

Terms of Reference for Request for Proposals

First Fleming Fund Country Grant to Vietnam

1 Overview of this grant

This is a Request for Proposals (RFP) for the first Country Grant to address critical gaps in surveillance of antibiotic-resistant bacteria in Vietnam. It has been created in response to a Request for Support from the Government of Vietnam. The grant will be funded by the UK Department of Health and Social Care, under its Fleming Fund Grants Programme, which is managed by Mott MacDonald, the Management Agent.

This first Fleming Fund Country Grant for Vietnam will focus on strengthening the antimicrobial resistance (AMR) and antimicrobial use (AMU) surveillance systems in both the human and animal health sectors. It will facilitate a stronger One Health approach to surveillance, bringing together multi-sectoral stakeholders to share surveillance data and gain a better understanding of AMR and AMU.

This grant will align with the national AMR policy framework and with the investments made by other donors and stakeholders in this area. In the human health sector, the grant will invest in the improvement of AMR and AMU data management, as well as in the reinforcement of both reference and surveillance site laboratories. In the animal health sector, the grant will invest in the improvement of national surveillance coordination and information management, as well as in the reinforcement of both the reference and regional AMR veterinary laboratories. In addition, the grant will contribute to further develop and support the coordination with ministries and between technical institutions involved in AMR/AMU surveillance.

The Grantee will be responsible to Mott MacDonald for all aspects of the grant, including the management of any partners, their performance, technical delivery and financial accountability. The Grantee will be expected to sign the Grant Agreement and will be expected to enter into sub-granting arrangements with partners on the same back-to-back terms.

The Grantee will need to work in close coordination with the National Steering Committee (NSC) on the prevention of AMR, as well as Mott MacDonald and other national stakeholders. The Grantee will also be required to harmonise efforts on this Country Grant with other types of grants under the Fleming Fund Grants Programme, namely Regional Grants and the Fleming Fellowship Scheme.

This grant is expected to last 36 months. Grant applications are expected to be in the region of £8-10 million, including all capital and recurrent costs, overheads and management costs.

2 Overview of the Fleming Fund

2.1 Introduction

The UK Government has established the Fleming Fund to respond to the global threat of drug-resistant infections, also known as antimicrobial resistance (AMR). The Fleming Fund will be a critical tool in achieving the resolution of the 68th World Health Assembly, 2015 (WHA A68/20), and in realising the 'Political Declaration of the High-Level Meeting of the United Nations General Assembly (UNGA) on Antimicrobial Resistance, 2016'. These recognise that urgent cross-sectoral rationalisation of antibiotic use, and prevention and control of infections in humans, animals, food, agriculture, and aquaculture sectors, are key to tackling AMR and call for: innovative research and development; affordable and accessible

antimicrobial medicines and vaccines; improved surveillance and monitoring; increased governance on antimicrobial use; and increased international cooperation to control and prevent AMR.

The Fleming Fund aims to address critical gaps in surveillance of antibiotic-resistant bacteria in low- and middle-income countries (LMICs) in Asia and Sub-Saharan Africa. Countries in these areas are set to bear the highest burden of antibiotic-resistant infections. A Global Action Plan on Antimicrobial Resistance (AMR) has been developed by the World Health Organization which acts as the blueprint for a multi-stakeholder global response to averting a global health crisis caused by AMR.¹

The Fleming Fund comprises a number of workstreams. One workstream provides support to the Tripartite Alliance – the Food and Agriculture Organization (FAO), the World Organisation for Animal Health (OIE) and the World Health Organization (WHO) – as part of the ‘One Health’ approach. Through funding to the Tripartite Alliance, the Fleming Fund has contributed to the development of National Action Plans in Sub-Saharan Africa, South and South East Asia, and to the building of the evidence base and guidance for AMR surveillance. This work will be critical for the overall success of the Fleming Fund Grant Programme and underpins the delivery of the portfolio of Country and Regional Grants and Fleming Fellowship Scheme, as these will target capacity gaps identified in National Action Plans. The Fleming Fund also funds initiatives in academic institutions to develop guidance on the development of AMR surveillance systems.

The Fleming Fund Grants Programme is the largest stream of financial support available through the wider Fleming Fund. The UK Department of Health and Social Care has appointed Mott MacDonald as the Fleming Fund Management Agent for the Fleming Fund Grants Programme. Mott MacDonald is a global company with expertise in multi-sectoral international development and fund management. On behalf of the UK Government, Mott MacDonald is responsible for funding allocation and oversight of all investments made across the whole portfolio of grants in different activities and in different countries.

The aim of the Fleming Fund Grants Programme is to improve the ability of recipient countries to diagnose drug-resistant infections, with an emphasis on bacterial infections, and to improve data and surveillance to inform policy and practice at national and international levels. The overall goal is to avert the human and economic burden of AMR.

The geographic focus of the Fleming Fund Grants Programme is 20-24 LMICs from Sub-Saharan Africa, and South and South East Asia. It will provide financial support over a five-year period from 2017 to 2021 to participating countries via three funding channels:

- Country Grants
- Fleming Fellowship Scheme Grants
- Regional Grants

Resources may also be available to conduct Operational Research on selected topics within these funding channels. These studies will provide an opportunity to better examine implementation ‘blockages’ or undertake more detailed case study analysis in themes of interest (e.g. value-for-money) for programme learning and adaptation purposes.

The Fleming Fund will be independently evaluated and Itad, a specialist evaluation firm, has been appointed by the UK Department of Health and Social Care for this purpose.

¹ <http://www.who.int/antimicrobial-resistance/global-action-plan/en/>

2.2 Problem statement to be addressed by the Fleming Fund

The main issues to be addressed by Fleming Fund Country Grants are outlined below:

- There are too few trained microbiologists to undertake the volume of testing required for representative surveillance on AMR.
- There are few health facilities that routinely undertake bacterial culture; still fewer facilities that meet the requirements for accreditation, or who do routine antimicrobial drug sensitivity tests.
- Routine AMR testing in healthcare delivery is not practised, or there is no culture of surveillance for AMR in healthcare delivery and there are barriers to developing it.
- There is little perceived use of surveillance data on any level, including low demand for the data from policy makers.
- There is a lack of knowledge on the use and consumption of antimicrobial agents across One Health sectors.
- There is a lack of antimicrobial stewardship.
- Logistical challenges are significant – transporting samples in a safe and secure manner under challenging transport conditions; ensuring a quality assured and sustained supply chain for reagents and consumables; and ensuring appropriate servicing of equipment are a few examples.
- Surveillance systems (national, regional and global) that do exist are often vertical in nature, are not linked, and are often unwilling to integrate.
- There are weak One Health structures and poor inter-sectoral collaboration.
- There is a heterogeneous picture across countries and regions in terms of starting points, political will, capability, and donor interest and engagement.
- There are poorly defined and applied quality assurance standards in laboratory testing.
- There is lack of understanding from basic surveillance of pathogens on transmission patterns and drivers such as inappropriate use of antimicrobial drugs across all sectors.

2.3 Fleming Fund investment areas and outputs

To address the problems above, the Fleming Fund Grants Programme invests in:

- Laboratory infrastructure enhancement.
- Human resource strengthening and workforce reforms.
- Surveillance systems strengthening.
- Building foundations for AMR surveillance data use.
- Promoting rational use of antimicrobial medicines.

Investment in these areas is expected to achieve the following outputs:

- Improved laboratory skills and conditions for bacterial identification and Antimicrobial Susceptibility Testing; and, therefore, improved data quality.
- Strengthened One Health workforce with a range of relevant skills for AMR surveillance.

- Stronger AMR surveillance systems and processes at country and regional levels.
- Stronger demand for AMR data at regional, country, subnational and facility levels.
- Better knowledge of country level patterns of practice and use of antimicrobials (particularly for bacterial infection) across sectors.

Fleming Fund outputs are expected to contribute to the following country outputs:

- Increase in quality and quantity of AMR data collected.
- AMR data shared in country to support evidence based policy and practice.
- AMR data shared internationally to improve and inform the global response.

The RFPs for Country Grants have been designed to ensure that investments and activities contribute directly to outputs. Grantees are expected to adhere to and demonstrate this alignment and contribution to outputs in their applications.

2.4 Core principles within the Fleming Fund Grants Programme

The Fleming Fund is built on four core principles. Grantees are expected to demonstrate how they will align with these principles while implementing the grant.

- 1. Country Ownership:** The Fleming Fund Grants Programme will work closely with national governments to ensure that country plans and aspirations, as laid out in their National Action Plans, are implemented; we will consult and work hand-in-hand with national governments to agree the approach and ensure sustainability. Grants and RFPs will conform to national priorities outlined in the National Action Plan and as articulated during Country Assessment visits. Unless there are good reasons to do so, Fleming Fund grants will chiefly invest in public sector laboratories and surveillance systems, thereby supporting national public health systems.
- 2. One Health:** The Fleming Fund recognises that the problem of AMR is a great danger to human health and cannot be controlled without a One Health approach. A specific set of One Health investment parameters has also been developed and is summarised below. This approach is aligned with key documents and guidelines from OIE² and FAO³ as well as the Global Action Plan.
 - a. Collaborative multi-sectoral governance of AMR:** Leadership and resourcing of AMR surveillance and mitigation measures in all sectors that contribute to the emergence of AMR.
 - b. Integrated AMR and antimicrobial use and consumption surveillance in all sectors:** Surveillance in humans, livestock, aquaculture, crops, food and the environment to produce information that is interpreted by multi-sectoral teams to help understand factors associated with AMR emergence within and between sectors
 - c. AMR mitigation policies and programmes prioritised across multiple sectors:** Evidence-based policies and programmes for AMR mitigation measures that are prioritised across the relevant sectors, based on information generated through AMR and AMU/C surveillance in all sectors.

² OIE Standards, Guideline and Resolution on Antimicrobial resistance and the use of antimicrobial agents;

³ The FAO Action Plan on Antimicrobial Resistance, 2016-2020.

- 3. Alignment of Approach:** The Fleming Fund Grants Programme will seek to invest in areas which complement and build on work done to date, rather than create new systems. Grant applicants will need to demonstrate that they understand other actors' work in the field of improved laboratory capacity (both within and outside the sphere of AMR surveillance), improved disease surveillance, and the One Health approach. The Fleming Fund Grants Programme will assess grants for duplication of efforts and/or the development of parallel systems. To the extent possible, prospective Grantees will need to demonstrate how their proposals add value to existing and planned investments and systems.
- 4. Sustainability:** The Fleming Fund Grants Programme will focus assistance on national systems with a view to long-term sustainability. Investment size and scope should, as far as possible, be aligned with national government spending so that systems created with Fleming Fund grants are sustainable within the public health system. We also recognise that the public good of conducting AMR surveillance means medium- to long-term support, and it is expected that countries that demonstrate good performance will have access to additional funds to provide ongoing support.

2.5 Fleming Fellowship Scheme

The Fleming Fellowship Scheme is part of the broader Fleming Fund Grants Programme, and is also managed by Mott MacDonald. Fellowships will provide grants to fund a 24-month programme of structured learning, mentoring and skills development for four to eight Fellows in each investment country. Rather than duplicate basic training, the Fellowships will focus on building advanced skills and leadership to promote the application of best practice in identified 'Beneficiary Institutions'. Beneficiary Institutions are organisations that add strategic value and complementarity to achieve the Fleming Fund's aims in the country, and who are likely to derive sustainable benefit from the Fellowship activities, such as AMR reference laboratories, national epidemiology units, hospitals and/or national drug administration agencies

The initial focus will be on strengthening the quality of laboratory diagnostic data and the analysis, and use of AMR and AMU surveillance data in Beneficiary Institutions. The scheme will support individuals and institutions to build the sustainability of programmes that seek to address AMR. The data they generate will be applied to deliver evidence-based approaches to tackling AMR, for example to improve antimicrobial stewardship.

Each country's national AMR committee, with Mott MacDonald, will determine the priority areas to be supported through Fellowships and the Beneficiary Institutions under the Fellowship Scheme. Each Fellowship will be matched with a 'Host Institution' from a preselected pool. When these have been decided, the Fellowship application process will open. Following selection, each Fellow, together with their Beneficiary and Host Institutions, will develop a budgeted work plan which will be agreed and funded by the Fleming Fund through the Host Institution.

Activities will include mentoring, secondments, participation in collaborative projects and specialised training that will support the Fellows within their workplace. These institutions will also support Fellows' workplaces to allow Fellows to implement what they have learned.

We expect this process to run in parallel with the selection of the Grantee for the Country Grant, which will enable the Grantee and the Host Institutions to align their work programmes.

2.6 Fleming Fund activities in Vietnam to date

This is the first RFP for a Fleming Fund Country Grant to be released in Vietnam through the Fleming Fund Grants Programme. In preparation for this grant, Mott MacDonald carried out a Scoping Visit in May-June

2018 which was followed, in July 2018, by Positioning Activities (assessments) in a number of public health and animal health laboratories potentially involved in AMR/AMU surveillance.

Key stakeholders in the animal and human health sectors have been consulted throughout the process, including UN agencies and other development partners. This is to assist in alignment of Fleming Fund grant investments with other proposed activities. The assessments identified major gaps and needs for strengthening AMR and AMU surveillance in humans and animals, identified other key stakeholders working in AMR and AMU surveillance, including WHO and FAO, and informed agreement with the Government of Vietnam about the grant objectives and outputs in line with Vietnam's National Action Plan for Antimicrobial Resistance.

Through a separate Fleming Fund grant, the Oxford University Clinical Research Unit (OUCRU) received a Fleming Fund grant directly from the UK Department of Health and Social Care to enhance the capacity of a laboratory at NHTD's Dong Anh campus and to support AMR surveillance activity in human health. Similarly, a Fleming Fund grant through FAO is supporting activities relating to AMR and AMU in the animal sector.

3 The current AMR situation in Vietnam

3.1 National Action Plan for AMR

In 2013, the Vietnamese Ministry of Health (MoH) developed a National Action Plan (NAP) on AMR, and was the first country in the WHO Western Pacific Region to do so. The NAP follows the priorities outlined by the Global Action Plan but it is predominantly focused on human health. It covers the period 2013-2020. It includes the six following objectives, under which activities are split between phase 1 (2013-2016) and phase 2 (2016-2020): (i) raise awareness of community and health workers on drug resistance; (ii) strengthen, improve national surveillance system on the use of antibiotics and drug resistance; (iii) ensure adequate supply of quality medicines to meet the needs of people; (iv) promote proper safe use of drugs; (v) promote infection control; and (vi) promote proper safe antibiotic use in livestock, poultry, aquaculture and cultivation. The NAP focusses almost exclusively on the human sector, with a few passing paragraphs on the livestock sector.

For that reason, the Ministry of Agriculture and Rural Development (MARD) released in June 2017 their own AMR NAP 2017-2020. This Plan, entitled 'National action plan for the management and use of antibiotic and control of antibiotic resistance in livestock production and aquaculture', has been supported by several donors including FAO – through a Fleming Fund grant – and USAID. It contains five objectives: (i) review, revise and enforce policy and governance related to AMR and AMU in livestock production and aquaculture; (ii) increase awareness on AMU and the risk of AMR occurrence among agriculture and food professionals; producers and consumers; (iii) implement good practices in treatment, animal feeding production and livestock production and aquaculture; (iv) monitor AMR, antibiotic residues and AMU in livestock production and aquaculture; and (v) facilitate inter-sectoral collaboration activities related to AMR control.

These two NAPs do not include AMR-related activities in the environment sector. Their implementation could be improved compare to the proposed timelines. Although the objectives of the envisaged Fleming Fund Country Grant and Fellowship Scheme are aligned with the national AMR policy framework, it is worth mentioning that the Fleming Fund will primarily focus on supporting the objectives in the two NAPs that address AMR and AMU surveillance and inter-sectoral sharing of information, namely: Objective 2

‘Strengthen, improve national surveillance system on the use of antibiotics and drug resistance’ of the NAP 2013-2020, and Objective 4 ‘Inter-sectoral approach for the surveillance of AMR, AMU and residues’ as well as Objective 5 ‘Facilitate inter-sectoral collaboration activities related to AMR control’ of the MARD NAP (2017-2020).

3.2 One Health

While there is a history of a One Health (OH) collaboration between the General Department for Preventative Medicine (GDPM) in MoH and MARD to manage zoonotic diseases – which grew out of the zoonotic severe acute respiratory syndrome (SARS) and highly pathogenic avian influenza (HPAI) outbreaks in the early 2000s –there are still opportunities for better collaboration on managing AMR in humans and animals.

The One Health Partnership (OHP) supports the OH approach that underlies the Global Health Security Agenda for Vietnam, facilitating collaboration and information sharing to manage zoonotic diseases in Vietnam. The ‘Viet Nam One Health Strategic Plan (OHSP) for Zoonotic Diseases 2016 – 2020’ was drafted in early 2017, with a view to annual review. The OHSP reporting form on the human health side includes focus area 6 ‘Applying a One Health approach for Antimicrobial Resistance Management’, while the OHSP reporting form for the animal health side includes focus area 6: ‘Applying a One Health Approach in controlling antibiotic resistance’. However, further facilitation is needed to strengthen information sharing between the Medical Services Administration (MSA) – sometimes referred to as the Vietnam Administration for Medical Services (VAMS) – and the Department for Animal Health (DAH), and between research institutions and the government departments whose mandate is to manage AMR in humans and animals.

The AMR NAP (2013-2020) refers to the establishment of a cross-sectoral steering committee which reflects to a certain degree the ambition of Vietnam to address AMR through a OH approach. This committee has the Minister of Health listed as the Chairman, with the Vice Minister of Health and Vice Minister of Agriculture and Rural Development listed as the Deputy Chairmen, and various others listed as Commissioners, Secretaries, sub-committees, and a Permanent Division. However, the animal health sector could be better represented in the committee, and there are opportunities to improve the functioning of this committee overall.

In June 2015, an Aide-Memoire on ‘Multi-stakeholder Engagement to combat AMR in Vietnam’ was jointly signed by MoH, MARD, Ministry of Industry and Trade (MOIT), Ministry of Natural Resources and Environment (MONRE), including other development partners such as WHO, FAO and OUCRU. To further support the multi-sectoral approach to AMR control in Vietnam, the MoH established in October 2016 a National Steering Committee on the prevention of AMR serving from 2016 to 2020. The Committee includes 31 members from the four ministries that supported the Aide-Memoire including external partner institutions. For MoH, the focal department is the Medical Services Administration (MSA), while for MARD it is the Department of Animal Health (DAH). This steering committee has met once formally since it was established.

The human health sector’s main focus of addressing the possible contribution of AMU and AMR in animals to AMR in humans is promoting the safe use of antibiotics in animals (see Section 3.1 above). However, it is important that policies to manage AMR in humans are based on a sound scientific understanding of all the risk factors for AMR, including association with AMU in humans and association with AMR and/or AMU in livestock, aquaculture or agricultural production systems and with environmental contamination. A OH

approach is needed to understand any association of AMR in humans with AMR and/or AMU in livestock, aquaculture or agricultural production systems and with environmental contamination. While there is a recognised need to work across the sectors to reduce the development of AMR and to limit the use of antibiotics critically important to human medicine, at the same time it is important that policies protect food safety and security and protect the livestock production economy and rural livelihoods. A better understanding of the risks associated with AMU in animals and how they might be reduced is required to achieve this.

Several research institutions in Vietnam are implementing studies on AMR and have already produced information that contributes to the understanding of priority AMR patterns and possible risk factors. There are, however, opportunities to improve the sharing of findings by these institutions within and between sectors, in order to improve the integration of research outputs into overall knowledge and understanding of the epidemiology of AMR in Vietnam. Furthermore, improving the flow of this knowledge to the key government departments responsible for recommending policy – as evidence to underpin policies for effective management of AMR in humans, animals and the environment – would improve Vietnam’s approach to addressing AMR on the whole.

Recently a number of technical institutions have proposed forming an Interdisciplinary AMR Surveillance Technical Working Group (IASTWG) to support the multi-sectoral and multi-disciplinary sharing of information generated through their respective research efforts with the intention of integrating their outputs into a more comprehensive body of scientific evidence to underpin policy advice. Their research findings will need a mechanism through which they can integrate their results with the outcomes from AMR and AMU surveillance. Such cross sharing of data is needed to provide comprehensive evidence underpinning policy recommendations and to identify knowledge gaps to guide future surveillance and research.

3.3 AMR Surveillance – human health

In human health, a surveillance network was established in 2013, under the Viet Nam Resistance Project (VINARES) funded by Swedish SIDA, operated by the National Hospital of Tropical Diseases.

The National Surveillance System on AMR was established in 2016 by MoH, with support from US CDC, and comprises 16 central- and provincial-level hospitals. These 16 hospitals are enrolled in the UK National External Quality Assessment Scheme (UKNEQAS), with support from OUCRU.

The National Steering Committee on the prevention of AMR would like to expand the number of surveillance sites to at least 30 and has included an additional three to the 16 mentioned above in the ‘Request for Support’ to the Fleming Fund (see table below). The three extra hospitals are teaching hospitals (in blue in table below) which are not at present active but have good microbiology facilities and have requested inclusion in the network.

Table 1. List of surveillance sites in the human health sector for which Fleming Fund support has been requested by the National Steering Committee on the prevention of AMR

No.	Name of site	Location	Sector
1	Bach Mai Hospital	Ha Noi	Human
2	National Hospital of Tropical Disease	Ha Noi	Human
3	Vietnam National Children’s Hospital	Ha Noi	Human
4	Viet Duc Hospital	Ha Noi	Human

No.	Name of site	Location	Sector
5	Saint-Paul Hospital	Ha Noi	Human
6	Hanoi Medical University Hospital	Ha Noi	Human
7	Uong Bi Viet Nam – Sweden Hospital	Quang Ninh	Human
8	Viet Tiep Hospital	Hai Phong	Human
9	Hue University Hospital	Thua Thien Hue	Human
10	Hue central hospital	Thua Thien Hue	Human
11	Danang General Hospital	Danang	Human
12	Binh Dinh General Hospital	Binh Dinh	Human
13	Khanh Hoa General Hospital	Khanh Hoa	Human
14	Dak Lak General Hospital	Dak Lak	Human
15	Cho Ray Hospital	Ho Chi Minh	Human
16	Ho Chi Minh Hospital for Tropical Diseases	Ho Chi Minh	Human
17	Pediatric Hospital No1	Ho Chi Minh	Human
18	Ho Chi Minh City University Medical Centre	Ho Chi Minh	Human
19	Can Tho Central General Hospital	Can Tho	Human

Currently, in advance of an official surveillance protocol, the sites are reporting positives samples only to the MoH. A subset of the proposed surveillance sites take part in US CDC-sponsored surveillance of hospital acquired infections (HAI) using standardised case definitions. Samples for HAI include blood and urine with a plan to expand this to include ventilator associated pneumonia and surgical site infection.

There is currently no formally designated national reference laboratory for AMR. The National Steering Committee on the prevention of AMR would like to appoint two or three. It proposes to nominate these laboratories by the end of 2018. The shortlisted laboratories are all based in hospitals (National Hospital for Tropical Diseases at the Dong Anh campus, Bach Mai General Hospital, and the Hospital for Tropical Diseases in Ho Chi Minh City (HCMC)).

Surveillance activities in Vietnam are being supported by a number of different groups. US CDC has been providing support for AMR surveillance since 2016, providing technical support, including protocols, guidelines, and training. They also arrange mentoring of selected sites laboratories by the American Microbiology Society, who send a trainer who stay at the site for two weeks, then follow up with another week in the following year. National microbiologists also support at sites, supported by US CDC. Training on using WHONET for data entry and analysis, as well as the use of microbiology techniques, has also been supported by US CDC.

The monthly donors co-ordination event currently hosted by PATH would be an important mechanism for the Grantee to ensure alignment of Fleming Fund activity with other donors.

OUCRU received a Fleming Fund grant in 2016. Activities under this grant include the creation of a reference laboratory facility at the National Hospital for Tropical Disease at the Dong Anh campus.

Hospital-based AMU surveillance is an activity of the national AMR surveillance system. Since the beginning of the VINARES project AMU surveillance has been incorporated in the surveillance activities using prevalence survey and antimicrobial consumption data at the hospital level. Data on a Defined Daily

Dose basis from hospitals outside the surveillance system are collected the AMU surveillance unit in MSA at MoH.

Separately to the national hospital-based surveillance there is a community-based surveillance network co-ordinated by GDPM, supported by the National Institute of Hygiene and Epidemiology (NIHE), supported in part by the UK Government's Newton Fund. At the moment, it does not seem to play a formal role in AMR surveillance and there appear to be no current plans to incorporate this network for AMR/AMU surveillance. However, US CDC are planning to support GDPM to form a 'National Public Health Laboratory'. The lab will be fitted out for microbiology and will likely include AMR. NIHE already has capabilities for Whole Genome Sequencing and broth dilution.

3.4 AMR Surveillance – animal health

Conducting AMR surveillance in animals and food of animal origin is the responsibility of the DAH, MARD. Within DAH, the Veterinary Drug Management Division (VDMD) has the mandate to collate and review all the information generated on AMR, AMU and AMC, to understand the contribution of this information to epidemiology of AMR in animals and to recommend policies to the MARD relating to antimicrobial use in animals. The Head of the VDMD is the focal point for AMR within DAH. In addition, the VDMD is responsible for registering drugs imported for veterinary use, for managing data on imports and manufacture of antimicrobials, and for leading AMU and AMC surveillance.

AMR surveillance in animals is at a very early stage in Vietnam. Active AMR surveillance was conducted in healthy pig and poultry populations in five provinces from September 2017 until March 2018, with the support of FAO funded through another Fleming Fund grant and USAID.

To date 175 samples have been collected from pigs in abattoirs and 170 samples from poultry in markets from three provinces in the North (Ha Noi city, Quang Ninh, Hai Phong) and two in the South (HCMC, Long An). The aim was to cover 10 provinces but to date there has only been sufficient resource to cover five provinces. SOPs have been prepared for sample collection and for culture, identification and antibiotic sensitivity testing (AST) for *E. coli* and non-typhoidal *Salmonella*. These results show high levels of resistance to many of the 20 antibiotics that were tested.

DAH has proposed a network of three laboratories to support AMR surveillance, including: NCVHI1 in Hanoi, NCVHI2 in HCMC and Regional Animal Health Office No. 4 (RAHO4) in Da Nang city covering the north, south and the centre of the country, respectively. DAH has identified NCVHI1 as the national AMR reference laboratory.

FAO conducted an ATCLASS assessment of NCVHI1 in June 2017 and supported the strengthening of this laboratory in the pilot phase of AMR surveillance in animals in 2017/2018. OUCRU trained microbiology staff in NCVHI1 to conduct AST in *Salmonella* and *E. coli* against a panel of 20 antibiotics using disk diffusion methods and assisted with the production of SOPs. NCVHI1 staff travelled to the provinces to collect samples in the first round of surveillance. However, they plan to train provincial staff to conduct the sampling in the future, under supervision of the NCVHI1 staff. Isolates from the surveillance programme are currently stored in a -30 freezer in NCVHI1, as the -80 freezer is malfunctioning.

FAO conducted an ATCLASS assessment of NCVHI2 in July 2018 and will strengthen this laboratory to conduct diagnostic testing for AMR surveillance. FAO will support further AMR surveillance in pigs and poultry in NCVHI1 and NCVHI2 until September 2019. However, FAO currently have no plans to strengthen the RAHO4 laboratory.

Some AMR surveillance was conducted in tilapia and traditional fish aquaculture in Hai Duong Province in 2017. A total of 177 samples were collected from tilapia and traditional fish species (common carp, grass carp, climbing perch) on 60 fish farms. Target bacteria, *Aeromonas hydrophila* and *Streptococcus* spp, were tested for resistance against a panel of 14 antibiotics.

DAH aims to complete a surveillance plan for livestock and aquaculture species in September 2018, with support from FAO.

3.5 Laboratory capacity – human health

In Vietnam the hospital network is under the direction of MSA. It consists of a number of national-level hospitals that are based mainly in Hanoi and HCMC, some of which have specialisms, for example in surgery or tropical diseases. The 58 provinces and five municipalities each have at least one provincial-level hospital and in many cases will also have specialist hospitals such as paediatric or maternal health. These provincial hospitals will take direct admissions as well as referrals from lower level facilities. Vietnamese provincial hospitals often have more than 1,000 beds. Below provincial level there are district hospitals, some of which have laboratory capacity which in some cases extends to bacteriology. The lowest level of health facility is the commune health centre that will not normally be able to perform bacterial culture. The national AMR surveillance system sites described above are all provincial- or national-level hospitals.

Based on the information gathered during the preparation of this grant, surveillance site laboratories seem to be relatively well equipped for bacteriology. The laboratories visited were in good physical condition and basic biosafety equipment was present. No laboratory reported problems with electricity or water supplies. Automated blood culture machines and automated identification machines were present at all sites visited, however, this will have to be confirmed through a systematic assessment of the 19 targeted laboratories to be conducted by the Grantee(s) during the inception phase of this Country Grant.

Equipment certification, upkeep and maintenance is reported to be a challenge in Vietnam. Provision for maintenance comes out of hospital budgets and provision varies between sites. Many hospitals have leasing agreements for specialised equipment from the manufacturers. In some cases, the site pays a higher than market rate for consumables and, in return, gets use of the machine, free maintenance and servicing.

Maintenance of biosafety cabinets is of particular concern, with some sites not having performed maintenance for several years, and there is no clear plan in place to address this problem. Maintenance is sourced commercially or from engineers that work for NIHE and the Pasteur Institute. Grantees will need to suggest ways to address these issues.

Most bacteriology tests (approx. 70%) are paid for by the national insurance system, which covers 80% of the cost of diagnosis and treatment. Automated blood culture systems are included in this at a fixed rate of remuneration.

A particular biosafety problem in SE Asia including Vietnam is *Burkholderia pseudomallei*, the causative agent of melioidosis, which is frequently isolated from blood, urine and pus cultures. *B. pseudomallei* is a containment level 3 organism because of the risk it presents to laboratory workers. In areas of higher prevalence, grantees will need to help sites plan develop strategies and SOPs to ensure safe handling and identification of this organism.

At present, AMR data is reported using WHONET for positive samples and, although it can be compared to the number of overall samples or numbers of patients, there is limited information on the patient and

presenting illness thereby limiting the clinical utility of the findings. All hospitals operate a Hospital Information System (HIS) and routinely enter admission information and in many sites also outpatient appointments. A number of different HIS software systems are in use. Most laboratories use a Laboratory Information System (LIS), and where used this was LABCOM. All reporting to the surveillance system is done using WHONET. Several problems were observed in the IT infrastructure. Patient identifiers are re-used and IT systems do not connect efficiently. This leads to duplication of effort and increased data entry error and limits availability of data on the patient. At the best sites currently, it is possible to extract patient demographics, disease and treatment data for a single patient which could allow very detailed analysis of surveillance data. Several donors are working on this including US CDC with the support of PATH and FIND (see Output 2.4)

3.6 Laboratory capacity – animal health

NCVHI1, NCVHI2 and RAHO4 laboratories all conduct microbiology for food safety testing and have ISO17025 accreditation for a number of microbiology tests, which includes almost all of the organisms included in AMR surveillance with the exception of *Enterococcus*. Each laboratory has a quality manager and quality management systems to meet ISO accreditation standards. ATCC strains are used for bacteriology associated with food safety.

The buildings are in good condition with a generator for power back-up and adequate water supplies. NCVHI2 has very small workspaces for bacteriology and it would be useful to identify relatively minor modifications to the partitions to improve these workspaces. The laboratories are generally well-equipped though some additional equipment would be needed. For example, all laboratories need a new BSCII biosafety cabinet and training in how to decontaminate the cabinets before and after use. Equipment is generally well maintained in targeted laboratories.

An improved system needs to be supported at NCVHI1 for maintaining a national biorepository of bacteria isolates. Isolates are currently stored in a -30 freezer at NCVHI1, which appears to be malfunctioning. An inventory of stored isolates is maintained in Microsoft Excel with infrequent back-up. Therefore, a more suitable inventory system with a programme for regular back-up is needed.

NCVHI1 has capability for culture, identification and AST for *Salmonella* and *E coli*. NCVHI2 will be supported by FAO to develop this capability during 2018. RAHO4 has no current capability for AST.

An external quality assurance system has still to be organised for the three surveillance laboratories for AST. OUCRU has provided one round of proficiency testing for NCVHI1, but there is no regular EQAS in place. Ideally EQAS for the veterinary laboratories should be included in EQAS for hospital laboratories participating in AMR surveillance.

RAHO4 will not be supported by FAO and the laboratory will need to be set up for culturing and conducting AST on animal samples in a separate area to the “clean” area for culturing food samples. The laboratory has an unused room identified for this purpose and already has much of the necessary equipment. Some renovation work is required to set up work flows, bench space and to install equipment.

None of the laboratories have a Laboratory Information Management System (LIMS), with all records recorded on paper and some use of Microsoft Excel. Each laboratory needs a more up-to-date computer, printer and uninterrupted power supply (UPS), in order to store laboratory data. WHONET is not installed in any of the laboratories.

3.7 Rational use of drugs

The legal framework for the management and use of antimicrobials in Vietnam is covered by 114 legal documents under the responsibility of four ministries: MOH, MARD, MOIT and MONRE.

In public health, there is strong drug registration, which conforms to the ASEAN Common Technical Dossier and is aligned to the International Council for Harmonisation recommendations. There is also a system of monitoring and quality assurance for drugs. Three institutes, two in Hanoi and one in HCMC, are able to perform detailed drug quality analysis. In parallel, 62 provinces have more limited drug quality testing facilities. In total 30,000-40,000 samples are tested annually across all drugs. A focussed testing strategy is used for selecting drugs to test that includes antibiotics. Pharmacies operate under a code of conduct of best practice. However, while control is working well in the hospital system, it is reported that antibiotics are freely available without prescription in the commercial pharmacy sector. The ministry lacks the human resources to enforce existing regulation. Technical guidance is available to guide prescription in both outpatient and inpatient. However, misuse of antibiotics by clinicians in both public and private health care facilities is reportedly common.

Antimicrobials are used extensively in livestock production and aquaculture in Vietnam. One study estimated that the volume of antimicrobials used per chicken produced in Vietnam was approximately six times higher than that reported in some European countries, with 84% of antimicrobials being used for prophylactic purposes. Use of feed medicated with antimicrobials has been very high, especially in aquaculture and pig production, and often relied on antimicrobial classes considered of importance for human medicine by WHO. However, the use of antimicrobials for growth promotion was banned in Vietnam in early 2018. There are currently no legal restrictions or guidelines on the use of antimicrobials for therapeutic purposes in livestock production and aquaculture. Antimicrobials are distributed by domestic or foreign wholesalers to veterinary pharmacies and local veterinarians, who sell to farmers without a prescription.

All antimicrobials are imported into Vietnam, either as ready-to-use products or as raw materials for processing in Vietnam. The VDMD in DAH is responsible for registration of imported antimicrobials for veterinary use. The VDMD has contributed to OIE's recently established reporting system on antibiotic use in Vietnam, based on an analysis of the imported antibiotic raw materials. It is extremely challenging and time consuming to analyse the antibiotic volumes in imported ready-to-use products and the VDMD has requested support from FAO to establish a data management and analysis system to assist with this.

In both human and animal health it is important that the results of AMR surveillance are considered in the context of understanding AMU in the populations being surveyed. An understanding of antibiotic use patterns, and the socio-economic factors associated with antibiotic use for livestock production, is also extremely important to underpin policies that restrict antibiotic use in livestock to ensure that policies do not have a negative impact on livestock production and food security and on farmers' livelihoods. The Danish government is supporting research into antibiotic use in pigs in one northern province, while OUCRU is conducting research into antibiotic use in poultry in the south of Vietnam. Under the Fleming Fund Grants Programme, it is proposed that a Fleming Fellowship will be based within the VDMD and will focus on AMU surveillance (see Annex 2).

4 Scope of this Country Grant

4.1 Grant Objectives and Outputs

Objectives and outputs for this Country Grant are summarised as follows. Section 7 provides more detail. It is expected that applicants will respond to this RFP by developing and proposing activities that are costed and by proposing appropriate indicators (see Section 9). All inputs must be permitted under the list of Eligible Funding Items, as outlined in Annex 1.

Objective/Output	Inception	Implementation
Objective 1: Strengthened One Health approaches to information sharing		
Output 1.1: AMR and AMU surveillance information is shared between MoH and MARD		x
Output 1.2: Enhanced sharing of AMR knowledge between research institutions and government		x
Output 1.3: A national AMR symposium is held		x
Objective 2: Strengthened AMR and AMU surveillance system in the human health sector		
Output 2.1: Assessment of priorities and needs for AMR surveillance completed	x	
Output 2.2: Functional reference laboratories for AMR		x
Output 2.3: Improved biosafety and biosecurity in reference laboratories and surveillance sites		x
Output 2.4: Functional surveillance site laboratories		x
Output 2.5: Surveillance sites are linking clinical and laboratory data		x
Objective 3: Strengthened AMR and AMU surveillance system in the animal health sector		
Output 3.1: Assessment of priorities and needs for AMR surveillance completed	x	
Output 3.2: The Veterinary Drug Management Division is leading knowledge management and policy development for AMR, AMU and AMC in animals		x
Output 3.3: National reference laboratory established for AMR		x
Output 3.4: NCVHI1, NCVHI2 and RAHO4 laboratories are producing reliable culture, identification and AST results for priority bacteria		x
Output 3.5: Improved biosafety and biosecurity in NCVHI1		x
Output 3.6: NCVHI1 maintains a national AMR database, analyses and reports on AMR to VDMD and the contributing laboratories		x
Output 3.7: VDMD captures data on antimicrobials imported for veterinary use, undertakes analyses and provides accurate reports to stakeholders and to OIE		x

4.2 Duration and phasing of the grant

The grant is expected to last for 36 months.

The grant will be divided into two phases, an inception phase expected to last up to six months, and an implementation phase which will cover the remainder of the grant. The table above illustrates which outputs are expected to be delivered in which phase.

During the inception phase, the Grantee will:

- Complete or begin work on the Outputs, as outlined above.

- Collaborate with the Fleming Fellows and their Host Institutions to understand the Fellowship workplans.
- Develop a detailed budget and workplan for the implementation phase that is aligned with the Fellowship workplans.
- Agree an MOU with the Government of Vietnam, in order to operate.

The remainder of the outputs should be completed during the implementation phase, as outlined above.

Proposals for the grant will require a detailed budget and workplan for the inception phase; these activities need to be in line with government restrictions on what can take place while the project MOU is not yet finalised.

On the same budget and workplan template, proposals for the grant should also include an indicative budget and workplan for the implementation phase which should be detailed to the extent possible. At the end of the inception phase, the Grantee will be expected to revise and update their workplan and budget (including procurement) for the implementation phase, and will propose which standard indicators will be used to measure success (see Section 9). These will be subject to review and subsequent sign-off by the Mott MacDonald team.

The Grant Agreement will be signed on award of the grant, but the Grantee will need to agree an MoU with the Government of Vietnam in order to carry out implementation activities. Where possible, Mott MacDonald will assist with and provide support in gaining approval for the MoU, but in the event that that the MoU is not granted, the Grant Agreement will be reviewed accordingly.

4.3 Funding envelope

Grant applications are expected to be in the region of £8-10 million, including all capital and recurrent costs, overheads and management costs.

The Fleming Fund wishes to see value for money (VfM), and all applicants will be expected to demonstrate their understanding of VfM. The Guidance Notes for the Grant Application Form provides different dimensions that should be considered as part of a VfM approach – economy, efficiency and effectiveness – and an indication of how we may assess VfM.

4.4 Procurement

A procurement plan and budget should be developed by the end of the inception phase. Pending approval from Mott MacDonald, the Grantee would be expected to facilitate the procurement process. Their choice of procurement route may be subject to assessment by the International Procurement Agency (IPA), a partner of Mott MacDonald in the Fleming Fund Grants Programme providing advisory services, and the Grantee will be expected to work with IPA if necessary to optimise the procurement process.

5 Key partnerships, alignment and coordination

The Country Grant must be delivered in a way which supports the national effort and which takes account of current capacity levels, absorptive capacity, alignment with others, and the particular challenges – cultural, political and linguistic – of working in Vietnam. The Grantee must also ensure that all inputs complement and build on work done to date and avoid duplication and development of parallel systems.

In the human health sector, the delivery approach and inputs must be closely aligned with national priorities, as stated in the NAP and other related policy and strategy documents. There must also be close alignment with inputs being provided by other development partners supporting AMR/AMU-related activities. This means that the Grantee, in addition to working closely with national stakeholders, must work closely with the development partners involved in AMR during both the inception and implementation phases. Allocation of grant resources should support the national effort in a transparent way by specifying resource allocation in a workplan and budget that has been jointly developed by government officials and the Grantee, where possible.

In the animal health sector, the delivery approach and inputs must be aligned with the NAP 2017-2020. They should also build on the surveillance programme that is implemented with the support of FAO during 2018 until September 2019 and be in line with the Danish programme to support sharing of research information for policy development.

Building a relationship with the One Health Partnership would also be useful to contribute to AMR information sharing in this forum.

Much of the success of this grant, in particular Objective 1, depends upon the ability of the Grantee to bring stakeholders from multiple sectors together and facilitate joint working. Close collaboration with a wide range of stakeholders at different levels in the Government of Vietnam is central to the success of this grant. The Grantee will also need to build and leverage partnerships with several AMR stakeholders beyond those in government, to include academic, training and research institutions, the private sector, and other development partner-supported programmes.

The Grantee must particularly bear in mind the need to enable sustainability of AMR surveillance beyond the life of the grant. Prospective Grantees will be expected to describe concrete strategies to promote sustainability of outputs in their proposals.

6 Complementing other grants from the Fleming Fund Grants Programme

The Country Grant is expected to work effectively and synergistically with other grants under the Fleming Fund Grants Programme at the regional level. This relates to both the Fleming Fellowship Scheme (see Sections 2.5) and Regional Grants.

The Regional Grants will focus on strengthening networking and data sharing on AMR at the regional level. The Grantee is expected to liaise, through Mott MacDonald, with such grants for maximising the sharing of AMR data and learning at the regional and global levels.

According to current plans, nine Fleming Fellowships, including five for the human health sector and four for the animal health sector, will be issued in Vietnam. Successful applicants will receive specialised training in AMR epidemiology, AMR and AMU data management and analysis, laboratory quality management, and advanced laboratory technical skills.

Fellows are expected to become technical leaders in AMR and AMU surveillance in Vietnam, and it is hoped that they will play a role as mentors and active trainers in capacity building activities that will be implemented through this Country Grant. Therefore, once established, the Grantee is expected to work in collaboration with Fleming Fellows and potentially their Beneficiary Institution (where they are usually based) and their Host Institutions (who provide remote support to the Fleming Fellows).

Summary terms of reference for all the Fellowships, currently being finalised, are attached in Annex 2. It is our expectation that, by the time the Grantee can begin implementing the Country Grant, the Fellowships will be established.

7 Detailed Objectives and Outputs

7.1 Objective 1: Strengthened One Health approaches to information sharing

Output 1.1: AMR and AMU surveillance information is shared between MoH and MARD

Currently, the MSA and DAH are the focal departments for addressing AMR in the MoH and MARD respectively. Within DAH, the VDMD is the focal point for AMR knowledge management and for One Health coordination.

The Fleming Fund Grants Programme intends to support MSA and VDMD within DAH to:

- Hold regular meetings to provide a platform for exchange of information generated through AMR, AMU and AMC surveillance in humans and animals.
- Understand the contribution of surveillance results to the knowledge on AMR in humans and animals, identify key issues and recommend priorities for further surveillance and formulation of policy initiatives.
- Undertake periodic reviews of the level of information being shared, identify gaps and suggest changes to address these

An AMR Epidemiology Fleming Fund Fellowship in MSA and DAH will significantly contribute to this output by supporting the fellows, who is AMR leaders within each division, to bring together the information to be shared between MSA and DAH (see Annex 2).

By the end of the grant it is expected that the following results will be achieved:

- MSA and VDMD have conducted a strong series of meetings building a collaborative relationship that allows for sharing of information on AMR, AMU and AMC from human and animal sectors.
- MSA and DAH work together to understand the risk factors for AMR in humans and animals and identify critical risks that need to be addressed.
- MSA and DAH produce sector-based reports on AMR and AMU surveillance that each includes a section cross-referencing the surveillance results from the other sector and potential impacts for their sector.
- There is evidence that meetings and reports are relevant to the needs of decision makers and are influencing policies and budgets.

Output 1.2: Enhanced sharing of AMR knowledge between research institutions and government.

At present, significant AMR and AMU related research programmes are implemented by various technical institutions in Vietnam, generating important information to understand the priority AMR patterns together with risk factors and transmission pathways associated with these. A number of these institutions meet on an ad hoc basis and report that an updated AMR situational analysis – similar to the initial

situation analysis conducted by GARP in 2015 – would be useful, in order to underpin identification of policy recommendations and knowledge gaps.

It is expected that the Grantee will work with the NSC to identify how best to facilitate the integration of the disparate research and surveillance outputs on AMR and AMU in humans and animals to support the NSC in leading the AMR management programme and formulating AMR policy.

By the end of the grant it is expected that the following results will have been achieved:

- A government-supported group of AMR/AMU experts from technical institutions, comprising academia, government, and non-governmental organisations working on AMR/AMU, is meeting regularly to provide a platform for cross-sectoral information sharing between research groups and government agencies.
- An updated AMR multi-sector situation analysis has been completed.
- Improved cross-sectoral understanding of AMR and AMU in Vietnam.
- Improved understanding of the costs related to AMR in both human and animal health, and the possible cost-savings better control of AMR could produce.
- Evidence-based policy recommendations and knowledge gaps are presented to the NSC.
- There is evidence that meetings and reports are relevant to the needs of decision makers and are influencing policies and budgets.

Output 1.3: A national AMR symposium is held

The Grantee will be expected to work with MSA, DAH and other relevant parties to organise a national AMR symposium, that brings stakeholders from the multiple sectors and programmes together and promotes sharing of information generated through their programmes, with the aim of achieving a better understanding of AMR and AMU in Vietnam. The symposium should be under the overall leadership of the NSC, and it will be also important from a One Health perspective that the Grantee facilitates coordinated leadership and oversight of the symposia by the line ministries concerned, MoH and MARD.

The symposium should preferably be held towards the end of the grant period, providing a focus for Fleming-funded participants and others to bring together the information generated through the programme, assess its contribution to understanding AMR in Vietnam, present on lessons learned and recommend priorities for future work. By summing up knowledge on AMR and identifying ways forward to pursue reinforcing the response to AMR in Vietnam, this symposium will represent a tangible contribution to the sustainability of the Fleming Fund country programme.

By the end of the grant we expect that the following will have been achieved:

- A national AMR symposium successfully delivered towards the end of the programme.
- Active participation in the symposium by representatives from the line ministries, MSA and DAH, research institutions from the human and animal health sectors and wider AMR stakeholders.
- Improved cross-sectoral understanding of AMR and AMU in Vietnam.
- Ways to pursue engagement in AMR and AMU are identified and discussed among stakeholders.

7.2 Objective 2: Strengthened AMR and AMU surveillance system in the human health sector

Output 2.1: Assessment of priorities and needs for AMR surveillance completed

At the time of the development of this RFP, several aspects of the surveillance system were not yet defined. These include: (i) a nationally agreed surveillance plan and a decision on which laboratories will act as co-ordinating reference laboratories for the system; and (ii) international sharing of data namely through the WHO GLASS database. Planning for surveillance should thus consider the 'priority pathogen' sample types, bacteria and antibiotics that the GLASS database is accepting.

By the end of the inception period, the Grantee should have identified, in close collaboration with MSA, how the Grantee will contribute to the further development of the national surveillance strategy. These inputs will align with those from Government, other stakeholders and donors supporting this area.

The Grantee will need to assess all 19 sites (listed in the table above in Section 3.3) during the inception phase. As the sites vary in capability, the level and type of support offered is expected to vary between them. The Grantee will draw up a plan of support for the laboratories.

By the end of this output, we expect that the following results will have been achieved:

- MSA has a defined role as National Co-ordinating Centre for AMR in human health
- The national human health AMR and AMU surveillance plan with identified laboratories and all necessary supporting documentation have been written, for example SOPs with clear choice of bacteria (both for GLASS and also for Vietnam).
- A budget for this plan has been developed and endorsed by the MoH
- Reference laboratories are appointed, their terms of reference defined and training and equipment needs identified using the Fleming Fund laboratory tool.
- Surveillance sites support requirements have been assessed using the Fleming Fund laboratory tool and training and equipment needs identified.

Output 2.2: Functional reference laboratories for AMR

We would expect to support two or three laboratories to perform reference functions (e.g. confirmation of unusual resistance patterns, advanced organism identification). The reference laboratories co-ordinating AMR surveillance will be new to their role in providing AMR reference services and will require assistance in defining their activities depending on their current capabilities.

The Grantee is expected to support the reference laboratories to take up their role with minimal delays. Prospective Grantees, in their proposals, must identify strategies to ensure sustainability of the reference laboratories' greater role beyond the life of the grant.

Possible areas for support by the Grantee include:

- **Biorepository.** A secure repository of isolates is an important asset to allow further investigations of the pathogens isolated. Purchase of ultra-low temperature (-80°C) freezers is needed. Before installation, power supply both on mains and back up sources should be considered. The repository needs to be inventoried and isolates need to have epidemiological data associated with them. An appropriate inventory system such as PACS should be installed. Finally, there need to be clear policies for its use, for example which isolates get selected for banking, for how long they are

retained, and how access is granted for their use. The use of freeze drying equipment for long term isolate storage should be explored and relevant equipment purchased if agreed.

- **Isolate Transport.** A mechanism of transport of isolates to and from the reference laboratory is needed. The Grantee should work with the reference lab to implement a sustainable and bio-secure means of getting QC and EQA strains from the reference laboratories and isolates from the surveillance sites.
- **Supervision.** The reference laboratories will need support to undertake a supervisory role. This will include assistance in development of SOPs and bench aids suitable for use by surveillance site laboratories. The reference laboratories should monitor quality of the surveillance sites by following EQA and IQC results as well as other quality parameters such as blood culture contamination rates. Supervisory/training visits to the sentinel sites need to be supported.
- **Training/mentoring.** On-site training and mentoring appears to be the most successful strategy used in Vietnam. The reference laboratories will need to co-ordinate this. Training of trainers could be used to produce support personnel that can support the system beyond the life of the grant.
- **EQA.** Currently all surveillance sites are participating in the UK National EQA Scheme (UK-NEQAS), paid for by the Fleming Fund. This should continue if agreed by the NSC, arranged by the Grantee and monitored by the reference laboratories. The national EQA scheme should be supported to improve so that it can become the principle EQA scheme for the surveillance system.
- **Maintenance.** There are challenges in maintenance of laboratory equipment in Vietnam due to variable budget availability. The Grantee should support maintenance contracts of key specialist equipment.
- **Strategy for dealing with biosafety level 3 pathogens.** Given that *B. pseudomallei*, a hazard group 3 pathogen, is regularly isolated from cultures in Vietnam, all laboratories should be properly equipped, with trained staff and procedures put in place for biosafety and biosecurity. (See also Output 2.3).
- **Provide advanced testing services.** The Grantee should be able to provide technical advice and training if needed on advanced testing that may not yet be feasible or which is above what can be reimbursed by the health insurance system. This might include the use of MALDI-TOF Mass Spectrometry identification, or confirmation of antibiotic resistance using advanced phenotypic and genotypic methods.
- **Whole Genome Sequencing (WGS).** The Grantee should support the laboratories in careful planning to define specific surveillance questions to be answered by WGS, which already exist variously in the surveillance network. Equipment could be purchased and training could be provided, in order to get the best use out of the machines.

By the end of the grant we expect that the following will have been achieved in two or three reference laboratories:

- A secure, inventoried, biorepository system in place together with policies for its operation (e.g.: selection of isolates for saving, arrangement for accessing isolates, transfer of isolates in a bio-secured manner, etc.).

- Reference laboratories deliver quality support services in bacteriology to its subordinate laboratories, including documentation and confirmation of results.
- A maintenance plan is in place and implemented for all specialist laboratory equipment; this plan includes a budget and adequate resources are made available.
- Agreed plans for handling dangerous pathogens in place and implemented.
- Advanced techniques such as WGS are being used for defined purposes.

Output 2.3: Improved biosafety and biosecurity in reference laboratories and surveillance sites

Following the assessments and planning carried out during inception, the Grantee will be expected to provide training and other inputs to ensure a high level of biosafety and biosecurity.

By the end of the grant we expect that the following results will have been achieved in each laboratory:

- The laboratory is equipped with appropriate safety equipment and staff are wearing personal protective equipment while conducting testing.
- All biosafety cabinets are regularly maintained and calibrated, and staff have been trained on their use.
- All waste is disposed of in a safe manner.
- All staff are trained and supervised to the appropriate level for their job descriptions / roles
- Appropriate ongoing supervision of biosafety and biosecurity is supported by training and the appointment of a Biosafety Officer.

Output 2.4: Functional surveillance site laboratories

Assessment of the laboratories during the inception period will inform the details of the actions required to make the surveillance site laboratories fully functional. The Grantee, in discussion with the NSC and the reference laboratories, will be expected to support renovation, equipment procurement and training at the laboratories as needed. The Grantee will need to develop and support the implementation of equipment maintenance contracts in each laboratory.

By the end of the grant we expect that the following results will have been achieved:

- Surveillance site laboratories are equipped to a standard level.
- Surveillance site laboratories are producing high quality and timely bacteriology results for internal clinical use as well as surveillance
- Isolates can be stored at the site pending transfer to a reference laboratory
- Maintenance of all equipment is properly conducted in all laboratories.

Output 2.5: Surveillance sites are linking clinical and laboratory data

Even where laboratories are processing samples to a high standard, clinical microbiology services are currently under-utilised. Reasons for this may be a lack of trust in the laboratory results, delayed or no communication of results, or that giving empirical antimicrobial therapy is often quicker and cheaper than taking a culture.

It is vital for the Grantee to engage clinicians to ensure that appropriate cultures are taken and that relevant clinical data (for example, presenting infection syndrome) is recorded for further analysis. The

Grantee should therefore develop approaches to securing clinician engagement, by ensuring that systems are in place to provide rapid feedback of culture results so that clinicians can take appropriate action to modify patient management if necessary. At the surveillance site level, clinical and laboratory staff should be encouraged to interact so that clinicians better understand laboratory processes, and laboratory staff become more aware of the direct importance of their work on patient care. A possible approach could be to identify a pair of practitioners (one clinician and one laboratory professional) in each surveillance site, and to engage those pairs through seminars and workshops. The expectation is that this would lead to good understanding and use of the tests, as well as appropriate and prompt use of results.

At present only laboratory-based data is being reported to the MoH. Linking clinical data to this would substantially improve the value of the surveillance data, and the Grantee should develop mechanisms to capture relevant clinical data (e.g. on request forms, or from electronic hospital information systems), so that laboratory and clinical data can be linked for downstream analysis which will contribute to our understanding of the actual burden of drug-resistant infection.

By the end of the grant we expect that the following will have been achieved:

- Training provided on AMR surveillance protocols, antimicrobial stewardship, and antimicrobial sensitivity data to clinical staff at proposed surveillance sites delivered.
- Increased clinician awareness and use of diagnostic microbiology services at surveillance sites, with feedback of results in clinically useful timeframes
- There is an increase in the number of samples collected and sent to the laboratory for microbiological analysis which do not confer any additional costs to the patients.
- A software solution is being used at each surveillance site that allows collection of clinical information from the HIS and reduces unnecessary data entry at the laboratory.
- Data reported by all reference and surveillance sites include both laboratory and clinical data.
- A clearer understanding of the root causes of why clinical microbiology services are currently under-utilised, and options on how to respond.

7.3 Objective 3: Established AMR and AMU surveillance system in animals

Output 3.1: Assessment of priorities and needs for AMR surveillance completed

The Grantee will be expected to work with DAH in the inception phase to review the results of animal AMR surveillance and identify priority livestock sectors, geographic areas, bacteria and antibiotics for the AMR surveillance programme to be supported through the grant. Surveillance activities will be defined to address the identified surveillance objectives.

The Grantee should update assessments of the three selected laboratories to finalise the upgrading required to their infrastructure, equipment, diagnostic capability, quality management systems, biosafety and AMR data management.

The Grantee will also need to assess the support required by VDMD to upgrade its data management and analysis of AMC data (i.e. data on imported and manufactured antimicrobials) to support reporting to the OIE.

By the end of the inception phase, it is expected that the Grantee will have assessed the capability of NCVHI1, NCVHI2 and RAHO4 to conduct reliable diagnostic testing in support of the defined AMR

surveillance programme, agreed with DAH and any additional training required in diagnosis and quality systems.

By the end of the inception phase, the following areas will be assessed – using, where relevant, the Fleming Fund Veterinary Laboratory Needs Assessment tool – and modifications to the Country Grant will be proposed if necessary:

- Laboratory renovations and equipment needed for safe bacterial isolation, identification and AST including maintaining a biorepository at NCVHI1;
- The servicing and calibration required for laboratory equipment;
- Laboratory biosafety and biosecurity needs;
- Data management and database requirements for AMR data at national and regional laboratories;
- Any agreements needed to send AMR data and isolates from the regional laboratories to NCVHI1; and
- Data management and training needed to support analysis of AMC data by VDMD.

Output 3.2: The Veterinary Drug Management Division is leading knowledge management and policy development for AMR, AMU and AMC in animals

It is expected that the VDMD will be the entity to interpret the results of AMR surveillance with reference to AMU and other risk factors, and so develop an understanding of the epidemiology of AMR in animals and any links with human AMR. It is also expected that VDMD will act as the MARD focal point for One Health coordination and the sharing of the results of animal AMR and AMU surveillance and epidemiology with MSA (see Output 1.1 above). In order to achieve this, the VDMD should establish a team bringing together relevant staff from NCVHI1, VDMD, and other experts as appropriate.

The Grantee will be expected to support the team to meet at least quarterly to review progress on AMR, AMU and AMC surveillance, to understand the results to date, and to make any necessary revisions to the surveillance programme. The Grantee should also support quarterly meetings of the VDMD and MSA to share the progress and results of AMR and AMU surveillance in people and animals.

After the approved AMR sample collection and testing has been completed, the dataset should be analysed, and findings should be reported to the VDMD where the results can be further interpreted alongside AMU data. The team will be expected to review the AMR and AMU surveillance results to develop knowledge on the epidemiology of AMR in animals.

The Grantee should then support VDMD to prepare a report on the results of AMR and AMU surveillance and share this with a range of stakeholders in the animal and human health sectors.

VDMD should then hold a workshop – with the support of the Grantee – with the wider AMR stakeholder group to share initial results from surveillance and to also provide an opportunity for other research groups to share their results. The team will then take the lead on integrating the surveillance and research results on AMR in animals and any possible links with humans. Note that this workshop is to be held in addition to the national symposium that is described in Output 1.3, as it focuses on bringing together researchers and the government departments responsible for managing AMR in animals.

By the end of the grant we expect the following to have been achieved:

- VDMD is effectively leading and coordinating AMR and AMU surveillance activities and AMC data capture, with formal analysis, including of risk factors.

- VDMD is reporting to regular meetings of the DAH AMR team, sharing information with relevant AMR stakeholders.
- At least one workshop has been held with a wider group of stakeholders to disseminate surveillance results and to gather additional AMR and/or AMU information from research and other programmes.
- A report of the current knowledge of AMR/AMU epidemiology in animals is prepared and the information shared with relevant AMR stakeholders.
- Guidelines and/or policy recommendations have been determined for the mitigation of risk factors for AMR – where there is sufficient evidence to support these.
- Future priorities are reviewed for further rounds of AMR and AMU surveillance in animals and foods of animal origin to address gaps in epidemiological knowledge.
- All AMR, AMU and AMC reports and documents are stored on data management systems with regular off-site backups.
- There is evidence that those reports, meetings and workshops are then being actively consulted and used and are influencing the policies and budgets to address AMR.

Output 3.3: National reference laboratory established for AMR

It is understood currently that NCVHI1 – which has ISO17025 accreditation for a number of tests and a laboratory manager – will be established as the national AMR reference laboratory and provide national leadership and technical support, including for NCVHI2 and RAHO4.

In establishing NCVHI1 as the national reference laboratory, additional quality assurance will be required, which should be supported by the Grantee. The Grantee will be expected to support and upgrade NCVHI1 so it can fully undertake its role as the national reference laboratory for AMR in animal health.

NCVHI1 should be supported to:

- Train and mentor microbiology technicians at NCVHI2 and RAHO4, and other laboratories as required, to conduct bacterial culture, identification and AST.
- Develop and maintain quality systems in the AMR surveillance laboratories including activities such as providing national guidelines and SOPs for all priority bacteria, working with laboratories to prepare bench guides/flow charts, training/mentoring laboratories on Quality Management Systems, running proficiency testing for the AMR surveillance laboratories, including with international EQAS, and maintaining reference strains (e.g. ATCC / NCTC strains) for quality assurance.
- Collate and verify AMR surveillance diagnostic and demographic data from the contributing laboratories, analyse/interpret the data and share results with VDMD and with participating laboratories.
- Maintain a national biorepository of isolates from all laboratories in the surveillance network with an inventory of all isolates including data on source demographics/risk factors; a database will be developed and maintained with appropriate backup systems.
- Develop the capability to undertake more advanced diagnostic methods such as: ESBL, acquired AmpC (pAmpC), carbapenemase-producing organism confirmation, *Salmonella spp* serotyping and

Minimum Inhibitory Concentration (MIC) tests (e.g. by broth dilution) on a specified subset of isolates.

By the end of the grant, we expect the following to have been achieved:

- Updated SOPs for culture, identification and AST of all the bacteria included in the AMR surveillance programme used in all the AMR surveillance programme laboratories.
- NCVHI1 has run training workshops for microbiology technicians from participating laboratories in culture, identification and AST.
- A national biorepository of bacterial isolates, with inventory, from all laboratories is maintained at NCVHI1.
- A collection of all the necessary ATCC/NCTC strains is maintained at NCVHI1.
- NCVHI1 achieves satisfactory results in an international EQAS.
- NCVHI1 runs proficiency testing with the laboratories participating in the AMR surveillance programme.
- A national database of verified AMR data is maintained by NCVHI1 using WHONET.
- The national AMR dataset has been analysed and information shared with VDMD and contributing laboratories.
- NCVHI1 has the capability to conduct phenotypic testing to confirm ESBL-, acquired AmpC and/or carbapenemase-producing pathogens.
- NCVHI1 has the capability to serotype the major *Salmonella* species found in animals and food.
- NCVHI1 has conducted MIC tests.
- There is evidence that those laboratory results are being actively consulted and used and are influencing the policies and budgets to address AMR.

Output 3.4: NCVHI1, NCVHI2 and RAHO4 laboratories are producing reliable culture, identification and AST results for priority bacteria

The livestock populations to be sampled for AMR surveillance and the priority bacteria-antibiotic combinations to be tested will be agreed in consultation with DAH and other stakeholders. It is likely that the main target bacteria for AMR surveillance in animals will be *Salmonella*, *E. coli*, *Campylobacter* and *Enterococcus* species.

An overview of the current status of the laboratories is provided in Section 3.5. The Grantee will need to update the laboratory assessment already undertaken using Fleming Fund tools to ensure that the laboratories have suitable facilities and are well equipped with operational and calibrated equipment, good quality reagents, and up-to-date SOPs. It is expected that effective laboratory quality management systems would be in place with reliable data entry and validation and the safe and reliable transport of isolates to the national reference laboratory (NCVHI1).

By the end of the grant, it is expected that the following will be achieved:

- Laboratories are undertaking AMR activities (isolation, identification and AST of priority bacteria) and providing reliable validated results.
- Laboratories have an internal quality assurance system (IQAS) including national SOPs for data handling, culture, identification and AST of all the bacteria included in the AMR surveillance programme.

- Laboratories participate in an EQAS.
- Microbiology technicians trained in culture, identification and AST
- Data on samples tested is being maintained with routine data back-up
- Bacterial isolates, with inventory, provided to NCVHI1
- There is evidence that those laboratory results are being actively consulted and used and are influencing the policies and budgets to address AMR.

Output 3.5: Improved biosafety and biosecurity in NCVHI1

Following assessment during the inception phase (Output 3.1), additional training and other inputs, as required, are to be provided by the Grantee during the implementation phase to ensure biosafety and biosecurity.

By the end of the grant, it is expected that the following will be achieved:

- The three laboratories are equipped with appropriate safety equipment and staff are wearing personal protective equipment while conducting testing.
- Biosafety cabinets are operational and are being used by staff appropriately.
- All waste is disposed of in a safe manner.
- All staff are trained and supervised to the appropriate level for their job descriptions / roles
- Appropriate ongoing supervision of biosafety and biosecurity is undertaken, to include appointment and training of a Biosafety Officer.
- Laboratory biosafety and biosecurity is integrated into the laboratory quality management system

Output 3.6: NCVHI1 maintains a national AMR database, analyses and reports on AMR to VDMD and the contributing laboratories

All three project surveillance laboratories will maintain an accurate database of their AMR diagnostic testing results with demographic and risk factor data for each sample. Data collected for each sample should include: sampling date, location, species, type of sample, production system, farm of origin (if known), etc.

NCVHI1 will be responsible for maintaining a national database, compiling data from the three laboratories. WHONET or similar software will be used in each laboratory to store AST results and so facilitate standardised data storage and the interpretation of AST results using CLSI or EUCAST standards, as appropriate. Data transfer protocols should be developed for the sharing of AMR results between the two regional laboratories and the national reference laboratory. NCVHI1 has the responsibility to analyse and report on the AMR surveillance dataset. Surveillance results will be shared with VDMD and the submitting laboratories on a regular basis.

By the end of the grant, it is expected that the following will be achieved:

- NCVHI1 maintains a national database of AMR surveillance diagnostic testing and results with matching demographic data, compiled from the three surveillance laboratories.
- NCVHI1 shares results of the surveillance activities with VDMD and contributing laboratories.

- This information is used to inform policy.

Output 3.7: VDMD captures data on antimicrobials imported for veterinary use, undertakes analyses and provides accurate reports to stakeholders and to OIE

AMC is assessed by working with importers and manufacturers, gaining their support to gather data on active materials being imported, including packaging, reformulation and general information on their distribution. Currently, FAO are undertaking work in this area. Ultimately, the quantity and type of illegally imported antimicrobials could then be estimated by working with the relevant government agencies and customs agency. In order to do this, VDMD will need to reconcile the data collected on AMC and AMU in the different livestock sectors in Vietnam to provide information on antimicrobial distribution and use. It is expected that the Grantee is able to support VDMD in this endeavour, resulting in a more sustainable surveillance system to monitor AMC over the long-term.

By the end of the grant, it is expected that the following will be achieved:

- VDMD has the capability and tools to calculate the volume of imported antimicrobials used for veterinary purposes, summarising consumption by antibiotic category, formulation and end-use/species/multispecies.
- VDMD is providing more accurate AMC reports to OIE.
- Recommendations on the implementation of a national AMU surveillance system in livestock.
- Monitoring changes in antimicrobial use as policies are implemented.
- This information is used to inform policy.

8 Grantee Roles and Responsibilities

The main role of the Grantee – or Lead Grantee if the successful applicant is to be a consortium – will be to plan and implement the 15 outputs and deliver the three objectives listed above. The Grantee is responsible for providing, either through in-house resources alone, or through a partnership or consortium, the expert technical assistance and high-quality support needed to achieve agreed results.

The Lead Grantee is also responsible for financial management and controls for the grant as a whole (including the contributions of sub-grantees if applicable), and for monitoring and reporting to Mott MacDonald. Reporting of financial expenditure against budgeted activities is a requirement of the grant and Grantee(s) will need to show evidence of sufficient capabilities to undertake these responsibilities.

9 Measuring success

Country Grants are ultimately expected to generate results that can be tracked using a standard set of indicators that will monitor progress and achievements within and across Country Grants. A copy of the full list of indicators will be shared in the Application Pack. However, Mott MacDonald recognises that the suggested indicators may not all be applicable. Therefore, applicants are expected to select from the standard indicator set only where appropriate.

In summary, while the completion and level of attainment for *all* activities requires monitoring, the type/level of activity will determine the monitoring method. When developing the application, applicants should:

- Select from the proposed indicators for activities, where appropriate, or,
- Identify targets and timeframe completion for ‘process’ type activities (i.e. where indicators provided are not applicable / too advanced).

A mix of these options is also appropriate depending on application content. In the revised and updated workplan to be submitted to Mott MacDonald at the end of the inception phase, prior to implementation, the Grantee will be expected to revisit/confirm the monitoring plan which will then be agreed with Mott MacDonald.

In addition to measuring grant performance against the objectives and outputs stated above, the grant will also be monitored on the implementation of, and adherence to, the Fleming Fund core principles described in Section 2.4, and practical implications for this will be discussed with the successful applicant. No further action is required at this stage.

10 Application requirements

10.1 Grant Eligibility Criteria

Potential grant applicants must satisfy the following eligibility criteria before applications will be assessed in detail. Applicants:

- Must demonstrate that they are competent organisations responding to this call for proposals.
- Must have an appropriate track-record in supporting laboratory capacity development, surveillance, capacity building, and One Health.
- Must have experience of programme implementation in Vietnam.
- Must demonstrate that they are registered to work within the country, including the provision of essential documents such as articles of incorporation.
- Must demonstrate an understanding of the MoU process with the Government of Vietnam.
- Must be prepared to accept the Grant Agreement terms.
- Must be able to provide the same information and assurances for all sub-grantees, where the application is from a consortium.
- Should be able to provide all information required for due diligence checks, including clear evidence of financial standing and systems of financial management and control.
- Should be able to provide evidence of suitability in the form of references from clients and donors for previous work undertaken within the last three years.
- Can be a single organisation or consortium, though the latter must clearly identify a Lead Grantee with the appropriate governance and coordination mechanisms to manage sub-grantees.
- Can be:
 - National institutes – such as a university or research institutes;
 - Non-governmental organisations (NGOs);
 - UN Agencies;

- Private companies;
- Government-owned enterprises or institutions, provided they can establish that they are (i) legally and financially autonomous, (ii) operate under commercial law, and (iii) are not dependent agencies of national governments

10.2 How to apply

Prospective applicants must express their interest to receive the official Application Pack by **17 September 2018**. This is done by writing to flemingfundSEA@mottmac.com, and should include the organisation's name, the name, phone number and email address of the main focal point.

In addition, there will be an **Applicant Information Session (AIS) in Hanoi on Friday, 14 September 2018**. The details of the venue will be shared with applicants who have registered their interest in writing **by 1400 ICT (GMT +7), Monday, 10 September 2018**. Dial-in details will also be available for those who have registered interest after this point.

Ahead of the AIS, an example Application Pack will be shared with prospective applicants and will include an application form, budget and monitoring template, and Guidance Notes in order to orientate applicants to the process. Following the AIS, the official Application Pack will be sent out on 18 September 2018 to prospective Grantees who have registered.

To apply, please complete the application form and the budget and monitoring template, in line with the Guidance Notes.

Note the key requirements set out at the beginning of the Country Grant application form:

- Your submission should be returned by the deadline indicated in the RFP.
- When submitting the application document, press "Reply All" from the Application Pack automated email that you will receive with the application documents attached. Do not send it to us from a new email, and do not modify the Subject-line. Only "Reply All" emails will register the documents in our system.
- Keep file sizes as low as possible - there is a 9MB size limit to each individual email that can be received by the grant submission software. You can submit documents by sending multiple emails attaching submission documents to each one. Please follow the instruction (above) using "Reply All" to the original email.
- Applicants should observe the word limit indicated for each question. Additional words outside the limit will be disregarded.
- All documents included as part of the proposal must be submitted in Word, Excel, and PDF format (body font: Calibri 11pt). Do not send through as zipped files.
- You should include a covering letter, signed by the person authorised to represent your organisation for the submission of this proposal.

Proposals that do not satisfy these criteria may not be accepted and may be returned.

10.3 Evaluation criteria

The Application Pack will include the application form, indicating the scoring and weighting for each section of the application. The Application Pack will also contain Guidance Notes explaining what we are looking for in terms of a good quality response for each question, including approach to Value for Money (VfM).

In particular we are looking for a Grantee / Grantees who can demonstrate its:

- technical capacity to address the different aspects of AMR covered by this Country Grant.
- ability and preparedness to bring stakeholders together in an effective and productive working arrangement, promoting a One Health approach.
- ability to operate effectively in Vietnam.

10.4 Restrictions/limitations

Any conflict of interest, or potential conflict of interest, should be declared to Mott MacDonald when applicants are registering their interest to apply for the grant. If a conflict of interest, or potential conflict of interest, arises after that point the prospective Grantee must clearly declare this in their proposal.

10.5 Key dates

- Publication of RFP: **30 August 2018.**
- Deadline for registering interest to attend the Applicant Information Session: **1700 ICT (GMT+7) on 10 September 2018.**
- Applicant Information Session: **14 September 2018 between 1400-1700**, Hanoi.
- Deadline for registering to apply for the grant is **1700 ICT (GMT+7) on 17 September 2018.**
- Application submission deadline: **1700 ICT (GMT +7) on Friday, 26 October 2018.**
- Anticipated start of grant: **January 2019.**

10.6 Contact details and support information

Any questions on the Request for Proposals should be sent to flemingfundSEA@mottmac.com. Mott MacDonald will endeavour to respond to queries within three working days.

Annex 1: Eligible funding items

Laboratory Infrastructure Enhancement

- Infrastructure: renovation, redecoration, electricity and water supply, environmental controls, waste and waste disposal.
- Equipment: appropriate equipment for the level of capability; biosafety and biosecurity equipment; automated culture and identification platforms; IT equipment.
- Reagents, durables & consumables: appropriate media, reagents, culture plates, etc; glassware; sample collection consumables.
- Transport and logistics: vehicles or contracted services for transport of goods, and people; safe and secure transport of specimens and samples; logistical support for surveys.

Human Resource Strengthening and Workforce Reforms

- Training: clinical, veterinary, agricultural and One Health surveillance protocols; biosafety and biosecurity; microbiology, laboratory science and laboratory management; epidemiology and surveillance; genomics; IT training.
- Long-term support: ongoing and refresher training according to the competency and capabilities framework; Fleming Fellowship Scheme.

Surveillance System Strengthening

- Governance: support for AMR Coordination Committees & working groups; operational planning; cross-sectorial meetings and strategy reviews; evaluation(s).
- Quality assurance and control: site visits and audits, laboratory twinning / mentoring.
- Data: transfer and storage; safety and security; analysis software and training.
- Recurrent costs: utilities, maintenance of equipment, upkeep of laboratory space, small maintenance, personnel costs.

Building Foundations for Surveillance Data Use

- Support to build demand for AMR data: general awareness among prescribers, dispensers and agricultural consumers (i.e. farm workers, agribusiness); publication charges; workforce training.
- Evidence based strategy, policy and practice change: data / information sharing conferences, meetings and initiatives; conference attendance; IT platforms for data sharing and awareness / transparency.

Rational use of Antimicrobial Medicines

- AMU/C surveillance: development of strategies for AMU/C surveillance; use of AMU data for appropriate prescribing / informing stewardship programmes.

Annex 2: Possible Fleming Fellowships in Vietnam

Sector	Fellowship	Beneficiary Institution	Understanding AMR	Surveillance expertise	Diagnostic training	Lab quality management systems	Data collection, analysis and use	OH information sharing	Collaborative project
Human	AMR Advisory	MSA	Review evidence and advise on policies and programmes on AMR, AMC and AMU				Develop leadership in AMR epidemiology	Provide sound evidence-based advice on AMR policy development in the human health sector, within a One Health framework	To be discussed at the time of agreeing on the Fellowship workplans
Human	AMR Surveillance	MSA	Integrate results from AMR surveillance with research results to understand the priority AMR patterns and their epidemiology Keep up to date with all the available information on AMR and AMU in Vietnam	Contribute to designing future targeted AMR surveillance			Collate and analyse AMR surveillance data Understand data biases Interpret AMR results in consultation with microbiologist and AMU data	Discuss AMR and AMU surveillance results and understanding of AMR epidemiology in humans with counterpart from VDMD, DAH	To be discussed at the time of agreeing on the Fellowship workplans

Sector	Fellowship	Beneficiary Institution	Understanding AMR	Surveillance expertise	Diagnostic training	Lab quality management systems	Data collection, analysis and use	OH information sharing	Collaborative project
Human	AMU Surveillance	MSA					<p>Work with 1 or a small group of hospitals to conduct a survey of prescribing practices</p> <p>Analyse and interpret AMU surveillance results</p> <p>Work with clinicians to modify prescribing practices to reduce potential for AMR</p>	Discuss AMR and AMU results from humans and animals (with Epidemiology, AMR Surveillance and Laboratory Fellows)	To be discussed at the time of agreeing on the Fellowship workplans
Human	Laboratory (x3)	National Hospital for Tropical Diseases at the Dong Anh campus, Bach Mai General Hospital, and the Hospital for Tropical Diseases in Ho Chi Minh City (HCMC)			<p>Culture, identification and AST</p> <p>Phenotypic testing for resistance (e.g. ESBL+)</p>	<p>Benchmark guidelines</p> <p>SOPs</p> <p>Quality control</p> <p>External quality assurance</p> <p>ISO accreditation – preparatory activities</p>		Discuss AMR and AMU results from humans and animals (with Epidemiology, AMR Surveillance and AMU Surveillance Fellows)	To be discussed at the time of agreeing on the Fellowship workplans
Human	Molecular Epidemiology	One of the 3 labs listed above			<p>Genomic testing of AMR isolates from both humans and animals</p> <p>Molecular epidemiology training</p>		<p>Analyse genomic results and make recommendations</p> <p>AMR information sharing nationally and internationally</p>		To be discussed at the time of agreeing on the Fellowship workplans

Sector	Fellowship	Beneficiary Institution	Understanding AMR	Surveillance expertise	Diagnostic training	Lab quality management systems	Data collection, analysis and use	OH information sharing	Collaborative project
Animal	AMR Advisory	VDMD	Review evidence and advise on policies and programmes on AMR, AMC and AMU				Develop leadership in AMR epidemiology	Provide sound evidence-based advice on AMR policy development in the human health sector, within a One Health framework	To be discussed at the time of agreeing on the Fellowship workplans
Animal	Laboratory	NCVHI1			Culture, identification and AST Phenotypic testing for resistance (ESBL+)	Benchmark guidelines Quality control ATCC strains External quality assurance-preparatory activities ISO accreditation		Discuss AMR and AMU results from humans and animals (with AMR Epidemiology, AMR Surveillance and AMU Surveillance Fellows)	To be discussed at the time of agreeing on the Fellowship workplans
Animal	AMR Surveillance	NCVHI1		Contribute to designing future targeted AMR surveillance			Analyse AMR surveillance data Understand data biases Interpret AMR results in consultation with microbiologist and AMU data	Discuss AMR and AMU results from humans and animals (with AMR Epidemiology, Laboratory and AMU Surveillance Fellows)	To be discussed at the time of agreeing on the Fellowship workplans

Sector	Fellowship	Beneficiary Institution	Understanding AMR	Surveillance expertise	Diagnostic training	Lab quality management systems	Data collection, analysis and use	OH information sharing	Collaborative project
Animal	AMU Surveillance	VDMD					<p>Design a survey in a sub-population included in AMR surveillance</p> <p>Analyse and interpret AMU surveillance results</p> <p>Recommend an approach to national-level AMU surveillance</p>	<p>Discuss AMR and AMU results from humans and animals (with AMR Epidemiology, AMR Surveillance and Laboratory Fellows)</p>	<p>To be discussed at the time of agreeing on the Fellowship workplans</p>