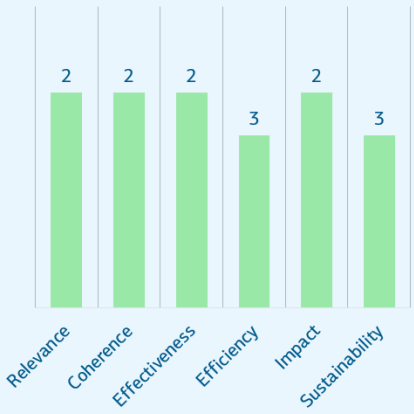
Ex-post evaluation
Veterinary control of avian influenza, Indonesia

Title	Veterinary control of avian influenza				
Sector and CRS code	Healthcare, 12250				
BMZ number	BMZ No. 2007 66 105				
Commissioned by	Federal Ministry for Economic Cooperation and Development, BMZ				
Recipient and executing agency	Republic of Indonesia, represented by the Ministry of Finance / Directorate for General Livestock Services in the Ministry of Agriculture (MoA).				
FC financing volume and instrument	EUR 3 million budgetary grant				
Project duration	2009-2017	**Reporting year**	2025	**Year of random sample**	2019

Overall rating

successful



1: very successful – **6:** completely unsuccessful

Project objectives and implementation

The outcome-level objective was for veterinary laboratories to use qualitatively reliable and high-quality testing procedures for vaccine testing. At the impact level, the aim was to contribute to the control and containment of the avian influenza epidemic among poultry in Indonesia. To this end, a biosafety level 3 (BSL-3) laboratory was built, equipped with the necessary equipment and the capacities of the laboratory staff were strengthened.

Key findings

The project is successful because its systemic approach and strong ownership by the Indonesian government contribute significantly to controlling poultry health and thus preventing outbreaks of avian influenza.

- The relevance of the project is also considered successful due to the One Health approach, which is currently the focus of development policy, and the overall design, which is essentially appropriate for this purpose.
- The construction and equipping of the BSL-3 laboratory has made a significant contribution to the use of safe, high-quality testing procedures for vaccine testing in Indonesia. The effectiveness is therefore appraised as successful.
- Due to project delays and associated cost increases, the efficiency is still appraised as only partially successful.
- It is assumed that the project has made a noticeable contribution to combating and containing the avian influenza epidemic in poultry and has thus been successful in terms of its overarching development policy impacts.
- Despite the Indonesian government's strong ownership, sustainability is appraised as having limited success due to the laboratory's lack of financial resources.

Conclusions

- Early training measures and the promotion of external partnerships are important for minimising biosecurity risks.
- Modular project planning creates flexibility in the implementation of critical infrastructure and adaptation to available resources, especially in a crisis context.
- The integration of FC programmes into the national context is essential, but not necessarily sufficient to ensure adequate funding for maintenance and operation.

Contents

List of abbreviations

AI	Avian influenza
PCR	Final inspection
BBPMSOH	Balai Besar Pengujian Mutu dan Sertifikasi Obat Hewan (formerly: NVDAL)
BMZ	Federal Ministry for Economic Cooperation and Development
BSL	Laboratory with biosafety level
DAC	Development Assistance Committee
DIC	Disease Investigation Centres
EUR	Euro
EZ	Development cooperation
FAO	Food and Agriculture Organisation
FC	Financial Cooperation
FC E	FC Evaluation
GoI	Government of Indonesia
H5N1	Highly pathogenic avian influenza virus
IB	Infectious Bronchitis Virus
IBD	Infectious Bursal Disease Virus
IDR	Indonesian Rupiah
JICA	Japan International Cooperation Agency
FMD	Foot-and-mouth disease
MoA	Ministry of Agriculture
MoF	Ministry of Finance
MoH	Ministry of Health
NVDAL	National Laboratory for Veterinary Drug Testing (now: BBPMSOH)
OECD	Organisation for Economic Co-operation and Development
PDR	Pandemic Disease Response
PA	Project appraisal
PAR	Project appraisal report
PV	Project proposal
Reo	Reovirus
SDGs	Sustainable Development Goals, Ziele für nachhaltige Entwicklung
TC	Technical Cooperation
US CDC	US Centre for Disease Control and Prevention
USD	US dollar
WHO	World Health Organisation
WOAH	World Organisation for Animal Health

Overview

General conditions and classification of the project

Avian influenza (AI) is a poultry disease caused by the highly pathogenic H5N1 virus, which was first detected in Hong Kong in 1997 and has been endemic in poultry and migratory birds in Southeast Asia since 2003.[1] The virus has the potential to be transmitted to humans. According to the WHO, there have been 954 cases worldwide (since 2005), 464 of which were fatal. In addition, there is a possibility that the virus could further adapt to humans, posing the risk of a widespread flu epidemic ("human influenza") through human-to-human transmission, resulting in a large number of fatalities. The high mortality rate of avian influenza has alarmed the international community since 2005. In Indonesia alone, 200 cases have been reported since 2005, 168 of which were fatal. Between 2005 and 2009 in particular, Indonesia had the highest number of human influenza cases worldwide. The project was planned during this period.

Brief description

The FC project aimed to strengthen animal health control in poultry in Indonesia through targeted intervention, thereby contributing to the prevention of the global spread of avian influenza in humans. The core of the measures was the establishment of a biosafety level 3 (BSL-3) veterinary laboratory[2] at the "National Laboratory for Veterinary Drug Testing" (BBPMSOH, formerly NVDAL) for testing vaccines for poultry against the highly pathogenic avian influenza virus, which is endemic among poultry in Indonesia. The measures also included training in the operation and maintenance of laboratory equipment and the development of a monitoring system for the subordinate levels. The FC project was an essential component of the National Strategic Plan. The project was intended to counteract Indonesia's high risk of becoming the starting point for a pandemic caused by influenza viruses transmitted from animals to humans, in line with the international efforts of the WHO, WOAH and FAO. The target group of the project in the narrower sense was the employees of the current BBPMSOH, and in the broader sense also commercial poultry farmers and smallholders in Indonesia.

Breakdown of total costs

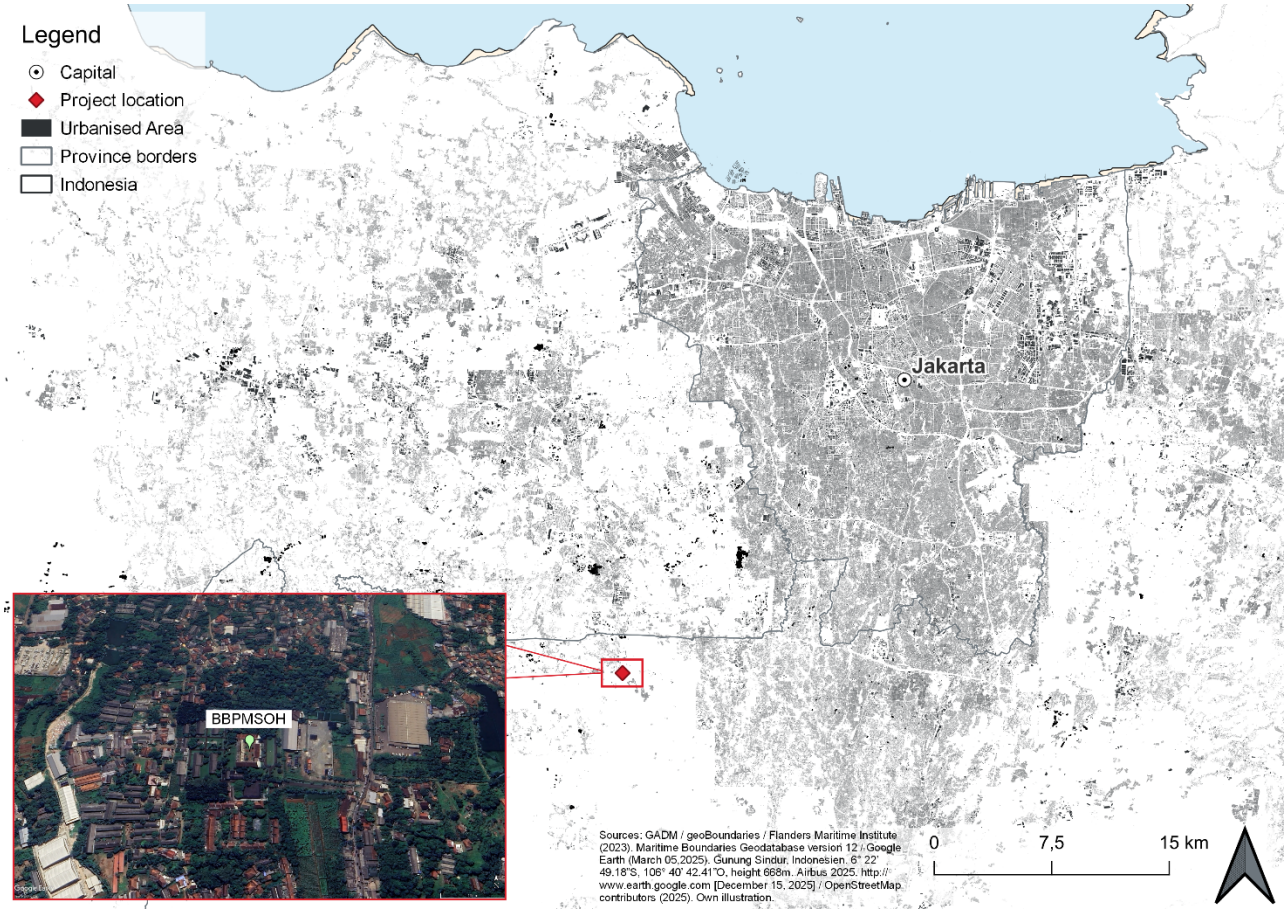
The total cost amounted to EUR 3.5 million, of which the FC contribution was EUR 3 million, while the Indonesian government contributed EUR 0.5 million. The breakdown of total costs can be found in Table 1.

	Investment (plan)	Investment (actual)
Investment costs (total) in EUR million	**3.3**	**3.5**
Own contribution in EUR million	0.3	0.5
External funding in EUR million	3.0	3
of which BMZ funds in EUR million	*3.0*	*3.5*

***Table 1**: Breakdown of costs.*

[1] In short, H5N1 is a subtype of avian influenza, also known as bird flu. However, bird flu can also be caused by other subtypes. For the sake of readability, the term bird flu will be used throughout the rest of this report.
[2] Indonesia operates several biosafety level 3 (BSL-3) laboratories, which are of central importance for the diagnosis and research of highly pathogenic pathogens such as the H5N1 bird flu virus. Information on the exact number of BSL-3 laboratories for bird flu in Indonesia is not publicly available, as such details are security-related and are not communicated publicly.

Map of the project region



Project-specific strengths and weaknesses of the project

The strengths include in particular:

- The partner has demonstrated ownership by mobilising additional funds and maintaining laboratory operations.
- Although the project was small in scale, with a total budget of EUR 3.52 million (including EUR 3 million in FC funding), the work of the BBPMSOH is considered by the FAO, WHO and US CDC to be crucial for avian influenza surveillance and the local development and quality assurance of vaccines.
- The project had a modular structure, which made it possible to adapt it to the available budget by eliminating or reducing individual measures.
- Other partners were able to build on the results of the project and provided support in the form of expertise, further training measures and equipment.

The weaknesses include in particular:

- Lengthy tendering and decision-making processes led to considerable delays, and the budget was insufficient for all planned modules because the costs had been underestimated at the outset.
- Training and supervision after the installation of the laboratory equipment would have been beneficial for the laboratory. The lack of a laboratory partnership and the mobilisation of additional funds were associated with operational risks, which, however, did not materialise.
- A sufficient maintenance budget and financial support from other partners are still not secured, which poses a risk to long-term operation.

General conclusions/lessons learned

- The need for support and the necessary processes should be fully taken into account in the tender documents for implementation consultants.
- Decision-making processes can be accelerated through appropriate political support to avoid delays.
- Projects should be planned in a scalable manner to ensure flexibility in implementation and adaptation to available funds.
- The integration of FC projects into the national context is crucial, but not necessarily sufficient to secure funding for maintenance and operation.
- Early training measures and the promotion of external partnerships are important to minimise biosafety risks.

Assessment according to OECD DAC criteria

Relevance

1. Alignment with policies and priorities

The first outbreaks of the highly pathogenic avian influenza virus (HPAIV) H5N1 occurred in 2003 and spread rapidly from Java to Bali, Kalimantan and Sumatra. In 2006, the virus moved further east to Papua and much of Sulawesi. To prevent a pandemic, the Indonesian government implemented a national strategy to combat avian influenza, which included vaccination programmes, culling and compensation measures for farmers, improved laboratory and quarantine procedures, and movement controls (e.g. transport permits or quarantine regulations) for poultry and poultry products.

The project "Veterinary control of avian influenza" aimed to contribute to the control and containment of the avian influenza epidemic in Indonesia (impact level). The provision of a biosafety level 3 (BSL-3) laboratory was intended to enable the BBPMSOH[3] to apply high-quality, reliable testing procedures for vaccine testing, thereby facilitating effective disease surveillance (outcome level). In addition, the laboratory staff at the BBPMSOH should be appropriately qualified and other laboratories at the nationwide Disease Investigation Centres (DICs) should be supported with the appropriate equipment.

The project's objectives are aligned with the global, regional and country-specific priorities of the Indonesian government (GoI) as well as with the political guidelines and development goals of the Federal Republic of Germany, in particular those of the BMZ. Within the framework of its development cooperation, Germany pursues the overarching goal of containing global health risks and promoting sustainability. The project consistently follows the One Health approach, which emphasises the close link between human health, animal health and environmental protection – an important principle of German health policy at the international level. At the time the project was conceived, the Sustainable Development Goals (SDGs) had not yet been adopted. Until 2015, the Millennium Development Goals (MDGs) applied, and the project contributed to the achievement of MDG 6, which dealt with combating HIV/AIDS, malaria and other serious diseases. In the SDG nomenclature, the project contributes in particular to SDG 3, which promotes health and well-being, and to SDG 2, which deals with food security. Specifically, the project aimed to reduce the risk of national and international health crises and contribute to protecting all people from communicable diseases. The project's objectives were also in line with the Food and Agriculture Organisation (FAO) and World Organisation for Animal Health (WOAH) *Global Strategy for the Prevention and Control of High Pathogenicity Avian Influenza* (2024–2033).

The institutional and political framework conditions of the GoI were sufficiently taken into account in the design of the measure and were in line with the government's strategy to combat avian influenza. At the same time, the project was designed to build on and further develop existing partner structures. From today's perspective, the project was assigned to the right actor and continues to be a key piece of the puzzle in the fight against avian influenza in Indonesia. It is therefore consistent with national regulations, including the "National Strategic Plan for Avian Influenza Control and Influenza Pandemic Preparedness" and several government regulations and ministerial decrees, including No. 47/2014, No. 61/2016, 17/2017 and, most recently, 7/2022 on the control of zoonoses.

2. Alignment with the needs and capacities of stakeholders and beneficiaries

The target group of the project in the narrower sense was the laboratory staff of the BBPMSOH, who were to be equipped and trained in handling highly pathogenic virus strains under BSL-3 laboratory conditions. The target group in the broader sense was poultry farmers and smallholders, and thus in particular the rural population of Indonesia. Although vulnerable groups were not explicitly taken into account in the project, it was nevertheless given a GG1 designation. One reason for this is that women who are smallholder farmers are often exposed to a high risk of poultry exposure and usually take on the care of family members who fall ill with influenza. In addition, a large proportion of the employees at the BBPMSOH are women, especially among the laboratory staff.

Several dimensions were covered in the problem analysis. At the time, the World Health Organisation (WHO) considered there to be a risk of global spread through human-to-human transmission. Indonesia was considered the country with the highest risk of virus mutation. At that time, 35 % of all human bird flu infections and 45 % of all deaths occurred in Indonesia, with densely populated areas being the most severely affected. In addition, people in Indonesia lived in close proximity to poultry, with only 20 % of poultry production taking place in large companies. The virus is now considered endemic in many parts of Indonesia, and

[3] The BBPMSOH is embedded in Indonesia's national health network, which consists of several central institutions. As the central authority for quality testing and certification of medicines and vaccines, the BBPMSOH carries out the necessary safety and efficacy tests. In doing so, it works closely with the Ministry of Health, which is responsible for the approval and management of vaccine programmes. In addition, the Disease Investigation Centre (DIC) provides important epidemiological data and diagnoses through surveillance and research. Together, these institutions ensure the safe development, appraisal and approval of vaccines in the health sector.

one of the most important control measures is vaccination with effective, high-quality vaccines. The core problem identified at the time was that the vaccines available on the market were neither considered safe nor had confirmed efficacy due to a lack of testing. Ineffective vaccines increase the risk of virus mutation. Since highly pathogenic avian influenza H5N1 is endemic in Indonesia, it occurs there on a permanent basis. At the same time, the global spread of the virus is increasing, as was also evident in the USA and Europe in 2025. There is a high probability that further virus mutations will occur, particularly in Indonesia, which could be dangerous for humans. In addition, spillover events are to be expected, in which highly pathogenic avian influenza and other viruses are transmitted from animals to humans. Indonesia's high population density and the cohabitation of animals and humans in a confined space pose major risks there, which are further accelerated by climate change (including sea level rise, extreme weather events, deforestation for agricultural land). Therefore, from today's perspective, the relevance of the core problem is still fully valid and correctly identified.

Based on the target group and the core problem, the framework conditions and capacities of laboratory staff, who are at high risk of exposure when handling highly pathogenic live avian influenza viruses, should be strengthened in particular. This took into account the needs of laboratory staff for a safe testing environment and those of the population for effective vaccines for poultry and the associated reduction in the risk of possible transmission of infection from animals to humans.

3. Appropriateness of design

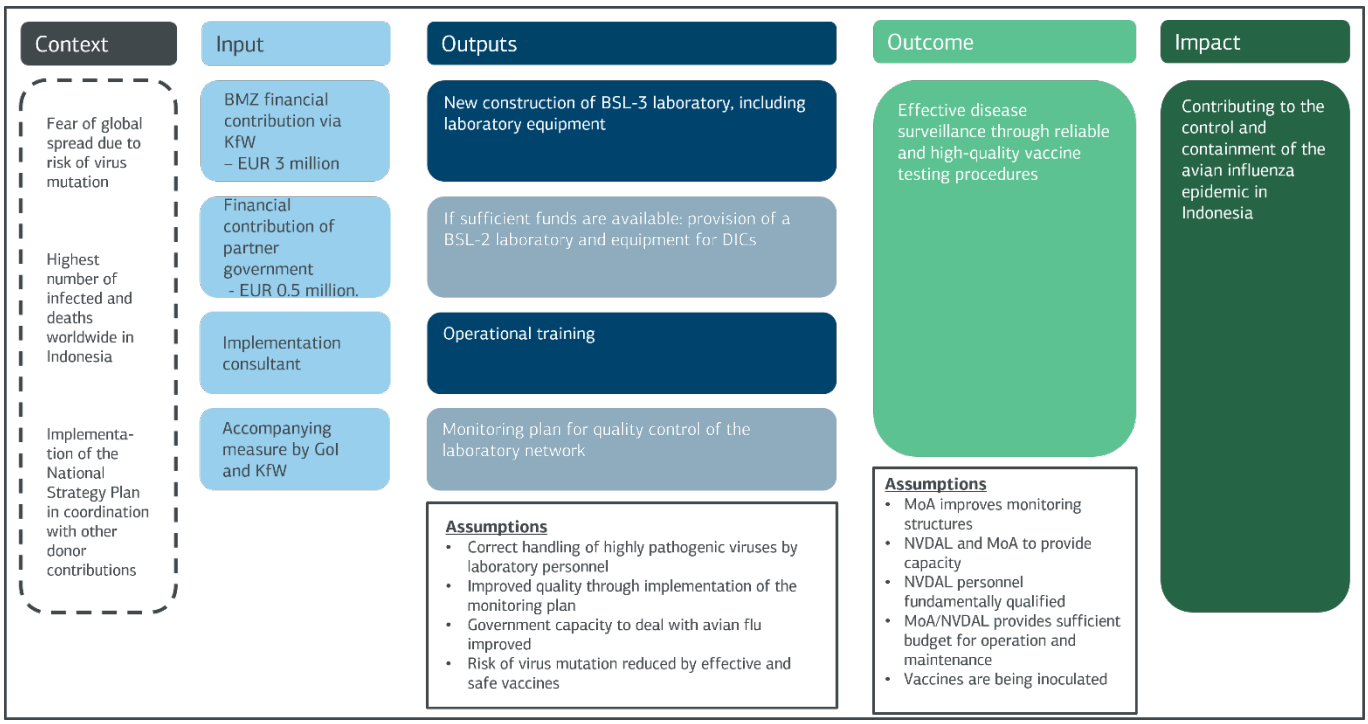


***Figure 1**: Impact logic of the project.*
***Source**: Own illustration.*

The chain of effects underlying the project ties in with the correctly identified core problem of the lack of vaccine testing. According to the reconstructed impact logic (see Figure 2), the financial input for the project amounted to EUR 3 million and was divided into four outputs: a) Construction of a new BSL-3 laboratory, including laboratory equipment; b) Provision of a BSL-2 laboratory and laboratory equipment for DICs[4] ; c) Operational training on the correct handling of highly pathogenic viruses; and d) Development of a monitoring plan for quality control[5] . The aim was to achieve effective disease surveillance at the outcome level through the use of qualitatively reliable and high-quality test procedures for vaccine testing in order to contribute to the control and containment of the avian influenza epidemic among poultry (impact level).

The chain of effects between input and impact is essentially aimed at reducing the risk of virus mutation through safe and more effective vaccines, thereby preventing human-to-human transmission of the virus. At the same time, the government's scope for

[4] This measure should be taken into account provided that the funds are sufficient to implement all the measures listed. It was already apparent in the inception report that this measure could not be implemented with the funds pledged.
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action to combat avian influenza is improved, as vaccinated animals drastically reduce the risk of transmission to humans. High-quality and safe testing procedures increase the number of approved, high-quality vaccines on the market. The chain of effects is fundamentally plausible and comprehensible from both a past and present perspective.

Although the original concept of the measure is based on the described impact logic, the matrix does not correspond to the model commonly used today. For example, there is no clear value assignment for the indicators (base and target values) at any level (impact, outcome, output). Furthermore, only two outcome indicators were assigned, rather than the required three to five. At the output level, no indicators were listed, only activities. The following output indicators were therefore added for the purpose of the evaluation: a) the BSL-3 laboratory is functional and operational; b) the DICs are functional and operational; c) 12 training courses were held, with up to 10 employees trained in each case. The outcome indicators are only suitable to a limited extent and were supplemented or focused on by additional indicators. The available indicators at the impact level were suitable for measuring the success of the project.

4. Adaptability – response to change

The modular structure of the project was fundamentally scalable, which meant that it was possible to respond to changes in financial planning. For example, the significant increase in cost planning in the inception report meant that only the main measure of the four measures originally planned was fully implemented with the construction of the BSL-3 laboratory, including equipment. The other measures were either completely (BSL-2 laboratory/monitoring plan) or partially (operational training) omitted. The GoI significantly increased its share of the funding in order to bring the project to a meaningful conclusion.

Rating summary of relevance: successful (2)

Controlling avian influenza remains a priority for the Indonesian government, especially as the virus is constantly mutating and new classes and subtypes are now endemic in Indonesia. Control is not only important for the Indonesian export market for poultry products, where outbreaks can lead to industry-wide collapse, but also in view of the pandemic potential of transmission of highly pathogenic avian influenza viruses from animals to humans. The project is also highly relevant in view of the geopolitical priorities of the GoI and the German Federal Government. The core problem existing at the time of conception was correctly identified and addressed in a decisive manner in the project. The measures envisaged were geared to the needs of the target group in the narrower sense (BBPMSOH employees); from today's perspective, the impact logic also appears plausible. For the target group in the broader sense (poultry farmers in Indonesia), the impact logic is only applicable to a limited extent due to the large attribution gap. The concept was in line with local, national and supraregional development strategies of the Indonesian government and its development partners. From today's perspective, the lack of indicators and their formulation is incomprehensible. Overall, the relevance of the project is considered successful, partly due to the One Health approach, which is currently the focus of development policy, and the concept, which is essentially appropriate for this.

Coherence

5. Internal coherence

Germany's involvement was a direct response to the Indonesian government's request for support during the spread of the bird flu pandemic. At that time, the health focus in Indonesia was already being phased out (BMZ decision in 2007); there was no development cooperation programme and therefore no coordination of priorities. The project falls into the category of 'scope for action'. All TC activities in the sector were completed by 2011. The former German Agency for Technical Cooperation (GTZ, now GIZ) financed smaller measures to integrate avian influenza protection measures into school lessons through a regional programme and, complementary to the FC project, the appraisal of a local laboratory (DICs) for compliance with quality standards. The first collaboration with the Ministry of Agriculture (MoA) in the project did not overlap with an earlier emergency aid project from 2006/2007 (BMZ No. 200566281), under which the Indonesian Ministry of Health had established and equipped a network of 44 laboratories in 34 locations in 22 provinces for human diagnosis of avian influenza. Although there was also cooperation between the MoA and MoH during the outbreak at that time, there was a clear separation between veterinary and human laboratories and the associated monitoring. Integrated monitoring of avian influenza by the two ministries was not launched until 2025.

With this project, German development cooperation is contributing to the implementation of the One Health approach, in particular to the prevention of zoonoses and to pandemic preparedness and response. Specifically, the project aims to prevent and control avian influenza, a disease that poses significant health risks to both animals and humans. By controlling the spread of the disease, the project contributes to protecting the health of the local population and thus to the human right to health and

life. Combating avian influenza through appropriate vaccination and control measures also indirectly supports animal welfare by reducing the spread of disease in poultry populations, which is in line with international human rights standards that emphasise the ethical treatment of animals.

6. External coherence

The FC programme complemented the priorities of other donors in avian influenza control and various aspects of avian influenza control measures. For example, there were direct links to FAO activities, and the FAO only published its recommendations after the opening of the BSL-3 laboratory at the BBPMSOH in 2015 in order to be consistent with the delays in the FC project plan and to enable seamless operationalisation. The FAO also organised various laboratory training courses with partner support, including on biosafety and biosecurity, which also trained BBPMSOH staff.

In the past, the main supporters in the sector were the USA (USAID, US-CDC, BEP), Australia (ACPD, DFAD) and Japan (JICA), but they mainly promoted capacity-building measures rather than infrastructure support. From 2014 to 2015, JICA initiated a project to strengthen the national laboratory for combating highly pathogenic avian influenza and other diseases in Indonesia, but the focus was on human health. JICA is currently working with the Indonesian Ministry of Health on a project to strengthen early warning and response capabilities for infectious diseases, including avian influenza. In the past, USAID organised regular partner meetings on avian influenza to avoid duplication of effort. However, with the discontinuation of USAID, the group is no longer active. The differing interests of the individual donors, a low level of donor coordination and the particular dynamics of the Indonesian context made it difficult to involve the right stakeholders. In the area of avian influenza, the FAO and WHO were leading partners with whom KfW also maintained close contact.

The US Centre for Disease Control and Prevention (CDC) supported Indonesia in developing communication campaigns and outbreak monitoring. The CDC is still active today, but with a focus on outbreaks in humans. In this sense, the CDC supports the government in its Pandemic Disease Response (PDR). The WHO also focuses its work in particular on influenza infections in humans. It is working with the government on an integrated digital reporting system that includes human and animal health as well as the environment as part of the One Health approach.

While many of the former donors are no longer active today, the current focus on "One Health" and the multisectoral nature of the issue is opening up new avenues for cooperation. To improve joint control measures, a One Health Technical Working Group was established in 2022, comprising various ministries (MoA, MoH, MoF) and actors from different sectors (including FAO and WHO) and led by the Ministry of Coordination for Human Development and Cultural Affairs. This promotes cooperation between the various ministries and stakeholders on avian influenza and zoonoses in general, including the development of laboratory capacities and joint work on high-quality vaccines.

Rating summary of coherence: successful (2)

The project consistently supported the partner country's own efforts to implement the development strategies outlined under 'relevance'. In particular, coherence with other active actors was conceptually ensured due to the complementary nature of the measures. There were hardly any synergy effects between TC and FC due to a lack of overlap in implementation. The potential for strategic and operational coordination by the government and within the sector could have been exploited more effectively, but coherence is nevertheless considered to have been successful over much of the implementation period.

Effectiveness

7. Achievement of objectives

The objective of the measure (outcome level) is "Effective disease surveillance through qualitatively reliable and high-quality testing procedures for vaccine appraisal". Specifically, the project involved the construction and equipping of a BSL-3 laboratory for the appraisal and approval of vaccines, as well as the training of laboratory staff. The achievement of this objective was confirmed during the on-site evaluation ( ), even though the quantitative appraisal was very limited due to the lack of target values when conducting the appraisal of the project, as explained in section 3, "Appropriateness of design".

The following indicators were used to measure the outcome objective:

Indicator	Status at time of review	Target value at EPE (review)	Actual value at PCR	Actual value at EPE
(1.1) Number of vaccines tested under BSL-3 and approved for the market	No data	n.a.	2009: 3 2010: 0 2011: 0 2012: 7	- Data insufficient
NEW: (Instead of 1.1.): Number of vaccines tested under BSL-3 for certification* *Includes vaccines against avian influenza, anthrax and brucellosis	...	n/a		2016: 4 2017: 2 2018: 6 2019: 13 2020: 5 2021: 4 2022: 6 2023: 14 2024: 11 Target value achieved
NEW (1.2.) Number of vaccines against avian influenza tested (certified) under BSL-3 conditions		n.a		2016: 2 2017: 2 (0) 2018: 3 (3) 2019: 11 (11) 2020: 4 (4) 2021: 2 (4) 2022: 7 (3) 2023: 3 (2) 2024: 11 (9) *Currently, only local virus strains are used for AI vaccines in Indonesia. Therefore, the number of certified AI vaccines will not necessarily increase as long as the existing ones prove to be effective against the circulating viruses.* Target value achieved
(2) Evidence of effective control of the vaccine market in the veterinary sector[6]				
(2.1) Number of applications and licences per year	n.a.	Increase	2011: 0 2012: 7	2016: 43 2017: 56 2018: 40 2019: 59 2020: 61 2021: 88 2022: 52 2023: 66 2024: 83 *All vaccines for animals, including non-highly pathogenic vaccines, are included (e.g. vaccines against panleukopenia, distemper, hepatitis-parainfluenza (DHPPI), fowl pox, reo, IBD, IB, FMD, lumpy skin disease*

[6] Sub-objectives 2.1-2.3 added within the framework of the PCR; these were not included at the time of the project proposal.

				(LSD), classical swine fever (, CSF, etc.). Target value achieved but comparative figures from previous years not verified
(2.2) Time between licence application and decision (added: for initial application)	n.a.	Decrease	n.a	2024: 3 months *No difference to 2011, as this is a standardised vaccine testing process that requires a minimum of 75 working days (3 months) per virus strain.*
(2.3) Duration between licence renewal application and decision (added: for licence renewal)	n.a.	Decrease	2010: 19 months 2011: 3 months	Target value achieved
NEW: (3) Proportion of licensed AI vaccines administered in Indonesia				100

***Table 2**: Outcome target achievement.*
***Source**: Own illustration with data from BBMSOH.*
***Note**: *includes vaccines against avian influence, anthrax and brucellosis.*

8. Contribution to the achievement of objectives

Three components were partially financed as part of the FC module:

a) Construction of a BSL-3 laboratory, including the procurement of medical and non-medical laboratory equipment (main measure);

b) FC consultant to support implementation;

c) Training measures (incomplete).

The funded BSL-3 laboratory is fully operational and is used for vaccine testing. Vaccines are tested in the BSL-3 laboratory of BBPMSOH for various purposes: some are tested for certification, others are tested for quality monitoring/quality control. As veterinary avian influenza vaccines in Indonesia are only used against locally circulating virus types, the number of certified vaccines will not necessarily increase, but rather remain stable or decrease, provided that existing vaccines continue to be effective against circulating viruses. This is closely monitored in collaboration with the DIC and the national veterinary avian influenza reference laboratory at the DIC Wates. The focus of national avian influenza vaccine development is on vaccines that are effective against the predominant avian influenza types in the country. In Indonesia, all avian influenza animal vaccines are currently certified and approved (100 %) and are also produced there. Between 2018 and 2025, a total of 71 vaccines were certified at the BBPMSOH, including 52 avian influenza vaccines, 13 anthrax vaccines and 6 brucellosis vaccines.

The time between submission and approval of a vaccine at the BBPMSOH was stable at 3 months for one virus clade (increasing with the number of clades), and this also applies to licence renewals. The time required for an appraisal of a vaccine also depends on other limiting factors. For example, the appraisal of a specific veterinary vaccine (e.g. in the event of a current disease outbreak) may be given higher priority. This can mean that planned vaccine tests have to be carried out at a later date, as there are only a limited number of animals at the facility on which the vaccine candidates can be tested in vivo. SIHAPSOH, a digital platform for applying for drug approval at the BBPMSOH, which was launched in 2019, had no impact on the duration of testing, as vaccine tests must go through established processes and require a series of specific analyses and tests on animals (in vitro and in vivo testing).

The BSL-3 laboratory at the BBPMSOH has been used not only for avian influenza, but also for other pathogens (including anthrax and brucellosis). In the last two years, the BSL-3 laboratory has also been frequently used for FMD analyses (foot-and-

mouth disease) . Other tests carried out in the BSL-3 laboratory of the BBPMSOH include genetic characterisation to investigate whether currently used vaccines are still effective against circulating viruses.

As already explained under relevance, the impact matrix does not meet today's requirements. At the output level, for example, key indicators for measuring the achievement of objectives were missing. For example, there were no indicators for the construction and equipping of a BSL-2 laboratory in a regional reference laboratory ("DIC"), there was no indicator for the number of training courses and the number of trained employees, and there was also no indicator for the development of a monitoring plan for quality control. Based on the inception report, the construction of the BSL-2 laboratory at the DIC and the development of the monitoring plan were omitted for cost reasons. However, based on the FAO mapping tool for laboratory components (module 1) and the laboratory management plan (module 2), internal and external controls of the laboratories are now carried out by the MoA.

Continuous staff training and monitoring is an essential part of quality assurance. Constraints in the project budget led to a reduction in planned training and supervision after completion of the BSL-3 laboratory. Nine preparatory and generic BSL-3 training courses were already conducted for BBPMSOH employees in 2013, but there was no further practical training on the BSL-3 equipment supplied except for user training by the suppliers. There was also no supervision of BSL-3 staff who were initially unfamiliar with practical BSL-3 work and the high-end equipment available at the time. No refresher training has taken place in the past 10 years and no laboratory partnership has been established. However, there were some laboratory training courses organised by other partners, in which BBPMSOH staff also participated.

With regard to improved disease surveillance at the DIC level (included in the original objective), some capacity building was carried out as part of the measure through BSL training for DIC staff, but the focus of the measure was clearly on establishing the BSL-3 infrastructure at BBPMSOH. However, there is a close link between the surveillance of circulating avian influenza viruses by the DICs and vaccine validation at the BBPMSOH. Its analyses help to assess whether the current vaccines are still effective against the circulating viruses (based on genetic characterisation by the DIC Wates).

While the selected outcome indicators provide only limited evidence of the effectiveness of the measure, it should be emphasised that the laboratory fulfils its main function of conducting quality tests on animal vaccines for their efficacy and potency against both avian influenza and other zoonoses. Through the establishment of a fully functional BSL-3 laboratory at the BBPMSOH and accompanying training, it is plausible that the project has contributed to improving national capacities for vaccine quality testing and thus to the control of zoonoses in Indonesia.

9. Quality of implementation

The BSL-3 laboratory building is of solid construction quality. During the EPE, minimal cracks in the plaster were found on one wall and the rainwater pipe was leaking in one place. Inside the building, as far as could be assessed, there was no damage. All laboratory rooms have access control and are monitored by CCTV. With a computer-controlled HVAC system, a HEPA filter system and appropriate wastewater and waste decontamination facilities, the laboratory meets the safety standards of a BSL-3 laboratory and can continue to be used for its intended purpose in the coming years. The laboratory equipment did not meet the expected quality standards upon delivery. Some equipment therefore had to be replaced after delivery at the supplier's expense. An inventory list and a maintenance plan are in place. At the BBPMSOH, a maintenance technician is specifically responsible for maintaining the BSL-3 laboratory and regularly conducts appraisals of the systems.

All procurement processes in the project (implementation consultant, general contractor for the BSL-3 laboratory) were significantly delayed. Although the implementation consultant demonstrated good technical expertise, he was not adequately prepared in terms of the processes to be followed and the communication requirements of the partner. This resulted in further delays and cost increases, as coordination and decision-making on the Indonesian side proved to be very difficult in conjunction with KfW requirements.

Due to cost increases resulting from delays in project implementation and extended duration, it was necessary to forego further necessary training and supervision of laboratory staff after installation of the equipment. The staff subsequently acquired the necessary knowledge, but the decision to forego the necessary capacity-building measures must be viewed critically, as there was a risk of quality losses and incorrect handling of the equipment, including biosafety risks. However, this risk did not materialise.

10. Unintended effects (positive or negative)

It is extremely positive to appraise the fact that, in addition to testing avian influenza vaccines, the BSL-3 laboratory also tests other highly pathogenic viruses such as anthrax and brucellosis and plays a role in testing for foot-and-mouth disease. While BSL-3 utilisation for vaccine testing has been limited to a few hours per week in recent years, the additional use for highly pathogenic FMD analyses in the recent past has resulted in daily utilisation of the BSL-3 laboratory. The impact of the project thus extends far beyond avian influenza. In addition, further animal vaccines for the Indonesian market are being tested at the BBPMSOH (e.g. against panleukopenia, distemper, hepatitis-parainfluenza (DHP-PI), fowl pox, reo, IBD, IB, FMD, lumpy skin disease vaccine (LSD) and classical swine fever (CSF). Particularly in view of the increasing importance of the One Health approach, which takes a holistic view of animals, humans and the environment, testing vaccines against both low- and highly pathogenic pathogens at the BBPMSOH promotes animal health, while the prevention of zoonoses contributes to public health.

Although the project was small in scale (total EUR 3.52 million, of which EUR 3 million was a grant from the FC), the work of the BBPMSOH, whose laboratory capacities for handling highly pathogenic pathogens were strengthened by the project, is considered by the partners surveyed (FAO, WHO and US CDC) to be an important part of avian influenza monitoring and local veterinary vaccine development and quality assurance in the country.

However, increasing urbanisation poses risks to the operation of the laboratory. The laboratory site in Bogor was once located outside human settlements. Due to population growth and increasing urbanisation, the village has now moved closer to the laboratory and there are now houses in the immediate vicinity of the BBPMSOH site, approximately 15 metres away from the animal stables and the BSL-3 laboratory and separated only by a wall approximately three metres high. The risk of a so-called spillover, in which a pathogen is transmitted from one animal species to humans and spreads there, is low due to the enclosed animal housing and the high-security laboratory, but it is not inconceivable. To mitigate the risk, the FAO conducts biosafety training every two years.

Rating summary of effectiveness: successful (2)

The construction and equipping of the BSL-3 laboratory has made a significant contribution to containing and monitoring the avian influenza outbreak in Indonesia. The laboratory plays a crucial role in monitoring mutations in virus strains and providing tested and approved vaccines. This reduces the risk of avian influenza being transmitted to humans. At the same time, the laboratory is a key element in the monitoring of animal health and the approval of animal vaccines in Indonesia. Overall, the effectiveness is appraised as successful.

Efficiency

11. Production efficiency

As part of the project, a BSL-3 laboratory was built, equipped with the relevant equipment and the employees were trained before the laboratory was handed over. This means that only some of the measures originally planned were actually implemented. As already explained, the construction and equipping of a BSL-2 laboratory, the quality monitoring plan and parts of the training (after the laboratory was handed over) were omitted. EUR 1.5 million was originally earmarked for the BSL-3 laboratory, EUR 425,000 for equipment, EUR 275,000 for the BSL-2 laboratory and EUR 700,000 for training and consulting services, with the remaining EUR 400,000 set aside for contingencies.

With total costs of EUR 3.5 million, the originally planned budget of EUR 3.3 million was exceeded. The FC share of EUR 3 million remained constant, with the additional expenditure of EUR 221,000 being borne by the Indonesian government. Compared to the originally planned contribution of EUR 300,000, this represents a 73 % increase in the partner contribution, which can be appraised as a positive sign of ownership on the part of the partner. Ultimately, the costs for the BSL-3 laboratory amounted to EUR 2.2 million plus approximately EUR 28,000 for contract adjustments and approximately EUR 94,000 for medical equipment. The fees for consulting services amounted to approximately EUR 792,000 at the end of the project, plus approximately EUR 68,000 for training and approximately EUR 55,000 for taxes. Consulting services accounted for a total share of 24.4 %. According to PCR, the Indonesian government also provided approximately EUR 194,000 for the BSL-2 laboratory.

Component	Planning (in EUR)	Actual at PCR (in EUR)
Construction of the BSL-3 laboratory	1,500,000	2,207,612
Equipment for the BSL-3 laboratory	425,000	Not listed separately, included in construction costs
Expansion of BSL-2 laboratory	275,000	194,321
Accompanying measures and consulting services	700,000	860,605
Taxes	0	55,110
Maintenance, additional equipment	0	204,150
Contingencies	400,000	0
Total	**3,300,000**	**3,521,798**

***Table 3**: Budget overview.*

The cost increase can be attributed to two main factors: Firstly, at the start of the project, the wish list was too long for the available budget. It was already clear during the project review that the funds might not be sufficient to cover all components in full. Secondly, the project was significantly delayed. Instead of the originally planned 30 months, the project was only completed after 82 months, exceeding the planned duration by almost 4.5 years. In addition to inflation-related cost increases, these delays also led to increased costs on the part of the implementation consultant. The ultimate consequence was that training and, in particular, supervision had to be dispensed with after the second handover, as both the FC budget and the partner budget had been exhausted. Despite efforts on all sides, no further funds could be made available. A partnership with other international laboratory institutions such as the Friedrich Löffler Institute or support from Senior Expert Services (SES) also failed to materialise. On a positive note, however, at the time of the ex-post evaluation, there was no evidence of any knowledge gaps in the operation of the BSL-3 laboratory for its intended purpose. In addition, BBPMSPH staff were also invited to laboratory training courses offered by other partners.

The delays were initially due to tenders for the construction and supply contract, which dragged on from 2010 to 2012. Construction then began in the fourth quarter of 2012 and was completed in the first half of 2014. Delays in the delivery of laboratory equipment (in particular due to lengthy administrative processes, customs problems and transport damage to key laboratory equipment) meant that the first handover of the laboratory and thus the provisional completion of the project measures could not take place until November 2015. After the construction and supply company had finally rectified the list of identified defects, the laboratory was accredited by the consultant at the end of May 2016.

In addition, some of the equipment procured did not meet the latest standards and/or was of inferior quality. Since installation, some of the equipment has required spare parts that are available in Indonesia but are very expensive. A rough estimate by the WHO shows that the annual operating costs of a BSL-3 laboratory amount to around 10 % of the initial construction costs, while the PCR spoke of 2-5 % of the investment costs. 10 % would correspond to IDR 2.8 billion per year. The average annual maintenance budget for the BSL-3 laboratory over the last six years was around IDR 783 million. This corresponds to a quarter of the amount recommended by the WHO. It is currently estimated that around 40 % of the equipment provided is defective and needs to be repaired or replaced. In the meantime, BBPMSOH has also replaced defective equipment from its other laboratories in order to maintain the functionality of the BSL-3 laboratory. Although the potential service life of medical laboratory equipment depends on the type of equipment and manufacturer, intensity of use and quality of maintenance, a general guideline for the service life of laboratory equipment is between five and 10 years. From this perspective, it is reasonable to assume that the equipment purchased has been used efficiently.

Ultimately, the construction costs for the BSL-3 laboratory were average, based on international comparative costs of between USD 4,000 and USD 7,000 per square metre. If one compares the construction costs with those of a BSL-3 laboratory financed by JICA (which, however, was ultimately only used as a BSL 2+ laboratory due to identified floor defects), the costs of the FC-financed construction project are significantly lower. JICA estimated the total cost of the approximately 15-20 square metre laboratory at USD 2 million.

Another positive aspect is the contribution made by the Indonesian government, which, in addition to unspecified construction preparation costs, contributed a total of EUR 521,000 for equipment, maintenance contracts and additional training, which was 73 % higher than the originally planned contribution of EUR 300,000.

Overall, we appraise the production efficiency as only partially successful, particularly due to the long delay.

12. Allocation efficiency

The following section provides an appraisal of whether the outcomes/impacts could have been achieved by other means and, if so, at lower cost. At the time of the project review, another smaller BSL-3 laboratory was under construction at BALITVET, but it was used for research purposes and had virtually no animal husbandry capacity. In addition, it was under the authority of a different directorate in the Ministry of Agriculture than the current BBPMSOH, so dual use would not have made sense. Currently, the FC-funded BSL-3 laboratory is the only laboratory in Indonesia that carries out registrations and challenge tests to ensure animal health.

At the time of the project review, it was not possible to share costs with other international partners. It is also questionable whether co-financing would have made sense given the investment amount or whether it would only have exacerbated the lengthy processes. Most donors financed capacity-building measures rather than infrastructure measures.

All parties confirmed that the laboratory plays a central role in monitoring avian influenza and is an essential piece of the puzzle in combating it. Other possible investments, such as monitoring poultry farmers and markets and promoting further research, would not have achieved the same cost-benefit ratio. A systematic evaluation of HPAI measures in Indonesia shows that the decisive direct measure is the provision of vaccinations. "*The results show that preventive AI vaccination is consistently rated as a top priority measure. Combining the results of both ex-post and ex-ante evaluation, we created a list of preferential measures for the government, including budget allocation priorities. This table lists the priorities from all categories of measures: (1) preventive AI vaccination, (2) biosecurity, and (3) stamping-out.*"[7] The measure contributed to the development and provision of effective vaccines for Indonesia.

We therefore appraise the allocation efficiency as successful.

Rating summary of efficiency: moderately successful (3)

Overall, the efficiency of production and allocation is assessed as limited success. Questions arise in particular with regard to production efficiency due to significant cost increases, long project delays and the partial discontinuation of project components. However, this is offset by the ownership on the part of the partners to provide additional funds and to maintain and use the laboratory. In addition, in terms of Allocation efficiency, the funds provided were invested wisely and other options would not have yielded a greater cost-benefit factor.

Impact

13. Overarching developmental changes

In terms of impact, the Indonesian government currently has avian influenza under control, mainly due to continuous monitoring by the regional DICs and vaccines developed against local strains and regularly tested for effectiveness. However, vaccination is only mandatory for large poultry production facilities, as vaccinations are difficult to carry out on free-range poultry kept by domestic poultry farmers and are not financed by the state. Although this means that there is still a risk of local outbreaks in private households without compulsory vaccination, according to the MoA, these smaller outbreaks have no significant impact on larger poultry populations and farms in Indonesia.

The achievement of the impact-level objective of contributing to the control and containment of the avian influenza epidemic among poultry in Indonesia can be summarised as follows: "The risk of transmission of HPAI to humans has been significantly reduced as a result of control and containment measures". The status of PA and EPE can be found in the following table .

[7] Pramuwidyatama, Hogeveen, Saatkamp (2019): A Systematic Evaluation of Measures Against Highly Pathogenic Avian Influenza (HPAI) in Indonesia, Frontiers in Veterinary Science, Volume 6, p.8.

Indicator	Status at time of review	Target value at EPE (review)	Actual value at PCR	Actual value at EPE
(1) Development of the number of human bird flu cases and deaths	Deaths in 2008: 135	Decrease	Infections and deaths in 2015: 0	Infections and deaths 2018-2024: 0 Target value achieved
(2) Number of annual bird flu outbreaks on poultry farms, smallholders[8]	2008: 1,413	Decrease	2015: 123	2022: 34 2023: 47 2024: 51 Target value achieved

***Table 4**: Impact target achievement*

The number of human infections and deaths peaked before the BSL-3 laboratory opened, but since 2014/15 only a few human infections and deaths have been reported, and no H5N1 cases have been recorded since 2018 (Figure 3).

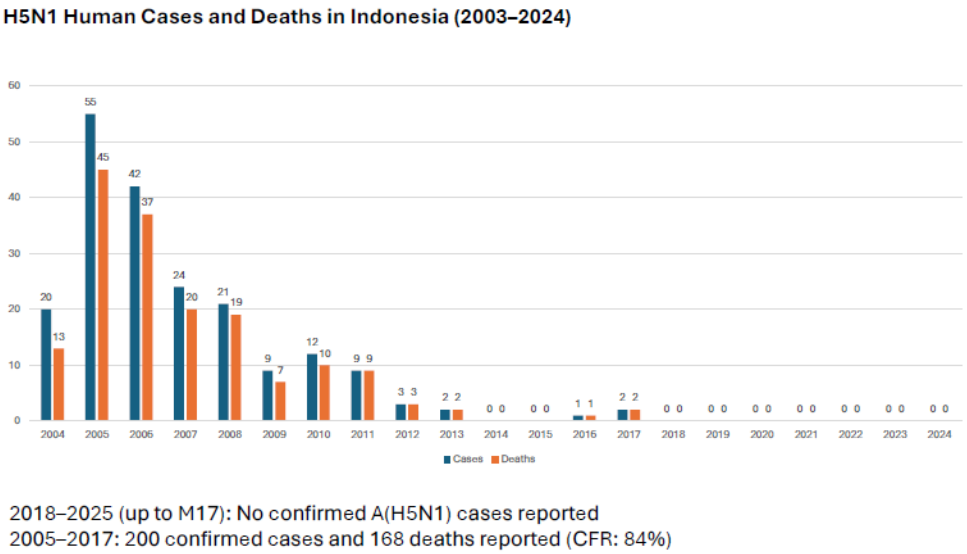

***Figure 2**: Confirmed H5N1 outbreaks in humans in Indonesia between 2003 and 2024. Confirmed H5N1 outbreaks in humans in Indonesia between 2003 and 2024.*
***Source:** WHO. Presentation by WHO Indonesia during our interview with WHO representatives on 8 May 2025 in Jakarta.*

The number of bird flu outbreaks, which peaked between 2008 and 2009, has also declined over the years. The last bird flu outbreak in Indonesia cannot be clearly determined, as the virus is endemic and continues to circulate. However, as can be seen in Figure 4, there have been no confirmed serious outbreaks of avian influenza since 2019. An outbreak of avian influenza in 2023 did not result in any confirmed human infections. According to the MoA, local outbreaks mainly occurred in backyard flocks, where poultry is often not vaccinated (the focus of government vaccination control efforts is on commercial flocks).

[8] This indicator was added retrospectively as part of the PCR and was not part of the project proposal.

Confirmed H5N1 outbreaks in poultry (domestic) in the last 10 years.

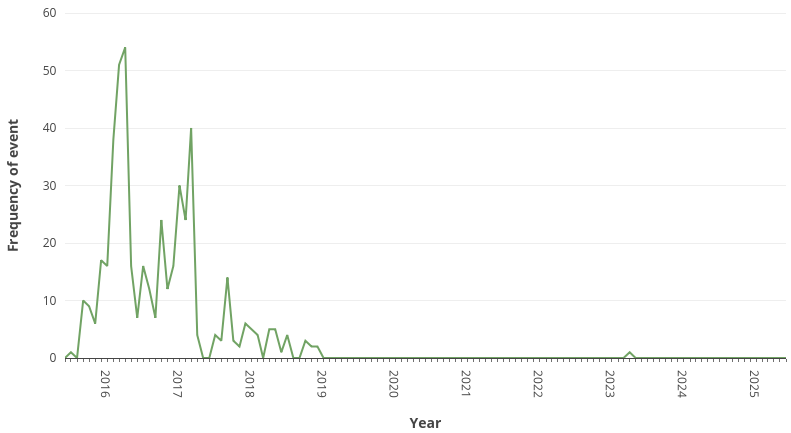

***Figure 3**: Confirmed H5N1 outbreaks in poultry (domestic) in the last 10 years.*
***Source**: FAO. 2025. EMPRES-i PLUS [Data File]: Calculation for Indonesia on confirmed H5N1 outbreaks in domestic poultry; Available at: https://empres-i.apps.fao.org/diseases (Accessed 11/06/25)*

Avian influenza is endemic in Indonesia but well controlled. The genetic evolution of the avian influenza virus is closely monitored by veterinary control facilities throughout the country, with the DIC Wates in Yogyakarta serving as the national reference laboratory for avian influenza and working closely with the ACDP (Australian Centre for Disease Preparedness). By using local virus strains for veterinary vaccines against avian influenza in Indonesia and the veterinary vaccine control laboratory at BBPMSOH as a lever for successful vaccine testing and monitoring, the measure supports context-appropriate local vaccine development through improved genetic characterisation of circulating avian influenza viruses and regular appraisal of the fit of existing vaccines.

It can be concluded that the measure was an important part of the fight against and containment of the avian influenza epidemic in poultry through its contribution to more effective vaccination. While poultry vaccination and containment measures have dramatically reduced the risk of HPAI transmission to humans, complex transmission routes, particularly through backyard poultry farming, live animal markets and slaughter practices, continue to pose a risk.

The project thus contributes to the achievement of Sustainable Development Goal SDG 3 – Good Health and Well-being.

14. Contribution to overarching intended developmental changes

Even though the decline in deaths from avian influenza and the drastic reduction in annual outbreaks of avian influenza on poultry farms and among small farmers in Indonesia cannot be attributed solely to the intervention, the contribution of the BSL-3 laboratory at BBPMSOH as part of the chain of action to to reduce the risks of avian influenza mutations and thus transmission to humans. However, the achievement of the impact-level objectives is facilitated by a number of other factors. For example, the government is relying on the concept of "compartmentalisation"[9], a strategy in which special safety precautions apply to individual housing compartments, thereby reducing the risk of transmission in the event of an avian influenza outbreak in larger poultry farms. In addition, the government has launched several awareness campaigns and large-scale efforts to monitor the overall situation. The government is supported in this by the FAO.

Coordination and cooperation between the various ministries have improved as the importance of the link between human and animal health and the environment (One Health) has become increasingly recognised and has even been enshrined in Ministerial Decree No. 7, 2022. A technical working group has also been in place since 2022, which initiates initiatives at the subnational level in close cooperation with the various sectoral ministries and international actors under the coordination of the Coordinating Ministry for Human Development and Culture. Since the beginning of 2025, integrated monitoring has also been established in parts of Sumatra, Java, Kalimantan and Sulawesi, with samples being collected by each ministry and the results being entered into both the respective sector databases (MoH-EWARS, MoA-ISIKHNAS and MoForestry-SehatSatli) and on the joint One Health data platform SIZE in order to be able to respond to outbreaks more quickly and in a more targeted manner. The interoperability of the SIZE database, particularly at the subnational level, is currently being improved, but in the foreseeable future, data on various diseases will be shared, thus serving as an integrated early warning system for zoonoses and newly spreading infectious

[9] Minister of Agriculture Decree Number 28/Permentan/OT.140/5/2008 since 2008 in conjunction with Terrestrial Animal Health Code (2021): Chapter 1.4. Animal Health Surveillance; Chapter 4.4. Zoning and Compartmentalisation; Chapter 4.5. Application of Compartmentalisation; and Chapter 10.4. Infection with High Pathogenicity Avian Influenza Viruses

diseases for national pandemic prevention. This will also enable the BBPMSOH, which reports to the MoA, to use data generated by other sectors.

Indonesia has recognised that the development of new and, above all, adapted vaccines is crucial for combating emerging diseases. Efforts in this direction have increased in recent years and, based on continuous monitoring of circulating virus strains, tailor-made vaccines have been developed. All avian influenza vaccines are manufactured in Indonesia, and there are no longer any untested avian influenza vaccines in circulation. The Indonesian government's goal is to increase the production of pharmaceutical products and vaccines, especially since Indonesia will host the global World Local Production Forum in 2027, a platform initiated by the WHO to develop global strategies and partnerships to promote sustainability in local production. BBPMSOH plays an important role in the development and quality control of new medicines and vaccines to promote animal health.

15. Contribution to overarching unintended developmental changes

There was very close collaboration between the MoA and MoH in the fight against avian influenza. Laboratory training courses were attended by laboratory staff from both sectors and there was close coordination. This has led to improved cross-sectoral coordination during the Covid-19 pandemic, particularly in the development of guidelines. Although no human samples were analysed for testing in the FC-funded BSL-3 laboratory at the BBPMSOH during the COVID-19 pandemic, some of the veterinary BSL-2 laboratories at the DICs carried out COVID-19 tests due to a lack of capacity at human medical laboratories. Even before COVID-19, outbreaks of avian influenza had highlighted the importance of vaccinations, early warning systems and monitoring of virus mutations. Nevertheless, the evaluation found that while efforts to protect human health have intensified significantly since COVID-19, the veterinary sector has not received the same level of attention. However, this now seems to be coming back into focus in light of increasing One Health efforts. Nevertheless, the loss of US funding has led to significant financial cuts, particularly in the areas of community-based monitoring, training for smallholder farmers and One Health donor coordination.

Rating summary of impact: successful (2)

Both the number of avian influenza infections and the number of human deaths from avian influenza declined during the project period and thereafter. The same applies to the number of annual avian influenza outbreaks on poultry farms and among smallholders. In view of the results achieved and the generally good position of Indonesia with regard to the implementation of One Health and the associated coordination, it is likely that the project has made and continues to make a significant contribution to combating and containing the avian influenza epidemic in poultry. Against this background, the project is appraised as successful in terms of its overarching developmental impact.

Sustainability

16. Capacities of beneficiaries and stakeholders

Despite the challenge for BBPMSOH to operate and maintain the laboratory in a sustainable manner, the evaluation revealed clear indications that the positive effects of the project will continue beyond the end of support. Since its completion, the laboratory has been fully functional and is being used for its intended purpose. In addition, since 2019, the laboratory has been supported by a digital registration platform for laboratory tests. Staff turnover at BBPMSOH is moderate. Experienced employees provide practical training to their younger colleagues. However, as some staff members will be retiring in the coming years, there is a need for further training.

A dedicated maintenance technician is employed by BBPMSOH and is responsible for the BSL-3 laboratory. He has been trained and is knowledgeable about all aspects of the equipment, the HEPA filter system, wastewater treatment, etc. A significant portion of the BSL-3 equipment procured is in need of repair or replacement after almost 10 years (according to the BBPMSOH list, this affects 40 % of the laboratory equipment). Although spare parts are available in the country, they are comparatively expensive. The age of the equipment, which is over 10 years old, increases the risk of delays and analysis errors. As already demonstrated in the chapter on efficiency, the average service life of laboratory equipment is between five and 10 years, depending on the type of equipment used, the intensity of use and the quality of maintenance. Given the advanced age of the equipment and its increased susceptibility to repair, repair costs should be weighed against replacement costs. It is to be expected that these costs will have a negative impact on the already limited budget in the future.

The operating and maintenance costs for the BSL-3 laboratory consume a large part of the total budget for BBPMSOH maintenance. The annual budget requirement for maintenance is estimated at IDR 2.5 billion (approx. EUR 133,000), of which only IDR 1.5 billion (approx. EUR 80,000) is currently available to the BBPMSOH. Sixty per cent of this budget (IDR 900 million) is required for the BSL-3 laboratory alone. Due to the continuous operation of two exhaust air systems to generate the negative pressure required for the BSL-3, the energy consumption of the BSL-3 laboratory is very high, accounting for approximately 50 % of the total electricity consumption at the BBPMSOH (IDR 100 million out of IDR 200 million per month; approximately EUR 5.3 thousand). Relevant upcoming measures, including a simplified and lower-risk HEPA bag-in-bag-out filter replacement system (BIBO), would enable the safe replacement of contaminated filters, but this would require a larger investment (estimated at IDR 200 million).

The MoA, which is responsible for financing the BBPMSOH, has been required to reduce its budget by 65 % as part of government austerity measures to finance a nationwide nutrition programme. Other ministries are also affected by this. Although this is only a cost-cutting measure for 2025 for the time being, it could have a negative impact on the operation of the BSL-3 laboratory, especially if the maintenance budget is affected. The BBPMSOH is already prioritising upcoming maintenance work based on the available maintenance budget, which could lead to further deficiencies and risks for the smooth operation of the BSL-3 laboratory. Although minor revenues are generated through the certification of vaccines, these are far from sufficient to cover operating costs. However, as the BBPMSOH is the only independent national laboratory for testing the efficacy of animal vaccines in Indonesia, it is in the national interest to maintain its functionality. In addition to a sufficient maintenance budget, this includes the timely replacement of equipment that is inoperable or has limited functionality.

Although Bogor, where the BBPMSOH is located, is also home to the Faculty of Veterinary Medicine at IPB University, which offers further advantages for the education and training of students at the BBPMSOH, high-risk laboratories should ideally not be located in densely populated areas. Precisely because of the increasing urbanisation in the vicinity of the laboratory, compliance with a biological safety infrastructure is therefore of great importance in order to prevent the transmission of highly pathogenic pathogens.

17. Contribution to supporting sustainable capacities

Overall, with the support of FC funding, the BBPMSOH has developed into a functional BSL-3 laboratory over the course of the project, capable of successfully conducting vaccine and drug testing and approvals. It is unrealistic to expect that the testing will generate enough income to cover the high maintenance costs of a BSL-3 laboratory. Given the high cost pressure on the MoA, this will continue to pose challenges for the laboratory in the future. However, as part of the ASEAN Animal Vaccine Network, BBPMSOH should continue to expand its regional network and explore requirements for testing and certifying samples and vaccines from partner countries, thereby generating at least additional income in the future.

The ongoing cooperation between BBPMSOH/MoA and the FAO is a positive development. Regular training courses on biosafety and laboratory safety have been held since 2014. The FAO is an important link in the area of human capacity building and donor

coordination, but its role is currently weakened by US budget cuts, particularly with regard to technical support activities for various ministries on One Health. The consequences for avian influenza support in Indonesia are not yet foreseeable.

Cooperation between the BBPMSOH and NUBIKA biosafety programme continues within the framework of collaboration between the Ministry of Agriculture and the Ministry of Defence.

18. Durability of impacts over time

We expect that the essential role attributed to the BBPMSOH in the quality control of animal vaccines, including for the prevention of future zoonoses, will fundamentally contribute to ensuring the sustainability of the project's effects over time. In addition, the BBPMSOH and the MoA have competent partners at their side in the FAO and the ASEAN Animal Network. The regular exchange between the MoA and the MoH on the topic of avian influenza and the increasing importance of One Health in Indonesia also play an important role in strengthening cooperation between the sectors and acquiring further funds for animal health and vaccine development and control.

The current prioritisation approach to maintenance is considered unsustainable in terms of sustainability. If critical elements of the laboratory fail, this will hamper operations in the longer term, leading to bottlenecks in the approval of vaccines for animal health and avian influenza surveillance. BBPMSOH is currently compensating for this by replacing non-functional equipment in the BSL-3 laboratory with equipment from other laboratories at the institute in order to maintain functionality.

Small farmers often do not vaccinate their animals. On the one hand, vaccination efforts are laborious in free-range systems, as the vaccine must be injected into each animal individually. On the other hand, some poultry species, especially ducks, do not stay within property boundaries. Vaccines are generally readily available and relatively inexpensive in the country (less than USD 1 per vaccination), but due to the above-mentioned vaccination problems and financial constraints, small farmers prioritise other expenses. Willingness to vaccinate would certainly be greater if the government provided vaccines free of charge. However, this would be a major cost factor for local governments, especially since small backyard populations mean that minor outbreaks do not have a significant impact on the larger populations in poultry farms, where vaccinations are carried out. In principle, the government's recommendations on good vaccination practices are in line with international standards.

Finally, social acceptance of the location is necessary for the sustainability of the BSL-3 laboratory's work. While the BBPMSOH was located in a very rural area when it was built, increasing urbanisation has led to people settling in the immediate vicinity of the BSL-3 laboratory and animal stables – , protected only by a high wall. Staff are regularly trained in biosafety and, according to the BBPMSOH, there is no risk of transmission. Local residents are aware that this is a laboratory, but based on our assessment and discussions with BBPMSOH staff, it appears that there has been no direct awareness-raising among the surrounding communities regarding the work carried out with highly pathogenic agents.

Rating summary of sustainability: moderately successful (3)

The large ownership of the BBPMSOH cannot compensate for the lack of financial resources, including for adequate maintenance. In summary, sustainability is appraised as limited success due to insufficient budgets for maintenance and a lack of investment in the future.

Overall assessment: successful (2)

The project is appraised as successful overall, particularly due to its systemic orientation and the Indonesian government's high level of ownership. The decline in bird flu outbreaks can be attributed to the government's approach of strengthening animal health controls in poultry through targeted intervention, thereby contributing to the prevention of bird flu outbreaks. It is clear that the project is making a positive contribution to reducing the risks posed by avian influenza mutations and their transmission to humans. The measures support SDG 3 (Good Health and Well-being) and pursue the "One Health" approach. The Indonesian government has demonstrated ownership by mobilising additional funds and maintaining laboratory operations. Another positive aspect is the successful promotion of cooperation between various ministries and partners such as FAO and ASEAN, which strengthens coherence in the health sector. Nevertheless, there is still a need for continuous training of staff, and long-term operational security is only guaranteed to a limited extent.

Contribution to Agenda 2030

The project contributes to the achievement of Sustainable Development Goal SDG 3 – Good Health and Well-being, particularly in the following areas:

1. Protecting all people from communicable diseases (such as AIDS or tuberculosis) and non-communicable diseases (such as cancer or diabetes).
2. Supporting research and development for vaccines and medicines against communicable and non-communicable diseases that primarily affect developing countries. This also includes ensuring access to affordable, essential medicines and vaccines. This takes into account the Doha Declaration on the TRIPS Agreement and Public Health, which reaffirms the right of developing countries to make full use of the flexibilities in the Agreement on Trade-Related Aspects of Intellectual Property Rights to protect public health. The aim is to ensure access to medicines for all.
3. Strengthening the capacities of all countries, particularly developing countries, in the areas of early warning, risk reduction and management of national and global health risks.

Methodology

Evaluation methodology

The ex-post evaluation follows the methodology of a rapid appraisal, i.e. a data-based, qualitative contribution analysis, and represents an expert opinion. The project is attributed effects based on plausibility considerations, which are based on a careful analysis of documents, data, facts and impressions. Where possible, this also includes the use of digital data sources and modern techniques (e.g. satellite data, online surveys, geocoding). The causes of any contradictory information are investigated, attempts are made to resolve them, and the assessment is based on statements that are confirmed by several sources of information (triangulation), where possible.

The analysis of the effects is based on assumed causal relationships, documented in the impact matrix developed during the project appraisal and updated during the ex-post evaluation, if necessary. The evaluation report sets out arguments as to why certain influencing factors were identified for the effects observed and why the project under review probably made a certain contribution (contribution analysis). The context of the development measure is taken into account in terms of its influence on the results. The conclusions are put into relation to the availability and quality of the data basis. An evaluation concept serves as the reference framework for the evaluation.

The method offers a balanced cost-benefit ratio for project evaluations, on average, with a balance between knowledge gain and evaluation effort, and allows for a systematic assessment of the effectiveness of DFG projects across all project evaluations. Individual ex-post evaluations cannot therefore meet the requirements of a scientific assessment in the sense of a clear causal analysis.

The main objective of the evaluations (knowledge interest) is to measure impacts, provide accountability, promote transparency and enable institutional learning.

Type of evaluation:

Trip to the project area.

Key questions of the evaluation according to the evaluation concept:

- Sustainability: Are the investments being used and maintained, and are there sufficient funds for operation and capacity development? How is the sustainability of the investment ensured?
- Efficiency: Limited budget – impact of unfunded measures? Is the staff qualified for BSL 3 testing? Would a (larger) loan be more reasonable?
- Relevance: Has the project improved the capacity of the Indonesian veterinary sector to detect, prevent and control outbreaks of avian influenza? If so, to what extent? The number of cases of bird flu in animals has risen over the last 15 years. Would the situation be even worse without vaccinations?
- Effectiveness: Has the number of vaccines tested for potency and efficacy at the NVDAL increased since the installation of the BSL-3? Have more vaccines against HPAI been registered in Indonesia (comparison before and after)?
- Coherence: How are the NVDAL and the BSL3 laboratory embedded in the national avian influenza strategy and avian influenza surveillance system?

Non-public (internal) documents

Internal and external project documents, secondary specialist literature, strategy papers, country and sector analyses, media reports.

Directory of public sources

Pramuwidyatama, Hogeveen, Saatkamp (2019): *A Systematic Evaluation of Measures Against Highly Pathogenic Avian Influenza (HPAI) in Indonesia, Frontiers in Veterinary Science, Volume 6*

Data sources and analysis tools

FAO: EMPRES-i PLUS (Data File Accessed 11/06/25): *Calculation for Indonesia on confirmed H5N1 outbreaks in domestic poultry; Available at: https://empres-i.apps.fao.org/diseases*

MoA (2008): *Minister of Agriculture Decree Number 28/Permentan/OT.140/5/2008*

WOAH (formerly OIE - 2021): *Terrestrial Animal Health Code*

WHO (2025): *Präsentation WHO Indonesien im Rahmen unseres Interviews mit WHO-Gesprächspartnern und Partnerinnen am 8.05.2025 in Jakarta.*

Project sites visited

Biosafety Level 3 (BSL-3) veterinary laboratory at the National Laboratory for Veterinary Drug Testing in Cibinong, 35 km southwest of Jakarta.

Assessment methodology

A six-point scale is used to assess the project according to OECD DAC criteria, with the exception of the sustainability criterion. The scale values are as follows:

Level 1 Very successful: results significantly above expectations

Level 2 Successful: results fully in line with expectations, without significant shortcomings

Level 3 Moderately successful: results below expectations, but positive results predominate

Level 4 Moderately unsuccessful: significantly below expectations and negative results dominate despite recognisable positive results

Level 5 Unsuccessful: despite some positive partial results, the negative results clearly dominate

Level 6 Highly unsuccessful: the project is useless or the situation has deteriorated

The overall rating on the six-point scale is based on a project-specific weighting of the six individual criteria. Levels 1–3 of the overall rating indicate a 'successful' project, while levels 4–6 indicate an 'unsuccessful' project. It should be noted that a project can generally only be classified as "successful" in terms of development policy if both the achievement of objectives at the outcome level (effectiveness) and impact level, as well as sustainability, are rated at least as "moderately successful " (level 3).

Imprint

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