GLOPID-R

STAR-IDAZ
International Research
Consortium on Animal Health

Mapping One Health

An Exploration of the Global Funding Landscape for One Health Research

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Contents

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1. Introduction

This report provides an overview of the current landscape of global One Health research funding and initiatives based on the outputs of activities conducted by members of the collaborative One Health Working Group, established and supported by GloPID-R (Global Research Collaboration for Infectious Disease Preparedness) and STAR-IDAZ (Global Strategic Alliances for the Coordination of Research on the Major Infectious Diseases of Animals and Zoonoses) International Research Consortium on Animal Health (IRC).

One Health embraces transdisciplinary and holistic approaches to interconnected and complex health threats, with an emphasis on communication, collaboration, coordination and capacity-building across sectors. Financing for One Health is highlighted in the Quadripartite One Health Joint Plan of Action (OH JPA)[1], as part of the first pathway of change. In the context of this report, One Health research funding refers to funding for research projects and programmes that focus on infectious diseases and involve at least two sectors (human health, animal health, plant health, environment health and wildlife health). By seeking insights into funding challenges, identifying priorities, and understanding gaps, the report contributes valuable information that complements the overarching goals of the GloPID-R and STAR-IDAZ networks to enhance global preparedness for infectious diseases, coordinate and streamline research efforts, and facilitate rapid and effective research collaboration. **The report will contribute to future outputs of the One Health Working Group, including recommendations for research funding organisations to better align their funding strategies with the priorities and requirements of the One Health research community.**

To better understand the current landscape of One Health research and funding challenges, a survey was circulated to the Working Group members in October 2023. The survey aimed to identify priorities and knowledge gaps to which future research funding should be addressed. Key areas for improvement in research funding coordination were highlighted as prevalent themes. A follow-up workshop in December 2023 focused on the short- and long-term improvements to research funding mechanisms and coordination to improve One Health research and integrate the One Health approach into research more widely.

[1] https://www.who.int/publications/i/item/9789240059139

2. Background

GloPID-R aims to unite funding organisations investing in research related to new or re-emerging infectious diseases to improve preparedness and coordinate research responses to infectious diseases.

STAR-IDAZ IRC is a global network of animal health funders and programme owners focused on improving global coordination of research funding and activities related to major infectious diseases of livestock and zoonoses to accelerate the delivery of disease control tools and strategies.

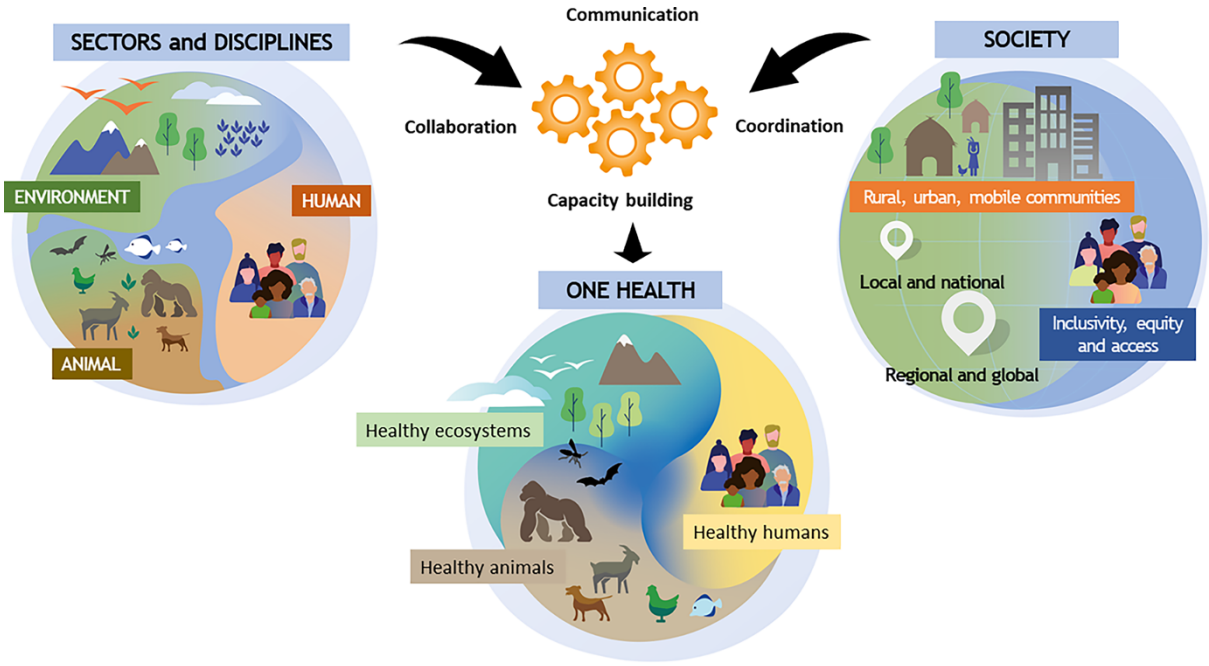
In 2022, GloPID-R and STAR-IDAZ established a collaborative Working Group on One Health. As both networks consist of research funding organisations, the aim of this collaborative initiative is to unite funding bodies investing in research on infectious diseases across humans, animals, and ecosystems. This objective is to enhance preparedness, enabling swift research responses to outbreaks, and to proactively prevent future occurrences. The outputs of this joint venture will focus on improving funding mechanisms for One Health and coordinating existing and future One Health research activities. The One Health High-Level Expert Panel's (OHHLEP) definition of One Health has been adopted as the definition used to guide Working Group discussions and activities.

One Health is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals, and ecosystems. It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and interdependent.

The approach mobilizes multiple sectors, disciplines, and communities at varying levels of society to work together to foster well-being and tackle threats to health and ecosystems, while addressing the collective need for healthy food, water, energy, and air, taking action on climate change and contributing to sustainable development.

OHHLEP's definition of "One Health".

Figure 1. One Health toward a sustainable healthy future as developed by OHHLEP, available here: https://doi.org/10.1371/journal.ppat.1010537.g001



The Working Group membership comprises One Health experts, representatives of key One Health panels and initiatives, including OHHLEP, veterinary scientists, medical doctors, epidemiologists, ecologists, plant scientists, social scientists and engineers. Funding agencies will be invited to collaborate later in a planned 2-day workshop.

The Report, 'Mapping One Health: an Exploration of the Global Funding Landscape for One Health Research,' provides an overview of One Health research funding and initiatives and will serve as a foundation for the Working Group's future activities and outputs.

i. Members of the One Health Working Group

In assembling the One Health Working Group, great care was taken to ensure a broad and diverse representation of the experts, both in geographical and scientific terms:

Aurelie Castinel	Senior Consultant, SAFOSO, Switzerland
Baldissera Giovani	Euphresco Coordinator, European and Mediterranean Plant Protection Organisation (EPPO)
Bassirou Bonfoh	Managing Director, Swiss Centre of Scientific Research in Côte D'Ivoire
Benjamin Roche	Research Director, Research Institute for Development (IRD), France PREZODE Co-founder and Global Science Leader
Chadia Wannous	One Health Global Coordinator, World Organisation for Animal Health (WOAH)
Diana Rojas Alvarez	Team Lead, Arboviruses, Epidemic and Pandemic Preparedness & Prevention Department, WHO Emergencies Programme

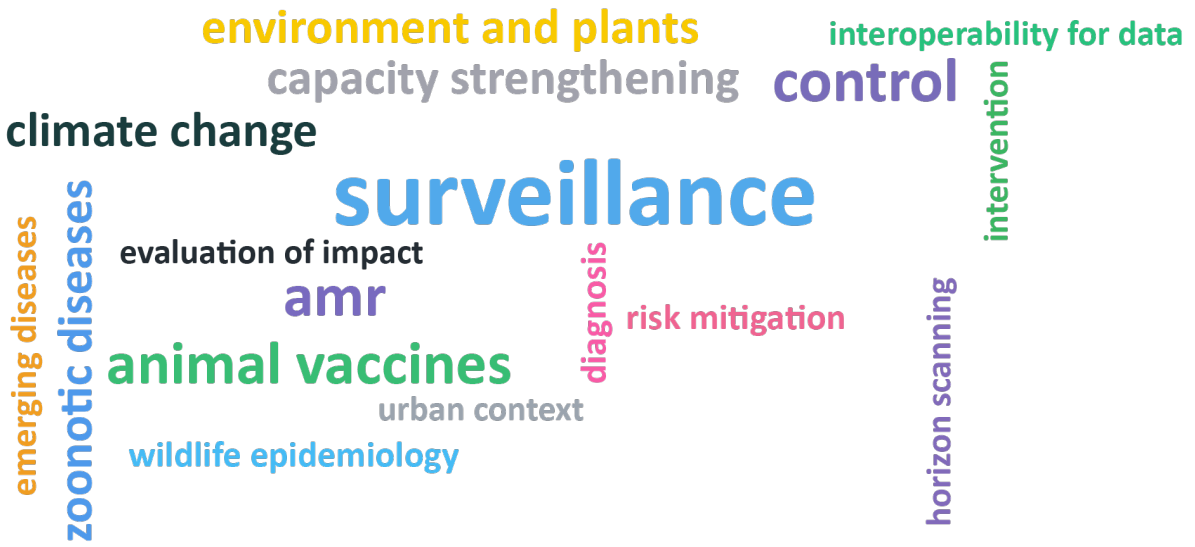
Dirk Pfeiffer	Director of Centre for Applied One Health Research and Policy Advice, City University of Hong Kong
Fabian Leendertz	Founding Director, Helmholtz Institute for One Health, Germany
Gabriela Di Giulio	Associate Professor, Environmental Health Department, School of Public Health, University of São Paulo, Brazil
Jakob Zinsstag	Head of Research Group on Human and Animal Health, Swiss Tropical and Public Health Institute, Switzerland
Joanne Webster	Director of the London Centre for Neglected Tropical Disease Research Professor, Royal Veterinary College and Imperial College of London, UK
Jonna Mazet	Vice Provost - Grand Challenge and Founder of One Health Institute, University of California, Davis, USA
Kris Murray	Professor of Environmental Change and Health, MRC Unit The Gambia, London School of Hygiene and Tropical Medicine
Linfa Wang	Professor, Programme in Emerging Infectious Disease, Duke NUS Medical School, Singapore
Malik Peris	Professor in Medical Science, University of Hong Kong
Marc Johnson	Professor in Molecular Microbiology and Immunology, University of Missouri, USA
Mariella Marzano	Principal Social Scientist, Forest Research UK
Misheck Mulumba	Senior Research Manager, ARC Onderstepoort Veterinary Research, South Africa
Muriel Vayssier-Taussat	Animal Health Department Head, INRAE, France
Nigel French	Professor of Infectious Disease Epidemiology and Public Health, Massey University, New Zealand
Paul Pronyk	Professor of Global Health, SingHealth Duke-NUS Global Health Institute, Singapore
Paula Prist	Principal Scientist, Conservation & Health, Ecohealth Alliance, New York, USA
Paulo Vela	Research Engineer Professor, Cayetano Heredia Peruvian University, Peru
Robyn Alders	Development Policy Centre, Australian National University Senior Consulting Fellow, Global Health Programme, Chatham House, UK
Salazy Bin Abubakar	Professor, Tropical Infectious Diseases Research and Education Centre, University of Malaysia, Malaysia
Sascha Knauf	Director, Institute of International Animal Health/One Health, Friedrich-Loeffler-Institute (FLI), Germany & Professor for One Health/International Animal Health, Faculty Veterinary Medicine, Justus Liebig University, Giessen, Germany

Tony Barnett	Professor of Social Science of Infectious Diseases, London School of Hygiene and Tropical Medicine, UK
Wanda Markotter	Director, Centre for Viral Zoonoses, University of Pretoria, South Africa Co-Chair of OHHLEP
Zelalem Tadesse	Senior Animal Health Officer for Zoonotic Diseases and One Health, Food and Agriculture Organization of the United Nations (FAO)

3. Priorities and knowledge gaps for One Health research funding

The priorities for One Health research funding raised by Working Group members include promoting a comprehensive, transdisciplinary, systems-based approach to research. This involves capacity building in low- and middle-income countries (LMICs), enhancing integrated global surveillance systems, developing effective and sustainable interventions and their evaluation, and ensuring equitable distribution of animal and human vaccines and alternative technologies to antimicrobials.

Figure 2. Word cloud visualisation of One Health research priorities and knowledge gaps mentioned within the survey.



A critical need for a broader approach in One Health was identified, integrating disciplines beyond animal and human medicines. Achieving this requires exploring the equivalence and complementarity of various disciplines and methodologies. The diverse knowledge systems and communities worldwide should be recognised and mapped, harnessing their valuable contributions to One Health research. It was highlighted that the role of plant health in preserving biodiversity and trade should be further acknowledged. Beyond this, the need for wider collaborations across sectors and transdisciplinary networks was highlighted. To ensure longer term improvement, there is a need for workforce targeting to integrate environment and veterinary scientists in public health work and curricula adaptation in all sectors involved in health.

Transdisciplinary research and cross-sectoral collaboration would generate knowledge to better understand causal mechanisms behind the challenges emerging within the global ecosystem, including the connection among disease emergence, climate change, land use change, biodiversity loss and more general animal, environmental and human health.

Funding should be directed to initiatives that enhance the capacity of LMICs to effectively prevent, detect, respond to, and mitigate infectious disease outbreaks since these are countries where diseases often emerge and that experience the highest burden of consequences.

A crucial need is to improve and enhance integrated global surveillance systems for human, animal, and environmental health to detect disease outbreaks with a high pandemic potential early. Developing non-invasive methods will result in cheaper disease surveillance and improve knowledge about disease dynamics, especially wildlife epidemiology. Important components for integrated surveillance will be improving data standardisation and interoperability between human and animal

health surveillance systems, which will require an interdisciplinary approach, and investing in technologies for rapid and accurate pathogen identification. In particular, One Health surveillance needs to be improved in LMICs. Another area that requires more research focus is One Health in an urban context.

Funds should target the development of effective and sustainable interventions, considering the optimum outcomes for human, animal, and ecosystem health. Projects should be practical and community-driven, involving meaningful engagement with local communities. This could include participatory research methods, community workshops, or partnerships with local and civil society organisations. Tailoring interventions to local needs and building community capacity are key considerations. Furthermore, it is critical to better articulate and evaluate these projects and interventions, specifically reviewing effectiveness (including best use of resources), impact (planning for future improvement), and sustainability (including outcome of capacity building). Another key aspect of monitoring and evaluation for One Health research projects would be demonstrating good value for money and efficient use of funds.

Funders should support research on zoonotic diseases, including efforts in prevention, diagnosis, and treatment, alongside surveillance, prevention, control of emerging diseases, and measures to prevent disease spillover. For specific control methods, there is a need to fund the development of technologies that can reduce antimicrobial resistance, such as sustainable, tailored bacteriophage cocktails. The development of new and improved vaccines for animal and human diseases, both for known and potential infectious diseases should be considered a priority in One Health. Beyond this, funds should be directed to ensuring equitable, reliable, sustainable access and distribution of vaccines globally. In addition, funding should facilitate the sustainable adoption of existing technologies to address animal diseases at the population level, including integrating insights from social sciences. This approach not only enhances animal and zoonotic disease surveillance sensitivity but also addresses social factors impacting communities. It can lead to reduced background mortalities, improved household and community food security, as well as enhanced local economies.

4. Current One Health research funding landscape

i. Main sources of funding for One Health research

According to the survey respondents, public funding agencies provide most of the funding for One Health research, pointing to their crucial role in supporting this research domain. Foundations and private funding play a smaller role in research funding in this area. Academia was highlighted as another source of funding, although some of this comes through public funding as well.

ii. Funding schemes that are well-designed to support One Health

Although it is recognised that funding organisations need to do more to encourage and support One Health research, there are strong examples of previous and current funding schemes that have been well-designed for this purpose. Recognising and identifying these examples will encourage and support funding organisations to better integrate One Health into their funding mechanisms and future calls or programmes.

These funding schemes vary in scope, from training programs and collaborative initiatives to grants supporting interdisciplinary research at regional and global levels. Some funding schemes identified below are dedicated funding for One Health, whilst others do not specify One Health as an objective. Still, their structure encourages a collaborative, coordinated, interdisciplinary One Health approach. **Please note that this list is not exhaustive; it comprises only the funding schemes referenced during the workshop and survey.**

Funding Scheme	Description
'Ecology and Evolution of Infectious Diseases (EEID)' Program	Multi-agency program supporting research on multidisciplinary drivers influencing transmission dynamics of infectious diseases. Encouraged to develop the appropriate multidisciplinary team.
Belgian FPS Health Contractual Research	Provides opportunities for contractual research.
DELTAS Africa	Co-funded initiative by Wellcome and UK FCDO coordinated by Science Foundation for Africa.
EU COST Actions	Brings people together for collaborative efforts.
EU's Horizon 2020 Research and Innovation Program	Funds research on topics related to the interconnectedness of human, animal, and environmental health.
Gates Foundation Global Grand Challenges	Supports innovative projects tackling global health issues.
Government Departments (e.g., Defra)	Government agencies funding One Health research.
IDRC Program	Focuses on One Health research.
New Zealand Mission-led Funding Schemes	Aligns OH research under missions recognising human, animal, and environmental/plant health dependencies; Māori research schemes inherently support One Health due to cultural interconnectedness.
NSF 'Biodiversity on a Changing Planet' Program	Cross-directorate and international program for interdisciplinary projects addressing grand challenges in biodiversity science
One Health Commission Grants and Funding Opportunities	Collaborates to provide grants emphasising human, animal, and environmental health intersections.
PREACTS (PREZODE in Action in the Global South)	Gathers researchers, stakeholders, and decision-makers to impact public policies.
PEPR MIE (supports more academic research)	Objective is to understand the risk factors associated with zoonotic disease emergence, the underlying ecological and epidemiological mechanisms involved, how to mitigate these emergences and how to detect such events as early as possible.
The World Bank 'The Pandemic Fund'	Funds One Health research initiatives, prioritising areas that build on surveillance for diseases, laboratory systems, and public health workforce capacities in eligible countries to strengthen disease surveillance and early warning, laboratory systems, and health workforce.
UKRI Global Challenges Research Fund	Effective funding for One Health research to promote challenge-led disciplinary and interdisciplinary research, like the One Health Poultry Hub.
USAID Emerging Threats Division Portfolio, including PREDICT Project historically and current One Health Workforce (OHW) Program	OHW Empowers One Health University Networks (AFROHUN and SEAOHUN) to develop and deliver programs that equip professionals with the transdisciplinary skills to address complex global health issues.
UKRI BBSRC cofunded-Defra "One Health approach to vector-borne diseases" funding call	Support for multidisciplinary and multi-institutional strategic, collaborative research focused on a One Health approach to vector (arthropod) borne diseases (VBD) research.

Perhaps even more important than highlighting these strong examples is identifying and understanding which aspects of their design have made them successful at supporting One Health research. These aspects should then be applied more widely to research funding schemes and programmes.

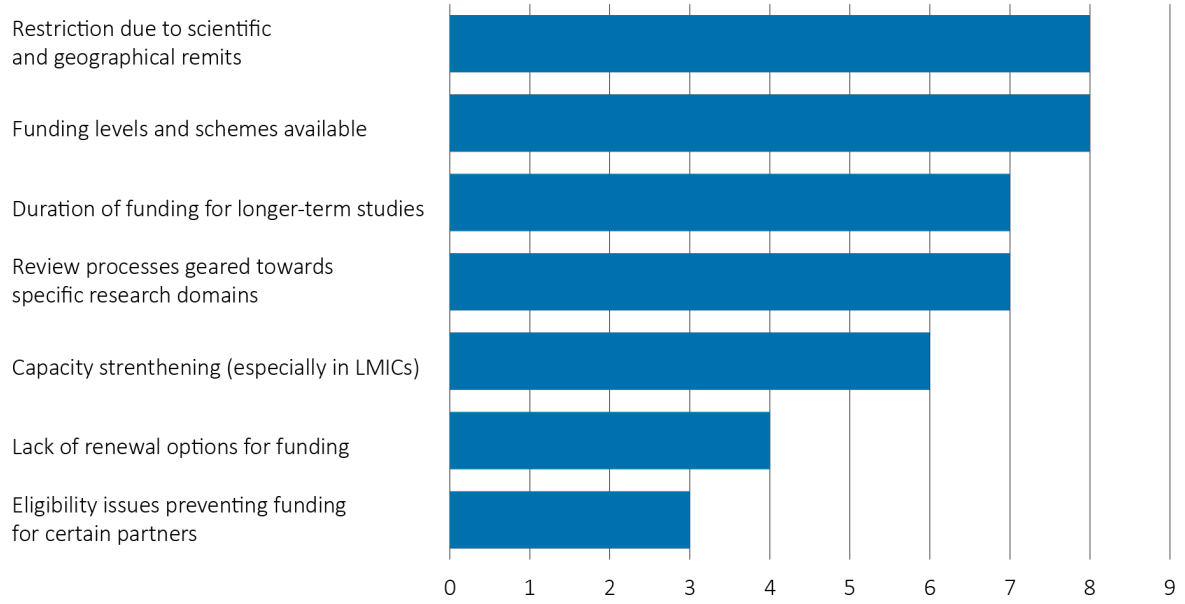
- **Longer Project Duration.** Allowing for extended project durations enables comprehensive research, development, and implementation, contributing to the effectiveness of the funding schemes.

- **Willingness to Support Adaptive Implementation.** Flexibility in adapting to changing circumstances or emerging challenges enhances the success of funding schemes by allowing projects to evolve based on real-world needs.
- **Transdisciplinary, Multisectoral, Multistakeholder Co-design and Co-implementation.** Involving a diverse range of expertise, sectors, and stakeholders (including communities affected) in both the design and implementation phases ensures ownership and a system-based approach, addressing complex issues from multiple perspectives. To ensure successful engagement of these stakeholders, due consideration must be given to the practical requirements of large research consortia, including sufficient funding.
- **Strong Partnerships between Project Members.** Collaborative efforts and effective communication among project members contribute to the success of funding schemes.

iii. Current limitations of funding One Health research

Despite the successes of funding schemes identified in this report, there are wider limitations to funding One Health research. Restrictions due to scientific silos and geographical remits inhibit cross-sectoral, interdisciplinary, and international collaborations in One Health research projects, which has been identified as a priority for ensuring a One Health approach. The structure of the funding schemes was highlighted by the group as a major limitation. In particular, the amount and duration of funding, and to a lesser degree, a need for renewal options, limited longer-term and more in-depth studies and the inclusion of all necessary and appropriate sectors. Another limitation was biases within the proposal review process leading to preference for specific research domains. A lack of capacity strengthening in LMICs also hindered effective funding of One Health research. Finally, some members of the Working Group identified eligibility requirements in the research call or programme that could prevent funding for certain partners.

Figure 3. Identified barriers to appropriate funding for One Health research (November 2023) 0-9 represents the number of times barrier highlighted by Working Group. (Capacity strengthening refers to lack of capacity as a barrier)



5. Recommended improvements to One Health funding

Reflecting on the priority knowledge and research gaps in One Health research and the current research funding landscape and its limitations, improvements funders could make to research funding mechanisms were identified and discussed. These improvements have been divided into short- and long-term changes to recognise the limited control of individual funding organisations. For example, individual public funders need permission from their respective Government Ministries and some long-term improvements would require widespread structural and attitudinal changes before they could be implemented effectively. There are several approaches to the funding model for One Health research – specific funding schemes focused on One Health research or tailoring and funnelling funding schemes from different sectors and disciplines, encouraging a coordinated, structured approach.

i. Short-term improvements to funding mechanisms to support One Health research

In the short term, priority should be given to reshaping funding mechanisms and strategies to better accommodate the diverse and interconnected aspects of One Health research. To achieve this goal, the focus and structure of funding programmes need to be adapted to encourage collaboration and cross-sectoral involvement. Grant review panel composition and panel induction training should be set up to improve understanding of transdisciplinarity and the connection between animal, human and environmental health. Project requirements should mandate One Health outcomes as project success metrics, and funding call text should be carefully formulated to eliminate unnecessary exclusionary language.

Research calls need to be tailored to allow, encourage and even require projects to take a One Health approach. Calls should be focused, realistic and measurable, with provisions for funding impact assessment and evaluation. Interdisciplinary collaborations are intrinsic to the One Health approach. Research funding schemes should focus on encouraging involvement across and beyond the disciplinary silos and should incentivise interdisciplinary collaborations. Often, researchers can struggle to think beyond their disciplines and unintentionally reinforce these silos.

Project durations should be extended, with a proposal of at least five years, to enhance collaborative aspects of funding and suit the complexities of interdisciplinary work, including the increased efforts required for intense communications. Extended project timelines would acknowledge that transdisciplinary partnerships and consortia take longer to build to allow for the establishment of common ways of working and language. Funding should support establishing and maintaining practical consortia with adequate resources.

The diversification of funding programs and their structures, depending on their aims and focus, could be used to distinguish between fundamental and applied research and encourage proof-of-concept and blue-sky research. Funding schemes focused on proof-of-concept would incentivise the involvement of engineering disciplines in research networks and consortia. The challenges of accepting systemic and integrated research by funding agencies were highlighted.

Research calls should be targeted to areas or regions where a One Health approach would have a significant impact; however, in-depth analysis and understanding are required to identify these areas and regions. It is important to involve civil society and end-users in research (e.g. through participatory research) and prioritise community-level implementation to bridge the gap between academic research and its practical application. Robust assessment and evaluation frameworks must be in place to effectively track the outcome and impacts of funding schemes and projects. One Health outcomes – including network development, collaboratively generated products, and multimedia communication pieces – could be included as project requirements and used as additional project success metrics. Crucially, exclusionary language should be avoided when possible. Research programmes should be as open and inclusive as possible to allow and encourage interdisciplinary and international collaboration.

Further to adjusting call text and funding structure, the review process and selection panel architecture need to be adapted to better support research within the One Health approach. The inclusion of One Health researchers, including social scientists and those with on-the-ground experience in relevant topics and geographies, on selection panels would greatly improve these processes and outcomes. However, it is recognised there is a scarcity of reviewers with an integrated One Health perspective and the definition of what constitutes a “One Health expert” still needs to be defined. A shorter-term improvement would be establishing varied, balanced views and expertise in the panel composition and providing induction training for selection panels on interdisciplinarity, understanding the One Health approach, unconscious bias and facilitating the use of common language. As previously highlighted, researchers can struggle to think beyond their disciplines. A key question raised was whether funding selection panels can be expected to assess how applicants frame research questions and whether these framings contribute to intersectoral team building.

ii. Long-term improvements to funding mechanisms to support One Health research

There is a strong call for capacity strengthening in LMICs to enhance the ability of individuals, organisations, and systems to undertake efficient and effective One Health research. Building institutional capacity is vital to ensure research (laboratory-, community-, or field-based) can be undertaken to a consistently high standard. Institutional and organisational support would also allow more efficient detection, response, and mitigation of infectious disease outbreaks. In particular, the need for qualitative research capacity is often overlooked. Building and strengthening institutional capacity is important for sustaining long-term impact. Additionally, individual training is an important aspect of One Health capacity building. There is a recognised need for more focused education programs and clear career pathways and prospects for individuals trained in or focusing on One Health. This capability strengthening would help cultivate and retain talent and expertise. It was recognised that the existing structures, particularly in academia, generally encourage specialisation rather than integrated problem-solving, through recognition and promotion processes. Funding incentives to researchers using a One Health approach would encourage a career in One Health. Opportunities and incentives for individuals with in-depth expertise in one area and broad knowledge in related areas would help to contribute to the One Health sector.

Another improvement to boost sustainability would be longer-term funding for impactful research, especially concerning climate change and disease transmission, and for projects with proven positive impact based on evaluation-based criteria. The latter again emphasises the importance of establishing robust monitoring and evaluation frameworks. The challenge would be convincing stakeholders and funders of the longer-term benefits, regardless of the commercial return. The importance of long-standing transdisciplinary research partnerships, including those spanning multiple projects, should not be underestimated. Funding to establish sustainable, improved integrated surveillance with data interoperability between human and animal health surveillance systems should be considered a long-term priority.

Another important aspect of sustainability is integrating One Health principles into policy frameworks and bridging policy gaps to improve joint discussions and approaches across different sectors at the national level in order to improve transdisciplinarity and a more cohesive One Health approach. The joint approach towards antimicrobial resistance (AMR) was highlighted as an area where cross-governmental working and joint policy frameworks are improving. However, the extent to which research funders can influence policy and governments will vary. Fostering partnerships with industry partners would help to produce tangible outputs and contribute to the impact and sustainability of One Health research.

Funding focused specifically on connecting and encouraging collaboration between existing projects or initiatives working in separate disciplines and not necessarily branded as One Health relevant would also enhance the value-added dimension of One Health. This would allow teams to collaborate across separate projects, leverage existing work, and ‘springboard’ off each other.

6. Conclusion

In conclusion, this report briefly explores the current landscape of One Health research funding, highlighting the priority knowledge and research gaps in One Health, the limitations to effectively funding One Health research, and short- and long-term improvements to research funding mechanisms. The collaborative Working Group focuses on improving funding mechanisms for One Health and coordinating One Health research activities relevant to research in the context of pandemic response and preparedness.

The report sheds light on some of the key priorities and gaps in One Health research funding, emphasising the importance of fostering a comprehensive, interdisciplinary, holistic approach to research. Priority areas were capacity building in LMICs, improved integrated global surveillance systems with data interoperability between human and animal surveillance systems, and the production and equitable distribution of animal and human vaccines and alternative technologies to antimicrobials. Identifying specific funding schemes that effectively support One Health research and understanding the important aspects of their design will help other funding organisations better integrate these into their funding mechanisms and future calls or programmes.

Despite the successes of funding schemes identified in this report, there are wider limitations to funding One Health research effectively, including challenges related to funding levels, eligibility criteria, and restrictions on scientific remit. Short-term improvements should focus on reshaping funding mechanisms and strategies to accommodate better the interdisciplinary and global nature of One Health research. To achieve this goal, the focus and structure of funding programmes need to be adapted to encourage collaborative research across the disciplinary silos. The composition of grant review panels and panel induction training could improve understanding of interdisciplinarity and One Health research to reduce biases. Project requirements should mandate One Health outcomes as project success metrics, and funding call text should be carefully drafted to eliminate unnecessary exclusionary language.

Long-term improvements would focus on the sustainability of One Health funding and research, including longer-term funding for impactful research and high-impact projects, encouraging long-standing transdisciplinary research partnerships, and integrating One Health principles into policy frameworks. In LMICs, capacity strengthening should focus on building institutional and individual expert training and capacity. Funding to establish sustainable, improved integrated surveillance with data interoperability between human and animal health surveillance systems should be considered a long-term priority.

In summary, this report serves as a resource for research funding organisations and stakeholders in the field of One Health research, providing insights, recommended improvements, and an overview of the current state of funding and collaboration. This report will serve as a foundation to further develop recommendations for improving One Health funding mechanisms and to better coordinate research funding strategies with the needs of the One Health research community.