WOAH SRR-SEA capacity building on risk analysis for transboundary animal disease control purposes in Southeast Asia

World Organisation for Animal Health

Australian Government
Department of Agriculture, Fisheries and Forestry

UNIT 7
RISK MANAGEMENT IN ENDEMIC SITUATIONS

Department of Emerging diseases and Global health

Animal Health Research Centre (CISA)

Institute for Agronomic and Food Research (INIA)

Spain's Research Council (CSIC)

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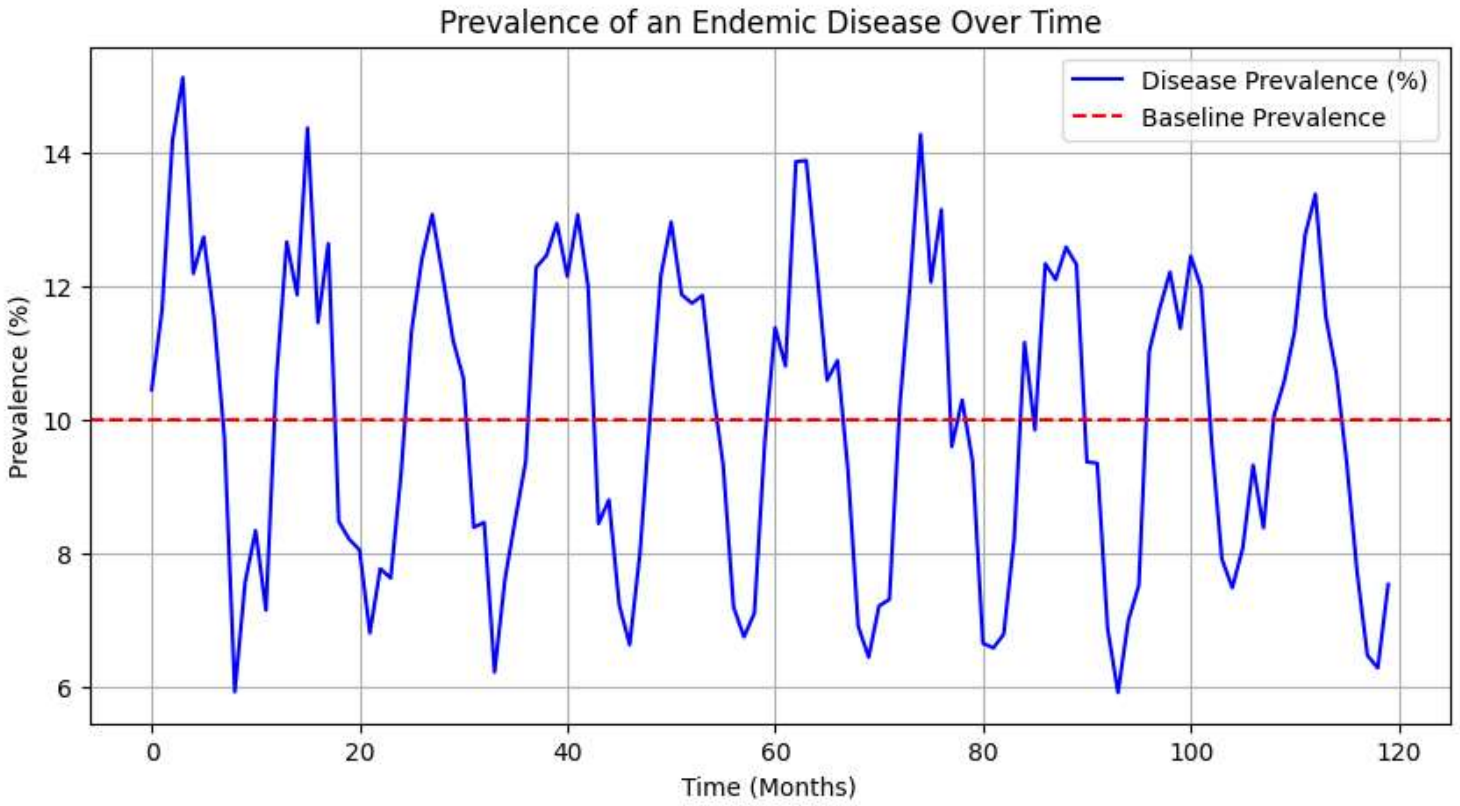
Outline

- Epidemic vs. endemic
- Risk-based surveillance
- Risk-based control strategies:
  - Vaccination
  - Movement control
  - Biosecurity
  - Zoning and Compartmentalization
- Evaluation of interventions
- Assignment
- Self assessment
- Resources

Endemic diseases require ongoing….



Risk management

spread

impact

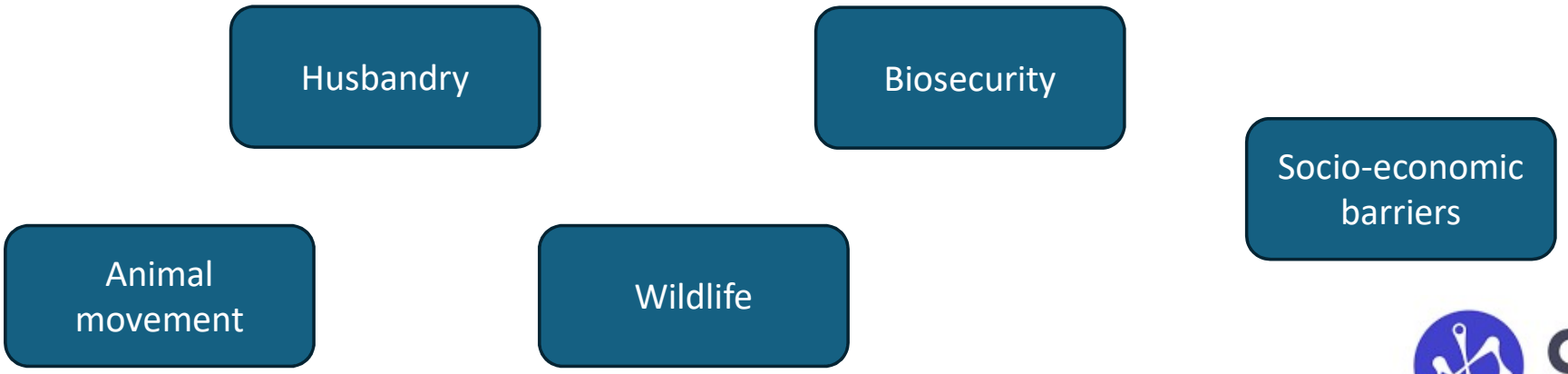
Surveillance

Control strategies

Policy

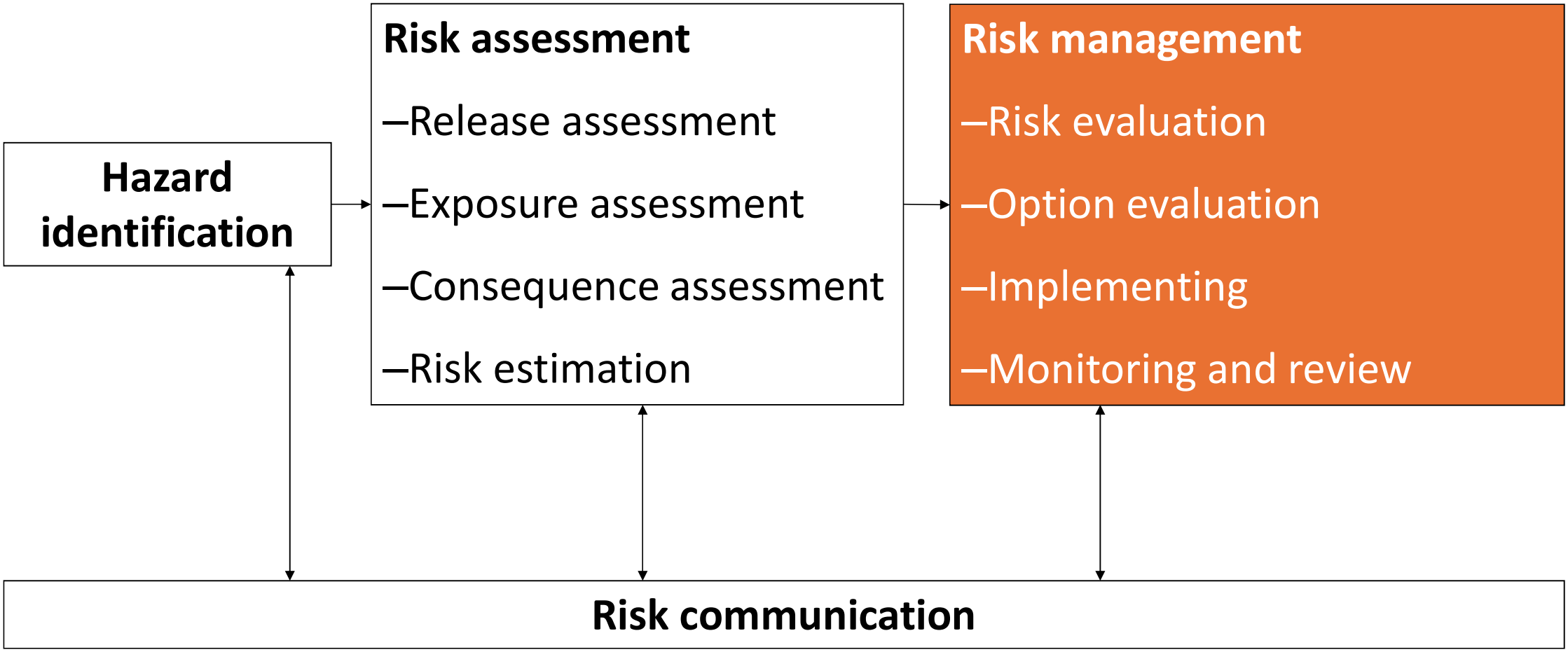
Endemic risk characterization

- Understanding **disease persistence** within populations
- Identifying key drivers that may cause a **transition from endemic stability to epidemic outbreaks**



Why risk-based control strategies?

- **Efficient allocation of resources**: high risk populations first
- **Enhances disease control impact**: Target areas where measures can "break the chain", can effectively reduce transmission
- **Prevents unnecessary interventions**: Reduces costs in low-risk areas where natural immunity or basic biosecurity may suffice
- **Supports international trade**: Helps compartmentalize disease-free areas, ensuring market access

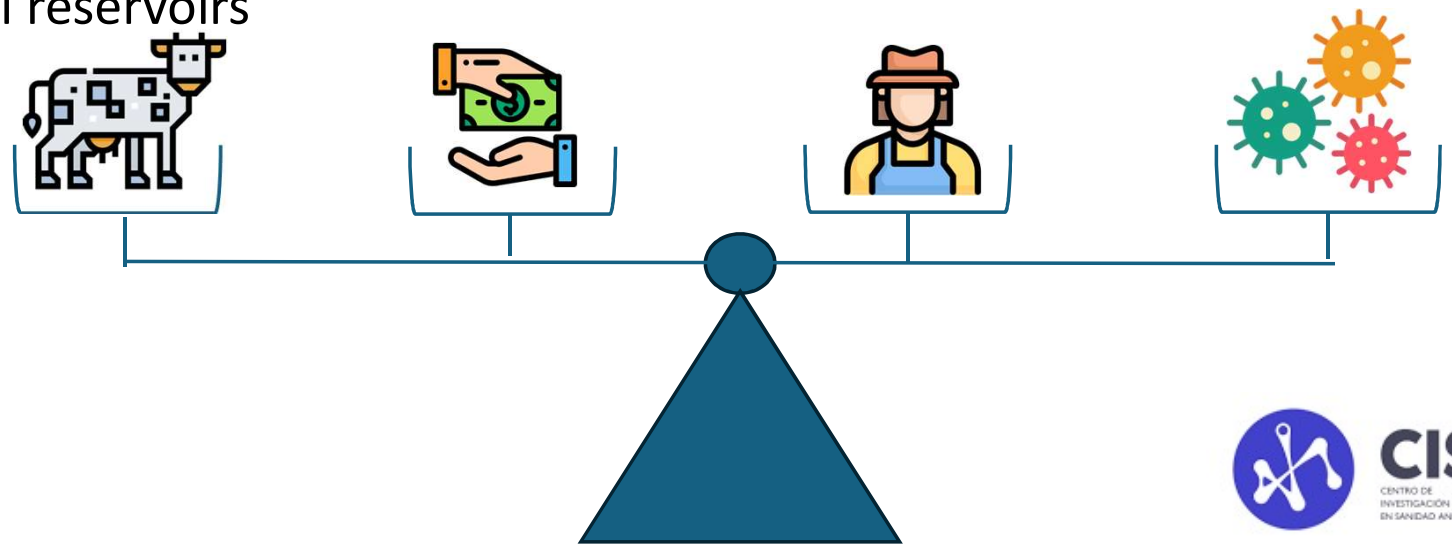


WOAH Risk Analysis Process

Risk factors for control strategy prioritization

1. Epidemiological

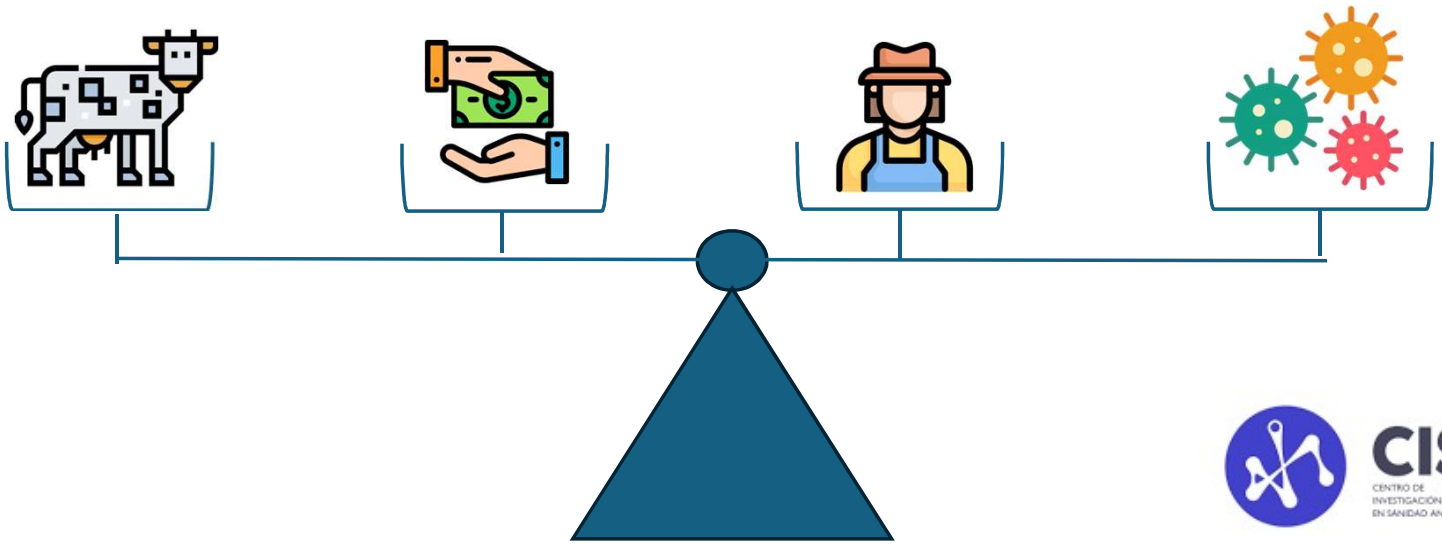
- High prevalence areas
- Persistent circulation
- High livestock density
- Poor biosecurity
- Increased transmisión
- Peak of trade and movements
- Wild animal reservoirs



Risk factors for control strategy prioritization

2. Economic and trade

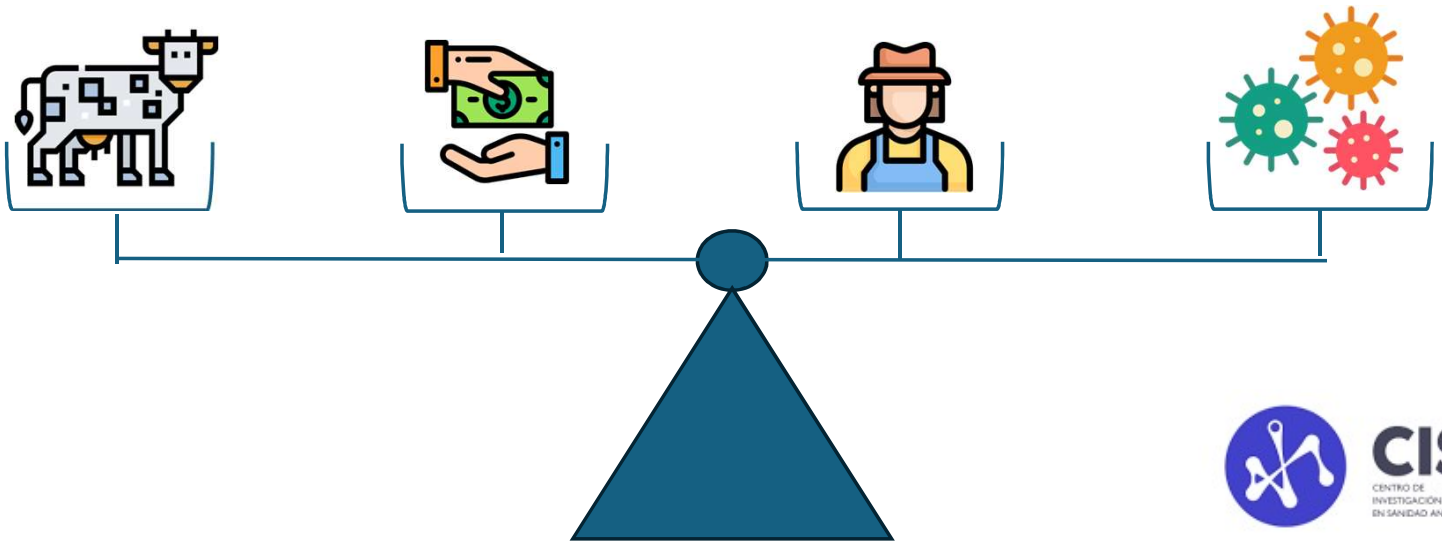
- **High value** livestock (breeders, export-oriented, etc)
- Target areas **at risk of export bans** or market losses



Risk factors for control strategy prioritization

3. Social and compliance

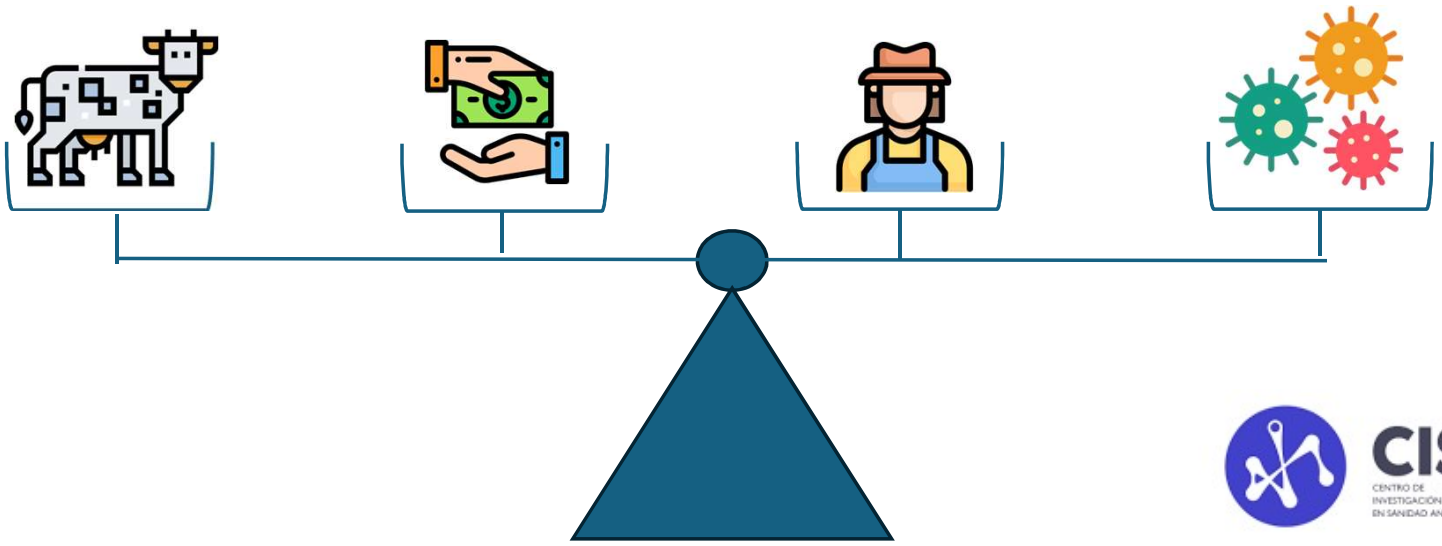
- Areas with higher acceptance first
- Alternative approaches for difficult-to-reach areas (i.e. community-led)

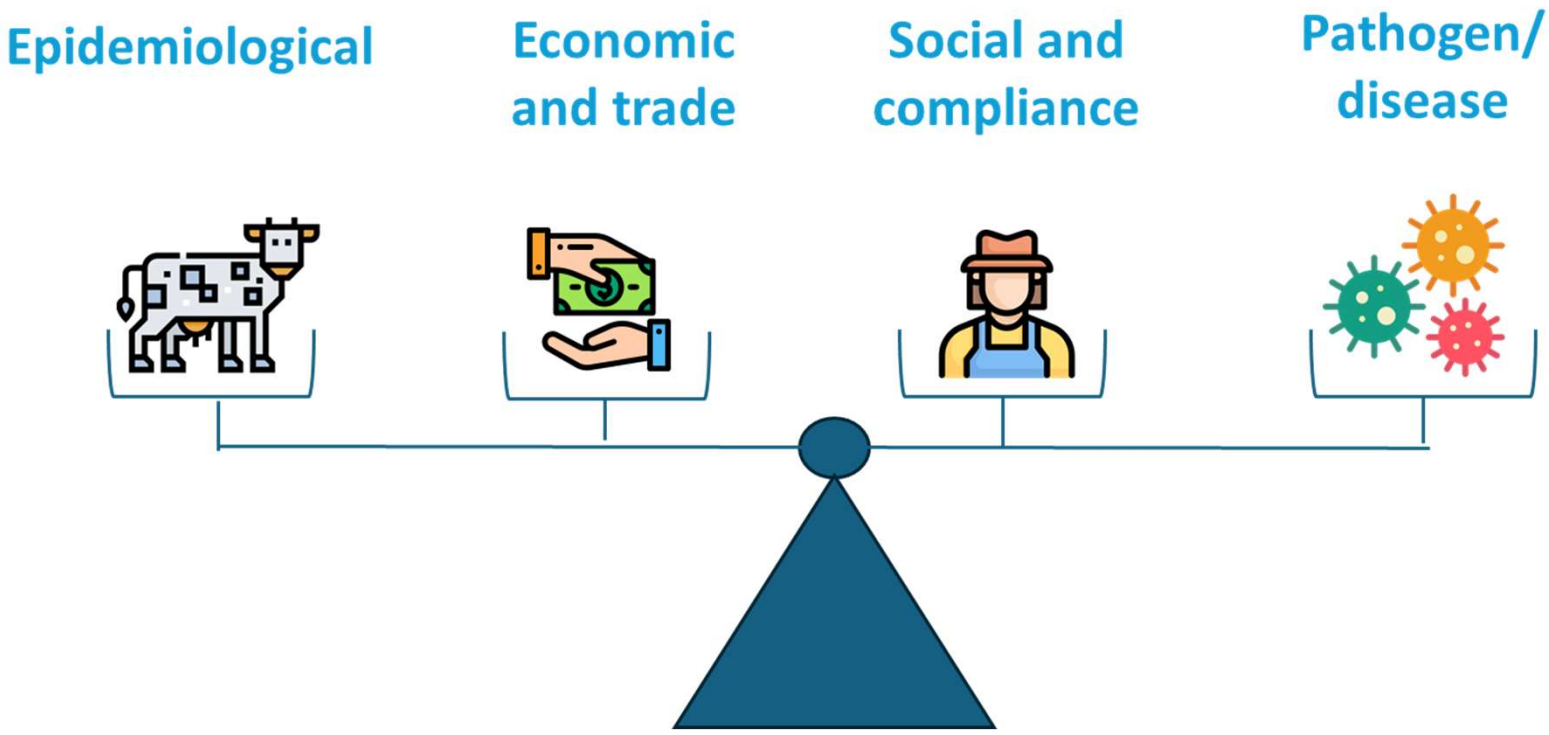


Risk factors for control strategy prioritization

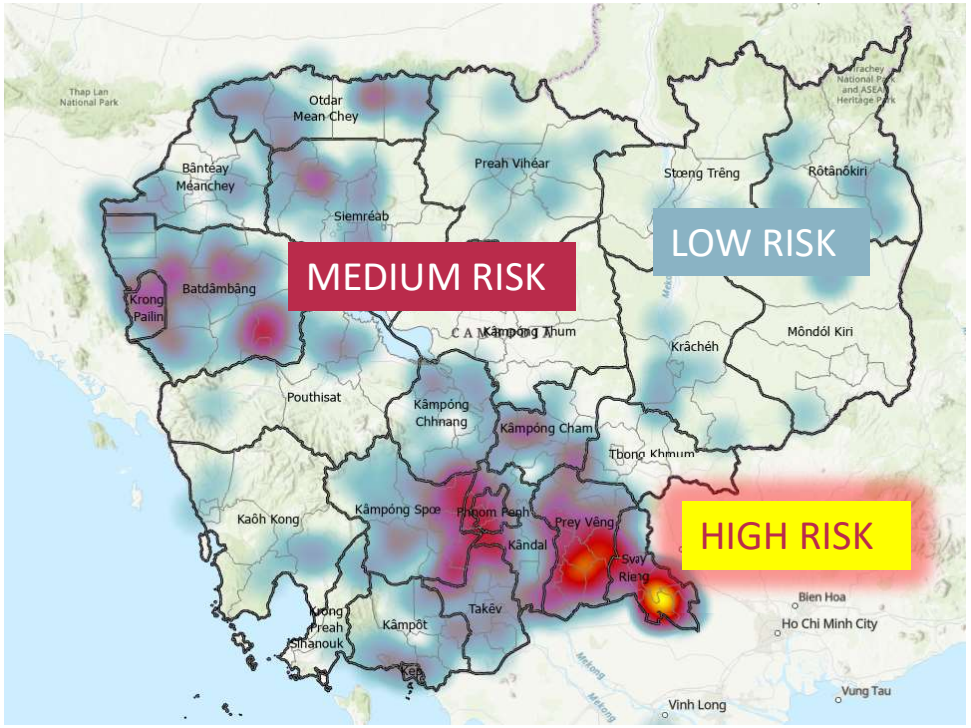
4. Pathogen/disease

- Transmission risk
- Risk pathways
- Severity




Epidemiological
Economic and trade
Social and compliance
Pathogen/ disease

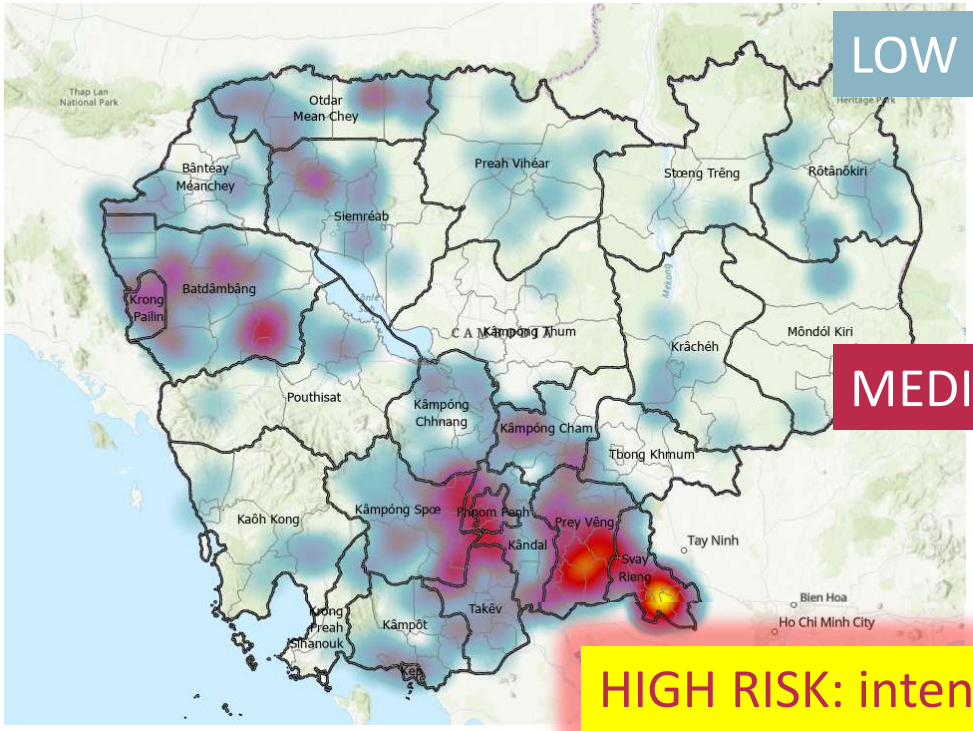
Using risk data for disease management



Risk mapping and zoning

Surveillance data

Using risk data for disease management: example of risk-based vaccination



LOW RISK: Biosecurity and monitoring

Areas with minimal exposure risk → vaccination may be unnecessary

MEDIUM RISK: surveillance and targeted vaccination

Areas with sporadic cases but controlled movement

HIGH RISK: intensive vaccination

Areas with frequent outbreaks, high cross-border trade, high density farms

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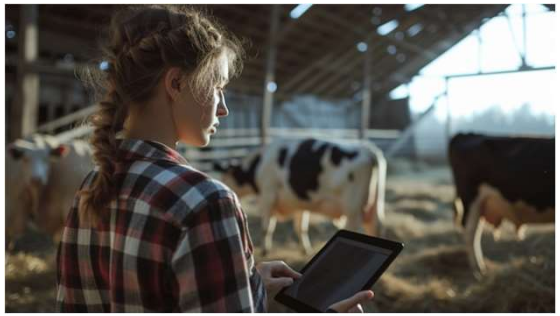
Using surveillance data to refine risk-based vaccination strategy

Serological testing:
Identifies **immunity gaps** in the population

Molecular surveillance:
Determines whether **new virus strains require updated vaccines**



Farmer reporting system:
Can identify high-risk areas

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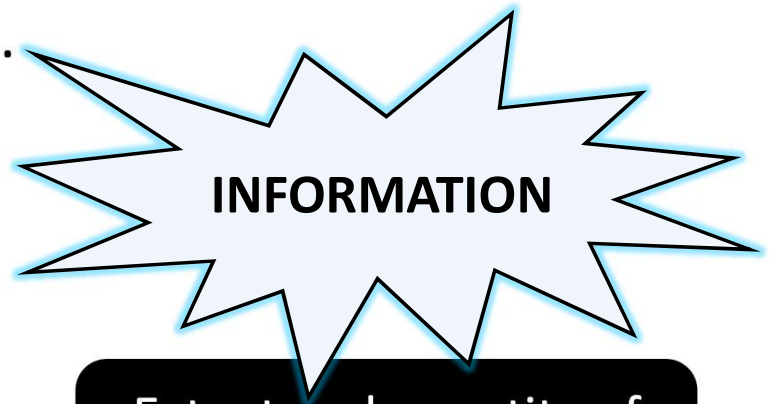
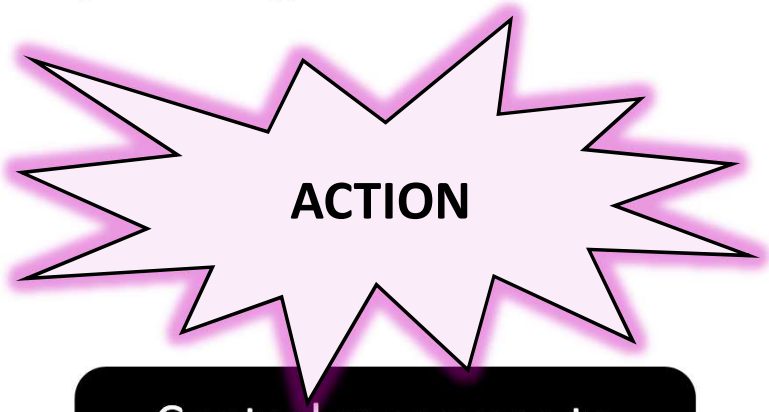
RISK-BASED SURVEILLANCE

Disease surveillance as a risk management tool

Surveillance helps **detecting, monitoring, and responding** to endemic diseases.



- Extent and quantity of infection
- Risk factors
- Control measure compliance



- Control measures to reduce extent/quantity
- Increase surveillance in at risk subpopulations
- Audit compliance and redesign as needed

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Review of types of surveillance

Surveillance helps **detecting, monitoring, and responding** to endemic diseases.

Passive

Data collected without actively looking for cases, relying on reporters (generally farmers, vets or labs, but also citizens)

- Animal found dead or with clinical signs
- Routine reporting

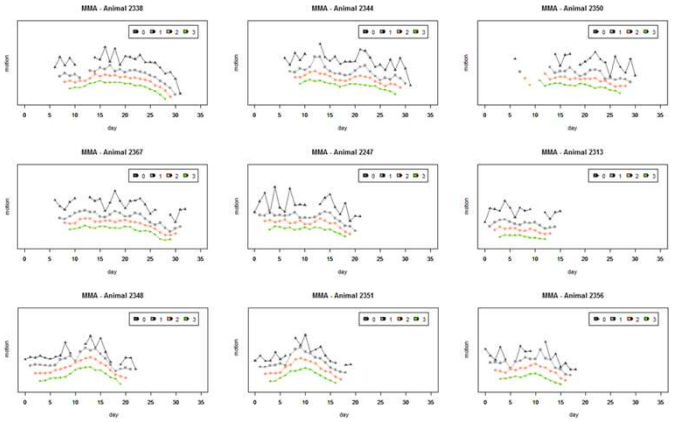
Active

Data collected from field visits, sample collection or lab testing, following a design scheduled in advance

- Random blood testing in positive regions
- Swabs from waterfowl at wintering sites

Review of types of surveillance

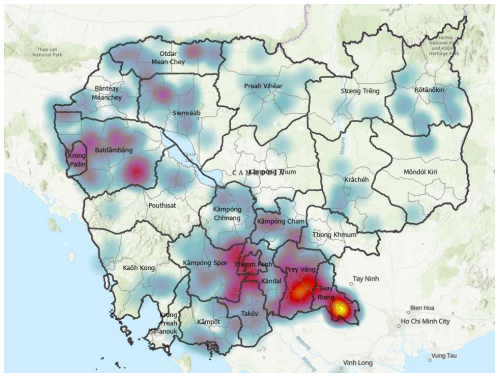
Surveillance helps **detecting, monitoring, and responding** to endemic diseases.



Syndromic

Health related information (clinical or other forms) that precedes a diagnosis and could be indicative of a suspicion in advance

- Sudden increase in vet drug sales for lameness and fever (FMD outbreak suspicion)



Risk-based

Planning, designing or interpreting results from surveillance based on probability of occurrence and impact or hotspots.

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What is surveillance monitoring

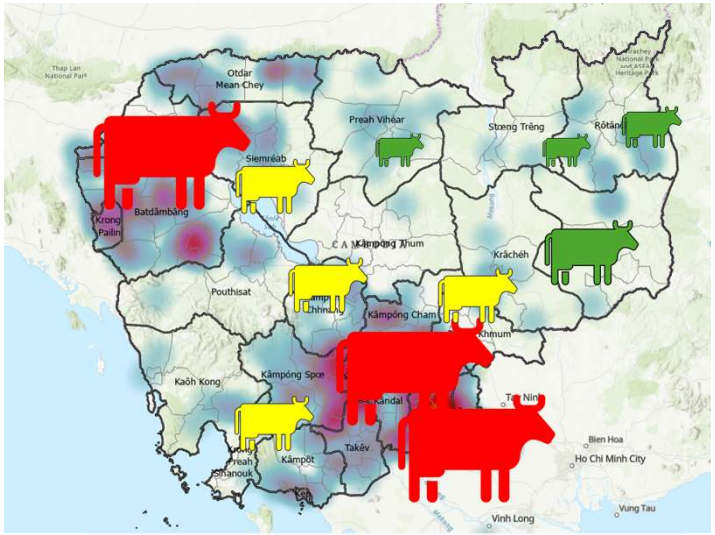
- **Health status**
  - Pathogen detection
  - Lesions and CS
  - Indicators (i.e. drug sales)
  - Predictions

BUT ALSO:

- **RISK FACTORS**:
  - Vector population
  - Movements
  - Environmental factors
- **INDICATORS**:
  - Commodity price (Illegal trade)

Risk-based surveillance

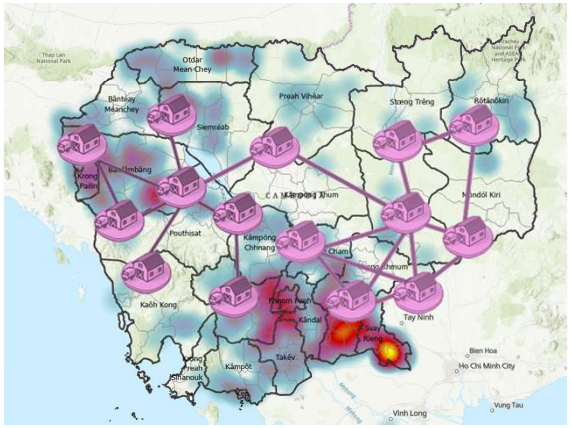
With risk-based surveillance, **a sub-population at greater risk of being infected or infectious** is targeted so that they are represented in a greater proportion than the general population in a surveillance plan.



Risk-tailored surveillance models

Monitoring clinical signs in high-risk farms

Targeted testing in strategic areas



Predicting disease hotspots to target surveillance

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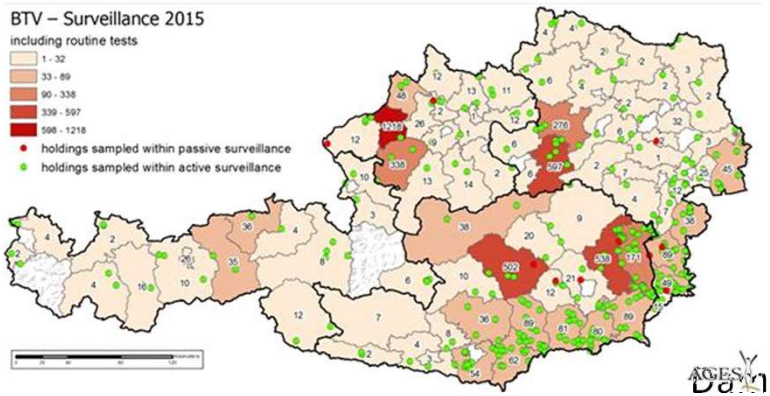
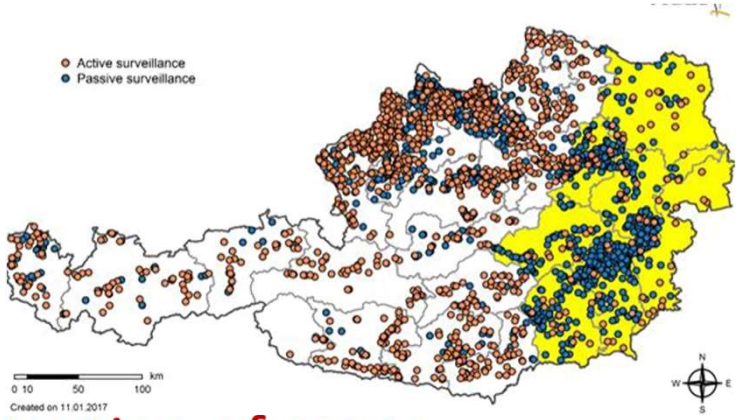
Risk-based surveillance example 1: Detection of BTV in Austria

- In order to detect a 2 % prevalence with a confidence of 95 % in the **high risk area, 150 samples per month** have been taken.
- Within the remaining regions four times a year 35 samples have been taken (10 % prevalence, 95 % confidence
- Target animals: Unvaccinated cattle, older than 12 month and free ranged





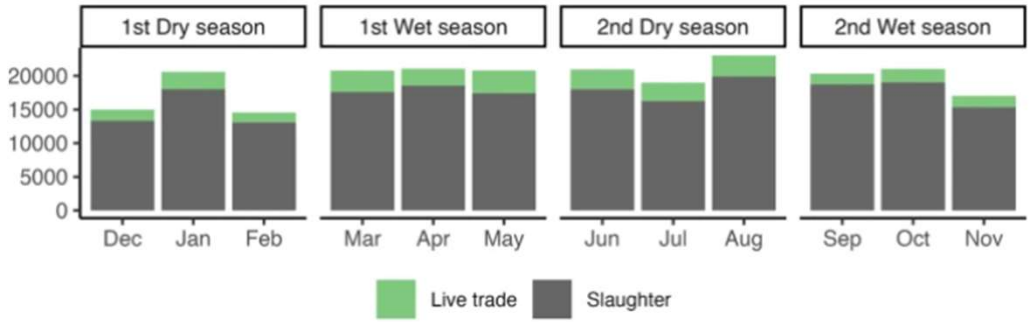
after detection of cases

- 28 regional units
- Sampling: 5 % prevalence (95 % security) ⇨
- 60 samples per unit from unvaccinated cattle
  - In free units: 4/year
  - In restricted units: risk based sampling once in autumn

Dahmoser, J. , 2017. Bluetongue situation in Austria. EU SCOPAFF meeting

Risk-based surveillance example 2:
Changes in movement trends of FMD linked to seasonal festivities

- By monitoring **livestock trade patterns** and **market prices**, authorities can anticipate high-risk periods and locations
- This allows for **pre-emptive vaccination** or **movement restrictions**



González-Gordon et al., 2023, https://doi.org/10.1038/s41598-023-44518-4

Risk-based surveillance example 3:
Early detection of HPAI with sentinels

https://rr-asia.woah.org

- Particularly **for free areas**
- Establishing **sentinel** birds for avian influenza in high-risk areas
- Small group of birds in strategic locations monitored regularly
- Tested for antibody conversion or active infections
- Cost-effective method and continuous data source

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RISK-BASED CONTROL STRATEGIES

Risk-based control strategies

With risk-based control strategies efforts are prioritized based on risk data to:

- ensure **resource allocation**
- **maximize disease control impact**

Risk-based vaccination

Where to vaccinate

Who to vaccinate

When to vaccinate

EXAMPLE:

Low-risk areas

Monitor antibody levels and only vaccinate if needed (immunity threshold)

Moderate-risk areas

Targeted vaccination at risk herds

Movement control

Surveillance

High-risk areas

Mass vaccination every 6 months

Prioritize high risk areas

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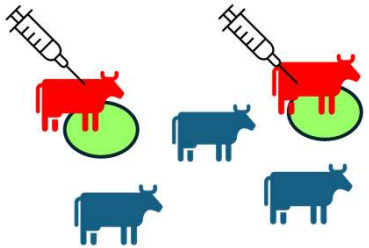
Risk-based vaccination strategies

Risk-prioritized

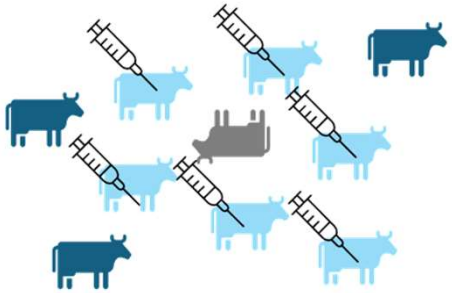
Focus on high-risk populations and regions



Examples:
- high value animals
- Young animals before entering trade network
- Transhumant livestock before moving between areas

Ring vaccination

Target vaccination around cases to create a buffer zone of immune animals



Example: outbreak containment

Risk-based revaccination

Aligning vaccination intervals with transmission models

Examples:
- Shorter immunity duration (e.g., **FMD: 4-6 months**) → Requires **biannual revaccination**.
- Seasonal vaccination strategies for vector-borne disease

Risk-based vaccination evaluation

Has the strategy achieved its purpose??

- ensure **resource allocation**
- **maximize disease control impact**

A) Key performance indicators
Reduction in disease incidence in vaccinated zones.
Seroconversion rates (how many vaccinated animals develop immunity).
Decrease in outbreak frequency and severity.
Economic benefits (e.g., increased trade access due to disease control).

Risk-based vaccination evaluation

Has the strategy achieved its purpose??

- ensure **resource allocation**
- **maximize disease control impact**

B) Continuous Risk Assessment for Adaptive Vaccination Plans
Regular **reassessment of risk data** ensures that vaccination strategies remain **cost-effective and epidemiologically relevant**.
Adapt strategies based on **emerging threats, new strains, and compliance levels**.
Combine with **movement control, biosecurity, and surveillance** for an **integrated risk management approach**.

Risk-based movement control

Restrictions **proportionate to disease risk**, informed by dynamic risk assessments and real-time surveillance data

EXAMPLE:

Moderate-risk areas
Detailed movement information by herd
Visual inspection of cleaning
Quarantine

Low-risk areas
Basic movement information

High-risk areas
All animals identified,
C&D protocols,
Premovement testing

Risk-based movement control strategies: examples

Who

Risk-based quarantine zones:
Focus on infected and high-risk populations

Where

Trade and market surveillance:
Monitoring high-risk movements

When

Livestock movement permits
Linking permits to risk classification

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Risk-based biosecurity

Implementation of **measures** stratified **based on risk levels** to optimize resource use and effectiveness

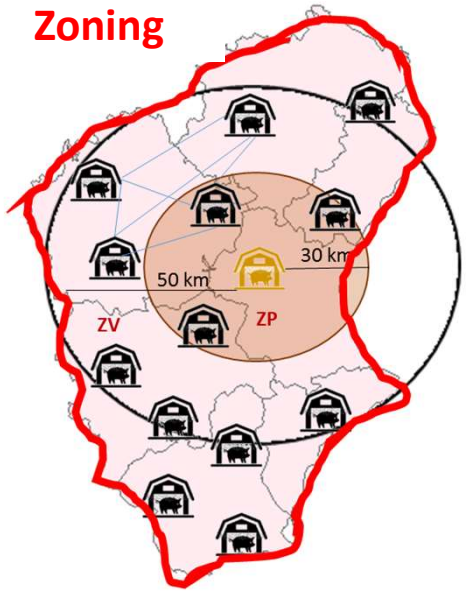
Moderate-risk areas
Controlled farm access, structured feeding

Low-risk areas
Basic sanitation and hygiene

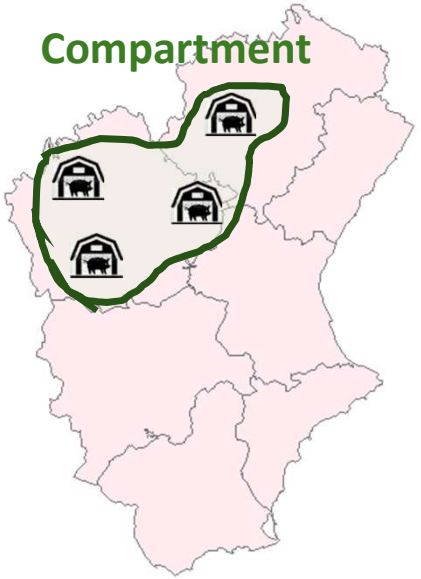
High-risk areas
Strict entry control, C&D protocols, PPE

Zoning and Compartmentalization

Establishing specific geographic areas, zones or compartments based on risk levels with targeted control measures in each level



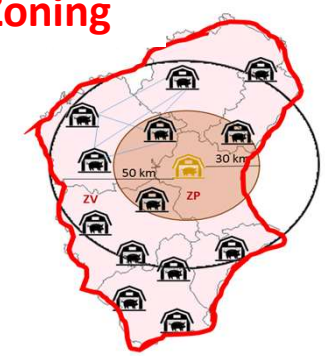
Chapter 4.4.
WOAH Terrestrial
Animal Health Code
(2024)



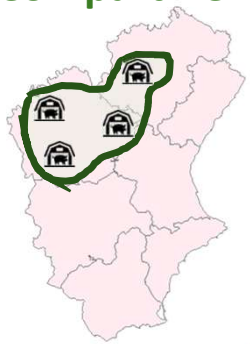
Zoning and Compartmentalization

	ZONING	COMPARTMENTALIZATION
Defined by	Geographical limits	Common management
Disease control	Movement restrictions	Strict biosecurity
Application	Entire region	Specific entities (farms, processing units)
Regulated by	Government	Public-Private-Partnership (PPP)

Zoning



Compartment



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Steps to establish a disease-free compartment

1. **Epidemiological risk assessment**: Identify **potential disease entry and spread pathways** on each component of the compartment
2. **Risk-based biosecurity management system**: i.e., implement **strict access control, sanitation, and movement restrictions** in high-risk areas
3. **Risk-based surveillance and monitoring**: i.e, regular **diagnostics, audits, and disease reporting**
4. **Traceability systems**: i.e. digital tracking of **animal movements and health records**
5. **Recognition & trade compliance**: Obtain official **disease-free certification**

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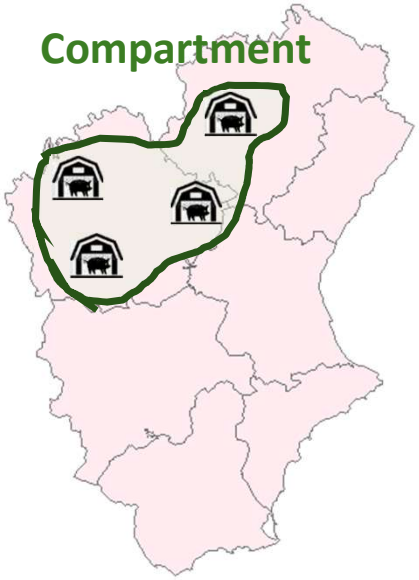
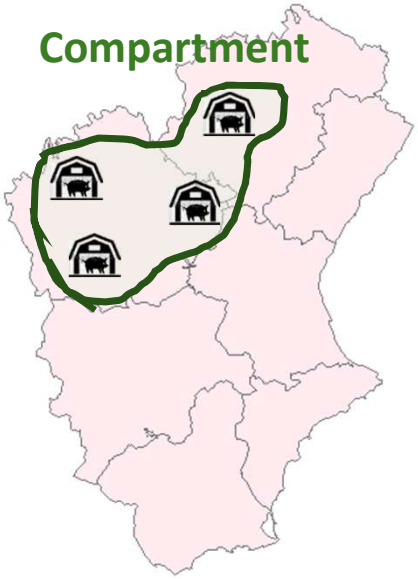
Benefits of compartmentalization in risk-based disease management



- **Maintains market access** for disease-free compartments during regional outbreaks.
- **Enhances biosecurity standards**, reducing disease introduction risks
- **Reduces reliance on widespread culling**, limiting economic losses

Benefits of compartmentalization at the farm level



- **Creates biosecure production units** that remain disease-free despite regional outbreaks.
- **Facilitates targeted vaccination and surveillance** within defined compartments.
- **Improves traceability and certification** for disease-free status, allowing continued trade.

Potential challenges in implementing compartmentalization in middle-and- low-income countries (MLIC)

1. Weak Regulatory Frameworks: **compliance monitoring**
2. Cost of Implementation: **investment in biosecurity**, infrastructure, and surveillance.
3. Limited Disease Surveillance and Diagnostics: i**nadequate laboratory facilities** and **low testing capacity;** poor sample collection and transportation; lack of real-time surveillance= delayed disease detection.
4. **Informal livestock trade and unregulated movements,** large informal livestock markets
5. **Low awareness and resistance to change**, unfamiliar to compartmentalization, perception as unnecessary, concerns over economic losses

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Discussion: What are the challenges in implementing compartmentalization in MLIC?

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Possible solutions???

Potential solutions to compartmentalization challenges in MLIC

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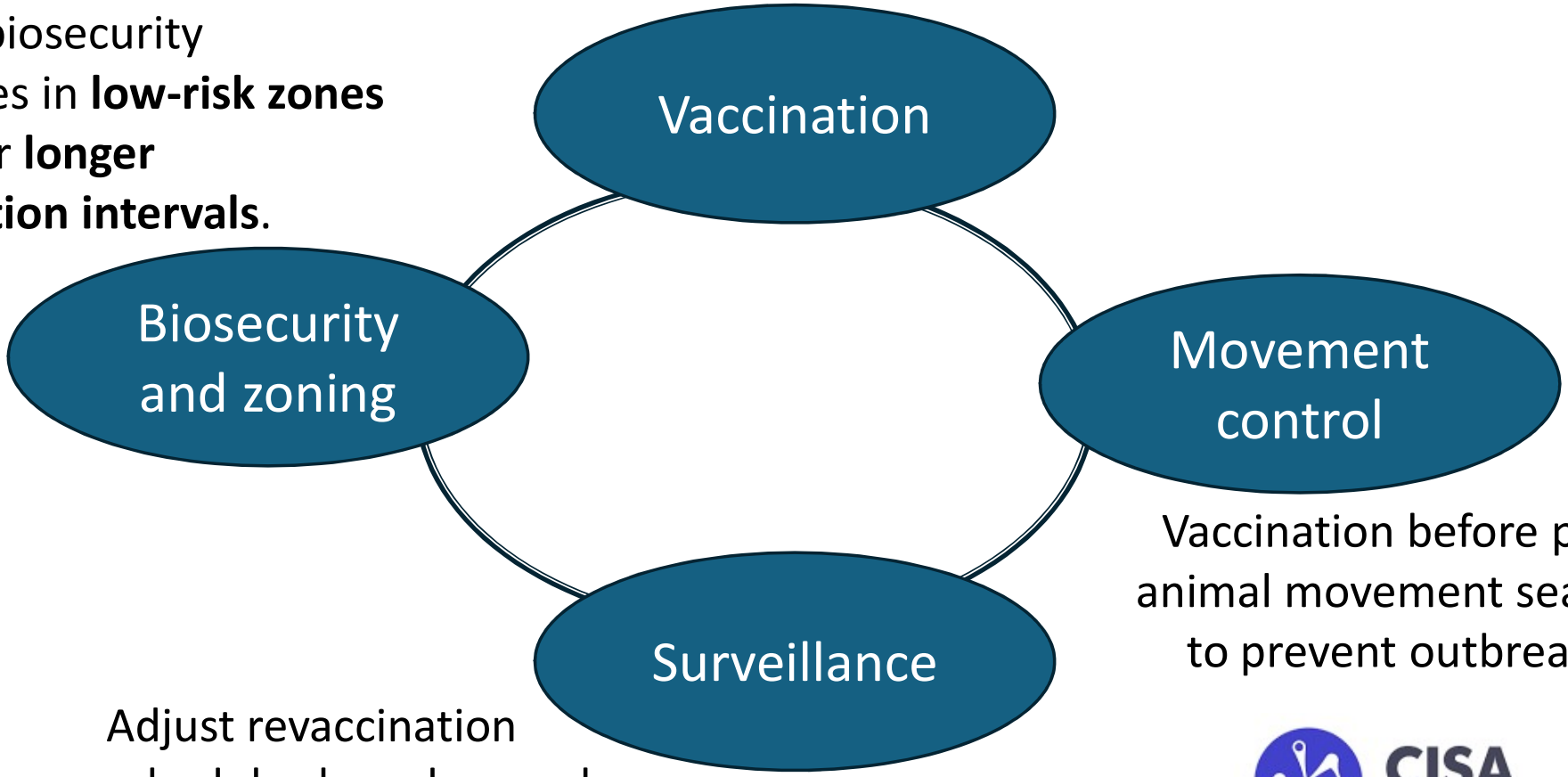
- Farmer training programmes
- Incentives (i.e. tax breaks, certification benefits)
- GPS tracking or digital movement permits
- Mobile diagnostic units
- Strengthen local labs
- PPP
- Low-cost compartmentalization models
- National compartmentalization guidelines
- Train OVS to enforce compliance

Integration of Risk-Based Control Measures

Higher biosecurity measures in **low-risk zones** allow for **longer vaccination intervals**.



Vaccination before peak animal movement seasons to prevent outbreaks.

Adjust revaccination schedules based on real-time serological data.

Challenges of risk-based control strategies

Vaccination:

- Incomplete coverage due to **financial constraints** or **vaccine hesitancy**
- **Cold-chain management risks** affecting vaccine efficacy

Biosecurity and zoning

- High costs for **full-scale biosecurity** in smallholder farms.
- Farmer resistance due to **lack of incentives**.

Movement control:

- Informal and cross-border trade complicate enforcement
- Economic disruptions if movement control is **too strict**

Surveillance

- Underreporting due to **fear of economic losses**.
- **Weak laboratory capacity** delaying test results.

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Questions/discussion

1. What is the primary difference between an **endemic** and an **epidemic** disease situation?
2. How does risk assessment shape the **difference between endemic and epidemic disease control**?
3. What factors determine **risk-based vaccination** priorities?
4. What are the challenges of **movement control** in Southeast Asia?
5. Why should movement control strategies be **tailored to risk levels** rather than universally applied?
6. How can **compartmentalization** improve disease management at the farm level?
7. What are the benefits of **compartmentalization** in risk-based disease management?
8. What role does **community engagement** play in disease control efforts?
9. How can socio-economic constraints impact the effectiveness of **risk-based surveillance**?
10. How can **biosecurity measures** be adapted for resource-limited farmers?