Observatory thematic study

2025

Use, challenges and impact of zoning and compartmentalisation

Part 2*: Analysis of the factors associated with the acceptance of zones by trade partners for avian influenza, African swine fever and foot and mouth disease in WOAH Members from 2018 to 2022

* This analysis was preceded by a descriptive analysis in Part 1, and partially relies on data collected by a WOAH survey to assess the use of zoning for avian influenza (AI), African swine fever (ASF) and foot and mouth disease (FMD), alongside the associated challenges, benefits and drawbacks.

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Use, challenges and impact of zoning and compartmentalisation

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Executive summary

The international standards of the World Organisation for Animal Health (WOAH) for zoning and compartmentalisation support Members to prevent and control the spread of disease, and contribute to ensuring the safe trade of animals and related commodities. The purpose of Chapter 4.4 of the WOAH *Terrestrial Animal Health Code* is to provide recommendations on the principles of zoning and compartmentalisation to Members that wish to establish and maintain different subpopulations with a specific health status within their territory. This chapter also outlines a process by which trading partners may recognise such subpopulations. However, effective implementation of zoning and compartmentalisation standards remains challenging, and Members' capacity to fulfil these standards is still limited. The WOAH Observatory aims to monitor the implementation of WOAH standards and has therefore decided to focus its first thematic study on these two concepts of zoning and compartmentalisation, as – in this subject – implementation is key.

In the project's first phase, a survey was conducted to assess the use of zoning for avian influenza (AI), African swine fever (ASF) and foot and mouth disease (FMD) and to examine the associated challenges, benefits and drawbacks. This report, published in early 2024, provided a descriptive analysis of the results.

Many of the conclusions of the descriptive analysis provided interesting insights into zone acceptance. From the trade perspective, zone acceptance has led to significant benefits in increasing export volumes. However, it appears to be a far-from-easy process and may take more than two years to achieve. Importers and exporters alike believed that transparency and trust in the certification system were the main drivers of zone acceptance by trade partners. The report also showed that there is little literature that discusses the main drivers facilitating zone acceptance. Lack of trust, difficulty in sharing information and insufficient coordination mechanisms were mentioned as barriers to the recognition of zones (Funes *et al*., 2020).

The WOAH Observatory wished to pursue a deeper analysis of the factors favouring and impeding zone acceptance by trade partners, using supplementary data sources and methods to complement the previous recommendations on this subject.

The present analysis, carried out as part of the WOAH Observatory Programme, combines information on Members' perceptions of factors associated with zoning acceptance, together with statistical analysis of recent observed data (for AI, ASF and FMD in 2018–2022). It has shown that the factors involved in zoning acceptance by trade partners are many and various. One of the strengths of this study is the use of several methods to assess convergence of the results.

The factors associated with zone acceptance may be categorised into six themes:

- First, the **quality of Veterinary Services**, as described in Chapter 3.2 of the *WOAH Terrestrial Animal Health Code (Terrestrial Code)* and, more specifically, in Article 3.2.2 on Fundamental operating principles. Both exporters and importers perceived transparency to be an important priority (Fundamental Operating Principle No. 5 in this article). The importance of transparency for zone acceptance was also shown by the statistical and perception results for WOAH tools that enable Members to demonstrate their transparency. These tools include: the World Animal Health Information System (WAHIS); the official status of zone(s) published by WOAH; the self-declared status of zone(s) published by WOAH; and the most recently published Performance of Veterinary Services (PVS) Evaluation Report.
- Second, **trust in the certification system of animals and animal products**. This issue is related to the quality of Veterinary Services, as described in Chapter 3.2 of the *Terrestrial Code*, but is set out more fully in Article 3.2.12 on International trade. The importance of this factor was demonstrated through both methods (statistical and perception-based analysis of historical situations). It is interesting to note that the first two factors were not specific to the application of zoning standards but more closely related to the general characteristics of Veterinary Services.

- When ordered by perception, factors associated with **standards on zoning and compartmentalisation** were ranked third, after the factors related to WOAH standards for the quality of Veterinary Services. These zoning standards are described in Chapter 4.4 of the *Terrestrial Code* and, more specifically, in **Article 4.4.3** on **Principles for defining and establishing a zone or compartment.** It is worth mentioning that numerous factors were considered important or statistically significant in this category. In particular, the importance of implementing WOAH standards for zoning was reflected by the statistical association between a Member's higher PVS level of advancement for critical competency in zoning, and zone acceptance by its trading partners.
- The **stability of the epidemiological situation** was ranked highly by both importers and exporters.
- The importance of the **existence of a bilateral procedure** was rated very highly by exporters, and much lower by importers.
- Finally, some factors related to the **quality of Veterinary Services**, as described in Chapter 3.2 of the *Terrestrial Code* and, specifically, in Article 3.2.3 on **Policy and management**, were statistically associated with zone acceptance. These factors were not included in the perception questionnaire.

These results provide valuable insights for both WOAH and WOAH Members and have informed the recommendations listed in this report's conclusion.

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WOAH would like to thank all WOAH Members, Delegates, national Focal Points and other government officials who answered the questionnaires. Without these data, the knowledge and insights presented in this report on the success of and barriers to the implementation of WOAH standards on zoning would not be possible. We also wish to thank all WOAH staff who contributed to this report. We extend particular thanks to the Members of the Observatory Consultation for their feedback and guidance during the development of this report.

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AI	avian influenza
Aquatic Code	WOAH *Aquatic Animal Health Code*
ASF	African swine fever
CI	confidence interval
FMD	foot and mouth disease
GLMM	generalised linear mixed model
PVS	WOAH Performance of Veterinary Services
SPS Agreement	WTO Agreement on the Application of Sanitary and Phytosanitary Measures
Terrestrial Code	WOAH *Terrestrial Animal Health Code*
UN	United Nations
WAHIS	WOAH's World Animal Health Information System
WOAH	World Organisation for Animal Health
WTO	World Trade Organization
VLU	veterinary livestock unit

1. Background and study objectives

1.1. General considerations

In addition to its epidemiological value in the control of animal diseases, zoning is of considerable economic importance. A 2022 study, estimating the economic impact of zoning, highlighted that 'producer revenue losses are reduced by between $3 billion and $9 billion in present value terms over 10 years at a discount rate of 7%' (Hafi *et al.*, 2022). This is why it is essential to understand more fully the factors that influence the use and acceptance of zoning by commercial partners.

Background information is compiled in the Annexes of this report. It covers the concept of zoning; the importance of zoning acceptance by trade partners; and the extent of zoning implementation for avian influenza (AI), African swine fever (ASF) and foot and mouth disease (FMD); as well as findings from Report Part 1 on WOAH Members' perception of the factors associated with zone acceptance for AI, ASF and FMD by trade partners for export. As noted in Part 1 of the report, literature that discussed the main drivers facilitating zone acceptance by trade partners was scarce. Lack of trust, difficulty in sharing information and insufficient coordination mechanisms were all mentioned as barriers to the recognition of zones (Funes *et al.*, 2020).

In the 2018 report published by WOAH on the state of play of the implementation of WOAH standards by Members, a significant number of Members reported the same key challenges. These included a lack of technical expertise, outdated veterinary legislation, lack of confidence in applying risk management, lack of transparency, and failure on the part of both importing and exporting Members to respect WOAH standards (Kahn, 2018). Two years later, WOAH Technical Item 2020 on opportunities and challenges for required competencies of Veterinary Services in the context of international trade highlighted several challenges related to legislation and enforcement; interaction with stakeholders; and technical capacity before, during and after trade negotiations (WOAH, 2020).

In reference to the first part of the analysis, it was useful to compare the perceptions of importers and exporters in regard to the factors favouring zone acceptance by export trade partners. Perceptions on some points were similar. For example, both importers and exporters believed the two most important elements to be transparency about the animal health situation and confidence in certification. On the other hand, there were variations in the importance attached to the bilateral process, which ranked fourth for exporters and 11th for importers. These differences occurred despite the fact that the questions were asked in exactly the same way of both categories of respondent (importers and exporters). This suggests that the variation was due to differences in perception between importers and exporters, and to the subjectivity of the assessment. Such subjectivity is to be expected from this type of questionnaire, which is based on respondents' perceptions and experiences, rather than on measurable, documented facts.

Results from Part 1 provided an initial response to the questions posed in the second part of the report, which were further supplemented by other analytical methods. This is examined below. It is important to note that these analyses were based on data related to the characteristics of the exporting Members applying the zoning, as a group. No information was collected on which Members had or had not accepted a given Member's zones for trade. The characteristics of importing Members were therefore not covered in this analysis, nor were the characteristics of the bilateral relationship.

1.2. Study objective for Part 2: measuring statistical associations between selected factors and zone acceptance by trade partners, for the period

As mentioned above, some of the elements presented in the first part of the report provided an initial response to the objective of the study, but this was insufficient as it was based solely on the perception of respondents to the survey.

Furthermore, due to the scarcity of literature in this area, further research is needed to explore the main drivers of bilateral acceptance of zones in the context of international trade.

The following sections of Part 2 aim to supplement these results by measuring the statistical associations between selected factors and zone acceptance by trade partners for AI, ASF and FMD, in the period between 2018 and 2022. This provides a complementary methodological approach, based on historical measurements, and presents results that supplement those set out in Part 1.

The analysis in Part 2 makes it possible to statistically test certain factors perceived as important by the respondents, in addition to other factors that were not covered by the survey circulated by WOAH in 2023. This work explores the relationship between incorporating standards into regulations and the probability of having zones accepted by trading partners.

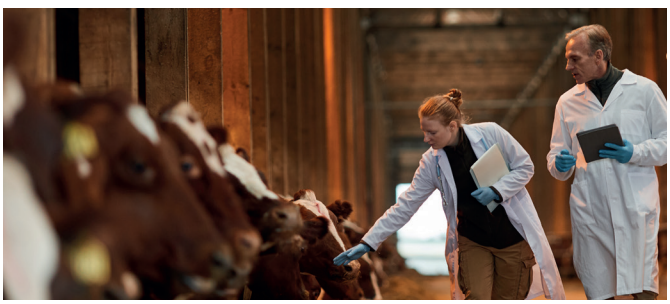
2. Approach and methodology for statistical analysis, based on past data, which complement the perception questionnaire

This section describes how the data collected during the survey were simplified, formatted, and aggregated with additional factors (data collected by WOAH or other external partners), and prepared for inferential data analysis.

2.1. Data collection

The following datasets were used for the statistical analysis:

- **Datasets extracted from the AI, ASF and FMD questionnaires** (WOAH survey conducted in 2023 – see Report Part 1).
- WOAH PVS data**: Level of advancement of critical competencies for zoning.** The PVS Pathway empowers national Veterinary Services by providing them with an extensive understanding of their strengths and weaknesses, using a globally consistent methodology based on WOAH international standards on animal health and welfare. It provides a useful external perspective that can reveal gaps, inefficiencies and opportunities for innovation. The first steps of the PVS Pathway establish a picture of a Member's situation, identify its strengths and weaknesses, and make recommendations for improvement and investment. Regular monitoring of progress allows each Member engaged in the programme to set national priorities and targets, to define activities and their cost, and then to benefit from tailored solutions. To establish the current level of performance of Veterinary Services, Critical Competencies (CCs) with five possible levels of advancement are identified in the PVS. Critical Competencies related to zoning are defined as: *the authority and capability of the VS to establish and maintain disease free zones, as necessary and in accordance with the criteria established by WOAH (and by the WTO SPS Agreement where applicable)*. See more information on the WOAH web page for PVS Pathway.
- WAHIS **data:** Control measures **reported in six-monthly reports.** WAHIS is the global reference platform for publishing official data on animal diseases of epidemiological significance. Access for reporting purposes is restricted to authorised users from national authorities. Official data are published on the WAHIS public interface and made available to the public for analysis, interpretation and risk-based decision-making. The information tracks the evolution of epidemiologically important diseases, assists in trade and policy decisions, and informs research, ultimately helping to safeguard national, regional and global animal and public health. Six-monthly reports provide information on the presence or absence of terrestrial and aquatic animal diseases on the WOAH List, and the preventative and disease-control measures applied.
- **WAHIS data: Workforce/VLU ratio.** The veterinary livestock unit (VLU) is used to quantify veterinary activities for a given animal population. It is calculated by establishing equivalence between species, using a coefficient. VLU measures are calculated from estimates of livestock populations by species, using conversion coefficients for different species.



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- **WOAH dataset on official recognition of freedom from disease status.** Since 1998, WOAH has held the mandate from the World Trade Organization (WTO) to officially recognise disease-free areas of Members for trade purposes. The procedure for official recognition of animal health status by WOAH is voluntary and currently applies to six diseases. Official recognition of the animal health status of Members is of great significance for international trade and constitutes one of the most important legal links between WOAH and the WTO, within the framework of the WTO Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement), which entered into force in 1995. In 1998, the official agreement between the WTO and WOAH further confirmed WOAH's mandate to recognise disease- and pest-free areas based on the SPS Agreement.
- **WOAH dataset on self-declaration of freedom from disease.** WOAH offers a procedure for Members to publish their self-declaration of freedom from disease in accordance with the provisions of the *Terrestrial Animal Health Code* or the *Aquatic Animal Health Code*.
- **WOAH dataset on simulation exercises.** This web page is used to disseminate announcements from WOAH Members on simulation exercises for disease introduction that are taking place in their countries and/or other territories. These simulation exercises are principally meant to test and practise procedures, based on an established national contingency plan.
- **WOAH dataset on contingency plans.** These data were extracted from a one-off review provided by the WOAH Preparedness and Resilience Department (2018).
- **United Nations (UN) Comtrade: dataset on trade exchanges.** The UN Comtrade database aggregates detailed global annual and monthly trade statistics by product and trading partner, for use by governments, academia, research institutes, and enterprises. The dataset was formatted to include one row per Member and per disease. Only Members that reported using zoning between 2018 and 2022 were retained in the analysis. This assessment was based on answers to survey question 1 circulated for AI, ASF and FMD (*During the period 2018–2022, did your country/territory establish and practically implement zones in relation to the disease for disease control purposes [i.e. to control the spread of the disease, achieve progressive eradication and/or prevent disease introduction into free areas] or for trade purposes [i.e. to secure its trade to other countries/territories]?*).

Members that did not require their zones to be accepted by trade partners, or that did not have trade partners during this period, were removed. This assessment was based on answers to survey question 18, circulated for AI, ASF and FMD (my country/territory did not request its trading partners to accept its zones; my country/territory does not export relevant animals or animal products to other countries/territories).

2.1.1. Dependent variable extracted from survey

The dependent variable used in the analysis was the acceptance of zones by trade partners for export, as reported by WOAH Members responding to the 2023 survey (see section 1.4 of that survey). The initial response from the survey, with three levels, was aggregated into two categories to convert it into a binary variable. Acceptance by one or more trade partners was considered as 'yes' and no acceptance by any trade partner was considered 'no'.

The questions put to Members that had implemented zoning for AI, ASF and FMD were as follows:

- Between 2018 and 2022, were African swine fever zones in your country/territory accepted by countries/territories importing live pigs and/or pig products from your country/territory (i.e. importing countries)?

- Between 2018 and 2022, were avian influenza zones in your country/territory accepted by countries/territories importing live birds and/or bird products from your country/territory (i.e. importing countries)?

- Between 2018 and 2022, were your zones officially recognised as free from foot and mouth disease by WOAH accepted by countries/territories importing live animals and/or animal products from your country/territory (i.e. importing countries)?

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2.1.2. Factors considered in the statistical analysis

In the survey, 16 factors were considered in the questions on importers' and exporters' perceptions of zone acceptance. Where data were available to test these factors statistically, they were also considered for the statistical association analysis. Where data were not available, they were not included in the analysis. In addition, several other factors (not initially covered in the survey) were added to the statistical analysis. In total, 41 factors were tested as predictors of zone acceptance (all presented in **Table 5**). They are classified as follows:

- Factors associated with **trade relations in general**, in accordance with WOAH Technical Item 2020 on 'Required competencies of Veterinary Services in the context of international trade: opportunities and challenges' (two factors):
  - Difficulty in discussing required competencies with potential trade partners for zoning;
  - Stability of trade partners between 2015 and 2017 (using the Jaccard index to represent the proportion of connections with trade partners for export that remained stable during this period and focusing on agricultural commodities that would be affected by the disease in question, i.e. AI, ASF or FMD).

- WOAH tools enabling Members to demonstrate their **transparency** (five factors):
  - A sound historic record of timely notification to WAHIS (in accordance with Chapter 1.1 on Notification of diseases and provision of epidemiological information and Article 3.2.12 on Quality of Veterinary Services, international trade). This was the wording used in the questionnaire. The criteria for assessing the soundness of the notification were not detailed in the questions;
  - Official status of zone(s) published by WOAH (existence of at least one official status for any disease for which WOAH provides an official status);
  - Self-declared status of zone(s) published by WOAH (existence of at least one self-declaration for AI and/or ASF);
  - The existence of a recently published PVS Evaluation Report;
  - Reports of simulation exercises to WOAH (a report of at least one simulation exercise for AI, ASF or FMD during the period 2005–2022).

- Factors associated with the **quality of Veterinary Services**, as described in Chapter 3.2 of the WOAH *Terrestrial Animal Health Code (Terrestrial Code)* (18 factors):

  *Article 3.2.2 on **Fundamental operating principles**:*
  - Difficulty in ensuring the appropriate technical independence of Veterinary Services;
  - Detailed scientific information provided to the trading partner about movement control;
  - Detailed scientific information provided to the trading partner about animal identification and traceability;
  - Difficulty in the implementation of traceability by Veterinary Services.

  *Article 3.2.3 on **Policy and management**:*
  - Ensuring that zoning legislation for the disease takes WOAH standards into account (in accordance with Chapter 3.4 on Veterinary legislation);
  - Difficulty in ensuring the proper implementation of zoning legislation (in accordance with Chapter 3.4 on Veterinary legislation);
  - Difficulty in ensuring the use of risk analysis methods by Veterinary Services;
  - Difficulty in ensuring an adequate information system;
  - Difficulty in ensuring a proper chain of command within Veterinary Services for zoning;
  - Difficulty in evaluating the cost–benefits of zoning;
  - Difficulty in ensuring the development of zoning policies;
  - Difficulty in obtaining political support for zoning.

  *Article 3.2.4 on **Personnel and resources**:*
  - Ratio of workforce (veterinarians and veterinary paraprofessionals) to VLUs (livestock units);
  - Difficulty in ensuring appropriate staffing of Veterinary Services for zoning.

  *Article 3.2.6 on **Stakeholders**:*
  - Difficulty in undertaking public or private collaborations for zoning.

*Article 3.2.7 on **Animal health**:*

– Difficulty in implementing prevention measures by Veterinary Services for zoning.

*Article 3.2.10 on **Laboratories**:*

– Difficulty in ensuring the adequate use of laboratory diagnosis by Veterinary Services for zoning.

*Article 3.2.12 on **International trade**:*

– Difficulty in ensuring certification.

- Factors associated with **Veterinary legislation**, as described in Chapter 3.4 of the *Terrestrial Code* (three factors):

  *Article 3.4.4 on the **Drafting of veterinary legislation**:*

  – Difficulty in ensuring sustainable funding for Veterinary Services for zoning (in accordance with Article 3.4.9 on Animal diseases as well as Article 3.2.5 on Quality of Veterinary Services, the veterinary profession).

  *Article 3.4.5 on **Competent Authorities**:*

  – Difficulty in ensuring sufficient capacity of Veterinary Services for zoning.

  *Article 3.4.9 on **Animal diseases**:*

  – Difficulty in ensuring an emergency response.

- Factors associated with **communication**, as described in Chapter 3.5 of the *Terrestrial Code* (one factor):

  – Difficulty in regard to communication between stakeholders for zoning.

- Factors associated specifically with **zoning and compartmentalisation**, as described in Chapter 4.4 of the *Terrestrial Code* (14 factors):

  General

  – PVS level of advancement for critical competency in zoning.

*Article 4.4.3 on **Principles for defining and establishing a zone or compartment**:*

– Establishing zone limits based on artificial boundaries;

– Establishing zone limits based on natural boundaries;

– Establishing zone limits based on political boundaries;

– Ensuring that zone populations are separated from other populations to maintain the zone;

– An animal identification system is in place, enabling recognition of the zone population;

– An identification system for animal products is in place;

– Difficulty in regulating identification by Veterinary Services;

– Ensuring that biosecurity measures are taken to maintain the zone;

– Difficulty in enforcing biosecurity measures by Veterinary Services for zoning;

– Ensuring that surveillance measures are taken to maintain the zone;

– Difficulty in conducting passive surveillance for zoning;

– Difficulty in conducting active surveillance for zoning.

*Article 4.4.7 on **Containment zones**:*

– Reporting contingency planning to WOAH (i.e. the existence of a contingency plan in the Member for any disease, data for 2018). The data were extracted from a one-off WOAH review (McDougle *et al.*, 2020).

- Other relevant factors (one factor):

  – The nature of the disease: ASF, highly pathogenic AI (HPAI), or FMD.

2.2. Data analysis

A Chi-square analysis and odds ratio estimation were used for categorical variables. The Kruskal–Wallis test was used for quantitative variables. The significance level for analysis was $p < 0.05$. All the data analysis was conducted using RStudio 2023.03.0 Build 386 (RStudio Team, 2023).

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3. Results of statistical analysis based on past data, to complement the perception questionnaire

3.1. Description of the dataset used for analysis

The dataset used for the analysis focused on Members that had implemented zoning for AI, ASF and FMD between 2018 and 2022. Each record was for a specific Member and a specific disease. Members could have up to three records each, in case they had undertaken zoning for all three diseases covered by the analysis. The dataset contained 78 records, of which nine related to Members with no acceptance of zones (none of their zones were accepted by their trading partners) and the remaining 69 with acceptance of zones. The latter involved one of the following four scenarios: all trading partners accepted all zones; all trading partners accepted some zones; some trading partners accepted all zones; or some trading partners accepted some zones. The 69 records resulted from the aggregation of 17 records from Members that declared that their zoning was fully accepted (i.e. with all partners accepting all zones), and 52 that declared their zoning partially accepted (the other three scenarios).

The most represented region in the dataset was Europe, with 49 records, and the least represented was Africa, with seven records. The highest percentage of non-acceptance of zone was observed in the Asia–Pacific region (33% of records) and the lowest in Europe (2% of records).

In terms of disease, the highest percentage of non-acceptance of zoning was observed for AI (17% of records), followed by ASF (5%), and the lowest for FMD (0%). Details of the distribution of the dependent variable by region (further divided by disease) are shown in Table 1. The information provided in the table is meant only for descriptive purposes.

Table 1. Distribution of dependent variable (zone acceptance or not) by region and disease

	Zones not accepted	Zones accepted	Total
Africa	**1**	**6**	**7**
Avian influenza	1	4	5
African swine fever	0	1	1
Foot and mouth disease	0	1	1
Americas	**1**	**9**	**10**
Avian influenza	1	3	4
African swine fever	0	1	1
Foot and mouth disease	0	5	5
Asia–Pacific	**4**	**8**	**12**
Avian influenza	3	5	8
African swine fever	1	1	2
Foot and mouth disease	0	2	2
Europe	**3**	**46**	**49**
Avian influenza	3	26	29
African swine fever	0	17	17
Foot and mouth disease	0	3	3
Total	**9**	**69**	**78**

3.2. Univariate analysis for categorical variables: results from Chi-square test and odds ratio values

The results of the univariate analysis of categorical factors are presented in **Tables 2** and **3**. Only predictors for which the test results were significant are shown in the tables. The results are presented in Tables 2 and 3 using a colour code: blue for factors with positive effects on zoning acceptance and red for factors with negative effects on zoning acceptance.

Categorical factors significantly associated with greater zone acceptance are presented in Table 2: legislation, traceability practices, zoning practices and official disease status recognition. All the categorical factors analysed are binary, meaning that if the factor was reported to be present, it had a **positive** effect on the odds of the zoning being accepted.

Table 2. Categorical factors associated with greater zone acceptance: their description and effect on the acceptance of zoning. An odds ratio with 95% confidence interval (CI) and *p*-value are provided

Factor category	Factor description	Odds ratio[a] (95% CI)[b]	*p*-value
Factors associated with the quality of Veterinary Services, as described in Chapter 3.2 of the *Terrestrial Code* *Article 3.2.3 on Policy and management*	Zoning legislation for the disease takes WOAH standards into account	4.4 (0.7 – 24.9)	<0.05
WOAH tools enabling Members to demonstrate transparency	Official status of zone(s) published by WOAH	6.1 (0.8 – 42.5)	<0.05
Factors associated specifically with zoning and compartmentalisation, as described in Chapter 4.4 of the *Terrestrial Code* *General*	PVS level of advancement for critical competency in zoning[c]	Towards infinity	<0.05
Factors associated specifically with zoning and compartmentalisation, as described in Chapter 4.4 of the *Terrestrial Code* *Article 4.4.3 on Principles for defining and establishing a zone or compartment*	Identification system in place for animal products	8.0 (1.4 – 48.8)	<0.01
	Identification system in place for animals, enabling recognition of the zone population	4.4 (0.8 – 25.1)	<0.05
	Zone populations are separated from other populations to maintain the zone	12.2 (1.7 – 90.7)	<0.01
	Zone limits are established based on artificial boundaries	7.8 (1.3 – 83.0)	<0.01
	Zone limits are established based on natural boundaries	7.6 (1.4 – 52.8)	<0.01
	Biosecurity measures are taken to maintain the zone	6.8 (1.1 – 41.1)	<0.05
	Surveillance measures are taken to maintain the zone	2.0 (0.1 – 24.0)	<0.05

a) An odds ratio is a relative measure of effect. It allows us to compare the group of countries with the given factor against the group of countries without the given factor.
b) The confidence interval (CI) indicates the level of uncertainty around the odds ratio (OR). Confidence intervals are used because the study is based only on the sample of countries implementing zoning that answered the survey (not the full group of countries implementing zoning). Thus, we can infer that the true population effect lies between the upper and lower CI.
c) Greater acceptance for levels of advancement 2 to 5 *versus* level 1

Factors significantly associated with less zone acceptance are presented in Table 3, showing challenges related to zoning expressed by national authorities. All the categorical factors analysed were binary, meaning that if the factor was reported to be present, it had a **negative** effect on the odds of the zoning being accepted.

Table 3. Categorical factors associated with less zone acceptance, their description and effect on the acceptance of zoning. An odds ratio with 95% confidence interval (CI) and *p*-value are provided

Factor category	Factor description	Odds ratio[a] (95% CI)[b]	*p*-value
Factors associated with the quality of Veterinary Services, as described in Chapter 3.2 of the *Terrestrial Code* *Article 3.2.2 on Fundamental operating principles*	Difficulty in implementing traceability by Veterinary Services	0.11 (0.01 – 0.70)	<0.01
	Difficulty in ensuring the appropriate technical independence of Veterinary Services	0.13 (0.01 – 0.75)	<0.01
Factors associated with the quality of Veterinary Services, as described in Chapter 3.2 of the *Terrestrial Code* *Article 3.2.3 on Policy and management*	Difficulty in ensuring an adequate information system	0.18 (0.02 – 1.12)	<0.05
	Difficulty in ensuring the use of risk analysis methods by Veterinary Services	0.18 (0.03 – 0.95)	<0.05
Factors associated with the quality of Veterinary Services, as described in Chapter 3.2 of the *Terrestrial Code* *Article 3.2.12 on International trade*	Difficulty in ensuring certification	0.15 (0.02 – 0.82)	<0.01
Factors associated specifically with zoning and compartmentalisation, as described in Chapter 4.4 of the *Terrestrial Code* *Article 4.4.3 on Principles for defining and establishing a zone or compartment*	Difficulty in ensuring the regulation of identification by Veterinary Services	0.14 (0.02 – 0.76)	<0.01

a) An odds ratio is a relative measure of effect. It allows us to compare the group of countries with the given factor against the group of countries without the given factor.
b) The confidence interval (CI) indicates the level of uncertainty around the odds ratio (OR). Confidence intervals are used because the study is based only on the sample of countries implementing zoning that answered the survey (not the full group of countries implementing zoning). Thus, we can infer that the true population effect lies between the upper and lower CI.

There was no significant difference in zone acceptance:

- depending on the implementation of movement control in the Member
- depending on the use of the WOAH process for self-declaration of freedom from disease
- depending on the reporting of simulation exercises to WOAH
- depending on the reporting of contingency planning to WOAH
- depending on the use of political boundaries in the zoning plan

- depending on the difficulties faced in:
  - ensuring appropriate staffing of Veterinary Services for zoning
  - ensuring sufficient capacity of Veterinary Services for zoning
  - ensuring the development of policies for zoning
  - ensuring the proper implementation of zoning legislation
  - obtaining political support for zoning
  - ensuring a proper chain of command in Veterinary Services for zoning
  - ensuring communication between stake-holders for zoning
  - ensuring sustainable funding for Veterinary Services for zoning
  - evaluating cost–benefits for zoning
  - implementing disease prevention and control measures by Veterinary Services for zoning
  - ensuring an emergency response
  - ensuring the enforcement of biosecurity measures by Veterinary Services for zoning
  - ensuring the adequate use of laboratory diagnosis by Veterinary Services for zoning
  - conducting passive surveillance for zoning
  - conducting active surveillance for zoning
  - implementing public/private collaborations for zoning
  - ensuring discussions with potential trade partners for zoning.

3.3. Analysis of quantitative variables: results from the Kruskal–Wallis test

Factors that were significantly associated with zone acceptance are presented in **Table 4**, along with interpretation of these results.

There was no significant association between zone acceptance and the ratio of workforce to VLUs.

Table 4. Quantitative factors, their description and effect on the acceptance of zoning. A *p*-value is provided.

Factor category	Factor description	Effect description	*p*-value
Factors associated with trade relations in general	Stability of trade partners for export between 2015 and 2017	Greater acceptance when stability is higher	<0.001

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4. Limitations of the statistical analysis

To properly evaluate and interpret the main findings of the analysis, which are presented later in the Conclusions (Section 6), it is important to bear in mind some limitations of the statistical analysis.

One of these limitations concerns the statistical methods used. The first approach considered by the authors was to analyse the data and assess the influence of the factors on the dependent variable. This is a robust method, involving the creation of a generalised linear mixed model (GLMM). As a result of the limited sample size, however, it became apparent that this method could not be used, as the GLMM showed severe convergence issues.[1] Univariate analyses were performed instead, to assess the effect of predictors on zone acceptance on a case-by-case basis. Limitations associated with this approach include:

- limited insight into the relationships between variables. Univariate analysis only considers one variable at a time, so it cannot reveal relationships, correlations or interactions between different variables. This makes it impossible to understand how the variables might influence each other);
- oversimplification of the assumption, meaning an inability to control for confounding variables. Thus, univariate analysis cannot control for these variables (variables that influence both the dependent and independent variables). This limitation can lead to misleading conclusions because the effect of the primary variable of interest cannot be isolated. Univariate analysis can lead to spurious correlations, also known as Simpson's paradox (where a trend appears in different groups of data but disappears or reverses when these groups are combined).

Another limitation concerns the quality of the datasets used for the predictors. A few datasets underrepresent reality (such as the dataset on simulation exercises notified to WOAH on a voluntary basis), while others (such as the dataset on contingency plans) only reflect the situation at one point in time and not from the entire period under consideration.

It is also important to keep in mind that, again due to the limited sample size, the absence of significance for certain factors does not always mean that there is no association with the factors considered. Increasing the sample size could provide more accuracy to the statistical testing.

Despite these limitations, the main findings, highlighted in section 6.1 below ('What are the main factors associated with zone acceptance and discussion?'), seem robust and meaningful. The strength of the interpretation was made possible by comparing and integrating the results of the statistical analysis with the ranking of factors from importers and exporters, as shown in **Table 5**.

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[1] Convergence problems occur when the algorithm used to estimate the model parameters fails to find a solution. In simpler terms, the model fitting process gets 'stuck' and cannot determine the best values for the parameters that describe the data. Data issues are the most commonly recognised causes for convergence (small sample sizes, unbalanced data, or data that do not contain enough information).

5. Comparison of WOAH Members' perceptions of the factors associated with zone acceptance and results of statistical testing

Several methods were used to identify the factors associated with zone acceptance. It is illuminating to compare the results obtained by these different approaches to assess the results' convergence. This comparison is presented in Table 5, and demonstrates the following:

1. Some of the most impactful factors were related to the **quality of Veterinary Services, as described in Chapter 3.2 of the *Terrestrial Code* and, more specifically, in Article 3.2.2 on Fundamental operating principles**. Transparency regarding the disease situation in the exporting Member was perceived as the most important factor by both importers and exporters. Other factors seen as important in this category were sharing information about movement control, and animal identification and traceability, while factors related to the technical independence of Veterinary Services and implementation of traceability were also statistically associated with zone acceptance.
2. The importance of transparency for zone acceptance was also shown by the perception results for **WOAH tools enabling Members to demonstrate their transparency**, i.e. WAHIS; the official status of zone(s) published by WOAH; the self-declared status of zone(s) published by WOAH; and the presence of a recently published PVS Evaluation Report. In addition to the results based on perception, the official status of zone(s) published by WOAH was also statistically associated with zone acceptance.
3. The second most important factor perceived by both importers and exporters also fell into the category of **factors associated with the quality of Veterinary Services, as described in Chapter 3.2 of the *Terrestrial Code*, and, specifically, in Article 3.2.12 on International trade,** i.e. trust in the certification system of animals and animal products. Its high level of importance was also reflected in the statistical tests (testing the association between reporting difficulties in ensuring certification and zone acceptance), indicating a clear convergence of results by all methods on this point.
4. The stability of the **epidemiological situation** in the exporting Member was ranked highly by both importers and exporters. This factor came into the group of general relevant factors, together with pre-acceptance in peace time and prior acceptance of zone(s) by another trading partner, which were perceived as less important.
5. The next top factors, in order of importance as perceived by importers and exporters, fell into the category of factors associated specifically with **zoning and compartmentalisation, as described in Chapter 4.4 of the *Terrestrial Code* and, more specifically, in Article 4.4.3 on Principles for defining and establishing a zone or compartment.** Sharing information about the biosecurity measures implemented in the exporting Member, surveillance and diagnostic tests was ranked highly in terms of perception by both importers and exporters. In addition, the type of boundaries established for zoning (artificial, natural), separating zone populations, implementing identification systems for animals and animal products, biosecurity measures and surveillance measures, were all statistically associated with zone acceptance. The importance of implementing WOAH standards for zoning and compartmentalisation was reflected by the statistical association **between increased PVS level of advancement for critical competency in zoning** and zone acceptance.
6. The importance of the **existence of a bilateral procedure** was rated very highly by importers but much lower by exporters. No information on the specific Members that had accepted or not accepted specific zones was requested by the survey. It was therefore not possible to test these factors statistically. In the analysis, the existence of a bilateral procedure fell into the category of 'Factors associated with trade relations in general'. In this category, the existence of prior trade, prior evaluation/audit of Veterinary Services, and the importer's own assessment of the zone's animal health status were perceived as moderately important, while the stability of trade partners for export was statistically associated with zone acceptance.
7. Some factors related to the **quality of Veterinary Services, as described in Chapter 3.2 of the *Terrestrial Code* and, specifically, in Article 3.2.3** on Policy and management, which were not presented in the perception questionnaire, were statistically associated with zone acceptance, e.g. factors related to information systems, use of risk analysis, and alignment of legislation with WOAH standards.

Table 5. Factors associated with zone acceptance

*These results were obtained by asking respondents about their perceptions, and from statistical testing based on historical data. The intensity of the colour reflects the strength of the estimated association (**orange** for enhancing the association and **grey** for impeding it).*

Factor category	Factor	Ranking by exporters	Ranking by importers	Results from statistical testing (significance and direction of association)
Factors associated with trade relations in general	Difficulty in ensuring discussions with potential trade partners for zoning	*Not assessed*	*Not assessed*	Not significant
	Stability of trade partners for export	*Not assessed*	*Not assessed*	Significant and positive
	Existence of a bilateral procedure	4	11	Not assessed
	Existence of prior trade	11	13	Not assessed
	Prior evaluation/audit of Veterinary Services	13	10	Not assessed
	Importer's own assessment of the zone's animal health status	*Not assessed*	9	Not assessed
WOAH tools enabling Members to demonstrate their transparency	Sound historic record of timely notification to WAHIS	8	7	Not assessed
	Official status of zone(s) published by WOAH	14	12	Significant and positive
	Self-declared status of zone(s) published by WOAH	14	12	Not significant
	Existence of a recently published PVS Evaluation Report	15	15	Not assessed
	Report of a simulation exercise to WOAH	*Not assessed*	*Not assessed*	Not significant
Factors associated with the quality of Veterinary Services, as described in Chapter 3.2 of the *Terrestrial Code* *Article 3.2.2 on Fundamental operating principles*	Difficulty in ensuring appropriate technical independence of the Veterinary Services	*Not assessed*	*Not assessed*	Significant and negative
	Detailed scientific information provided to the trading partner about movement control	7	6	Not significant
	Detailed scientific information provided to the trading partner about animal identification and traceability	9	8	Not assessed
	Difficulty in implementing traceability by Veterinary Services	*Not assessed*	*Not assessed*	Significant and negative
	Transparency regarding the disease situation	1	1	Not assessed

Factor category	Factor	Ranking by exporters	Ranking by importers	Results from statistical testing (significance and direction of association)
Factors associated with the quality of Veterinary Services, as described in Chapter 3.2 of the *Terrestrial Code* *Article 3.2.3 on Policy and management*	Zoning legislation for the disease takes WOAH standards into account	*Not assessed*	*Not assessed*	Significant and positive
	Difficulty in ensuring proper implementation of zoning legislation	*Not assessed*	*Not assessed*	Not significant
	Difficulty in ensuring the use of risk analysis methods by Veterinary Services	*Not assessed*	*Not assessed*	Significant and negative
	Difficulty in ensuring an adequate information system	*Not assessed*	*Not assessed*	Significant and negative
	Difficulty in ensuring a proper chain of command for zoning in Veterinary Services	*Not assessed*	*Not assessed*	Not significant
	Difficulty in evaluating cost–benefits for zoning	*Not assessed*	*Not assessed*	Not significant
	Difficulty in ensuring the development of zoning policies	*Not assessed*	*Not assessed*	Not significant
Factors associated with the quality of Veterinary Services, as described in Chapter 3.2 of the *Terrestrial Code* *Article 3.2.4 on Personnel and resources*	Workforce/VLUs ratio	*Not assessed*	*Not assessed*	Not significant
	Difficulty in ensuring appropriate staffing of Veterinary Services for zoning	*Not assessed*	*Not assessed*	Not significant
Factors associated with the quality of Veterinary Services, as described in Chapter 3.2 of the *Terrestrial Code* *Article 3.2.6 on Stakeholders*	Difficulty in implementing public/private collaborations for zoning	*Not assessed*	*Not assessed*	Not significant
Factors associated with the quality of Veterinary Services, as described in Chapter 3.2 of the *Terrestrial Code* *Article 3.2.7 on Animal health*	Difficulty in implementing disease prevention measures by Veterinary Services for zoning	*Not assessed*	*Not assessed*	Not significant

Factor category	Factor	Ranking by exporters	Ranking by importers	Results from statistical testing (significance and direction of association)
Factors associated with the quality of Veterinary Services, as described in Chapter 3.2 of the *Terrestrial Code* *Article 3.2.10 on Laboratories*	Difficulty in ensuring adequate use of laboratory diagnosis by Veterinary Services for zoning	*Not assessed*	*Not assessed*	Not significant
Factors associated with veterinary legislation, as described in Chapter 3.2 of the *Terrestrial Code* *Article 3.2.12 on International trade*	Difficulty in ensuring certification	*Not assessed*	*Not assessed*	Significant and negative
	Trust in the certification system for animals and animal products	2	2	Not assessed
Factors associated with veterinary legislation as described in Chapter 3.4 of the *Terrestrial Code* *Article 3.4.4 on the Drafting of veterinary legislation*	Difficulty in ensuring sustainable funding for Veterinary Services for zoning	*Not assessed*	*Not assessed*	Not significant
Factors associated with the quality of Veterinary Services, as described in Chapter 3.4 of the *Terrestrial Code* *Article 3.4.5 on Competent Authorities*	Difficulty in ensuring the sufficient capacity of Veterinary Services for zoning	*Not assessed*	*Not assessed*	Not significant
Factors associated with veterinary legislation, as described in Chapter 3.4 of the *Terrestrial Code* *Article 3.4.9 on Animal diseases*	Difficulty in ensuring an emergency response	*Not assessed*	*Not assessed*	Not significant

Factor category	Factor	Ranking by exporters	Ranking by importers	Results from statistical testing (significance and direction of association)
Factors associated with communication, as described in Chapter 3.5 of the *Terrestrial Code*	Difficulty in ensuring communication between stakeholders for zoning	*Not assessed*	*Not assessed*	Not significant
Factors associated specifically with zoning and compartmentalisation, as described in Chapter 4.4 of the *Terrestrial Code*	PVS level of advancement for critical competency in zoning	*Not assessed*	*Not assessed*	More acceptance for levels of advancement 2 to 5 versus level 1
Factors associated specifically with zoning and compartmentalisation, as described in Chapter 4.4 of the *Terrestrial Code* *Article 4.4.3 on Principles for defining and establishing a zone or compartment*	Zone limits established on artificial boundaries	*Not assessed*	*Not assessed*	Significant and positive
	Zone limits established on natural boundaries	*Not assessed*	*Not assessed*	Significant and positive
	Zone limits established on political boundaries	*Not assessed*	*Not assessed*	Not significant
	Zone populations are separated from other populations to maintain the zone	*Not assessed*	*Not assessed*	Significant and positive
	An animal identification system is in place to enable recognition of the zone population	*Not assessed*	*Not assessed*	Significant and positive
	An identification system is in place for animal products	*Not assessed*	*Not assessed*	Significant and positive
	Difficulty in ensuring regulations for identification by Veterinary Services	*Not assessed*	*Not assessed*	Significant and negative
	Biosecurity measures taken to maintain the zone	*Not assessed*	*Not assessed*	Significant and positive
	Difficulty in enforcing biosecurity measures taken by Veterinary Services to maintain the zone	*Not assessed*	*Not assessed*	Not significant

Factor category	Factor	Ranking by exporters	Ranking by importers	Results from statistical testing (significance and direction of association)
Factors associated specifically with zoning and compartmentalisation, as described in Chapter 4.4 of the *Terrestrial Code* *Article 4.4.3 on Principles for defining and establishing a zone or compartment* *(continuation)*	Detailed scientific information provided to the trading partner about biosecurity measures that have been implemented	5	3	Not assessed
	Surveillance measures taken to maintain the zone	*Not assessed*	*Not assessed*	Significant and positive
	Difficulty in conducting passive surveillance for zoning	*Not assessed*	*Not assessed*	Not significant
	Difficulty in conducting active surveillance for zoning	*Not assessed*	*Not assessed*	Not significant
	Detailed scientific information provided to the trading partner about surveillance and diagnostic tests undertaken	6	4	Not assessed
Factors associated specifically with zoning and compartmentalisation, as described in Chapter 4.4 of the *Terrestrial Code* *Article 4.4.7 on Containment zones*	Reports of contingency planning to WOAH	*Not assessed*	*Not assessed*	Not significant
Other relevant factors	Nature of the disease	*Not assessed*	*Not assessed*	Not significant
	Stable epidemiological situation	3	5	Not assessed
	Pre-acceptance in peace time	10	14	Not assessed
	Prior acceptance of the zone(s) by another trading partner	12	16	Not assessed

6. Conclusions and recommendations for Part 2

6.1. What are the main factors associated with zone acceptance? Discussion

This study showed that zone acceptance by trade partners was far from systematic. Through a combination of two methods (ranking and inferential approach), the study demonstrates a variety of factors that had an impact on acceptance of zones. One of its strengths is the use of several methods to assess convergence of the results. On the one hand, the study questioned the perceptions of importing and exporting Members and, on the other, undertook a statistical analysis of past events. The factors associated with zone acceptance fell into the six themes described below:

- First, **the quality of Veterinary Services, as described in Chapter 3.2 of the *Terrestrial Code* and, more specifically, in Article 3.2.2 on Fundamental operating principles**. This was perceived as being of high priority by both importers and exporters. The importance of transparency for zone acceptance was shown both by the results of the perception study and the statistical results for WOAH tools that assist Members to demonstrate their transparency. Such tools include WAHIS; the official status of zone(s) published by WOAH; the self-declared status of zone(s) published by WOAH; and the existence of a recently published PVS Evaluation Report.

  This theme reflects a gap highlighted in the 2018 WOAH report on the status of Members' implementation of WOAH standards. The report revealed that 74% of Members that contributed to the survey believed that exporting Members were not providing sufficient information on their disease-free zones/compartments for international trade. In that same analysis, about half of all respondents said that establishing market-access conditions regularly required the collection of additional information, sometimes including on-site visits (Kahn, 2018).

  In 2021, a study on live poultry demonstrated that 'super exporters' consistently sent more information on their listed poultry diseases to WOAH than other Members over a number of years. Authors commented that: 'this result was expected, given that transparency is a key requirement for export, as most countries' Veterinary Authorities of importing countries require the presentation of an international veterinary certificate attesting that recommended surveillance and control measures are implemented in their partner exporting countries' (Awada *et al.*, 2021).

- Second, and still related to the **quality of Veterinary Services, as described in Chapter 3.2 of the *Terrestrial Code* (Article 3.2.12 on International trade): trust in the certification system of animals and animal products.** The importance of this factor was demonstrated through both methods (perception-based, and statistical analysis of historical situations). It is instructive to note that these first two factors are not specific to the application of zoning standards but represent general characteristics of Veterinary Services. This underlines the importance of certification, as highlighted in WOAH Technical Item 2020 'Required competencies of Veterinary Services in the context of international trade: opportunities and challenges'.

- In regard to perception, factors associated with standards on zoning and compartmentalisation, as described in Chapter 4.4 of the *Terrestrial Code* and, more specifically, in **Article 4.4.3 on Principles for defining and establishing a zone or compartment**, were ranked third. The authors note that numerous factors were considered important or statistically significant in this category. Moreover, the importance of implementing WOAH standards for zoning and compartmentalisation was reflected by the statistical association between an increased PVS level of advancement in critical competency for zoning and zone acceptance. The eight specific statistically significant factors in this category were:
  - zone limits established on artificial boundaries
  - zone limits established on natural boundaries
  - zone populations separated from other populations
  - an animal identification system in place enabling recognition of the zone population
  - an identification system in place for animal products
  - difficulty in regulating animal identification by Veterinary Services
  - biosecurity measures to maintain the zone
  - surveillance measures to maintain the zone (see **Table 5**).

- The **stability of the epidemiological situation** was ranked highly by both importers and exporters.

- The importance of the **existence of a bilateral procedure** was rated very highly by exporters, and much lower by importers.
- Finally, three factors associated with the **quality of Veterinary Services, as described in Chapter 3.2 of the *Terrestrial Code* and, specifically, in Article 3.2.3 on Policy and management,** were statistically associated with zone acceptance but did not form a part of the perception questionnaire. These factors were:
  - **that zoning legislation for the disease takes WOAH standards into account**
  - **difficulty in ensuring the use of risk analysis methods by Veterinary Services in the exporting Member**
  - **difficulty in ensuring an adequate information system** (see **Table 5**).

It is worth noting that the highest percentage of non-acceptance of zones was observed for AI (17% of the global records, from 10% in Europe to 38% in Asia and the Pacific), followed by ASF (5% of the global records, the only rejection being recorded for the Asia–Pacific region), and the lowest for FMD (0%). This result is not surprising given that the use of zoning for the three diseases is very different and varies considerably from region to region. For example, one would expect that the existence of a procedure for official recognition of FMD-free status would encourage the acceptance of zones for this disease – more so than for AI or ASF, for which only self-declaration procedures exist. The disease in question was also associated with the time it took to have zones recognised (Annex C). Based on the survey results, at least half of those WOAH Members that implemented zoning for AI and ASF had to wait more than 24 months to have their zones accepted by their trading partners. For FMD, however, most respondents did not have to wait even six months for their zones to be accepted. Notwithstanding, the small number of records (resulting in low statistical power) was probably insufficient to demonstrate this difference statistically.

The limitation of low statistical power also applies to other factors, such as those linked to the workforce or laboratories, for example. It should also be noted that only Members that had already implemented zoning were included in the acceptance analysis. Members that have successfully implemented zoning are generally at an advanced level of general capability.

Extending this survey to more diseases, or repeating it in the future, would make it possible to increase the sample size and thus overcome these statistical limitations. Increasing the sample size would also make it possible to assess factors influencing total or partial acceptance of zoning. This is an aspect that was not included in the current analysis but that would be illuminating to explore with a larger sample size. As mentioned in Section 1, 'Background and study objectives', these analyses were based on data related to the group characteristics of the exporting Members applying the zoning. No information was collected on which Members had or had not accepted a particular Member's zones for trade. The characteristics of importing Members were thus not covered in this analysis, nor were the characteristics of the bilateral relationship. For future research, the data collection process and statistical model should include information on importers, as it is clear from the perceptions of importers and exporters that acceptance of zoning is partially related to the characteristics of importers (e.g. legislation, capacity of Veterinary Services, animal health status, etc.). However, this was not taken into account in the statistical analysis.

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6.2. Recommendations to WOAH Members for zone acceptance

To facilitate zone acceptance, exporters are encouraged to demonstrate transparency, as described in Chapter 3.2 of the *Terrestrial Code* and, more specifically, in Article 3.2.2 on Fundamental operating principles: 'Veterinary Services should be as transparent as possible in all their governance and technical activities, including but not limited to, disease reporting, policy and programme decision-making, human resources and financial issues'. WOAH has provided its Members with several tools to demonstrate transparency, the most important of which is reporting through WAHIS in a timely and comprehensive manner. Reporting through WAHIS is not only an exercise in transparency, but also a commitment that each Member makes when joining WOAH.

Other WOAH processes that could be requested by exporters, with a potential positive impact on zone acceptance by trade partners, are:

- official recognition of disease status
- publication of Members' self-declarations of freedom from a specific disease by WOAH.

The study showed that generating trust in the certification system of animals and animal products (as described in Article 3.2.12 of the *Terrestrial Code*) is a key element for zone acceptance. So is implementation of the standards described in Article 3.2.3 on Policy and management (such as the establishment of information systems, use of risk analysis and alignment of legislation with WOAH standards). These elements show that it is essential for exporters to demonstrate the implementation of quality standards in their Veterinary Services in order for their zones to be accepted. This can generally be facilitated by using the WOAH PVS assessment, where appropriate, and sharing the assessment report with trading partners.

Evidence of the implementation of standards on zoning and compartmentalisation, as described in Chapter 4.4 of the *Terrestrial Code* and, more specifically, in Article 4.4.3 on Principles for defining and establishing a zone or compartment, should be taken into consideration by exporters to define and/or establish zones, to facilitate acceptance.

The study further suggests that the importance of the exporter establishing a bilateral procedure with the importer should not be underestimated. Finally, Members are encouraged to promote the acceptance of zones through other international organisations such as the WTO; for example, via the SPS annual report on the implementation of regionalisation.[2]

For importers, it is advisable to consult the WOAH tools listed above to gather information on the animal health situation of the exporting Member, the quality of Veterinary Services and transparency, and to refer to WOAH standards as part of the zone recognition process. Additional data on the characteristics of importing Members would be needed to be able to make more targeted recommendations for this group of Members.

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[2]Annual report on the implementation of Article 6 of the SPS Agreement

6.3. Advocacy, capacity building and other support activities to be provided to Members by WOAH, to facilitate zone acceptance by trade partners

Developing international standards for animal health and welfare based on the latest scientific information lies at the heart of WOAH's mandate. However, Members can find the implementation of WOAH standards challenging. This thematic analysis, developed within the **WOAH Observatory Programme**, provided insights into the acceptance of zones, and the factors that facilitate or impede such acceptance. The conclusions of this study and the recommendations from this work can support WOAH Members in their implementation of zoning. In this context, it is relevant to continue such studies on complementary topics as part of the Observatory Programme, and to continue to measure changes in the implementation of zoning and its acceptance over time. This can be achieved via the Observatory indicators dedicated to zoning. From this perspective, it would be valuable to undertake a thematic study on certification systems.

This feedback will also be helpful in developing the new **Chapter 4.X of the WOAH *Terrestrial Code*** on the 'implementation of zoning'. Feedback from WOAH Members via the survey from this analysis should be considered when revising and extending this chapter.

This study showed that the use of several WOAH processes by exporting Members could have an impact on zoning acceptance. These processes included:

- Reporting through WAHIS. It is important that **WOAH continues to support its Members to notify animal diseases in a timely and comprehensive manner through this information system**.
- Use of official status recognition by WOAH, when applicable. It is important that **WOAH continues to perform this function and support its Members in submitting applications for and reconfirming their official status each year**.

It is further recommended that WOAH arrange a forum to make use of the successful experiences of Members that have had their disease-free zones officially recognised by WOAH. This forum should promote:

(i) sharing the practical experiences of Members from different parts of the world in establishing disease-free zones, examining both the challenges faced and success achieved;

(ii) global brainstorming on practical approaches, solutions and tools to be considered in creating and successfully maintaining a disease-free zone. Members wishing to engage in a zoning approach will have a pool of practical solutions to build on. Members who have already achieved disease-free zones may identify possible solutions to strengthen the sustainability or cost-effectiveness of their zoning approach, as well as share experience on the success or challenges faced in their bilateral trade negotiations

- Use of the WOAH process for self-declaration of freedom, when applicable. It is important that **WOAH continues to offer this service**.
- Use of the WOAH Network of Collaborating Centres and the WOAH Twinning Programme for capacity building. Since the technical independence of Veterinary Services and the capacity to conduct risk assessment are among the factors that have a significant impact on the acceptance of zoning, it is important that **WOAH continues to support Members through its network of experts and capacity-building programmes**.
- Use of the WOAH PVS Pathway, when applicable. In 2024, the PVS Pathway, WOAH's flagship capacity-building programme for the sustainable improvement of national Veterinary Services and Aquatic Animal Health Services, transformed into the **PVS Information System (PVSIS)**. This new information system should make it simpler for Members to gain access to the data in their PVS reports, and to share them more easily with the trade partners of their choice, to demonstrate their transparency and capacity assessments. In this spirit, WOAH should continue to develop easy data management solutions that enable Members to demonstrate their transparency.

- WOAH should continue to advocate and strengthen its capacity-building activities to improve the **role of Veterinary Services in ensuring and facilitating safe international trade**. WOAH should also continue to aid in the development of sound national official assurance systems, based on high-quality Veterinary Services, to support international veterinary certification, since trust in the certification system and transparency were reported as important drivers of zone acceptance.
- **Implementation of WOAH standards in national legislation.** WOAH should support Members in the implementation of international standards and encourage Members to consider such standards in their legislation. The Veterinary Legislation Support Programme aims to identify gaps and weaknesses in national veterinary legislation, and to assist Members in revising or developing new legislation. WOAH should continue to advocate the proper use of WOAH international standards for international trade. This should go beyond the mere use of recommended animal health measures for trade and include the use of horizontal standards for the bilateral assessment and acceptance of animal health status at the country of origin. It should also include official national assurance systems, including the use of zoning, based on sound criteria.

References

Awada L, Chalvet-Monfray K, Tizzani P, Caceres P, Ducrot C. Global formal live poultry and hatching egg trade network (2004–2016): description and association with poultry disease reporting and presence. Poult. Sci. 2021;100(9):101322. https://doi.org/10.1016/j.psj.2021.101322

Funes G, Merlo AL, Sowul M, Rendine N, Melon X, Marcos A. Disease-free zones: bilateral recognition procedure in South America [in Spanish & English]. Rev. Sci. Tech. 2020;39(1):119-30. https://doi.org/10.20506/rst.39.1.3067

Hafi A, Addai D, Breed AC, Bradhurst R, Capon T, Garner MG, *et al.* Economic benefits of implementing trading zones for Australian livestock disease outbreaks of limited duration. Aust. Vet. J. 2022;100(4):150-61. https://doi.org/10.1111/avj.13141

Kahn S. Implementation of OIE standards by Member Countries: state of play and specific capacity building needs: discussion + descriptive analysis and questionnaire (86 SG/9 A). Paris (France): World Organisation for Animal Health; 2018. Available at: https://doi.org/10.20506/TT.2936

McDougle J, Sabirovic M, Pietropaoli S, Hamilton K. The gulf between emergency plans and the resources needed: a global review. Rev. Sci. Tech. 2020;39(2):373-84. https://doi.org/10.20506/rst.39.2.3088

RStudio Team. RStudio: integrated development for R. Boston (USA); RStudio, PBC; 2020. Available at: http://www.rstudio.com/ (accessed on 10 July 2024).

World Organisation for Animal Health (WOAH). Required competencies of Veterinary Services in the context of international trade: opportunities and challenges. Paris (France): WOAH; 2020. Available at: https://www.woah.org/en/what-we-do/publications/technical-items/technical-item-2020/ (accessed on 25 November 2024).

Annexes

A. Reminder of the concept of zoning

A.1. Concept of zoning

As presented in the first part of the report, zoning is a key concept that supports animal disease control strategies and the safe trade of animals and related commodities. A 'zone' is defined in the *Terrestrial Code* as: 'a part of a country defined by the Veterinary Authority, containing an animal population or subpopulation with a specific animal health status with respect to an infection or infestation for the purposes of international trade or disease prevention or control'. In the WOAH *Aquatic Animal Health Code (Aquatic Code)*, it is defined as: 'an area in one or more countries containing an aquatic animal population with a specific aquatic animal health status with respect to a disease, in which surveillance and control measures and basic biosecurity conditions are applied. The zone should be defined by the Competent Authority.' **Figure 1** represents the concept of zoning. The white area represents a disease-free zone, which is primarily defined by its geographical limits and guaranteed by surveillance and control measures, such as control of animal movements and biosecurity measures.

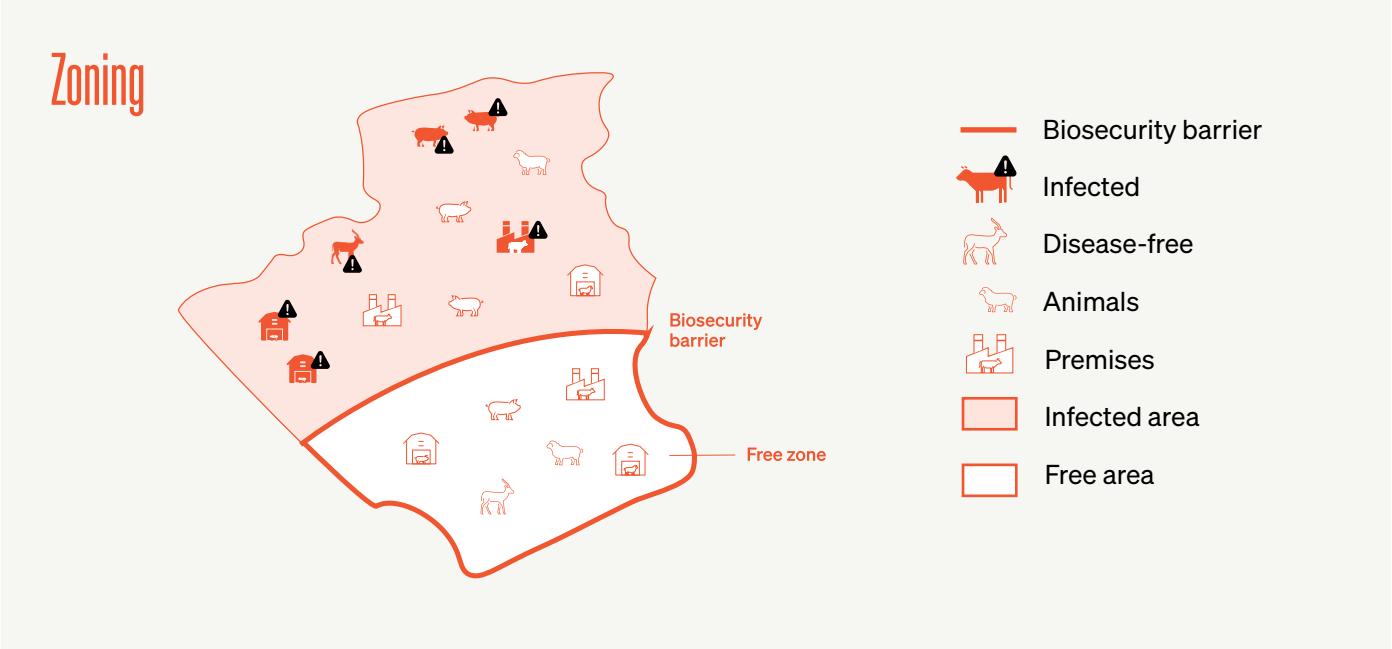

Figure 1. Visual representation of zoning

A.2. Purposes of zoning

Zones can be used for many different purposes. For example, Veterinary Authorities may establish zones to aid with disease investigation and response, including disease containment. This can facilitate the application of different regulations, levels of surveillance and control measures to different geographical areas. In cases of more stable epidemiological situations, such as the later stages of an outbreak, or when a disease is considered to be endemic, zones may be used for disease control purposes, such as preventing the spread of disease to disease-free areas, and/or targeting control or eradication efforts. Zones may also be established to ensure safe trade and movements of animals and animal products, both domestically and internationally.

The sanitary measures required to mitigate the risks of disease spread through international trade are dependent on the animal health status of the animal population (or subpopulation) from which they originate. The Veterinary Authority of an importing Member would define the sanitary measures required for the importation of commodities based on the international standards in the *Terrestrial Animal Health Code* and *Aquatic Animal Health Code*. If these commodities originate from a zone, the measures implemented by the exporting Member to define that zone will be critical to define the animal health status and should be based on the same standards.

Zoning can be useful to prevent and control diseases and facilitate trade. However, it cannot be applied in all situations. Each Member, as well as individual producers, should assess whether zoning is suitable for their specific circumstances. This assessment should take into account various factors, including the availability of resources, the capacity of Veterinary Services, the potential for public–private partnerships, geographic considerations, and the epidemiology of the particular disease in question.

B. Why is it important for zoning to be accepted by trade partners?

As presented in the first part of the report, the use and acceptance of zones for trade purposes can have significant impacts on trade volumes and can also mitigate the negative effects of disease outbreaks on trade. To be used for trade, zones should be accepted by trade partners. Some trade partners may automatically recognise zones that have been granted official status and recognition by WOAH, whereas other trade partners may recognise the status of each other's zones and compartments through a bilateral process, as described in Article 4.4.8 and Chapter 5.3 of the *Terrestrial Code*.

An analysis of historic WTO SPS notifications[3], which references WOAH as the relevant standard-setting body, found that 22% of all notifications submitted between 2005 and 2021 indicated that the new or modified legislation only targeted a specific region or zone, rather than an entire Member or all trade partners (2022 Annual Report of the Observatory). This indicates the use and importance that zones have for trade in animals and animal products. However, bilateral acceptance of zones and/or compartments between trade partners appears to be a challenge.

C. Are zones for AI, ASF and FMD implemented by exporting Members easily accepted by trade partners? Findings from Report Part 1

As presented in the first part of the report, despite the existence of standards and guidelines on import risk assessment, it is known that the steps for bilateral acceptance are rarely harmonised, particularly in terms of the information required by Members for their risk assessment and final decision-making (Funes *et al*., 2020).

The level of zone acceptance by trade partners for export was one element measured through the survey conducted by the WOAH Observatory in 2023 (see details in Report Part 1 and corresponding questionnaire).

Figure 2 shows to what extent zones established by WOAH Members were accepted by their trade partners for export.

Only the respondent WOAH Members that had implemented domestic zones for AI, ASF or FMD respectively were considered/included for the analysis. Percentages were derived from a question to which only one answer could be given. For AI and ASF, all kinds of zones were considered, whereas, for FMD, only zones that were officially recognised by WOAH as being FMD-free zones were addressed in the questions. Responses varied depending on the disease. It is interesting to note that for AI and ASF, only a low percentage of WOAH Members had all their zones accepted by all trade partners (7% and 24% respectively). For FMD, this percentage was higher (64%).

[3] WTO members can submit SPS notifications to notify their trade partners about new or modified sanitary legislation that may have a significant effect on trade.

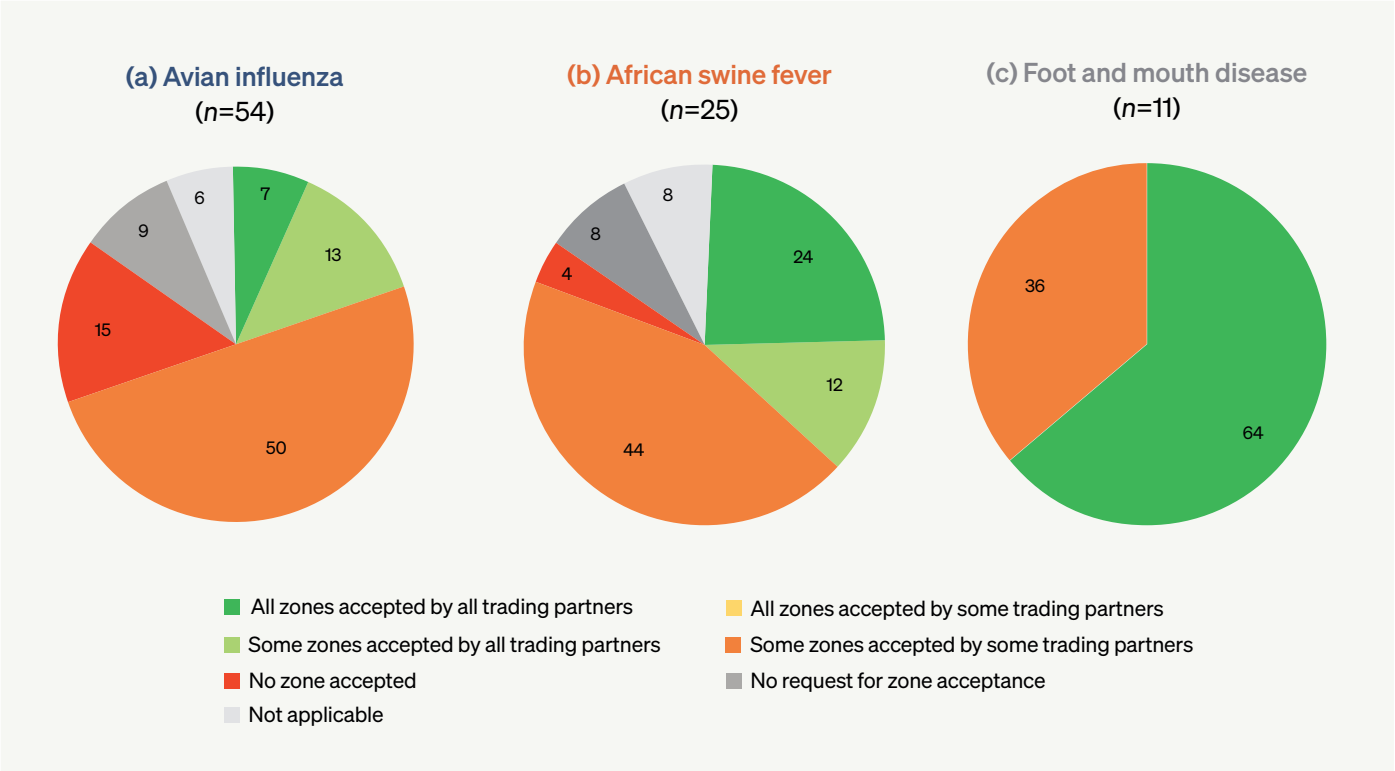

Figure 2. Percentage distribution of Members showing whether their zones were accepted by trade partners (WOAH survey 2023)

The time for zone acceptance by trade partners for export was another element measured through that survey conducted by the WOAH Observatory in 2023. As above, this point was specific to AI, ASF and FMD and the same pool of respondents were considered (see details in Report Part 1 and corresponding questionnaire).

Results are presented in **Table 6**. Here again, responses vary depending on the disease. It is interesting to note that for AI and ASF, at least half of WOAH Members that implemented zoning had to wait more than 24 months to have their zones accepted by their trade partners for export. For FMD, though, most respondents did not even wait 6 months for their zones to be accepted.

Table 6. Distribution of respondents according to reported time taken for zones to be accepted by trade partners (WOAH survey 2023)

Time taken to obtain zone acceptance by trading partners	Avian influenza (*n*=38)	African swine fever (*n*=20)	Foot and mouth disease (*n*=11)
Less than 6 months	14 (37%)	6 (30%)	7 (64%)
Between 6 and 12 months	1 (3%)	3 (15%)	1 (9%)
Between 12 and 24 months	2 (5%)	1 (5%)	2 (18%)
More than 24 months	21 (55%)	10 (50%)	1 (9%)

This analysis carried out in the first part of the study shows that zone acceptance is far from systematic and rapid and seems to vary according to the disease. Among the three diseases considered, FMD is the only one of these three diseases for which an official disease status recognition by WOAH is possible. Could this be a factor favouring acceptance? This is examined below in the report.

D. WOAH Members' perceptions of the factors associated with zone acceptance for AI, ASF and FMD by trade partners for export – findings from Report Part 1

As presented in Part 1 of the Report, the perceptions of WOAH Members on drivers of zone acceptance by trade partners for export were another element measured through the survey conducted by the WOAH Observatory in 2023 (see details in Report Part 1).

D.1. Perceptions of the exporter

To evaluate the perceptions of the exporters, only the respondent WOAH Members that had sought zone acceptance by trade partners for export were considered/included (for the analysis). Members were asked to score the factors that facilitated such acceptance by their trade partners, on a scale ranging from 1 (not important at all) to 4 (very important). Average results (for AI, ASF and FMD together) are presented in **Figure 3.**

Over all, transparency of the disease situation appeared to be the most important factor facilitating zone acceptance (average score 3.9), followed by trust in the certification system (3.8), a stable epidemiological situation (3.8), the existence of a bilateral procedure (3.8), and information about biosecurity measures (3.8). The self-declared or official status of the zone published by WOAH and the existence of a recently published WOAH PVS Evaluation Report were perceived as moderately important factors (average scores 3.2 and 2.8, respectively).

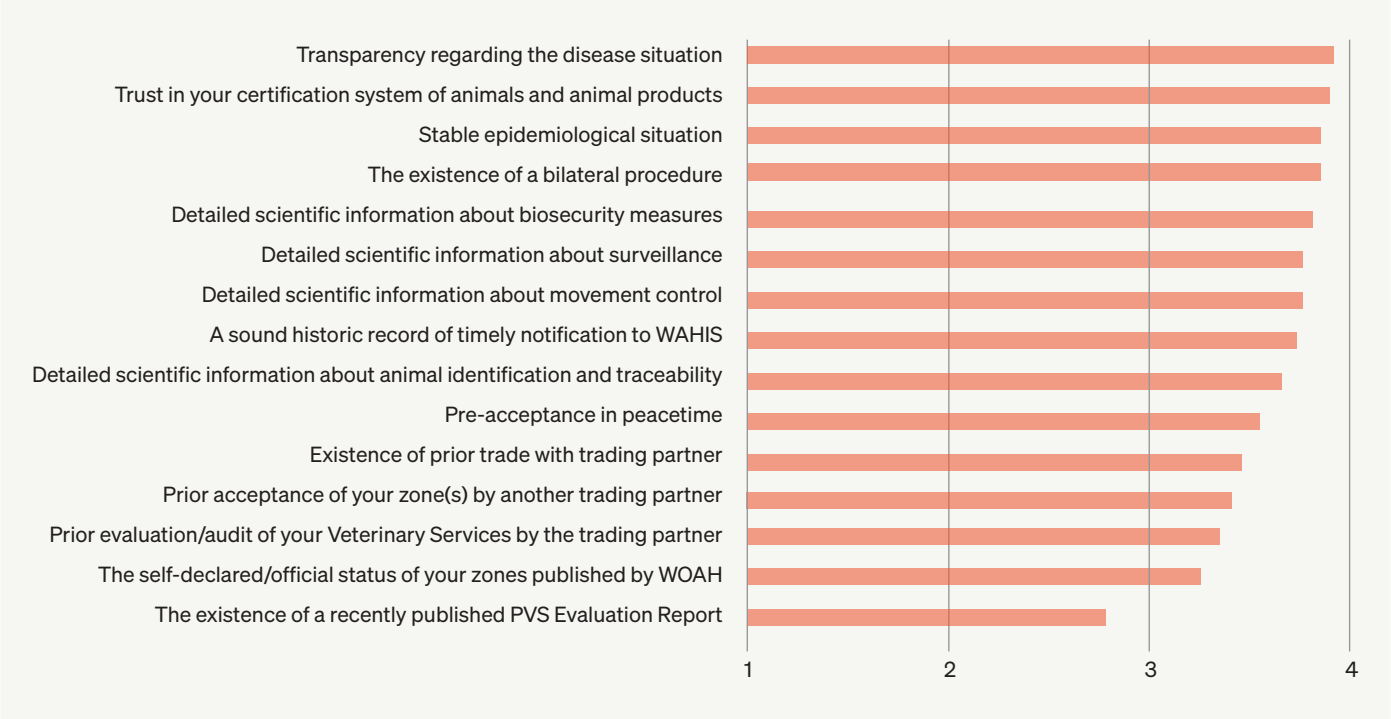

Figure 3. Focus on exporting Members: average perceived importance of factors that facilitated zone acceptance by trade partners (WOAH survey 2023)

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D.2. Perceptions of the importer

To evaluate the perceptions of the importers, only WOAH Members that reported having accepted the zones of their trade partners for import were included. Members were asked to score the factors that facilitated their acceptance, on a scale ranging from 1 (not important at all) to 4 (very important). Average results (for AI, ASF and FMD together) are presented in **Figure 4**.

Over all, transparency regarding the disease situation appeared to be the most important factor facilitating zone acceptance (average score 3.9); followed by trust in the certification system (average score 3.9); information about biosecurity, surveillance and movement control (3.9); a stable epidemiological situation (3.9); and information about movement control (3.9). The existence of a bilateral procedure and of a recently published PVS Evaluation Report were reported as less important factors, according to the respondents (average scores 2.7 and 2.8, respectively).

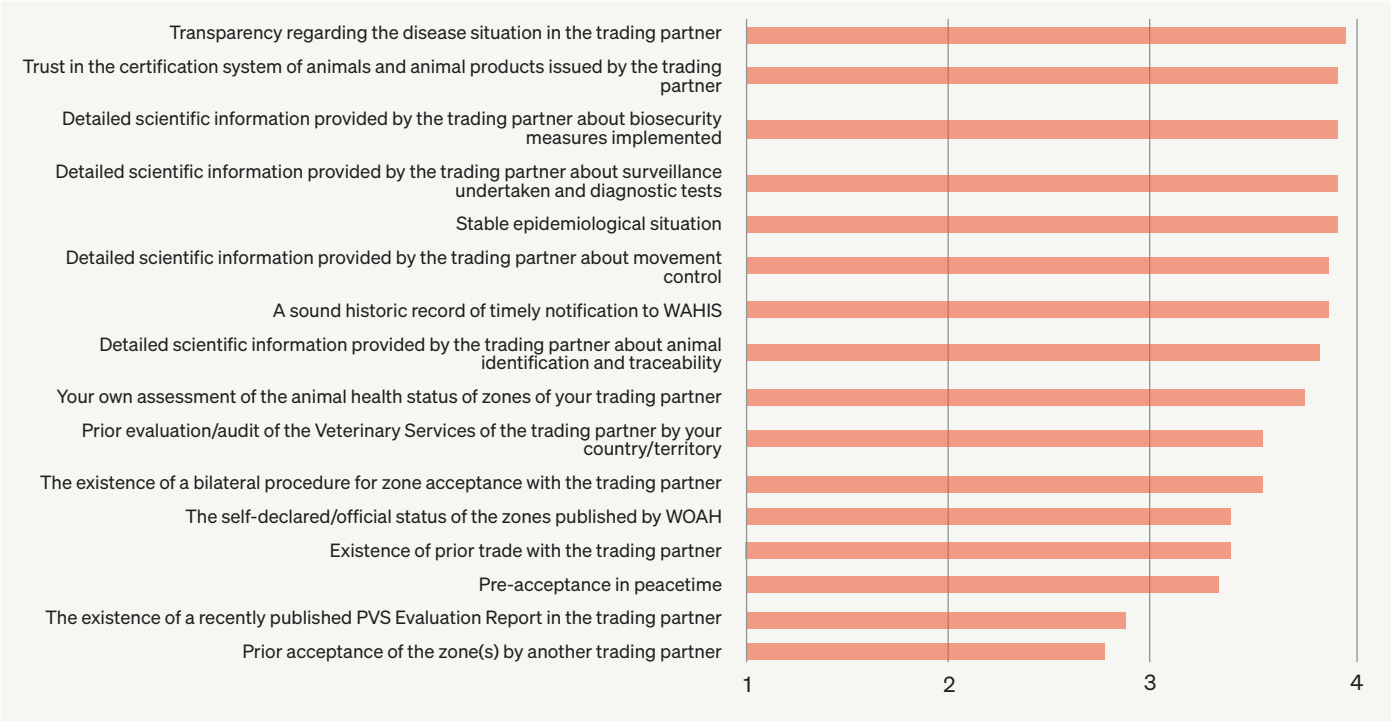

Figure 4. Focus on importing Members: average perceived importance of factors that facilitated acceptance of zones implemented by trade partners (WOAH survey 2023)

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