Malawi to test hypotheses about water dynamics under contrasting systems, building research capacity through

learning-centred research, formal training, capacity support within institutions, and collaboration with socioeconomic and farm system researchers.

CEPHaS increased capacity for measuring soil water and its dynamics at well-established conservation agricultural trial sites. New equipment made available through CEPHaS resulted in fully functional soil physics laboratories at all LLMIC partner institutions. These facilities were supporting research beyond the scope of CEPHaS and were seen as providing long-term benefit to the member institutes, by providing encouragement for potential funders and collaborators to develop new research partnerships. Equipment and software provided through CEPHaS for its research activities were also used to equip field sites for key CA research facilities in the region with capacity for monitoring soil water dynamics. A formal evaluation of CEPHaS reported greater capacity within all partner institutions for managing and coordinating challenge-led R&I for development impact. Both Northern and Southern participants reported an increased skill-base within their institutions to support future grant applications and projects. The CEPHaS evaluation also reported on increased interest in developing similar projects within UK partner institutions, and the establishment of processes for collaborating with LLMICs. Northern partners reported internal institutional recognition of the project as a model for international consortia.

The CEPHaS evaluation showed that the incorporation of CEPHaS training into teaching activity at partner universities in Malawi, Zambia and Zimbabwe had increased institutional capacity to develop researchers in current methodologies. By the end of the project, the Lilongwe University of Agriculture and Natural Resources, University of Zimbabwe and University of Zambia all had staff teams capable of using the Proactive Infrastructure Monitoring and Evaluation (PRIME) system for geophysical measurements and were rated by the British Geological Society (BGS) as the most advanced users of the system outside the BGS.

The CEPHaS evaluation provided evidence of the impact of CEPHaS training for individuals, reporting widespread subsequent application of learning: 50% of DAC-list partner training participants reported using their training at least monthly and 29% at least weekly. The CEPHaS evaluation also provided evidence that CEPHaS training and resources were valued, frequently utilised, and often transferred beyond the immediate CEPHaS membership for wider benefit. The CEPHaS evaluation also noted increased interest, enthusiasm or motivation, with participants valuing the applied 'learn by doing' approach of CEPHaS, as well as the highly inclusive leadership. Many CEPHaS ECRs have moved on to apply their new skills in academic roles in conservation agriculture.

CEPHaS has helped to build South-South connections, with African partners introducing the use of CEPHaS methods to other universities in Africa. CEPHaS also led to four successful funding bids by team members, building on capacity developed through the project. Research funded by BBSRC/European Joint Programme for Soils is using capacity that CEPHaS developed in Zambia,

Zimbabwe and Malawi to understand the impact of conservation agriculture on greenhouse gas budgets. CEPHaS partner, University of Zambia, is now involved with the UN FAO in a project on responses to climate change, in Africa and South America.

GROW Impact Case Study 5: DCP - Development Corridors Partnership

Development corridors are extensive geographical areas targeted by governments for public and private investment to spur economic growth and achieve national development visions. In a consortium led by the UN Environment World Conservation Monitoring Centre (UNEP-WCMC), the Development Corridors Partnership (DCP) conducted interdisciplinary research on the impacts of major infrastructure and agricultural developments on wildlife, ecosystems, and local communities in Kenya and Tanzania, and built the capacity of partners and key stakeholders to plan and implement sustainable, resilient, and inclusive development corridors.

DCP worked with the Southern Agricultural Growth Corridor of Tanzania (SAGCOT) to improve the planning and implementation of agricultural corridors and infrastructure development. This involved supporting SAGCOT with on-the-ground testing and roll-out of its Inclusive Green Growth tool that tracks environmental, social and business sustainability. DCP created an Impact Assessment Sourcebook, a Resources Hub and an E-learning course to provide decision-makers with a clearer understanding of the ongoing environmental and social issues and available tools for better environmental and social safeguarding. By 2024, 478 people had enrolled on the E-learning course from all over the world, helping to build a critical mass of policymakers and practitioners who can develop holistic strategies for implementation of development corridor projects.

> *The course provides key information and tools for decision-makers to build greater sustainability practices into development corridor conceptualization, investment, procurement, planning, implementation, and monitoring and evaluation. Completing the course has enabled me to appreciate more the need to make more sustainable decisions in the planning stages of development corridors to maximise benefits and minimise costs to people and nature at each stage of the development corridor process, especially in the face of climate change. I am aware of the available tools to maximise social and environmental benefits. (E-learning course participant)*

DCP's work informed (and is cited in) the UN Environment Programme (UNEP) International Good Practice Principles for Sustainable Infrastructure, developed as part of the implementation of UN Environment Assembly (UNEA) Resolution 4/5 on sustainable infrastructure, approved by all countries. DCP members also led the writing of a UNEP Global Environmental Outlook Business Brief for the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment on Future Proofing Infrastructure to Address the Climate, Biodiversity and Pollution Crises.

At the end of DCP, data gathered through the UNEP-WCMC Capacity Needs Assessment Tool provided evidence of an increase in individual researchers' perceived competency and confidence

across a range of key research and dissemination skills, stakeholder engagement and effective communication to different audiences. For example, confidence in conveying research to scientific and non-scientific audiences increased by 18% and 21% respectively. Individual capacity was built through knowledge sharing, new partnerships and collaborative DCP work. In Kenya and Tanzania, DCP researchers went on to secure research roles or posts in relevant NGOs.

The work of DCP led to a successful bid for a UKRI GCRF Global Interdisciplinary Research Hub on Trade, Development and the Environment (TRADE), securing £19m funding, with continuing involvement of DCP partners in Tanzania and Kenya. DCP's research also led to a proposal to the Global Environment Facility (GEF-8 impact project on infrastructure), together with UNEP, government agencies in developing countries, WWF US, and regional development banks. This project was ratified by the GEF council in February 2024, with a $23 million core allocation and around $400 million in co-financing.

GROW Impact Case Study 6: Thanzi La Onse (Health of All) - Frameworks and Analysis to Ensure Value for Money Health Care - Developing Theory, Changing Practice

Thanzi la Onse (TLO) worked in collaboration with research and health policy partners in Malawi, Uganda and Southern and East Africa to support resource allocation decisions, strengthen national health care systems, and improve population health. TLO produced the world's first full health sector model, simulating Malawi's entire health system and generating scenarios and analysis to inform health policy decisions, national health budgets and public health initiatives. TLO's research into health resource prioritisation directly informed the development of Malawi's Health Sector Strategic Plan III (HSSP III), and the associated Health Benefits Package. TLO produced methods to guide the ministries of health on resource allocation through health benefits package design, geographic allocation formulae and other major budgeting decisions.

> *The Ministry also acknowledges technical partners that contributed significantly to the strategy, namely … the University of York for supporting the development of the Health Benefits Package (HBP) and the entire Thanzi La Onse modelling team for the novel model which will be instrumental for HSSP III implementation. (HSSP III, p6)*

HSSP III aims to maximise health gains from limited resources by prioritising primary and community level health care. The US government lead for Global Health (at USAID) recently commended the Malawi Ministry of Health for achieving improved health outcomes.

> *I've arrived in Malawi … to get an up-close look at its primary healthcare system. In the past decade, Malawi has made significant gains by focusing on improving delivery of essential services. Life expectancy jumped from 55.6 to 64.7 years. During that time frame, big reductions were made in under-five deaths and maternal deaths, in particular. These gains occurred despite a fragile economy and severe health worker shortage. (Atul Gawande @GawandeUSAID on X, May 11, 2023)*

Although it is not possible to attribute these health gains directly to TLO's work, it is reasonable to conclude that its work on health prioritisation has made a significant contribution. In Uganda, TLO research informed the design of the Ministry of Health's health package of care and its prioritised national health budget. TLO research also influenced resolutions from East, Central and Southern Africa (ECSA) region ministers of health to strengthen health resource prioritisation and health financing. ECSA ministers of health also made a commitment in 2024 to strengthen health economics capacity in the region, following experiences with the TLO programme. With funding from Wellcome, the TLO model is being introduced in Eastern and Central Africa through a new project, Thanzi La Mawa (Health of Tomorrow), to improve population health through data-informed resource allocation and strategic planning.

TLO addressed identified shortages in health economics training and capability through the development of curricula for two new MSc programmes in health economics in Malawi and Uganda, establishing Kamuzu University of Health Sciences (KUHeS) and Makerere School of Public Health (MakSPH) as regional hubs for health economics excellence.

> *TLO has left an institution where we're over 15 people. Four to five masters research fellows, four to five PhD fellows, four Bachelors level research associates. It's big, with a lot of collaborators. Malawi needs the economists because we don't have many resources. We need them to run our model, to have an optimal decision-making tool. So, what I'm saying is the biggest impact [of TLO] is leaving the capacity. That capacity is impacting Malawi even more, even when the project is over. (Interview respondent 24 - LLMIC)*

TLO also launched Health Economics & Policy Units (HEPU) in Malawi and Uganda, providing a platform for academics and policymakers to discuss priority challenges and research needs for delivering public healthcare. The HEPU established by TLO at KUHeS in Malawi has received further funding via the Health Sector Joint Fund (in collaboration with FCDO) to sustain and expand its research and capability building activities in health economics. TLO team members are working with ministries of health in Eswatini and Zambia to establish HEPUs in their countries.

GROW Impact Case Study 7: PIIVeC - Partnership for Increasing the Impact of Vector Control

PIIVeC supported a cohort of trans-disciplinary scientists in Burkina Faso, Cameroon and Malawi to help governments tackle diseases caused by bites from insects, including sleeping sickness, dengue, and malaria. The project established multidisciplinary Technical Vector Control Advisory Groups (TVCAGs) to facilitate interactions between vector-borne disease researchers and policy makers and stakeholders in PIIVeC partner countries. These groups have influenced vector control and financing decisions at the national level in all three countries with evidence of health impacts.

TVCAG members in Burkina Faso used a PIIVeC policy brief to successfully advocate for the introduction of 'next generation' bednets, leading to the country's selection as one of the first pilot

sites for the improved nets with co-funding from Unitaid and the Global Fund. Preliminary data from health facilities indicated a reduction in malaria incidence of 16-25% in districts with next generation nets compared to districts where standard bednets were used. PIIVeC research in Burkina Faso led the TVCAG to commission operational community-based interventions to control dengue. Project outputs and subsequent TVCAG discussions with Ministry officials successfully persuaded the Ministry to support dengue surveillance efforts after several years of outbreaks (with finance from the World Bank). TVCAGs have continued to meet even after PIIVeC funding ended. In Malawi, the group has received NIHR funding to look at interventions to investigate the impact of large-scale irrigation plans and flooding on malaria, sleeping sickness, and schistosomiasis. The TVCAGs in both Malawi and Cameroon are now embedded in country decision making processes and continue to serve to identify key operational research for controlling vector borne diseases.

At an institutional level, the Centre for Research in Infectious Diseases (CRID) in Cameroon became the first African Research Institute to receive a multimillion-pound grant directly from Unitaid. CRID cited the PIIVeC project as the foundation for this success, with PIIVeC's capacity strengthening support leading to a silver accreditation in good financial practice. PIIVeC's support also led to new South-South collaborations between Cameroon, Burkina Faso and Malawi, including partnering on the $15M Unitaid grant and a $3M BMGF grant for the continuation of the TVCAGs established through PIIVeC. Cameroon have also been asked to provide technical support to the Central African Republic to advise them in establishing a similar advisory group there.

The PIIVeC Research Career Development Fellows (RCDF) cohort received over £100,000 in supplementary grant income during the life of PIIVeC. Nine of the 11 funded fellows have stayed in research active roles in local research institutes, many of them now on permanent contracts. Several fellows have been recognised as global experts in their fields through membership of WHO technical advisory teams, bringing real world insight into decision making. An evidence review authored by an RCDF has been cited in WHO's malaria guidelines. One fellow was awarded an innovation prize by the American Leprosy Missions that rewards ideas that provide cost-effective, scalable results for people affected by neglected tropical diseases. Capacity building also occurred at senior levels in the PIIVeC team, with Co-Is' increased skills and confidence leading to major research roles and funding.

> *Now thanks to skills gained from PIIVEC, I am leading several research consortia with partners in Africa and in Europe. … My confidence increased a lot to the point where, although mainly a geneticist working on malaria vectors, I formed a consortium to work on mathematical modelling for effective vector control in Africa and was successful in obtaining a $3 million grant from Gates Foundation. My skills have also significantly increased as evidence by a successful application to a UNITAID call of >$15M that I am leading with several partner thanks to the skills also obtained throughout the 4 years of PIIVEC. (Impact survey respondent 75 - LLMIC)*

GROW Impact Case Study 8: SAFEWATER - Low-Cost Technologies for Safe Drinking Water in Developing Regions

SAFEWATER collaborated with academic and NGO partners in Brazil, Colombia and Mexico to improve health in low-income communities through sustainable low-cost household water treatment and safe storage (HWTS). SAFEWATER designed and installed 250 HWTS systems in Colombia and Mexico which successfully provided safe drinking water to marginalized communities. The project trained community technicians, enabling communities to maintain and take ownership of the water treatment systems. SAFEWATER partners in Colombia, Centro de Ciencia y Tecnología de Antioquia (CTA), installed SAFEWATER systems in five rural schools and also provided training on the operation, use and maintenance of the systems. Communities implemented their own sustainability plans including finance. Cantaro Azul, SAFEWATER partners in Mexico, installed water treatment systems in a health clinic and two informal refugee settlements. Cantaro Azul received a Good Practices Award at the World Water Forum in Brazilia in 2018 for its use of the SAFEWATER model in schools, recognising the good practices and experiences in water and sanitation as the most successful in the Americas.

SAFEWATER systems resulted in improved bacteriological water quality for participating households and a decrease in the reported incidence of diarrhoea in the communities. Women reported improved quality of life, including better physical and mental health and reduced workload. Communities reported less reliance on untreated water sources, and greater awareness of negative health effects of drinking untreated water.

The CEO of NGO Cantaro Azul, SAFEWATER leader in Mexico, was appointed as an adviser to the National Water Commission (CONAGUA) in the new government in Mexico, to develop partnerships to strengthen community-based water management in the country. In Colombia, the University of Medellin reported that SAFEWATER systems are still being used by participating communities, and noted ongoing collaboration with SAFEWATER partner CTA, including the development of proposals for further projects on safe drinking water. SAFEWATER partners have established a Water Resilience Network in Latin America and are also collaborating on an EU India Horizon project.

GCRF funding for the SAFEWATER Translate project is exploiting SAFEWATER technologies further, working with SAFEWATER partners in Latin America and new partners from Malawi, Ethiopia, and Nepal. Participation in the SAFEWATER project allowed the NGO Cantaro Azul to leverage $2.3 M USD funding from the Kellogg Foundation for a water and sanitation project in Mexico. SAFEWATER partners at the University of Sao Paulo are continuing to work on low-cost technologies for drinking water in Brazilian rural communities with funding from the Royal Society and from Brazil's National Council for Scientific and Technological Development. A joint proposal is

in development through the lead agency agreement between the Sao Paulo Research Foundation in Brazil and UKRI.

Involvement in SAFEWATER led directly to a Co-I's promotion to full professor at the University of Sao Paulo (USP) in Brazil, where she has since established a large research team, and is now a visiting professor at the University of Ulster. SAFEWATER was seen as essential in strengthening USP's internationalization through undertaking projects with UK institutions and acquiring research resources to work on sustainable development goals. The project's PDRAs in Brazil went on to obtain related employment after the project, for example in a regulatory agency for sanitation services and in a public health research institute. Experience on the SAFEWATER project led to membership of the UKRI International Peer Review College for a Co-I from the University of Medellin. In the UK, both senior staff and RAs on the SAFEWATER project reported increased confidence in applying for funding to conduct international development research.

GROW Impact Case Study 9: None in Three (Ni3) - Centre for the Development, Application, Research and Evaluation of Prosocial Games for Prevention of Gender-based Violence

The None in Three (Ni3) GROW award worked with partners in Uganda, Jamaica and India to create games designed to reduce gender bias and various forms of gender-based violence (GBV), and to help children to change negative gender attitudes and become more empathic. In Uganda, a randomised control trial found evidence that children who played the games were less likely to favour under-age marriage and were empowered to take positive steps against the threat of child-marriage.

Ni3 led to additional funded research in Uganda which provided further evidence that the games had inspired participating children, improving their self-esteem, assertiveness and performance. The Uganda team secured government funding from its University Research and Innovation Fund program to develop a pilot 'school-based social work' concept, building on the GROW project work and working with the Ministry of Education and local government. They continue to collaborate with the Ni3 PI and Co-I, to apply for further funding to extend the Ni3 work in Uganda. The Minister for Gender Equality (who was a member of the Ni3 Advisory Board) has promoted the work of Ni3 throughout both Uganda and Nigeria.

Ni3 partner universities reported institutional benefits in terms of established teams that have continued beyond the end of the project and strengthened capacity to attract further funding.

> *Institutionally, it helped improve our collaborative tendency, it helped to improve our resource mobilisation skills, our research grant writing skills. We've been making a few applications: one has been successful so far. … So, we've been able to maintain our team, especially our UK partner and the people we had in Uganda that worked on the project. So,*

I believe institutionally it also has a huge potential of benefiting my university where I actually work. (Interview respondent 015 - LLMIC)

Ni3 has also been awarded follow-on funding of around £400,000 by UKRI to develop and trial a mobile phone-based game in Uganda, working with young people and NGOs and focusing on violence in adolescents' relationships. The Ni3 Country Director in Jamaica has been awarded $105,000 (USD) by the Sexual Violence Research Initiative in South Africa to conduct trials of the Jamaican Ni3 games, with approval at government level - from the Ministry of Education. Ni3 findings have also contributed to government consultations in Jamaica on sexual harassment in the workplace and on child sexual abuse (CSA). With partners in Brazil, Ni3 secured $750,000 (USD) funding from UNICEF/End Violence Against Children to develop a game targeting youth-perpetrated online CSA.

Capacity for delivering gender-based violence research was strengthened through formal training, mentoring and learning-by-doing. This included early and mid-career researchers gaining confidence from the experience of leading the research in Uganda, Jamaica and India, and achieving career progression through PhD awards, publications and promotions. For example, the Country Director in Jamaica reported that Ni3 has given the Jamaican team the skills, knowledge and confidence to develop an independent research agenda on GBV, which they continue to pursue. The Indian Co-Country Director reported that involvement with Ni3 had significantly aided her professional development and confidence as an academic and a researcher. A UK ECR was mentored by the PI to take on her first Co-I role on an international grant and gained confidence to lead the publication strategy for her work package, contribute to grant writing for further projects and obtain promotion to Deputy Head of Department.