

BIOSECURITY IN WILDLIFE FARMS TO PREVENT ZONOTIC SPILLOVER

ANALYSIS OF INTERNATIONAL GUIDELINES TO INFORM THE LEGAL FRAMEWORK IN VIET NAM



Implemented by

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH



Published by

The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

On behalf of

The German Federal Ministry for Economic Cooperation and Development (BMZ)

Project

Reducing Health Risks in the Wild Animal Trade in Viet Nam is jointly implemented by GIZ in collaboration with the International Cooperation Department of the Ministry of Agriculture and Rural Development (MARD).

Director: Mr Vu Thanh Liem, Deputy Director, International Cooperation Department (ICD)

Chief Technical Advisor: Ms Anja Barth, GIZ Viet Nam

Responsibility

Ms Anja Barth

Authors

Madelon Rusman

Micol Fascendini, MD MPH

Photos

©GIZ/Nguyen Quang Hai

©GIZ/Do Doan Hoang

©GIZ/Giap Van Hung

English language editor

Harold Browning

Disclaimer

The findings, interpretations and conclusions expressed in this document are based on information gathered by GIZ and its consultants, partners and contributors. They do not represent the views of GIZ, ICD of MARD nor BMZ. Neither GIZ, ICD of MARD nor BMZ guarantee the accuracy or completeness of information in this document, and cannot be held responsible for any errors, omissions or losses which result from its use.

November 2023

BIOSECURITY IN WILDLIFE FARMS TO PREVENT ZOOBOTIC SPILLOVER**ANALYSIS OF INTERNATIONAL GUIDELINES TO INFORM THE LEGAL FRAMEWORK IN VIET NAM**



Abstract



The study was conducted under the project “Reducing health risks in the wild animal trade in Viet Nam”, financed by the German Ministry for Economic Cooperation and Development (BMZ) and coordinated by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH alongside the One Health Partnership (OHP) Secretariat.

Recognising the significant risk of zoonotic disease spillover and spread in the wildlife farming industry of Viet Nam, the study aimed to contribute to the enhancement of biosecurity standards in the innumerable facilities spread across the country. Specifically, it developed a set of policy recommendations to serve as input for the development of the new Decree that will replace Decree No. 06/2019/ND-CP and Decree No. 84/2021/ND-CP on the management of endangered, precious, and rare wild fauna and flora.

The study was conducted using a literature review, content analysis method and applying the One Health approach. Fifteen international guidelines on biosecurity for facilities breeding (domesticated and wildlife) animals were included in the study and examined through a predefined matrix that allowed their systematic analysis. Guidelines were assessed in terms of their approach, their scope and focus, their obligation and target audience, their format and structure, and their

recommended biosecurity measures. Insight and knowledge gathered through the analysis of international documents guided the review of the preventive measures detailed in the Vietnamese Law on Veterinary Medicine (79/2015/QH13). These were unpacked, expanded and revised, depending on their applicability to wildlife farming and their feasibility in a Vietnamese context.

The analysis of international guidelines allowed the identification of seven specific biosecurity categories, each referring to a different biosecurity domain (Site management, Waste management, Feed management, Veterinary prevention, Animal management, Transport, Staff safety and capacity). The preventive measures detailed in the current Veterinary Law were compared to the aforementioned seven categories, revealing that the current legal framework lacks specific requirements, especially in reference to the categories of Animal Management, Transport, Staff Safety and Capacity.

The international guidelines led to thirteen recommendations that can inform the formulation of the new Decree revising the Decree No. 06/2019/ND-CP and Decree No. 84/2021/ND-CP and enhance the management of wildlife farms in Viet Nam. Recommendations are grouped under the seven biosecurity categories to ease their integration in the Decree and their further definition in related technical documents. The analysis of international guidelines enabled the preparation of a set of recommendations that can inform the development of biosecurity guidelines and other communication materials. These mainly refer to the approach and processes to follow ensuring biosecurity guidelines that are universally understood, accepted and applied by farm owners and staff at the facility level.

The safe management of wildlife farms in Viet Nam requires a multi-sectoral, trans-disciplinary and collaborative approach that engages all concerned actors. The One Health approach should be adopted to revise the policy framework, as well as to develop, implement and monitor biosecurity plans at farm level. The prevention and control of zoonotic disease spillover and spread in the wildlife farming industry is a shared responsibility of policymakers, farm owners and managers, veterinary and animal health professionals, as well as farm staff, visitors and the community at large.

Table of contents

| | | | | | |
|-----|---|----|-------|--|----|
| | ABSTRACT | 4 | | | |
| | ACRONYMS | 8 | | | |
| 1. | INTRODUCTION | 10 | 5. | DISCUSSION | 24 |
| 2. | STUDY OBJECTIVES | 13 | 5.1 | INSIGHTS FROM INTERNATIONAL GUIDELINES THAT CAN INFORM THE FORMULATION OF THE NEW DECREE ON THE APPROPRIATE MANAGEMENT OF WILDLIFE | 24 |
| 3. | METHODS | 14 | 5.1.1 | ANALYSIS OF THE SEVEN BIOSECURITY CATEGORIES AND RELATED RECOMMENDATIONS | 28 |
| 4. | RESULTS | 18 | 5.2 | INSIGHTS FROM INTERNATIONAL GUIDELINES THAT CAN SUPPORT THE DEVELOPMENT OF BIOSECURITY GUIDELINES AND OTHER MATERIALS FOR THE WILDLIFE FARM INDUSTRY | 32 |
| 4.1 | OVERVIEW OF THE ASSESSED INTERNATIONAL GUIDELINES ON BIOSECURITY | 18 | 6. | CONCLUSION AND OUTLOOK | 39 |
| 4.2 | ANALYSIS OF THE PREVENTIVE MEASURES AS DETAILED IN THE VETERINARY LAW | 20 | | REFERENCES | 42 |
| 4.3 | NOTABLE DOCUMENTS TO INFORM FUTURE BIOSECURITY GUIDELINES IN VIET NAM | 21 | | APPENDIX 1: SUMMARY OF 15 INTERNATIONAL GUIDELINES ANAL YSED BY THE STUDY | 45 |

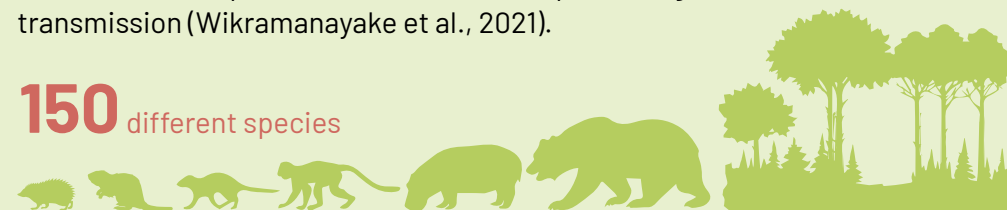
Acronyms

| | |
|-------|--|
| ANAC | Animal Nutrition Association of Canada |
| BAFRA | Bhutan Agriculture and Food Regulatory Authority |
| BMZ | German Federal Ministry for Economic Cooperation and Development |
| CDC | Centre for Disease Control and Prevention |
| CITES | Convention on International Trade in Endangered Species |
| FAO | Food and Agriculture Organization of the United Nations |
| GIZ | Deutsche Gesellschaft für Internationale Zusammenarbeit |
| MAFF | Ministry of Agriculture, Forestry and Fisheries |
| OHP | One Health Partnership |
| PPE | Personal Protective Equipment |
| USDA | United States Department of Agriculture |
| WHO | World Health Organisation |
| WOAH | World Organisation for Animal Health |

1. INTRODUCTION

Global food demand is increasing and estimated to reach a sharp increment by the year 2100 (Rohr et al., 2019), likely leading to increased and more intensified agricultural practices. Breeding and rearing animals for consumption means increased contact between animals and humans including farm staff, veterinary personnel and visitors, and during subsequent trade to markets or processing facilities such as slaughterhouses. These practices are not without risk, as close proximity and interaction between animals and humans increases the risk of the emergence, spillover and spread of zoonotic diseases from animals to humans. In addition to the more common worldwide practice of farming livestock species, Viet Nam has a multimillion-dollar wildlife farming industry which Pham et al. (2022) estimate to breed around 150 different species. Wildlife is a very common source of emerging human infections and several of these farmed wildlife species are considered to pose a high risk of zoonotic disease transmission (Wikramanayake et al., 2021).

150 different species



Recognising the gravity of this issue, initiatives like the project “Reducing Health Risks in the Wild Animal Trade in Viet Nam”, financed by the German Ministry for Economic Cooperation and Development (BMZ) and coordinated by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH alongside the One Health Partnership (OHP) Secretariat, have been instituted. This project aligns with the broader mission of the “International Alliance against Health Risks in Wildlife Trade”, which aspires to mitigate the potential threats from trading and consuming wild animal products. Emphasising the enhancement of the legal framework and biosecurity standards in wildlife farms in Viet Nam, substantial research efforts have been undertaken to assess and fortify policy development and its implementation regarding wildlife farming.

Literature emphasises the important role government regulations play in facilitating or hindering the adoption of biosecurity measures in animal farming. For instance, a study from Sichuan, China, spotlighted the correlation between government regulations and biosecurity adherence among pig farmers. The authors recommend strengthening of guided government regulations, including biosecurity training courses, to augment awareness among all concerned actors (Li et al., 2023). Additionally, the definition and understanding of biosecurity measures, though central to the One Health concept, remains a topic of debate and exploration (Huber et al., 2022). Huber et al. (2022) propose a harmonised definition for the term ‘biosecurity measure’ for animal production. The socio-cultural nuances of biosecurity application on farms highlight the complexity beyond policymaking. These underline the blend of local beliefs, practices, and the broader cultural environment influencing biosecurity practices. Results from a study by Mutua et al. (2022) show that implementing biosecurity measures in rural settings can be especially challenging due to resource limitations, friction with local cultural practices and poor enforcement.

This study follows previous research project conducted on the management of wildlife farms in Viet Nam which identified biosecurity as one the three most critical themes for the mitigation of zoonotic disease risks emerging at the human-animal interface (Rusman and Fascendini, 2023). The study focuses on a comprehensive analysis of international biosecurity guidelines for commercial (domestic and wild) animal farms. The imperative to ensure the safety and health of both animals and humans necessitates rigorous guidelines and regulations that are tailored to specific national contexts, yet also informed by global best practices.

Central to this study is the development of a new Decree, replacing Decree No. 06/2019/ND-CP and Decree No. 84/2021/ND-CP on the management of endangered, precious, and rare wild fauna and flora. The proposed revision in the new Decree focuses on the control of disease transmission from wildlife farms to humans and the natural environment, expanding from the preventive measures already specified in the Law on Veterinary Medicine (79/2015/QH13). The insights gathered from international guidelines, coupled with an in-depth analysis of the current mandatory measures, will provide a solid foundation for the development process of the new decree. Furthermore, through active collaboration and participation in select meetings with national consultants, this study seeks to ensure that the recommendations for the new decree is both robust in its foundational guidelines and agile in its adaptability to the unique Vietnamese context.

The document is structured into six chapters. The Introduction explains the rationale of the study and describes the context in which this was developed. Study objectives and methods adopted to address the research question are explained in the subsequent chapters. Insights and biosecurity practices emerging from the content analysis of international guidelines are reported under Results. The Discussion chapter provides a set of recommendations that could inform the development of the new Decree and other technical and communication materials. The last chapter offers a conclusion and outlook on the prevention and control of zoonotic disease emergence and spillover in Viet Nam, through the adoption of appropriate biosecurity measures in commercial wildlife farming.



2. STUDY OBJECTIVES

The study aims to develop a set of policy recommendations to serve as input for the development of a new Decree that will replace Decree No. 06/2019/ND-CP and Decree No. 84/2021/ND-CP. These recommendations are aimed at regulations relating to managing wildlife raising and breeding and managing disease spread from wildlife to humans and the environment. This study's main aim is to recommend improved strategies to mitigate the spread of zoonotic diseases in wildlife farming.

The study is divided into two consecutive phases. The first phase aims to compile and analyse international regulations and guidelines on biosecurity measures to prevent and control zoonotic emergence and spill-over in facilities breeding terrestrial animals for commercial purposes. Specifically,

The first phase of the study aims to:

- Compile and analyse regulations and guidelines on biosecurity in commercial facilities breeding terrestrial animals (domesticated and wildlife) in other countries.
- Identify approaches and practices that can be applied into a Vietnamese context, for the purpose of advising the new decree development.

The second phase of the study aims to develop a set of biosecurity measures to inform the new Decree and guide the development of biosecurity plans for commercial wildlife farms in Viet Nam. Specifically, the second phase of the study aims to:

- Analyse in detail the biosecurity measures contained in international guidelines on biosecurity for commercial facilities breeding terrestrial (domesticated and wildlife) animals;
- Review the mandatory measures already detailed in the Vietnamese Law on Veterinary Medicine and assess their applicability to commercial wildlife farming;
- Develop a set of minimum biosecurity measures that can be integrated into the new Decree specifically addressing risks involved with commercial wildlife farming.

3. METHODS

The study was conducted using the literature review and content analysis method and applying the One Health approach. The study was developed across two consecutive phases.

The first phase focused on a systematic content analysis of international guidelines on biosecurity for facilities breeding (domesticated and wildlife) animals.

Fifteen documents have been identified and selected with the support of GIZ experts. The search was done on Google and focused on practical biosecurity guidelines related to animals confined in captive environments, including both livestock and wild animals, commercial and non-commercial facilities. The relatively large scope of the search allowed overcoming the scarcity of biosecurity guidelines specifically addressing commercial wildlife farming, as is the objective of the study. An analysis matrix was purposely developed to guide and standardise the review of the international guidelines selected for the study (figure 1). The matrix contains ten criteria that guided the assessment of guidelines on predefined elements relevant to the study objective and the development of the legal framework on biosecurity in commercial wildlife farms in Viet Nam. The assessment criteria allowed reviewing the guidelines in terms of their approach, their scope and focus, their obligation and target audience, their format and structure, and their recommended biosecurity measures. Each assessment criterion is explained in the Discussion (see Chapter § 5), where the results of the content analysis lead the formulation of recommendations on developing biosecurity guidelines and other communication materials under the new Decree, addressing specifically the context of Viet Nam.

The second phase of the study focused on the revision of the mandatory measures detailed in the Vietnamese Law on Veterinary Medicine (79/2015/QH13)(box 1) and mainly referring to the prevention and management of disease in domesticated animals.

These measures were reviewed using the insight and knowledge gathered through the first phase of the study and the analysis of the international biosecurity guidelines. The measures were unpacked, expanded and revised,

accounting for their applicability to wildlife farming and their feasibility in the Vietnamese context. The revision of the mandatory measures led to the formulation of a set of recommended biosecurity measures that could inform the development of the new Decree. In line with the study objective, particular attention was given to the biosecurity measures suggested in each of the international guidelines. These measures were used to inform the development of the new Decree on the management of wild animal farming and the mitigation of the risk of disease emergence, spreading and spillover. To classify the array of different biosecurity measures found in the fifteen guidelines, seven categories were created during the matrix analysis process. Biosecurity measures were grouped in one of the seven categories, each referring to a different domain within the field of biosecurity (i.e., Site management, Waste management, Feed management, Veterinary prevention, Animal management, Transport, Staff safety and capacity). For example, the category Site management could include measures such as pest control, installation of hand washing stations and restricted access into quarantine areas of a farm. The category Waste management could include measures specifying the appropriate ways to store and dispose of animal bedding, faecal matter and carcasses. The adoption of practical measures from every category enhances the level of biosecurity across the entire facility.

Box 1 | Biosecurity measures detailed in the Law on Veterinary Medicine (79/2015/QH13)

Article 15. Prevention of animal diseases

1. Raising places and raising tools shall be cleansed and decontaminated, disinfected, and have vectors removed periodically after each raising period; raising places shall be conformable to local planning or approved by a competent agency.
2. Waste from animal raising shall be treated according to the law provisions on environmental protection. Regarding closed aquaculture systems, water supply for animal raising shall assure the quality; wastewater, waste matter shall be treated before being discharged to ensure veterinary hygiene and shall be in accordance with the law provisions on environmental protection.
3. Stud and feed used in animal raising shall be epidemic-free, ensure veterinary hygiene and shall conform to the law provisions on livestock breeds and the law provisions on animal feed.
4. Compulsory preventive measures for dangerous infectious diseases shall be adopted to animals at the request of veterinary authorities.

The study was conducted adopting a One Health approach. Biosecurity is an essential component of One Health as it promotes the prevention and control of zoonotic diseases. The mitigation of health risks emerging at the human-animal-environment interface requires a trans-disciplinary, multi-sectoral and collaborative approach. The review of the identified documents was done through a One Health lens and led to recommendations to take a trans-disciplinary, multi-sectoral and collaborative approach in the development of the new Decree. The international consultants engaged in the study, worked with the national consultants involved in the development of the new Decree. The exchange of information and data allowed the identification of a set of evidence-based, core biosecurity measures that strongly align to the international standards, while effectively responding to the local needs of wildlife farming in Viet Nam.

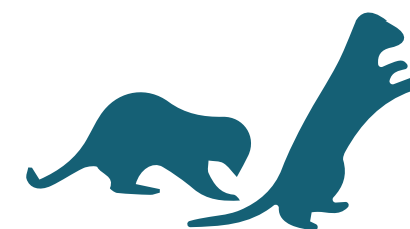
The study has adopted the definition of biosecurity proposed by the World Organization of Animal Health (WOAH) in the Terrestrial Animal Health code: “a set of management and physical measures designed to reduce the risk of introduction, establishment and spread of animal diseases, infections or infestations to, from and within an animal population” (WOAH, 2023b).



Figure 1: Matrix adopted for systematic content analysis of international guidelines

| REFERENCE DOCUMENTS | |
|--------------------------|--------------------------------------|
| DOCUMENT PROFILE | |
| Publishing date | Country |
| Type of document | Issuing authority |
| ASSESSMENT CRITERIA | |
| I. DEVELOPEMENT APPROACH | |
| 1. Top - down | |
| 2. Participatory | |
| II. SCOPE | |
| 1. Livestock | 2. Both livestock and wildlife |
| 3. Wildlife | 4. Specific disease (s) |
| III. FOCUS | |
| 1. All taxa | 2. A selection of taxonomix families |
| 3. One taxonomix family | |
| IV. OBLIGATION | |
| 1. Mandatory | |
| 2. Voluntary | |
| V. TARGET AUDIENCE | |
| 1. Farm owners | 2. Government officials |
| 3. Farm workers | 4. Multiple |
| 5. Veterinary | |

| | |
|---|--|
| VI. DOCUMENT FORMAT | |
| 1. Short | 2. Detailed and practical |
| 3. Medium size and easy to follow and understand | 4. Detailed using complex language |
| VII. DEFINITION OF BIO SECURITY | |
| 1. General definition of biosecurity | 2. Not included |
| 3. Revised definition of biosecurity for specific context | |
| VIII. ACTORS ROLE | |
| 1. Short list of actors with no role description | 2. Single actor with role description |
| 3. Multiple actors with detailed role descriptions | |
| IX. BIOSECURITY CHECKLIST | |
| 1. No checklist mentioned in the text | 2. Checklist detailed and provided in the text |
| 3. Checkilist proposed in the document, not provided | |
| X. BIOSECURITY CATEGORIES | |
| 1. Site management | 2. Animal management |
| 3. Waste management | 4. Transport |
| 5. Feed management | 6. Staff safety and capacity |
| 7. Veterinary prevention | |



4. RESULTS

The study analysed fifteen international guidelines using the analysis matrix. This chapter provides an overview of the assessed documents and a quick analysis of the preventive measures as currently detailed in the Veterinary Law, highlighting where improvements can be made. Furthermore, a few particularly noteworthy guidelines are listed at the end of the chapter as possible reference documents to the development of future biosecurity guidelines in Viet Nam.

4.1 Overview of the assessed international guidelines on biosecurity

The assessed international guidelines are relatively recent documents, all published after 2007 and a few prompted by the COVID-19 pandemic (USDA and CDC, 2020; OIE, 2021) which uncovered the health risks at the human-animal-environment interface and called for more effective biosecurity measures in commercial farms breeding livestock and wild animals.



The group of documents includes government guides (47%), high-level guides (20%), technical guidelines (20%) and industry guidelines (13%). Government guides are country-specific and issued by government departments of concern, such as the Centres for Disease Control and Public Health Institutes, Food Inspection Authorities and Departments of Agriculture. Despite not necessarily setting mandatory rules and regulations, these guides provide farm owners and managers with practical guidance and recommendations to establish and maintain minimum biosecurity standards at the facility level. The assessed government guides are from Australia (Northern Territory Government, 2010), Bhutan (Bhutan Agriculture and Food Regulatory Authority, 2015), Canada (Government of Canada, 2016), Japan (MAFF Government of Japan, 2021), the United Kingdom (Health and Safety Executive - UK Government, no date), and the United States of America (USDA and CDC, 2020; Illinois Department of

Agriculture, 2023). High-level guides are published by international agencies (i.e., FAO, WOA and WHO) and take a global perspective, sharing best practices and providing guidance and recommendations for the development of biosecurity plans in different settings. High-level guides are never mandatory and rather provide technical guidance for officials at policy and operational level, veterinary professionals and animal keepers and owners (FAO, 2007; OIE, 2021; WOA, 2023a). Technical guidelines are focusing more specifically on farm management and provide best practices and practical recommendations to ensure that any human-animal interaction happens in a safe manner following well defined biosecurity measures. FAO, OIE and WHO (2021) addresses veterinary authorities and animal health practitioners; USDAVIS (2020) addresses individuals involved in the care and use of mustelids; and Wildlife Health Australia (2018) addresses people interacting with wildlife, including managers, researchers, veterinarians and carers. Neither of these guidelines are mandatory, they rather provide a clear indication on how to manage biosecurity when working with livestock or wild animals and prevent the occurrence and spreading of zoonotic diseases. Technical guidelines are from Asia and the Pacific Region (FAO, OIE and WHO, 2021), Australia (Wildlife Health Australia, 2018), and the United States of America (USDAVIS, 2020). The study also analysed two industry guidelines developed by professional associations to guide biosecurity in commercial settings. ANAC (2018) focuses on biosecurity in the livestock and poultry feed sector, addressing feed manufacturing companies and their employees. The guideline has been issued by the Animal Nutrition Association of Canada. The National Milk Producers Federation (2022) focuses on biosecurity practices for dairy farmers and addresses farm owners, staff and visitors. The guideline has been issued by the US Milk Producers Federation.

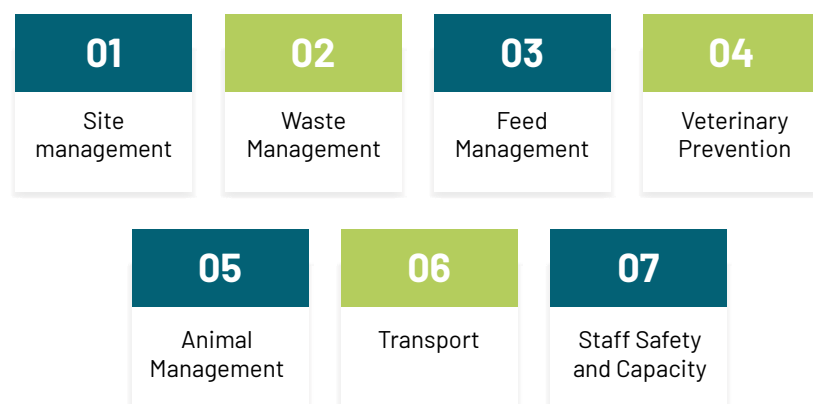
The analysis matrix, with its assessment criteria, facilitated a comprehensive review of the selected guidelines, examining their approach, scope, and focus, as well as their level of obligation, the format and structure of the guidelines and their target audience. The review of the guidelines allowed also to identify seven specific biosecurity categories, each referring to a different biosecurity domain, that facilitated the categorisation and analysis of the practical biosecurity measures emerging from the international guidelines. Furthermore, the seven categories allowed for a systematic analysis of the existing biosecurity measures in the current Veterinary Law.



4.2 Analysis of the preventive measures as detailed in the Veterinary Law

The preventive measures as detailed in the current Vietnamese Law on Veterinary Medicine (79/2015/QH13) (see box 1) were compared with the seven biosecurity categories that resulted from the guidelines analysis to determine whether they are providing a comprehensive framework for biosecurity in the wildlife farming industry.

The seven biosecurity categories identified during the guidelines analysis are:



The analysis of the preventive measures as detailed in the Veterinary Law (here below referred to as A, B, C and D) revealed that:

Preventive measure A: *'Raising places and raising tools shall be cleansed and decontaminated, disinfected, and have vectors removed periodically after each raising period; raising places shall be conformable to local planning or approved by a competent agency.'*

This measure can be assigned to the biosecurity category 1: Site Management. It refers to issues concerning cleaning and disinfection of facilities, on-site equipment and animal enclosures, as well as requiring breeding areas to follow local planning legislation.

Preventive measure B: *'Waste from animal raising shall be treated according to the law provisions on environmental protection. Regarding closed aquaculture systems, water supply for animal raising shall assure the quality; wastewater, waste matter shall be treated before being discharged to ensure veterinary hygiene and shall be in accordance with the law provisions on environmental protection.'*

This measure falls under category 2: Waste Management, as it refers to the environmental legislation for treating waste and wastewater.

Preventive measure C: *'Stud and feed used in animal raising shall be epidemic-free, ensure veterinary hygiene and shall conform to the law provisions on livestock breeds and the law provisions on animal feed.'*

This measure falls under category 3: Feed Management, as it refers to hygiene of feed and requires following of specific law provisions.

Preventive measure D: *'Compulsory preventive measures for dangerous infectious diseases shall be adopted to animals at the request of veterinary authorities.'*

This measure can be assigned to category 4: Veterinary Prevention, as it requires animal owners to follow instructions of veterinary authorities.

This analysis shows that the current measures in the Veterinary Law lack specific requirements for the last three biosecurity categories: Animal Management, Transport, Staff Safety and Capacity. This highlights a gap in achieving a comprehensive minimum biosecurity standard. Furthermore, current measures, as noted by Pham et al. (2022b), fall short in offering clear directions for enforcing requirements and setting standards.

The analysis of biosecurity measures and other assessment criteria is further reported in the Discussion (Chapter § 5). Results of the analysis are critically reviewed taking into account the Vietnamese context and linked to recommendations that can inform the formulation of a comprehensive set of minimum biosecurity measures to include into the new Decree on one side and support the consequent development process of biosecurity guidelines and other communication materials on the other.

4.3 Notable documents to inform future biosecurity guidelines in Viet Nam

Table 1 provides an overview of the fifteen guidelines assessed through the analysis matrix. A short summary of each of the fifteen documents is provided in Appendix 1, while the matrix itself filled in during the analysis process is annexed to this report.

Four of the fifteen assessed documents are particularly notable (Bhutan Agriculture and Food Regulatory Authority, 2015; Government of Canada, 2016; ANAC, 2018; Wildlife Health Australia, 2018). They are comprehensive documents, use a clear language and provide many practical examples and illustrations to clarify concepts. They outline the roles and responsibilities of different actors and contain practical measures and recommendations across most of the seven biosecurity categories. It is worth taking a careful look at them and using them as reference documents to the development of future biosecurity guidelines for wildlife farms in Viet Nam. For easy retrieval, notable documents have been shaded in table 1.

Table 1: Overview of the international guidelines selected for the study

| Ref. No | Title | Country | Date | Document type | Issuing authority |
|---------|--|------------------|------|------------------|----------------------|
| 01 | A key role for veterinary authorities and animal health practitioners in preventing and controlling neglected parasitic zoonoses | Asia and Pacific | 2021 | Technical guide | FAO, OIE, WHO |
| 02 | Guidance on working with farmed animals of species susceptible to infection with SARS-CoV-2 | Global | 2021 | High-level guide | OIE |
| 03 | Interim SARS-CoV-2 Guidance and Recommendations for Farmed Mink and Other Mustelids 1 | USA | 2020 | Government guide | USDA and CDC |
| 04 | Care and Use of Mustelidae | USA | 2020 | Technical guide | USDAVIS |
| 05 | National Farm - Level Mink Biosecurity Standard - Producers' Guide | Canada | 2016 | Government guide | Government of Canada |
| 06 | National Wildlife Biosecurity Guidelines | Australia | 2018 | Technical guide | Wildlife Health |
| 07 | National Biosecurity Guide for the Livestock and Poultry Feed Sector | Canada | 2018 | Industry guide | ANAC |

| Ref. No | Title | Country | Date | Document type | Issuing authority |
|---------|---|-----------|---------|------------------|---|
| 08 | Biosecurity Measures | USA | 2023 | Government guide | Illinois Department of Agriculture |
| 09 | Zoonoses - Agriculture | UK | no date | Government guide | HSE - UK Government |
| 10 | Crocodile Farms - Hygiene Procedures and Biosecurity Concerns | Australia | 2010 | Government guide | Northern Territory Gov |
| 11 | Biosecurity Standards (Horses) | Japan | 2021 | Government guide | MAFF Gov of Japan |
| 12 | Everyday Biosecurity - Reference Manual Version 1 | USA | 2022 | Industry guide | National Milk Producers Federation |
| 13 | In-country Livestock Biosecurity Guidelines | Bhutan | 2015 | Government guide | Agriculture and Food Regulatory Authority |
| 14 | Biosecurity Toolkit | Global | 2007 | High-level guide | FAO |
| 15 | Terrestrial Code Online Access | Global | 2023 | High-level guide | WOAH |

5. DISCUSSION

In this chapter, the results of the systematic analysis of the selected international guidelines are reviewed and translated into practical recommendations that are feasible and achievable in the Vietnamese context. The key elements retrieved from international documents are used to distil best practices and guidance to inform the development of the legal framework of biosecurity in the wildlife farming industry of Viet Nam. The chapter is divided in two sections:

The first section presents the analysis of the seven biosecurity categories that were identified during the content analysis of the international guidelines and suggests clear and straightforward recommendations and practical biosecurity measures under each of them. These recommendations are the result of compiling all measures found in the international guidelines and distilling them into comprehensive recommended measures. The main scope of this section is to inform the development of the new Decree that will replace Decree No. 06/2019/ND-CP and Decree No. 84/2021/ND-CP on the management of endangered, precious, and rare wild fauna and flora.

The second section presents the analysis of the other assessment criteria used to review the international documents (i.e., Approach, Scope, Focus, Obligation, Target audience, Document format, Definition of biosecurity, Actors' role, and Biosecurity checklist). The main scope of this section is to provide insight and guidance to the development of biosecurity guidelines at national and facility level, as well as other communication materials such as fact sheets, posters, and training courses.





5.1 Insights from international guidelines that can inform the formulation of the new Decree on the appropriate management of wildlife



As mentioned above, the seven biosecurity categories that were identified during the content analysis of international guidelines provide a robust framework to develop a comprehensive biosecurity plan. Ideally, farm-specific plans, as well as higher level guidelines, will provide biosecurity standards and measures from each of the categories. In reality, however, this was not the case in the analysed documents. In certain cases, measures may have been omitted due to relevance or applicability, as these fifteen documents were not all written for the same purpose. For example, the National Biosecurity Guide for

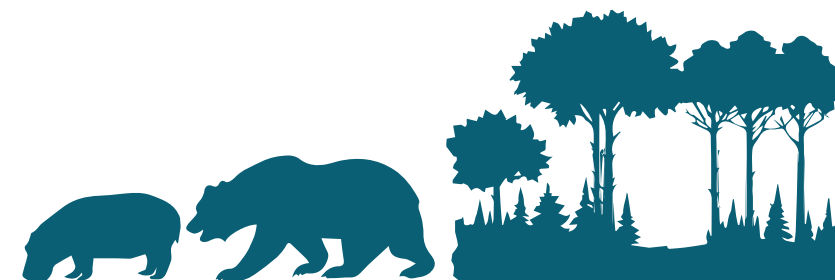
the Livestock and Poultry Feed Sector (ANAC, 2018), highlighted in this report as one of four notable documents, offers valuable recommendations and could be constructive in developing future biosecurity guidelines in Viet Nam. However, the target audience of these specific guidelines are people who work in animal feed manufacturing and so they logically do not contain any measures that would fall under the Animal Management category. Table 2 below shows an overview of the seven biosecurity categories and what percentage of the international guidelines provides relevant measures.



Table 2: Overview of the guidelines analysis as per the seven biosecurity categories

| BIOSECURITY CATEGORY | NUMBER OF GUIDELINES | GUIDELINES |
|---|----------------------|---|
|  1. SITE MANAGEMENT | 12/15 (80%) | FAO, OIE and WHO, 2021; OIE, 2021; USDA and CDC, 2020; Government of Canada, 2016; Wildlife Health Australia, 2018; ANAC, 2018; Illinois Department of Agriculture, no date; Northern Territory Government, 2010; National Milk Producers Federation, 2022; Bhutan Agriculture and Food Regulatory Authority, 2015; WOA, 2023 |
|  2. WASTE MANAGEMENT | 7/15 (47%) | OIE, 2021; USDA and CDC, 2020; Government of Canada, 2016; Wildlife Health Australia, 2018; Northern Territory Government, 2010; Bhutan Agriculture and Food Regulatory Authority, 2015; WOA, 2023 |
|  3. FEED MANAGEMENT | 5/15 (33%) | OIE, 2021; Wildlife Health Australia, 2018; ANAC, 2018; Bhutan Agriculture and Food Regulatory Authority, 2015; WOA, 2023 |
|  4. VETERINARY PREVENTION | 10/15 (67%) | OIE, 2021; USDA and CDC, 2020; Government of Canada, 2016; Wildlife Health Australia, 2018; Illinois Department of Agriculture, no date; Northern Territory Government, 2010; MAFF Government of Japan, 2021; National Milk Producers Federation, 2022; Bhutan Agriculture and Food Regulatory Authority, 2015; WOA, 2023 |

| BIOSECURITY CATEGORY | NUMBER OF GUIDELINES | GUIDELINES |
|---|----------------------|--|
|  5. ANIMAL MANAGEMENT | 7/15 (47%) | OIE, 2021; USDA and CDC, 2020; Government of Canada, 2016; Illinois Department of Agriculture, no date; Northern Territory Government, 2010; National Milk Producers Federation, 2022; WOA, 2023 |
|  6. TRANSPORT | 9/15 (60%) | OIE, 2021; Government of Canada, 2016; Wildlife Health Australia, 2018; ANAC, 2018; Illinois Department of Agriculture, no date; MAFF Government of Japan, 2021; National Milk Producers Federation, 2022; Bhutan Agriculture and Food Regulatory Authority, 2015; WOA, 2023 |
|  7. STAFF SAFETY AND CAPACITY | 9/15 (60%) | OIE, 2021; USDA and CDC, 2020; Government of Canada, 2016; Wildlife Health Australia, 2018; ANAC, 2018; MAFF Government of Japan, 2021; National Milk Producers Federation, 2022; Bhutan Agriculture and Food Regulatory Authority, 2015; WOA, 2023 |



5.1.1 Analysis of the seven biosecurity categories and related recommendations

This section provides a description of each biosecurity category and its relevance in the prevention of disease emergence and spread, followed by specific measures that are recommended for the development of the new Decree. These measures are the result of initially listing all measures found in the international documents and condensing them into clear, relevant and comprehensive recommendations.

Category 1: Site management



This category involves the protocols and infrastructure designed to maintain a controlled environment within a facility. It includes access control for staff and visitors, design and maintenance of buildings to facilitate cleanliness and prevent pest entry, and the establishment of sanitation protocols for entering and leaving the facility. Effective site management is crucial for preventing the introduction and spread of pathogens.

Recommended measures for inclusion into the new Decree:

- 1 Access to the facility is restricted only to staff and essential visitors through clearly marked pathways, ensuring temperature screening at point of entrance and keeping a logbook with names and contact details of each visitor.
- 2 Staff, essential visitors and vehicles are not allowed to enter the facility unless sanitation protocols, such as handwashing with soap, changing of shoes/sandals, wearing of face masks, and vehicle disinfection, have been properly adhered to.
- 3 New facilities are constructed, and old facilities renovated, to allow appropriate practices of animal management and effective cleaning and disinfection, avoid stagnant water and ease drainage of wastewater, prevent entry of birds, rodents and arthropods.
- 4 A pest control programme is implemented on a regular basis and deterrent measures applied to stop entrance into the farm of non-production animals, such as domestic pets, rodents, birds and other wildlife animals.

Category 2: Waste management



This category covers the systematic handling and disposal of manure, garbage, waste matter, and wastewater. It involves the use of covered containers to prevent pest access, safe disposal of animal carcasses, and the use of protective clothing during the management and disposal of waste. Proper waste management is essential to prevent environmental contamination and reduce the risk of disease transmission.

Recommended measures for inclusion into the new Decree:

- 5 Safe and proper management of manure, garbage, waste matter and wastewater is implemented, garbage stored in covered containers to minimise access by pests. Disposal of waste matter and wastewater follows the local environmental law and regulations to avoid contamination of wildlife habitat.
- 6 Animal carcasses and remains and potentially contaminated waste are safely disposed of and handled with gloves and protective clothing.

Category 3: Feed management



This category covers the practices related to the preparation, storage, and handling of animal feed to prevent contamination. It includes daily cleaning and disinfection of feed preparation areas and equipment, as well as maintaining the quality of feed ingredients. Ensuring feed management helps in maintaining the health of the animals and prevents the spread of diseases through feed.

Recommended measures for inclusion into the new Decree:

- 7 Feed preparation areas, tools and equipment are cleaned and disinfected on a daily basis and regularly maintained, and appropriate storage and handling practices implemented to protect feed ingredients and feed from contamination by pests.

Category 4: Veterinary prevention



This category involves the appointment of veterinary services for regular health monitoring, vaccination oversight, and disease management in farmed animals. It includes daily health observations, prompt disease reporting, and guidance on biosecurity measures during disease outbreaks. This proactive approach allows for early detection and containment of diseases, reducing the likelihood of widespread outbreaks and maintaining a strong line of defence in biosecurity.

Recommended measures for inclusion into the new Decree:

- 8 A veterinarian or veterinary clinic is appointed to the facility to guide daily observation and health management of animals, supervise the regular monitoring of vaccinations, diseases, and treatments in animals, and support the prompt notification, investigation and management of suspect or disease outbreaks that occur in the farm.
- 9 Sick animals are isolated from others and closely observed on daily basis, contact with them is minimised and separate tools and equipment used, enhanced biosecurity measures applied when interacting with or close to

them, and testing and epidemiological investigation conducted to determine the origin and transmission route of the infection agent control the potential outbreak.

Category 5: Animal management



This category includes the protocols for acquiring new animals, their quarantine, and integration into the facility. Ideally, it ensures that new arrivals are sourced from reputable suppliers. Effective animal management minimises stress and disease spread among animals.

Recommended measures for inclusion into the new Decree:

- 10 New animals are bought from well-known and certified suppliers, transported in well-ventilated and non-overcrowded transport cages or containers, and quarantined as per the national law and guidelines prior to being introduced in the facility.

Category 6: Transport



Clean and disinfected transport vehicles and containers are vital to prevent the introduction and spread of diseases between facilities. This aspect of biosecurity is critical as it acts as a barrier to disease transmission, ensuring that animals arrive at their destinations without bringing in or taking out pathogens.

Recommended measures for inclusion into the new Decree:

- 11 Cages and vehicles to transport animals are cleaned and disinfected before reuse.

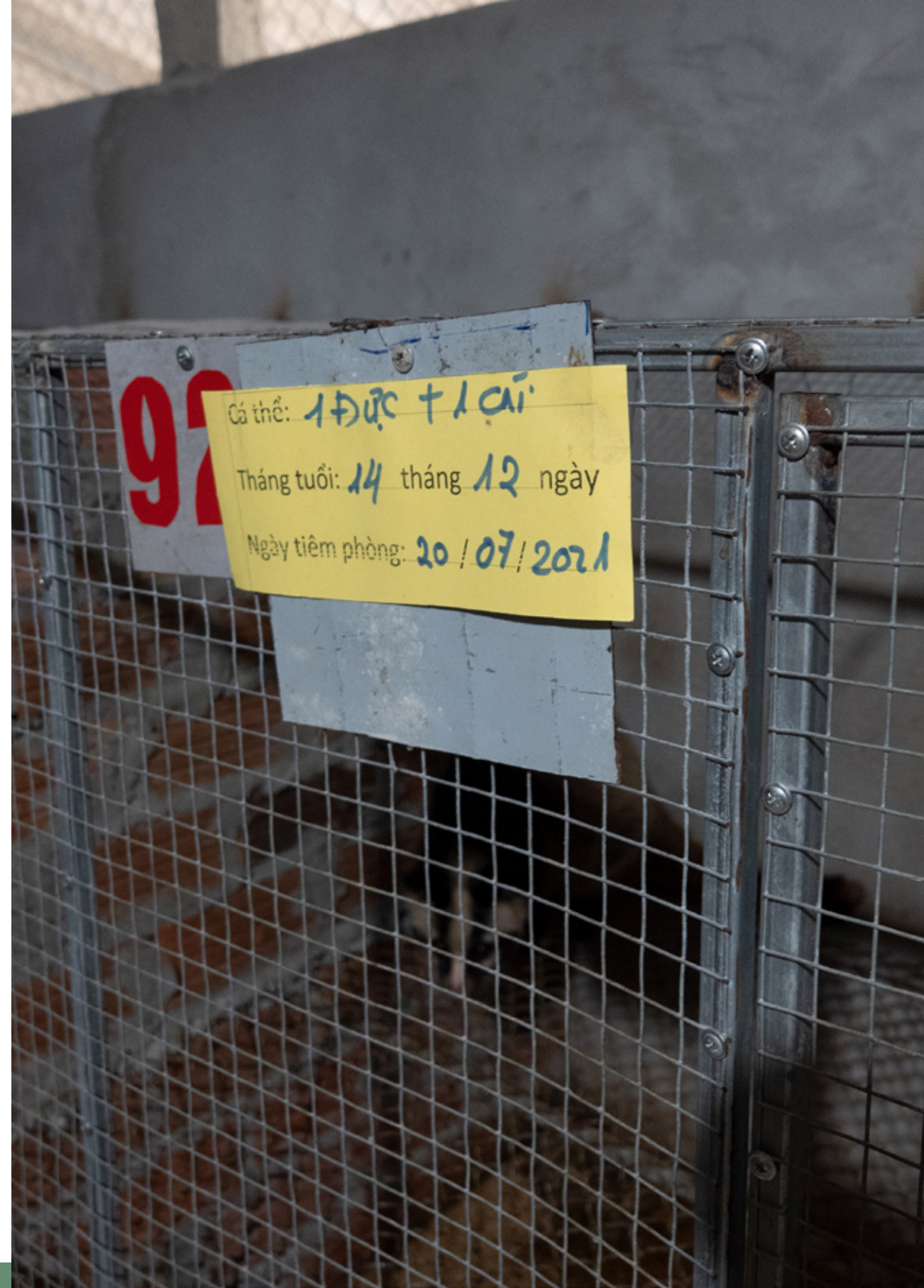
Category 7: Staff safety and capacity



This category focuses on ensuring that all management and staff are well-trained in biosecurity procedures and that personal protective equipment is used correctly. It includes regular biosecurity training, proper use of PPE, and clear understanding of roles and responsibilities. Staff safety and capacity are critical for maintaining a disease-free environment.

Recommended measures for inclusion into the new Decree:

- 12 Written biosecurity procedures in line with national laws and guidelines are available in the facility and biosecurity training for all management and staff implemented on a regular basis, ensuring that role and responsibility of each personnel are clearly understood, and biosecurity measures rigorously applied.
- 13 Personal protective equipment, such as gloves, masks, respirators, gowns and boots, are available at the farm in stock, and appropriately used by staff and visitors when interacting with or close to animals.



5.2 Insights from international guidelines that can support the development of biosecurity guidelines and other materials for the wildlife farm industry

This section discusses the nine matrix indicators that were used to analyse the structure and format of the assessed documents. A brief introduction to the purpose of each indicator is given, followed by the interpretation of the results. Recommendations are given for each indicator, aiming to provide insight into which approach and methods could be valuable when developing more detailed guidelines and other communications under the umbrella of the new Decree.

■ Criterion 1: Approach



This criterion highlights the method employed in formulating the guidelines, indicating whether they were devised by adopting a top-down approach, or developed collaboratively involving different stakeholders. This insight aids in understanding the source and perspective of the information provided.

The approach used in the development of the assessed guidelines was top down in 73% of the documents and participatory in 27% of the documents. This was an interesting analysis outcome, as documents that provide guidelines for a specific industry (in this case the farming of wildlife and livestock) would benefit from a participatory approach. When looking at this from a One Health perspective, in fact, a participatory approach to guideline development would allow for inputs of a wide range of stakeholders, including those who will be affected by the guidelines, and this ensures that the guidelines are relevant, practical, and more likely to be followed. Additionally, a participatory approach would help to build consensus and ownership of the guidelines, which can lead to better implementation.

Recommendations for the development of biosecurity guidelines and other materials:

- Adopt a participatory approach for developing biosecurity measures in wildlife farming, involving all concerned stakeholders such as farm owners, workers, and local authorities.
- Implement a One Health approach to ensure biosecurity measures are practical, culturally appropriate, and promote long-term compliance in the wildlife farming industry.

■ Criterion 2: Scope



This criterion categorises the guidelines based on their target sector, highlighting whether they are for the livestock or wildlife sectors or if

they specifically address individual diseases. This classification helps to define the primary focus and intended audience of each document.

The scope of the majority of documents is either on wildlife (33%) or livestock (47%), likely because biosecurity can vary between different industries. For example, biosecurity measures tailored for a mink farm, might not all be suitable for a dairy farm. Having guidelines that are specific to each industry makes them more relevant and easier to apply for those who own, work on, or visit these farms. Tailoring these guidelines to meet the unique needs of each industry could therefore make them more effective. However, while it is true that industry-specific guidelines are crucial for addressing the unique biosecurity needs of different sectors, it is equally important to acknowledge the value of universal biosecurity measures. Basic practices such as the use of personal protective equipment (PPE), effective pest control, and rigorous animal quarantine protocols are fundamental aspects of biosecurity that apply across all types of animal husbandry and farming.

Recommendations for the development of biosecurity guidelines and other materials:

- Include a broad biosecurity framework with mandatory minimum biosecurity standards in the new Decree, applicable across all wildlife farming sectors, regardless of the species being farmed and size of the farm.
- Develop sector-specific guidelines under the Decree, tailored to different species and/or taxonomic groups and guiding the implementation of comprehensive and relevant biosecurity practices at facility level across the diverse wildlife farming industry.

■ Criterion 3: Focus



The focus criterion distinguishes the documents based on the specificity of animal groups they address. It identifies if the documents target a single taxon, multiple related taxa, or all taxa broadly. This determination offers insight into the range of animals covered by each document.

Building on the previous paragraph (see above Criterion 2: Scope), it is noteworthy that the focus of the fifteen documents predominantly centres on specific taxonomic families. Despite the majority of these documents being tailored to either wildlife or livestock sectors, 40% of them concentrate on a single taxonomic family, while 47% cover a selection of taxonomic families. Only 13% of the documents focus on all taxa. The detailed attention to specific animal families allows for the development of targeted biosecurity strategies that go beyond base-level biosecurity measures.

Recommendation for the development of biosecurity guidelines and other materials:

- Develop sector-specific guidelines under the Decree, tailored to different species and/or taxonomic groups, guiding the implementation of comprehensive and relevant biosecurity practices across diverse wildlife farming sectors.

Criterion 4: Obligation



This criterion evaluates the nature of compliance required by the guidelines. It distinguishes whether adhering to the standards is compulsory, or if farmers or other target groups can choose to follow them on a voluntary basis. This distinction highlights the level of obligation placed upon individuals or entities using the documents.

In the analysis of biosecurity guidelines, it was found that a significant majority of the documents (87%) recommend biosecurity practices that are not mandatory but rather suggested for voluntary adoption. This approach encourages adherence through training and education, rather than through enforcement. It should be noted that this study did not focus on any legal frameworks, and so this number should not be interpreted as the documents' source countries not having any legal requirements in place. The majority of documents that were analysed in this study are guidelines that provide farmers and other target groups with specific and practical measures. Voluntary measures, when widely appreciated and universally adopted, can be highly effective in enhancing biosecurity.

However, the remaining 13% of documents mandate certain biosecurity practices, reflecting a more stringent approach. While mandatory measures assume compliance, enforcing these can be both expensive and challenging. This highlights a balance between encouraging voluntary best practices through farmers' education and engagement and implementing essential regulations to safeguard against biosecurity risks.

Recommendations for the development of biosecurity guidelines and other materials:

- Incorporate mandatory minimum biosecurity standards into the Decree to establish a baseline for all wildlife farming operations, ensuring essential biosecurity practices are uniformly applied across the industry.
- Develop additional, comprehensive biosecurity measures tailored to specific species or taxonomic groups, providing detailed guidance for farms specialising in these areas to enhance their biosecurity protocols beyond the minimum standards.

Ideally these more comprehensive measures, including both voluntary best practices and mandatory regulations, should be developed following a trans-disciplinary, multi-sectoral and collaborative approach to promote the universal appreciation and understanding of biosecurity at the farm level, support the consistent application of jointly defined biosecurity measures, and ensure their joint monitoring.

Criterion 5: Target audience



This criterion examines the intended recipients or beneficiaries of the guidelines. It determines whether the directives are crafted for farm owners, farm workers, veterinary personnel, local authorities, or any other specific group. This insight can help understand the expected proficiency level and responsibility of the audience in implementing the guidelines.

This specificity is important for ensuring that the measures are relevant and practical for different audiences. When guidelines are written with a particular audience in mind, they are more likely to address the unique challenges and needs of that group, thereby enhancing the likelihood of adherence. Instructions intended for veterinary professionals might focus more on technical aspects of disease management, while those for farm workers might focus on daily biosecurity practices. In 67% of the assessed documents, background information and specific measures are provided for multiple target groups, providing a comprehensive overview for all actors involved in maintaining biosecurity standards at the farm level. Three of the documents (20%), were specifically written for farm owners. For example, the Biosecurity Standards published by the Ministry of Agriculture, Forestry and Fisheries in Japan (MAFF Government of Japan, 2021) - which is a mandatory document -, orders farm owners to implement biosecurity measures on their farms, or otherwise appoint a biosecurity manager in order to make sure that the farm complies with relevant laws and regulations. Owners are obliged to develop a biosecurity plan for their farm and communicate this to staff by distributing printed manuals, installing signs and other formats, such as staff training on what to do in case of disease outbreaks.

Recommendations for the development of biosecurity guidelines and other materials:

- Create biosecurity guidelines tailored to specific audience groups, such as farm owners, workers, and veterinarians, ensuring each set addresses their unique roles, responsibilities, and challenges for more effective implementation.
- Ensure clear communication of specific responsibilities for different stakeholders, aiming to enhance their understanding and adherence to biosecurity measures.

Criterion 6: Document format



The criterion evaluates the length and structure of the guidelines, and analyses whether the document is practical and easy to follow and understand or rather if it adopts a complex language. The format of a document can influence its ease of use, with lengthier documents potentially being more comprehensive, but possibly less accessible for quick reference.

Of the documents that were analysed in this study, 27% were published in a short format, 27% medium sized and easy to follow, 33% were detailed and practical and two high-level documents published by FAO and WOAHA respectively (13% of total) were detailed and written in complex language as they are intended for authorities and policymakers.

The effectiveness of biosecurity guidelines depends on their ability to convey information clearly to a diverse audience. Different formats can cater to different needs: comprehensive documents provide in-depth information for those requiring detailed understanding, while concise versions, such as fact sheets and checklists, are ideal for quick reference in practical situations. Additionally, varying the complexity of language can make the guidelines accessible to a broader range of users, from experts to those with less technical backgrounds.

Recommendations for the development of biosecurity guidelines and other materials:

- Develop biosecurity guidelines in diverse formats, catering to the varied informational needs of different users. Diverse formats may include brief fact sheets with infographics for quick reference, practical guidelines that comprise biosecurity checklists, as well as comprehensive documents tailored to special audiences, such as veterinarians and high-level officials, for an in-depth study of the topic.
- Tailor the complexity of language in biosecurity guidelines to specific audiences, ensuring clear communication and effective implementation across all levels of expertise.

Criterion 7: Definition of biosecurity



This criterion was used to determine whether the guidelines provide a clear definition of “biosecurity”. A well-defined concept is crucial to ensure consistent understanding and compliance among stakeholders, as ambiguity can lead to varied interpretations and potential lapses in implementation.

In the analysis of the documents, the presence and nature of a biosecurity definition were key considerations. The documents fell into three categories:

those providing a general definition of biosecurity (27% of documents), those offering a revised definition tailored to their specific context (47%), and those without any definition (26%). The significance of including a clear definition cannot be overstated. A well-articulated definition of biosecurity ensures a unified understanding among all stakeholders. This clarity is essential for effective communication and implementation of biosecurity measures. Without a clear definition, there is a risk of varied interpretations, which can lead to inconsistent practices and potentially compromise biosecurity efforts. Therefore, the presence of a clear and context-specific definition in these documents is crucial for aligning understanding and ensuring that biosecurity measures, checklists, and related materials are relevant and effectively applied.

Recommendations for the development of biosecurity guidelines and other materials:

- Include a clear, context-specific definition of biosecurity in the new Decree, as well as in subsequent guidelines and communication materials, ensuring it is understandable across all stakeholder levels, from farm workers to policymakers.
- Use this definition as a basis for developing consistent and relevant biosecurity measures, checklists, and educational materials, to encourage effective and uniform implementation.

Criterion 8: Roles of actors



The criterion analyses if single or multiple actors are listed in the guidelines, and their roles and responsibilities defined to support the biosecurity level of the facility. The engagement of all actors is essential to ensure the adoption of biosecurity standards in commercial facilities breeding animals. In the realm of wildlife farming, the involvement and clear definition of roles for various actors – including farm owners, staff, veterinarians, and government officials – is crucial for effective biosecurity. The analysis of the documents reveals that 80% have taken a comprehensive approach by listing multiple actors and detailing their specific roles and responsibilities. This approach is beneficial for several reasons.

Firstly, it ensures a multi-faceted perspective on biosecurity, acknowledging that effective management requires input and cooperation from various sectors and groups of individuals. By outlining the roles of different actors, the guidelines facilitate a more coordinated and cohesive approach to biosecurity. This coordination is particularly important in wildlife farming, where the risk of disease emergence and transmission can be high.

6. CONCLUSIONS AND OUTLOOK

Secondly, having detailed role descriptions helps in creating a sense of accountability among all people involved. Each actor understands their specific duties and how their actions or inactions can impact the overall biosecurity of the facility. This clarity not only aids in the smooth functioning of daily operations but also in rapid response and effective management during a biosecurity breach or a disease outbreak.

Lastly, the inclusion of multiple actors with defined roles in the guidelines reflects a holistic approach to biosecurity. It recognises that effective biosecurity is not the responsibility of a single entity but a collective effort.

Recommendations for the development of biosecurity guidelines and other materials:

- Establish clear, detailed roles and responsibilities for various actors in wildlife farming, including farm owners, staff, veterinarians, and government officials, in biosecurity guidelines and other communication materials.
- Promote a collaborative, multi-sectoral approach in biosecurity planning and management, emphasising the importance of cooperation and input from all involved parties for effective disease prevention and control.

Criterion 9: Biosecurity checklists



The criterion assesses whether the guidelines suggest the development or provide examples of checklists to implement and self-monitor the adoption of biosecurity measures at the facility level. In the analysis of the documents, it was observed that 60% did not mention biosecurity checklists. While 20% of the documents acknowledged the concept of checklists, they did not include one. Only 20% provided a detailed checklist. Checklists can be an important tool as part of a farm-specific biosecurity plan, as they offer a clear and practical way for individuals, such as farmers or government officials, to understand and manage biosecurity practices. Checklists simplify complex procedures, ensuring that key biosecurity measures are consistently applied and not overlooked.

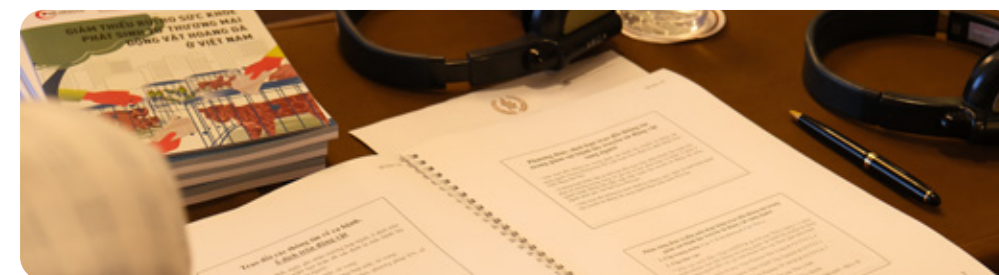
Recommendations for the development of biosecurity guidelines and other materials:

- Consider the inclusion of detailed biosecurity checklists in future guidelines to facilitate practical implementation and monitoring of biosecurity measures.
- Promote the use of checklists for both individual practitioners, like farmers, and oversight bodies, such as government officials, to enhance understanding and management of biosecurity practices.

The systematic analysis of the fifteen international biosecurity guidelines revealed gaps in the current mandatory biosecurity measures within the Vietnamese legislation and, at the same time, opportunities to develop a more robust and effective legal and policy framework for the prevention and control of zoonotic disease spillover and spread in the wildlife farming industry.

This report provides recommendations for the legal domain related to the safe management of wildlife farms in Viet Nam. It recommends a collection of biosecurity measures to be incorporated into the new Decree that will replace Decree No. 06/2019/ND-CP and Decree No. 84/2021/ND-CP on the management of endangered, precious, and rare wild fauna and flora. Considering the large number of wildlife farms in the country, in some cases breeding species that pose a high risk of zoonotic spillover, a comprehensive legal basis to mitigate pandemic risks is of utmost importance.

All measures from within the analysed international guidelines were collected and subsequently categorised to achieve a full picture of what biosecurity in farm settings entails globally, and to promote a better understanding of where the current Vietnamese legislation could be improved. This resulted in seven categories (Site management, Waste management, Feed management, Veterinary prevention, Animal management, Transport, Staff safety and capacity) which provide a framework for Viet Nam to develop comprehensive legislation to mitigate the risk of zoonotic spillover from its wildlife farming practices. When compared with the seven categories, the current biosecurity measures incorporated into the Law on Veterinary Medicine (79/2015/QH13) proved not to cover the full range of domains within biosecurity. The revision and expansion of the current measures is necessary to guarantee basic biosecurity standards across the wildlife farming industry.



However, revising and updating the biosecurity measures in the new Decree should be seen as merely a starting point. The universal adoption of biosecurity measures in the wildlife farming industry of Viet Nam requires a stepwise approach. The first step would be to create a country-wide accepted and understood definition of what biosecurity means, specifically in the context of the country and its large and varied wildlife farming industry. Pham et al. (2022a) found that poor understanding of wildlife policies among wildlife farmers is one of the challenges for wildlife management in Viet Nam, as well as a lack of understanding around human-animal health risks and how to implement safeguards and measures to mitigate these risks. A standardised definition of biosecurity and clear, comprehensive biosecurity measures will provide a solid basis for policy reform in Viet Nam. Subsequent steps would focus on drafting feasible and clear national biosecurity standards that align with legal requirements and eventually inform the development of biosecurity plans at facility level. The latter will differ based on the size, species and zoonotic risk identified in each farm and should include practical tools, such as checklists, to help farmers implement the set measures, and veterinary staff and enforcement authorities monitor their application.

Overall, effective and sustainable results in the safe management of wildlife farms in Viet Nam will be achieved only through a multi-sectoral, trans-disciplinary and collaborative approach that engages all concerned actors. Adopting the One Health approach is essential across the whole process, starting from the revision of the policy framework to the development, implementation and monitoring of biosecurity plans at farm level. The accurate application of evidence-based locally adapted biosecurity measures at the farm level, will require the active engagement of farmers and animal keepers and an effective training and biosecurity awareness programme. Preventing and controlling zoonotic disease spillover and spread in the wildlife farming industry in Viet Nam is a shared responsibility of policymakers, farms owners and managers, veterinary and animal health professionals, as well as farm staff, visitors and the community at large.

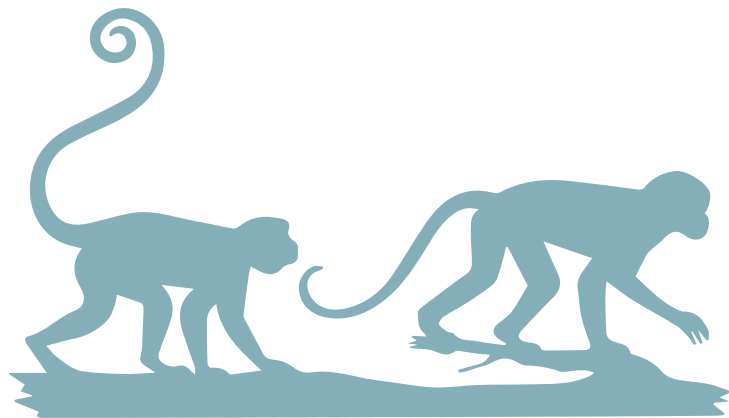


References



- [1] ANAC (2018) National Biosecurity Guide for the Livestock and Poultry Feed Sector Animal Nutrition Association of Canada National Biosecurity Guide for the Livestock and Poultry Feed Sector. Ottawa, Canada. Available at: <https://www.anacan.org/feed-industry/public-resources/national-biosecurity-guide-for-the-livestock-and-poultry-feed-sector/>.
- [2] Bhutan Agriculture and Food Regulatory Authority (2015) In-country Livestock Biosecurity Guidelines. Available at: <https://www.bafr.gov.bt/wp-content/uploads/2022/08/In-country-Livestock-Biosecurity-Guidelines-1.pdf>.
- [3] FAO (2007) Biosecurity Toolkit. Rome, Italy. Available at: <https://www.fao.org/documents/card/fr/c/dabe206a-5776-5bb7-83d3-316155d2d4f9/>.
- [4] FAO, OIE and WHO (2021) A key role for veterinary authorities and animal health practitioners in preventing and controlling neglected parasitic zoonoses A handbook with focus on Taenia solium, Trichinella, Echinococcus and Fasciola. Geneva, Switzerland. Available at: <https://www.who.int/publications/i/item/9789240040038>.
- [5] Government of Canada (2016) National Farm - Level Mink Biosecurity Standard - Producers' Guide - Animal health - Canadian Food Inspection Agency. Available at: <https://inspection.canada.ca/animal-health/terrestrial-animals/biosecurity/standards-and-principles/mink/eng/1377173051041/1377173051775?chap=0> (Accessed: 21 September 2023).
- [6] Health and Safety Executive - UK Government (no date) Zoonoses - Agriculture - HSE. Available at: <https://www.hse.gov.uk/agriculture/topics/zoonoses.htm> (Accessed: 21 September 2023).
- [7] Huber, N. et al. (2022) 'What is a biosecurity measure? A definition proposal for animal production and linked processing operations', *One Health*, 15, p. 100433. Available at: <https://doi.org/10.1016/J.ONEHLT.2022.100433>.
- [8] Illinois Department of Agriculture (2023) Biosecurity Measures. Available at: <https://agr.illinois.gov/animals/animalhealth/biosecurity-measures.html> (Accessed: 21 September 2023).
- [9] Li, J. et al. (2023) 'Government regulations, biosecurity awareness, and farmers' adoption of biosecurity measures: Evidence from pig farmers in Sichuan Province, China', *Frontiers in Sustainable Food Systems*, 7. Available at: <https://doi.org/10.3389/fsufs.2023.1106766>.
- [10] MAFF Government of Japan (2021) Biosecurity Standards (Horses). Tokyo, Japan. Available at: https://www.maff.go.jp/e/policies/ap_health/animal/attach/pdf/index-12.pdf.
- [11] Mutua, E.N. et al. (2022) 'From policy to practice: An assessment of biosecurity practices in cattle, sheep and goats production, marketing and slaughter in Baringo County, Kenya', *PLoS ONE*, 17(4 April). Available at: <https://doi.org/10.1371/journal.pone.0266449>.
- [12] National Milk Producers Federation (2022) Everyday Biosecurity - Reference Manual Version 1. Siler City NC, USA. Available at: https://nationaldairyfarm.com/wp-content/uploads/2022/10/FARM_Everyday-Biosecurity-Version-1-Reference-Manual_FINAL_101822_Web_pages.pdf.
- [13] Northern Territory Government (2010) BIOSECURITY of NT Crocodile Farms-Hygiene Procedures and Biosecurity Concerns. Available at: https://nt.gov.au/_data/assets/pdf_file/0005/268439/biosecurity-of-nt-crocodile-farms-hygiene-procedures-and-biosecurity-concerns.pdf.
- [14] OIE (2021) Guidance on working with farmed animals of species susceptible to infection with SARS-CoV-2. Paris, France. Available at: <https://www.woah.org/app/uploads/2021/06/en-oie-guidance-farmed-animals.pdf>.
- [15] Pham, Thuy Thu et al. (2022a) 'COVID-19 impacts, opportunities and challenges for wildlife farms in Binh Duong and Ba Ria Vung Tau, Vietnam', *Global Ecology and Conservation*, 40, p. e02314. Available at: <https://doi.org/10.1016/J.GECCO.2022.E02314>.
- [16] Pham, Thu Thuy et al. (2022b) 'Policymaker perceptions of COVID-19 impacts, opportunities and challenges for sustainable wildlife farm management in Vietnam', *Environmental science & policy*, 136, pp. 497-509. Available at: <https://doi.org/10.1016/j.envsci.2022.07.017>.
- [17] Rohr, J.R. et al. (2019) 'Emerging human infectious diseases and the links to global food production', *Nature Sustainability*. Available at: <https://doi.org/10.1038/s41893-019-0293-3>.
- [18] Rusman, M. and Fascendini, M. (2023) Management of Wildlife Farms in Viet Nam Framework of actions for the mitigation of zoonotic disease risks. Hanoi, Viet Nam.

- [19] USDA and CDC (2020) Interim SARS-CoV-2 Guidance and Recommendations for Farmed Mink and Other Mustelids 1. Available at: https://www.aphis.usda.gov/publications/animal_health/sars-cov-2-mink-guidance.pdf. The document included in the study has been recently updated and changed. For a copy used in this study, please contact the authors of this report.
- [20] USDAVIS (2020) Care and Use of Mustelidae: Ferrets, Weasels, Otters, Skunks, Badgers. Available at: <https://safetyservices.ucdavis.edu/units/occupational-health/surveillance-system/zoonotic-diseases/mustelidae> (Accessed: 21 September 2023).
- [21] Wikramanayake, E. et al. (2021) 'A tool for rapid assessment of wildlife markets in the Asia-Pacific Region for risk of future zoonotic disease outbreaks', *One Health*, 13. Available at: <https://doi.org/10.1016/j.onehlt.2021.100279>.
- [22] Wildlife Health Australia (2018) National Wildlife Biosecurity Guidelines. Sydney, NSW. Available at: https://wildlifehealthaustralia.com.au/Portals/0/ResourceCentre/BiosecurityMgmt/National_Wildlife_Biosecurity_Guidelines.pdf.
- [23] WOA (2023a) Terrestrial Code Online Access. Available at: <https://www.woah.org/en/what-we-do/standards/codes-and-manuals/terrestrial-code-online-access/> (Accessed: 21 September 2023).
- [24] WOA (2023b) Terrestrial Code Online Access - Glossary. Available at: <https://www.woah.org/en/what-we-do/standards/codes-and-manuals/terrestrial-code-online-access/?id=169&L=1&htmlfile=glossaire.htm> (Accessed: 21 September 2023)



APPENDIX 1: Summary of 15 international guidelines analysed by the study

GUIDELINE 1) A key role for veterinary authorities and animal health practitioners in preventing and controlling neglected parasitic zoonoses (FAO, OIE and WHO, 2021)

| | |
|-------------------|--|
| Publishing date | 2021 |
| Type of document | Technical guidelines |
| Country | Asia and Pacific Region |
| Issuing authority | FAO WHO WOAHA |
| Target audience | Veterinary authorities and animal health practitioners |

The main focus of this document is to highlight the important role that veterinary authorities and animal health practitioners play in preventing and controlling neglected parasitic zoonoses. The document provides information and interventions that the animal health sector can implement to prevent human and animal diseases caused by these parasites. It emphasises the need for awareness, knowledge, and collaboration among veterinary authorities, public health practitioners, animal health practitioners, and animal owners to effectively control and prevent neglected parasitic zoonoses. Developed by the Regional Tripartite organisations (FAO, OIE, WHO) in the Asia and Pacific region, and promoting the One Health approach.

GUIDELINE 2) Guidance on working with farmed animals of species susceptible to infection with SARS-CoV-2 (OIE, 2021)

| | |
|-------------------|--|
| Publishing date | 2021 |
| Type of document | High-level guidance |
| Country | Global |
| Issuing authority | WOAH |
| Target audience | Veterinary services, public health officials, animal keepers / handlers/ owners / breeders, government officials, private sector, general public |

This document provides guidance on working with farmed animals of species susceptible to infection with SARS-CoV-2. The document aims to support Veterinary Services, public health, and other partners in reducing the risk of introduction of SARS-CoV-2 to susceptible farmed animal populations using a One Health approach. It addresses the risks and risk pathways associated with different farming systems and proposes measures to follow in case of SARS-CoV-2 introduction to a farm.

GUIDELINE 3) Interim SARS-CoV-2 Guidance and Recommendations for Farmed Mink and Other Mustelids (USDA and CDC, 2020)

| | |
|-------------------|---|
| Publishing date | 2020 |
| Type of document | Government guidance |
| Country | USA |
| Issuing authority | United States Department of Agriculture (USDA), US Centre for Disease Control and Prevention (CDC), State Animal and Public Health Partners |
| Target audience | Mink farm owners, managers, and employees |

The purpose of the document is to provide guidance and recommendations for the prevention and control of COVID-19 in mink farms. It includes information about the current knowledge of mink and COVID-19, clinical signs of infection in mink, precautions for mink farm workers, and measures to be taken on the farm to minimise the spread of the virus. The document emphasises the importance of implementing infection control measures, such as practising good hygiene, wearing personal protective equipment (PPE), maintaining social distancing, and educating workers about COVID-19 prevention. It also provides recommendations for sick leave policies, employee training, and communication strategies.

GUIDELINE 4) Care and Use of Mustelidae (USDAVIS, 2020)

| | |
|-------------------|--|
| Publishing date | 2020 |
| Type of document | Technical guidelines |
| Country | USA |
| Issuing authority | University of California Davis |
| Target audience | People involved in the care and use of mustelids |

This document provides information on zoonotic diseases associated with mustelids, which are known for their sharp teeth and potential for transmitting diseases like rabies. Rabies is a viral infection that can be transmitted through direct contact with saliva, mucus membranes, or blood. Other zoonotic diseases mentioned include salmonellosis and campylobacteriosis, which are bacterial infections that can be contracted through contaminated food or water. The document emphasises the importance of hand hygiene, wearing gloves, seeking medical attention for injuries, and informing physicians about working with mustelids. It also provides links to additional resources for zoonotic diseases.

GUIDELINE 5) National Farm - Level Mink Biosecurity Standard - Producers' Guide (Government of Canada, 2016)

| | |
|-------------------|------------------------|
| Publishing date | 2016 |
| Type of document | Government guidance |
| Country | Canada |
| Issuing authority | Food Inspection Agency |
| Target audience | Mink farmers |

The main focus of this document is to provide mink producers with guidelines and recommendations for implementing a biosecurity programme on their farms. The guide covers various aspects of biosecurity, including access management, animal management, and operational management. It aims to help producers protect their mink herds from the introduction and spread of microbial pathogens, such as Aleutian disease, mink virus enteritis, mink distemper, and haemorrhagic pneumonia. The guide also emphasises the importance of ongoing implementation of biosecurity measures and the collaboration between industry, government, and subject matter experts in developing and improving biosecurity practices.

GUIDELINE 6) National Wildlife Biosecurity Guidelines (Wildlife Health Australia, 2018)

| | |
|-------------------|--|
| Publishing date | 2018 |
| Type of document | Technical guidelines |
| Country | Australia |
| Issuing authority | Wildlife Health Australia |
| Target audience | All people who work or interact with wildlife in Australia, including wildlife managers, researchers, veterinarians, carers, and others involved in wildlife-related activities. |

The main focus of these guidelines is to provide guidance on managing the risks associated with infectious diseases transmitted between wildlife, humans, and domestic animals. The purpose of the document is to promote good biosecurity practices among individuals and organisations working with Australian wildlife in order to protect the health and safety of wildlife, workers, and the community. It emphasises the importance of minimising the spread of infectious diseases and provides recommendations for assessing and managing biosecurity risks in various wildlife-related activities.

GUIDELINE 7) National Biosecurity Guide for the Livestock and Poultry Feed Sector (ANAC, 2018)

| | |
|-------------------|---|
| Publishing date | 2018 |
| Type of document | Industry guidelines |
| Country | Canada |
| Issuing authority | Animal Nutrition Association of Canada (ANAC) |
| Target audience | Canadian feed manufacturing companies and their employees |

The National Biosecurity Guide for the Livestock and Poultry Feed Sector is a document developed by the Animal Nutrition Association of Canada. Its goal is to provide guidelines for Canadian feed manufacturing companies and their employees to limit the introduction and spread of pathogens. The guide

emphasises the importance of biosecurity in improving productivity, reducing disease risks, protecting human health, and maintaining business reputation and markets. It covers various aspects of biosecurity, including people and vehicles, facilities, equipment, and processes. The guide also emphasises the need for planning, training, and documentation to assess pathogen risks and implement effective biosecurity practices. Overall, the guide aims to help feed suppliers identify areas for improvement and collaborate with suppliers and producers to achieve biosecurity goals.

GUIDELINE 8) Biosecurity Measures (Illinois Department of Agriculture, 2023)

| | |
|-------------------|--------------------------------------|
| Publishing date | 2023 |
| Type of document | Government guidance |
| Country | USA, State of Illinois |
| Issuing authority | Department of Agriculture |
| Target audience | Farm owners in the State of Illinois |

This short document contains an overview of biosecurity measures to avoid disease spread on farms. It is a short and to the point document.

GUIDELINE 9) Zoonoses Fact Sheets (Health and Safety Executive - UK Government, no date)

| | |
|-------------------|---|
| Publishing date | No date |
| Type of document | Government guidance |
| Country | UK |
| Issuing authority | Health and Safety Executive |
| Target audience | All people working with animals, including farmers, agricultural workers, and those involved in animal care and management. |

This is a website with a collection of zoonotic diseases. Each disease is described in a fact sheet with information such as background, incidence and transmission, occupations and processes where the disease poses a risk, clinical information, control and further information.

GUIDELINE 10) Biosecurity of Northern Territory Crocodile Farms - Hygiene procedures and biosecurity concerns (Northern Territory Government, 2010)

| | |
|-------------------|---|
| Publishing date | 2010 |
| Type of document | Government guidance |
| Country | Australia, Northern Territory |
| Issuing authority | NT Government |
| Target audience | Staff and management of crocodile farms who are responsible for ensuring the health and safety of the hatchlings and the overall operation of the farm. |

This document provides guidelines for biosecurity measures and hygiene procedures for preventing the introduction and spread of infectious diseases in crocodile farms. It emphasises for example the importance of maintaining a clean and sterilised environment for crocodile hatchling pens and recommends not introducing sick or healthy older crocodiles to the hatchlings. The document also highlights the need for monitoring water temperature and providing heating if necessary. It suggests having dedicated staff to work with the hatchlings to minimise the spread of infection from older crocodiles. Additionally, the document includes standard operating procedures for cleaning crocodile pens and outlines general biosecurity measures such as controlling farm personnel and visitors, proper cleaning practices, and record-keeping for deaths and illnesses.

GUIDELINE 11) Biosecurity Standards (Horses) (MAFF Government of Japan, 2021)

| | |
|-------------------|--|
| Publishing date | 2021 |
| Type of document | Government guidance |
| Country | Japan |
| Issuing authority | Ministry of Agriculture, Forestry and Fisheries (MAFF) |
| Target audience | Owners of horse farms or facilities involved in horse rearing and management |

The purpose of the document on biosecurity standards for horses is to outline the basic requirements and guidelines for owners of horses to prevent the outbreak and spread of horse infectious diseases. The document emphasises the responsibility of horse owners to establish and implement a biosecurity system, comply with relevant laws and regulations, and raise awareness of biosecurity management. It also provides instructions on various aspects of biosecurity, including cleaning and disinfection of facilities, daily health observation of horses, avoidance of pathogen spread outside the biosecurity area, instruction on health management by veterinarians, and prevention of pathogen entry into the biosecurity area. The document aims to ensure the health and well-being of horses and minimise the risk of infectious diseases.

GUIDELINE 12) Everyday Biosecurity (National Milk Producers Federation, 2022)

| | |
|-------------------|---------------------------------|
| Publishing date | 2022 |
| Type of document | Industry guidelines |
| Country | USA |
| Issuing authority | Milk Producers Federation |
| Target audience | Owners, staff, visitors, family |

The purpose or objective of the document is to provide information and guidance on biosecurity practices for dairy farmers. It aims to help farmers understand and implement measures to prevent the spread of diseases, ensure animal health and welfare, and maintain the safety and quality of animal products. The document covers various aspects of biosecurity, including animal health and disease monitoring, animal movements and contact, cleaning and disinfection, management of animal products, personnel hygiene, and vehicles and equipment hygiene. It also provides resources and tools for farmers to develop and implement biosecurity plans on their farms.

Remarks: The document mentions the Veterinarian-Client-Patient Relationship (VCPR) and the role of the Veterinarian of Record (VOR) in making recommendations for animal health. It also suggests that veterinarians should sign a VCPR annually to formalise the relationship.

GUIDELINE 13) In-country Livestock Biosecurity Guidelines (Bhutan Agriculture and Food Regulatory Authority, 2015)

| | |
|-------------------|---|
| Publishing date | 2015 |
| Type of document | Government guidance |
| Country | Bhutan |
| Issuing authority | Bhutan Agriculture and Food Regulatory Authority (BAFRA) |
| Target audience | BAFRA officials and livestock officers of the Department of Livestock (DoL) in Bhutan |

The main focus and purpose of the “In-Country Livestock Biosecurity Guidelines” document is to provide a reference resource for officials and livestock officers in Bhutan to practise good livestock biosecurity. The document outlines standard biosecurity practices that can be promoted in all farm operations, with a specific emphasis on commercial poultry and dairy farms. It also includes steps for conducting a livestock movement assessment process that incorporates routine evaluation of farm biosecurity practices and makes good biosecurity a condition for permitted livestock movement. The guidelines aim to strengthen the implementation of livestock biosecurity within the country and prevent and control the spread of livestock diseases.

GUIDELINE 14) Biosecurity Toolkit (FAO, 2007)

| | |
|-------------------|---|
| Publishing date | 2007 |
| Type of document | High-level guidance |
| Country | Global |
| Issuing authority | Food and Agriculture Organisation of the United Nations |
| Target audience | Officials at policy and operational level plus development agencies, consultants and trainers |

The purpose of this publication is to assist developing countries in their efforts to move towards a more coherent and holistic approach to biosecurity. The toolkit provides an introduction on biosecurity principles and components, a

guide to assess biosecurity capacity, and an overview and framework manual for biosecurity risk analysis. It aims to provide a contemporary context for the development and implementation of a harmonised and integrated biosecurity approach across all sectors.

Remarks: The document adopts an integrated cross-sector approach to better manage biosecurity as a means to protect public health, agricultural production, and the environment.

GUIDELINE 15) Terrestrial Animal Health Code (WOAH, 2023a)

| | |
|-------------------|--|
| Publishing date | 2023 |
| Type of document | High-level guidance |
| Country | Global |
| Issuing authority | WOAH |
| Target audience | Veterinary Authorities of WOA Member Countries |

This very comprehensive high level guidance publication provides standards to improve animal health, animal welfare and veterinary public health. Updated and new standards are based on the latest scientific information and are the responsibility of the Terrestrial Animal Health Standards Commission. The standards in the Terrestrial Animal Health Code are updated and published annually.

Remarks: Biosecurity is mainly addressed in Section 4 Disease prevention and control and Chapter 6.5 Biosecurity Procedures in Poultry Production of the Terrestrial Animal Health Code.

Project "Reducing Health Risks in the Wild Animal Trade in Viet Nam "

Unit 021, 2nd Floor, Coco Building
14 Thuy Khue Str., Tay Ho District, Hanoi, Viet Nam

T: +84 24 39 32 95 72

I: <https://alliance-health-wildlife.org/>

