



Case study: QRA Ethiopia

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**Risk Analysis training course
NIHE, Hanoi, Vietnam, 4-5 May 2016**



Qualitative Risk Assessment for the Risk of Introduction of HPAI H5N1 in Ethiopia via Wild Bird Trade Transit in the Country

1. Risk question & hazard identification

- Context: 2008 - Ethiopia wished to 1) assess the risk of introduction of HPAI H5N1 in the country and 2) identify risk mitigation measures
 - 2008 - HPAI H5N1 reported in Africa (Nigeria, Egypt, Niger, Burkina Faso, Ivory Coast, Sudan, Cameroon, Djibouti, Benin, Ghana and Togo)
 - Main routes of introduction: migration of wild birds, legal trade of domestic poultry, poultry products and wild birds, and illegal trade of the same
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1. Risk question & hazard identification

- Meeting with various stakeholders (Vet authorities, farmers, replication centers, wildlife services, research institutes):
 - Review of previous /work undergoing at the time (introduction via wild birds, commercial imports of poultry & products; spread of the disease via government multiplication centers and commercial farms, within and between villages and via movement of trades between markets and villages)
 - Stakeholders identified a potential route of introduction not addressed by previous work: wild bird trade transiting in Ethiopia

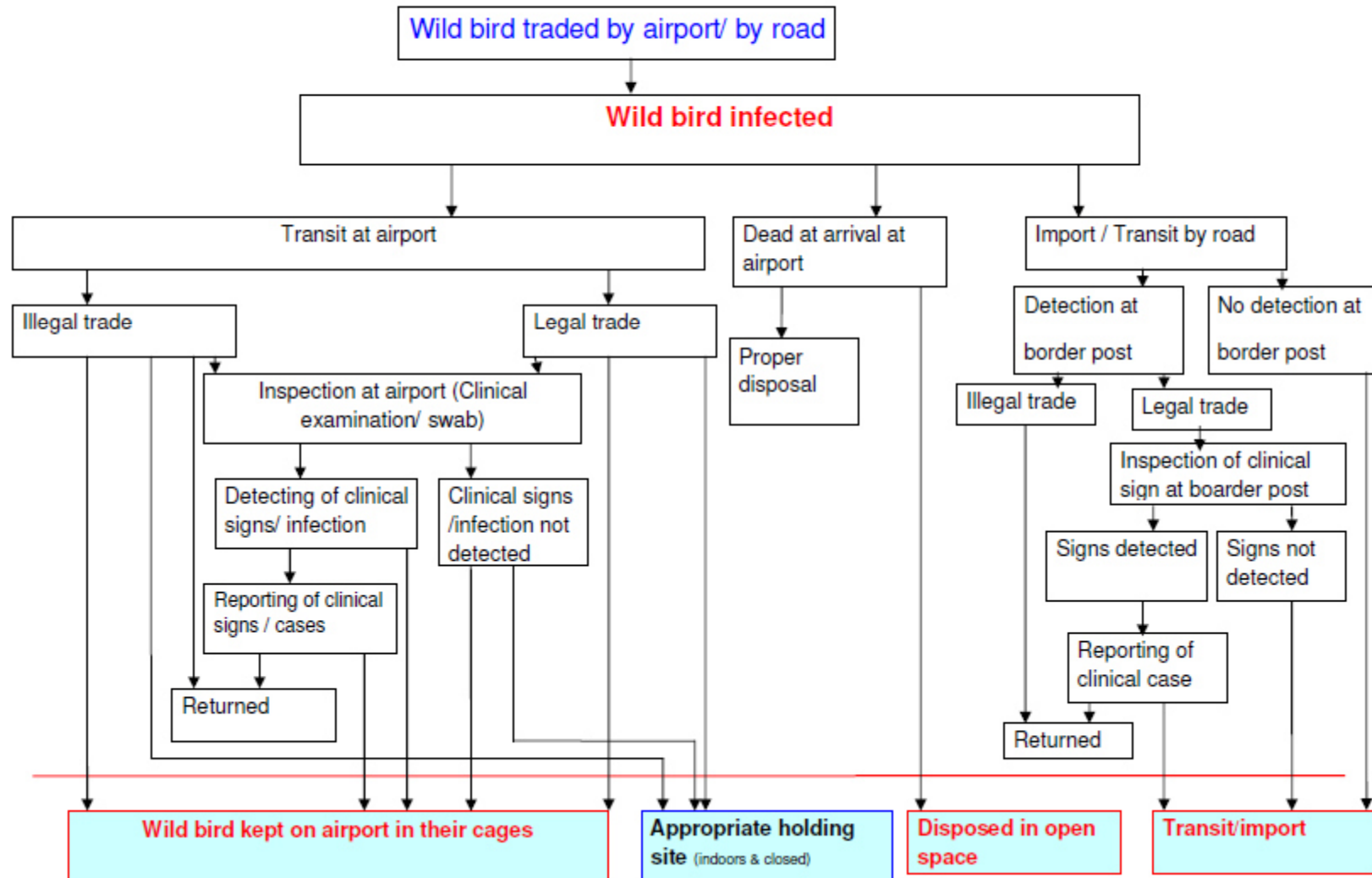
 - ⇒ What is the risk of introduction of HPAI H5N1 into Ethiopia via wild bird trade transiting in the country, resulting in the infection of a poultry farm?
 - ⇒ What is the subsequent risk of transmission of HPAI H5N1 between Ethiopian poultry farms (small-scale and large scale)?
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2. Risk pathways

- Description of all scenarios and steps required for the risk to occur
 - Differentiating release, exposure and consequences
 - Specifying assumptions
 - Critical step of the risk assessment
 - Needs to be complete and to address the risk question
 - Requires multiple experts: epidemiology of the disease, sources and mechanisms of transmission, demographics and practices in system(s) considered, existing prevention/control measures, environmental characteristics, etc.
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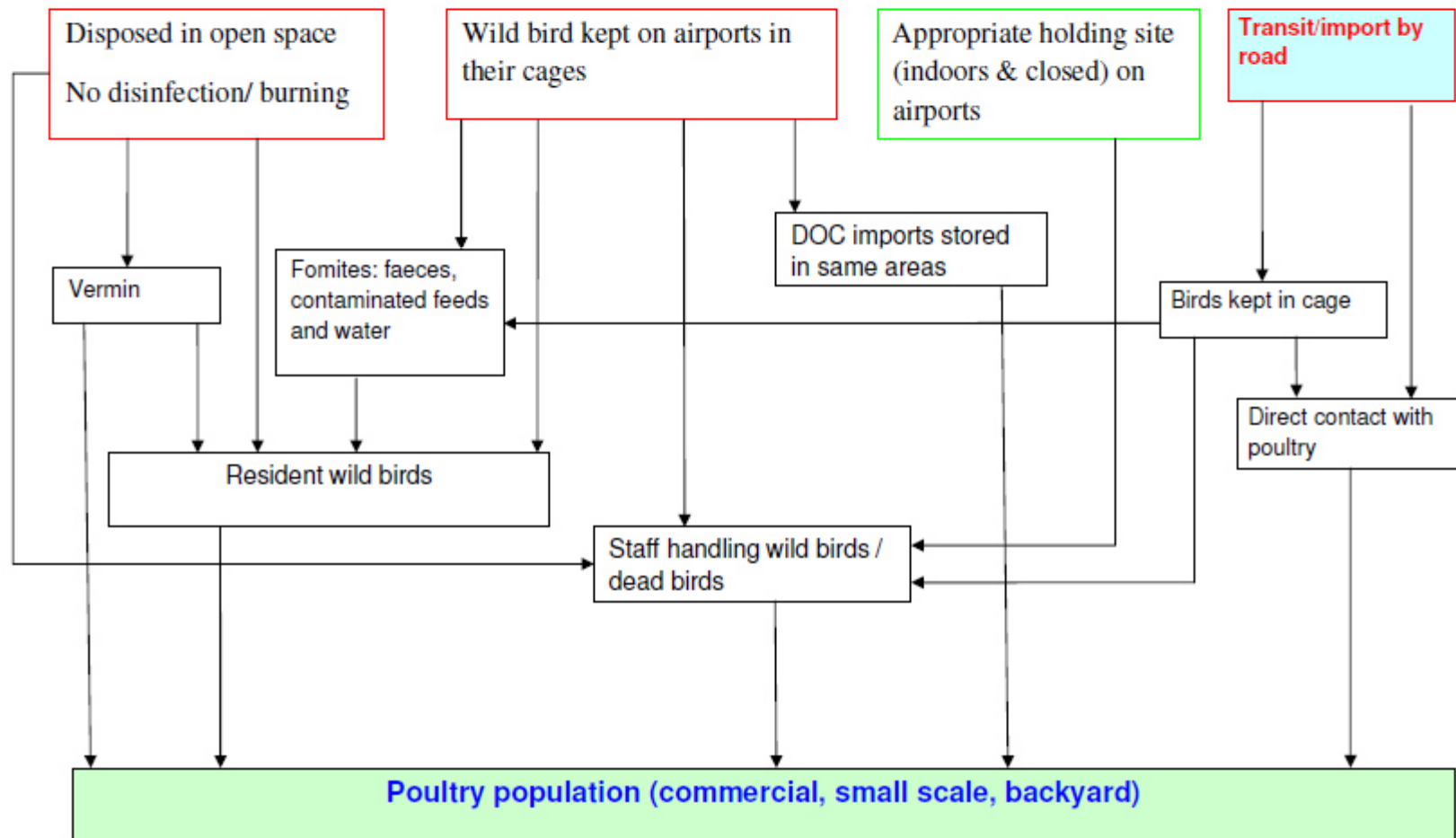
2. Risk pathways

Release Pathways

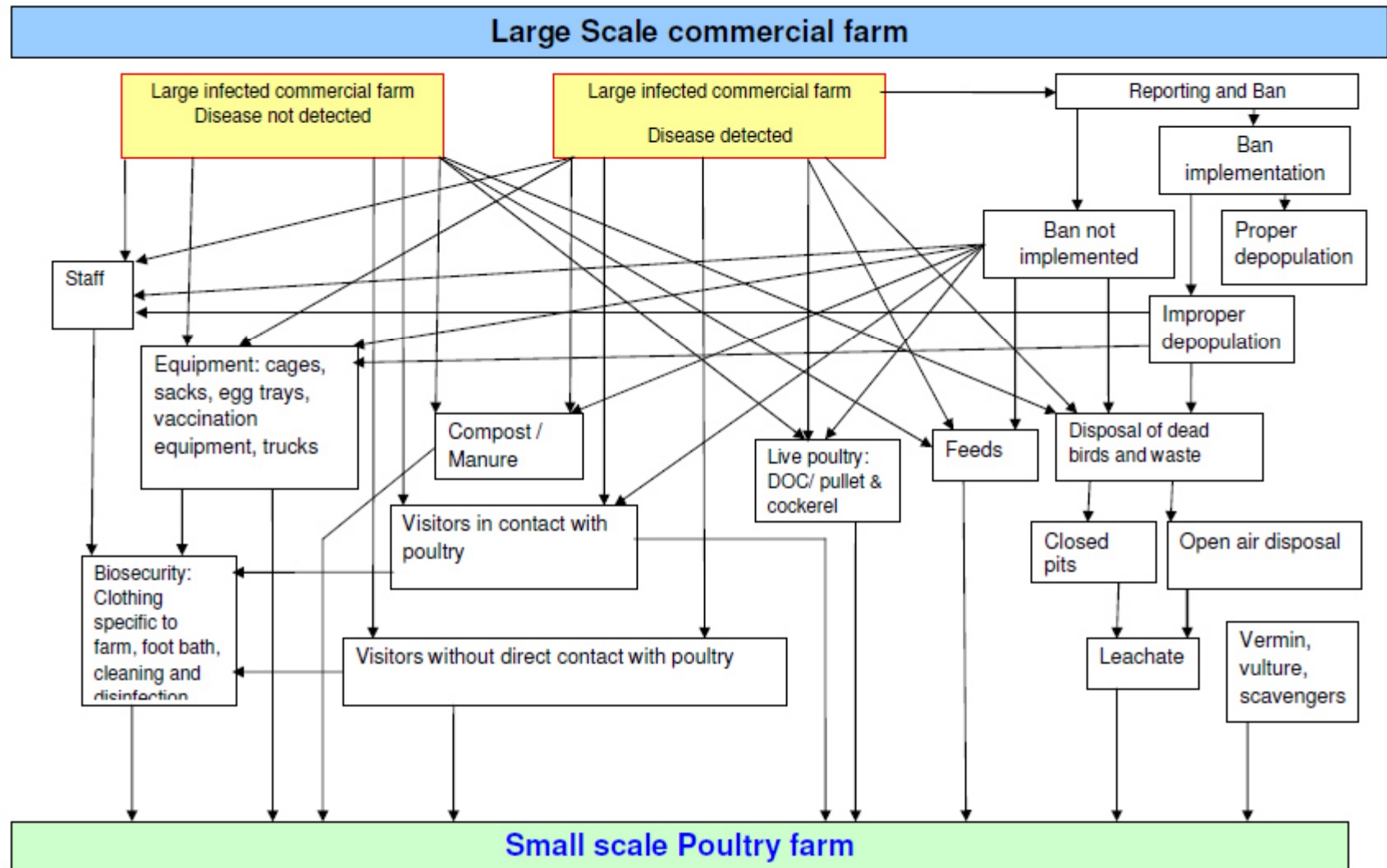


2. Risk pathways

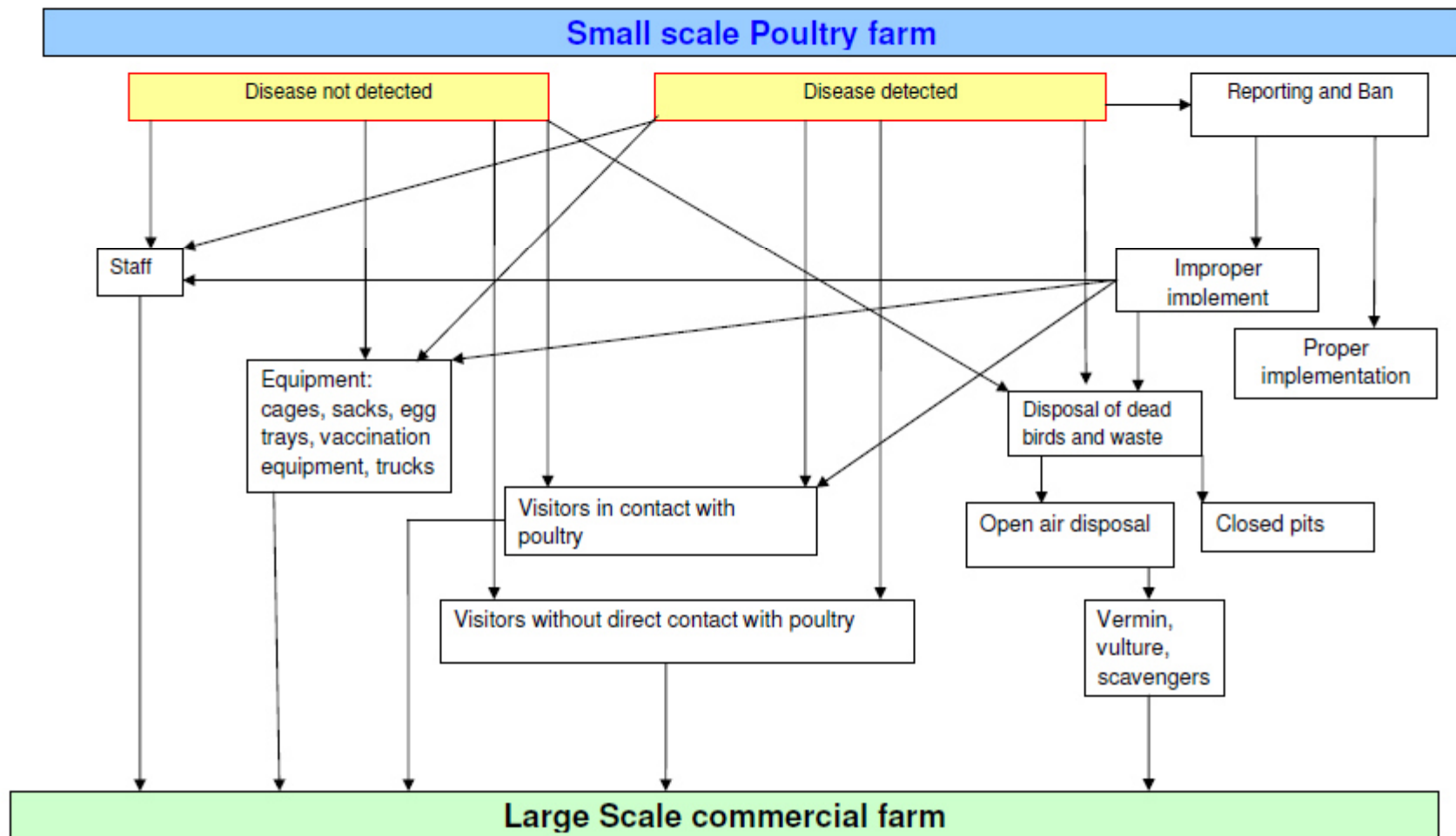
Exposure pathways



2. Risk pathways



2. Risk pathways



3. Data collection

- ❑ Based on pathways & scenario trees, list of data needs
 - ❑ Identification of relevant sources & data collection
 - ❑ Needs to consider strength of evidence, potential biases, etc.

 - ❑ Various type of data used:
 - Published literature on HPAI H5N1 and farming systems in Ethiopia
 - Grey literature – official reports, surveys and studies...
 - Interview of staff (questionnaire) at airport & border posts
 - Expert opinion elicitation on farming practices (questionnaire followed by mathematical combination of results)
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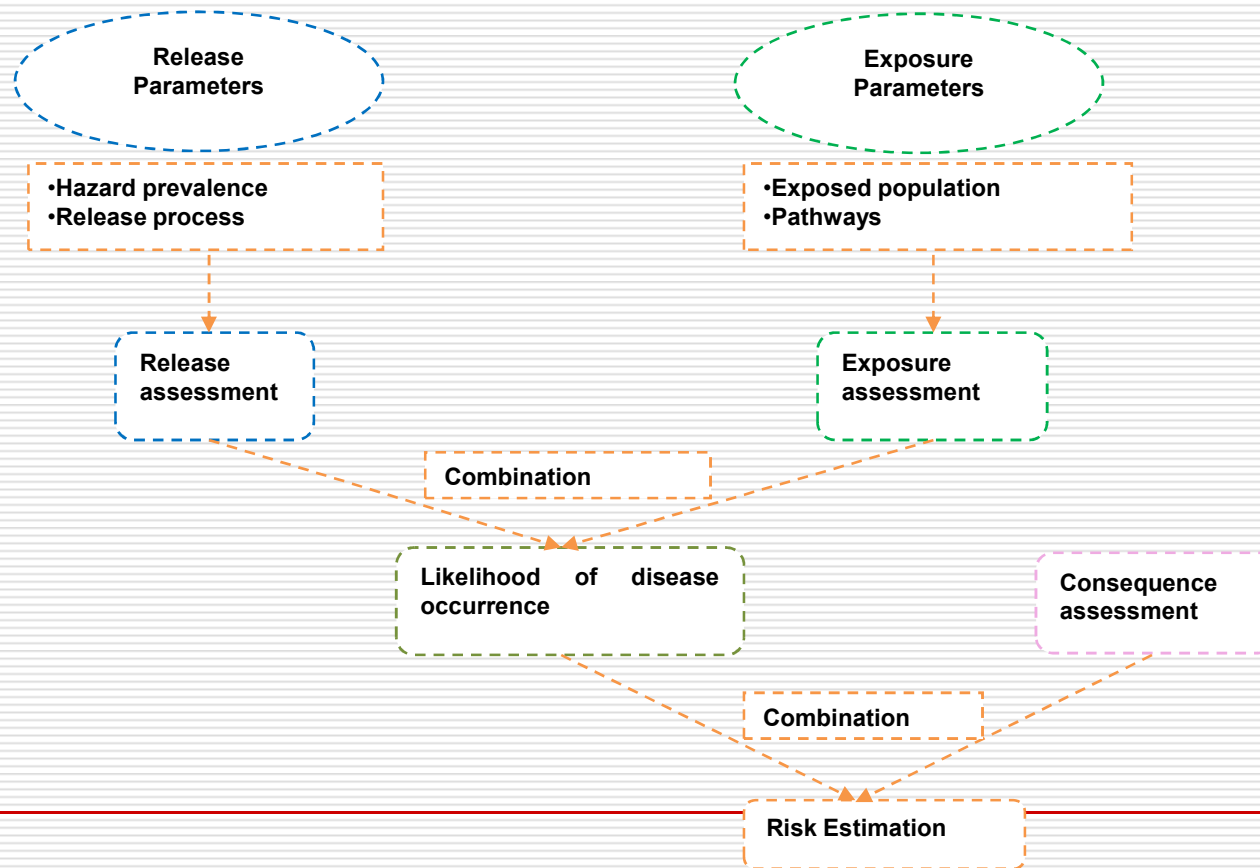
3. Data collection

Example for one step of the pathway:

Step of pathway	Information obtained	Source
Probability that a wild bird transiting Ethiopia is infected with H5N1 HPAI virus	1.H5N1 HPAI infection/outbreak status in the country(ies) of origin.	1.Bole International Airport Transit Supervisor, Ethiopian Wild life authority, OIE reports
	2.Species and susceptibility (partially) of the wild birds on trade transit to H5N1 HPAI virus	2. Bole International Airport Transit Supervisor & Ethiopian wild life authority; Perkins and Swayne (2003), R. Jackson et al. (2000), Alexander DJ (2000)
	3.Frequency and volume of wild birds on trade transit to Ethiopia	3.Bole International Airport Transit Supervisor
	4.Time spent on transportation to reach Ethiopia	4. Bole International Airport Transit Supervisor

4. Qualitative risk assessment

- The overall probability is obtained by combining the probabilities of the various consecutive steps:



4. Qualitative risk assessment

- Definition of approach to follow before conducting assessment:
 - Risk categories
 - Uncertainty
 - Combination matrices

 - Reasons: Ensure a more structured/systematic approach and increase objectivity
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4. Qualitative risk assessment

Probability category		Interpretation
Negligible		Event is so rare that does not merit to be considered
Very low		Event is very rare but cannot be excluded
Low		Event is rare but does occur
Medium		Event occurs regularly
High		Event occurs very often
Very high		Event occurs almost at certainly
Uncertainty category	Interpretation	
Low	There are solid and complete data available; strong evidence is provided in multiple references; authors report similar conclusions.	
Medium	There are some but no complete data available; evidence is provided in small number of references; authors report conclusions that vary from one another. Facts that can be seen / touched, for instance the presence or absence of building, facility, etc	
High	There are scarce or no data available; evidence is not provided in references but rather in unpublished reports or based on personal communication; authors report conclusions that vary considerably between them.	

4. Qualitative risk assessment

	Parameter 2 /Exposure risk category						
Parameter 1 / Release risk category	Negligible	Very Low	Low	Medium	High	Very High	
	Very High	N	VL	L	M	H	VH
	High	N	VL	L	M	H	H
	Medium	N	VL	VL	L	M	M
	Low	N	N	VL	VL	L	L
	Very Low	N	N	VL	VL	VL	VL
	Negligible	N	N	N	N	N	N

	Consequence/transmission risk category						
Combined release and exposure risk category	Negligible	Very Low	Low	Medium	High	Very High	
	Very High	N	VL	L	M	H	VH
	High	N	VL	L	M	H	VH
	Medium	N	VL	L	M	H	VH
	Low	N	VL	VL	L	M	H
	Very Low	N	N	VL	VL	L	M
	Negligible	N	N	N	N	N	N

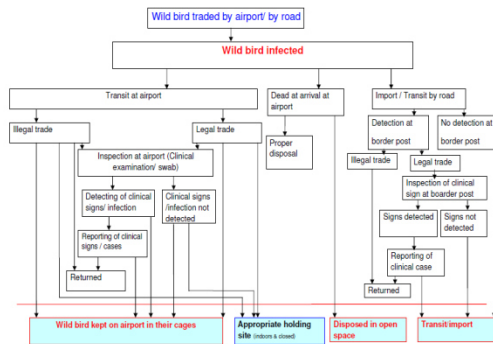
4. Qualitative risk assessment

- For each step of the pathway:
 - Description of data (concise & objective, with ref.), incl. variability and uncertainty
 - Interpretation of data and allocation of risk category
 - Summary of information in table

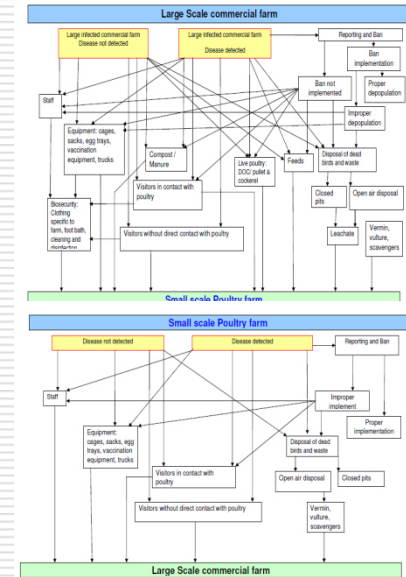
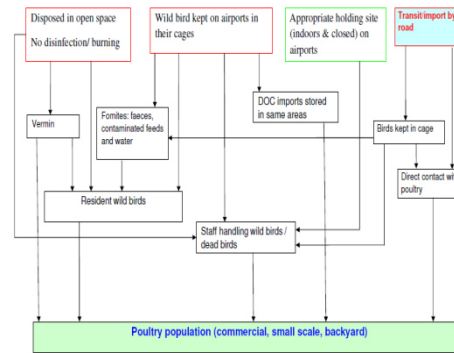
 - Risk estimation:
 - For a given pathway: combine risk categories using matrix
 - Estimate release and exposure risks, and consequence risk; then derive overall risk (matrix)
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4. Qualitative risk assessment

Release Pathways



Exposure pathways



Release Risk

Exposure Risk

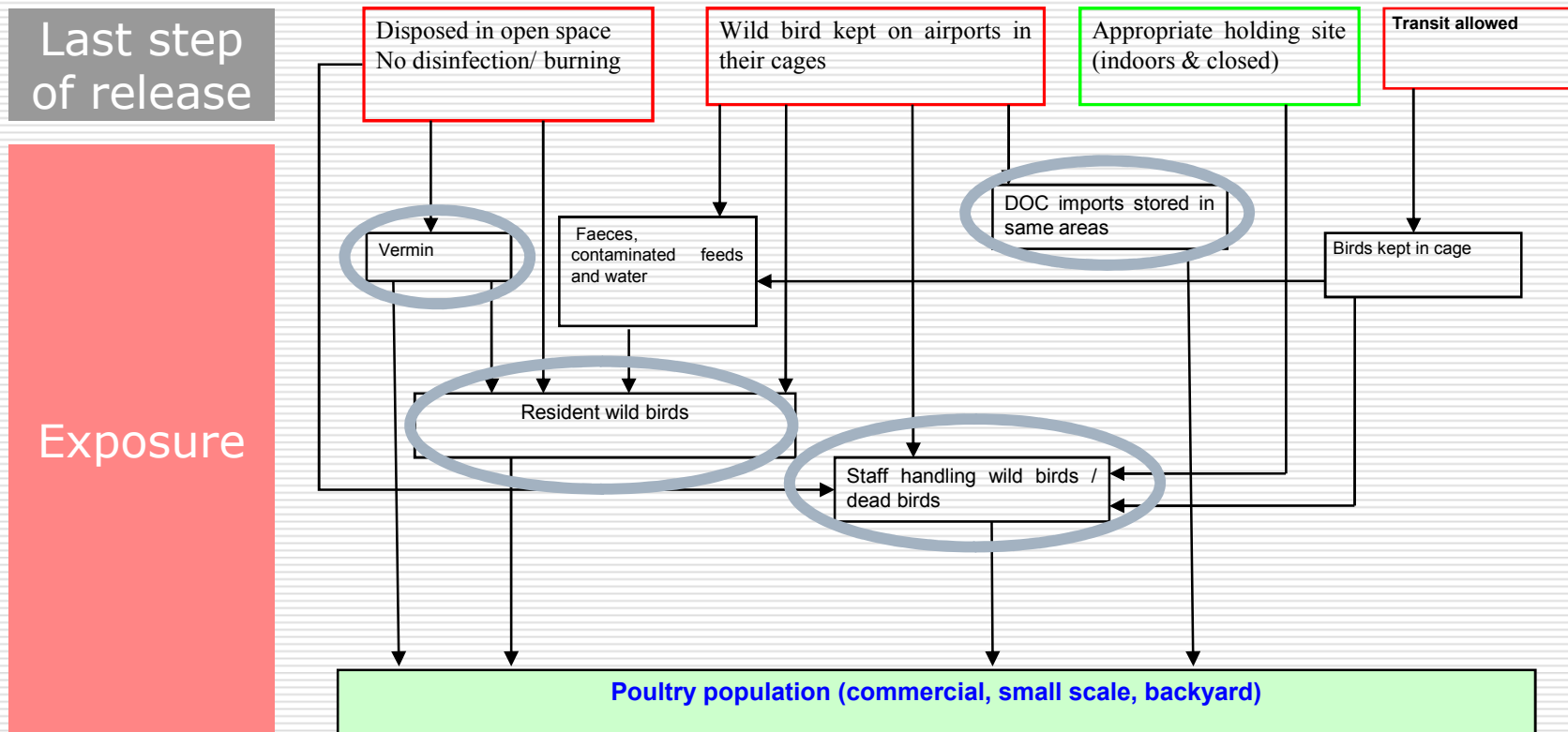
Likelihood of introduction

Consequence assessment

Risk Estimation

4. Qualitative risk assessment

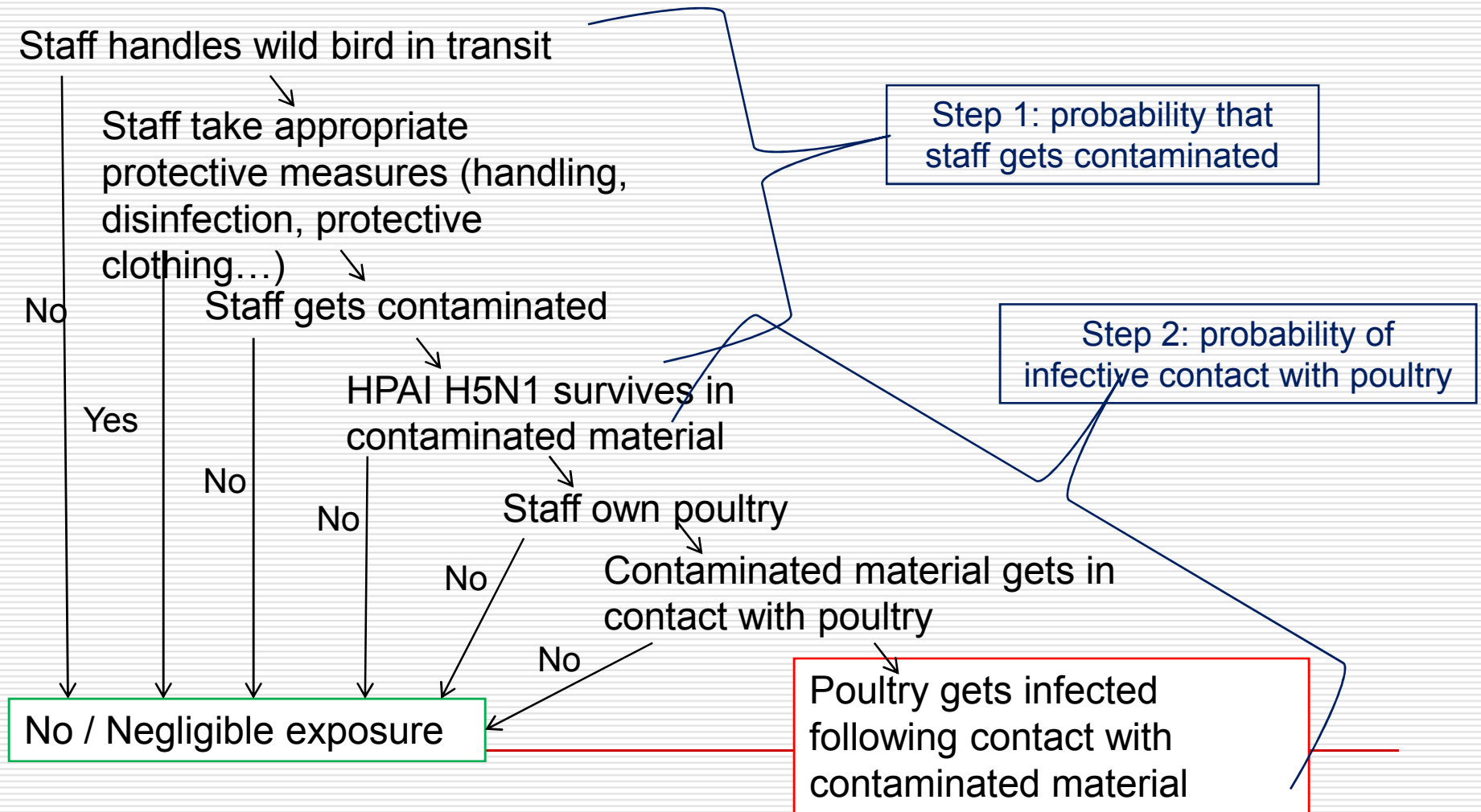
- Step-by-step illustration using the exposure assessment



4 exposure pathways

4. Qualitative risk assessment

- Step-by-step illustration using the exposure assessment:
- Pathway – staff handling birds in transit



4. Qualitative risk assessment

Step-by-step illustration using the exposure assessment: Pathway – staff handling birds in transit

Step	Information & references	Risk Category	Uncertainty
Step 1	Airport staff questionnaire: 18 staff Handling operations +/- 2h No prev. measure	High	High
Step 2	Faeces (survival, MID low) and humans acting as vector = sources of contamination (Soengsrn et al 2005, Alexander 2007) Outbreak Redgrave UK, 2007: poor biosecurity + movement of staff => spread to premise 11km (NEEG, 2007) Airport staff quest.: 1/18 staff keep poultry, for other limited possibility of contact with poultry	Low	High
Pathway risk		HxL=L	High

8.3.2. Probability of transmitting the virus to the poultry population¶

¶ The probability of transmitting the virus to the poultry population depends on the proportion of transit staff owning poultry, the probability of contact between contaminated material and poultry, the amount of virus in the contaminated material and the survival of the virus in contaminated environment, and the susceptibility of poultry.¶

¶ Information available¶

There appears to be a consensus among scientists that mechanical transfer of faeces plays a significant role in the spatial dissemination of the virus (various authors cited in Alexander, 2007). This mechanical transfer, among others, is usually attributed to movement of people. In experimental conditions, minimum infectious dose for susceptible poultry is considered to be greater than or equal to 10⁴ infective doses for HPAI.¶

To what distance the virus may be mechanically transmitted from an infected bird population in a facility to another susceptible population outside the facility is considered relative and is primarily dependant on strict compliance to biosecurity measures and the type of movement involved. The ability of the virus to trigger an infection in a susceptible species will depend on the intensity of mechanical transmission to associated other premises and the quantity and survivability of the virus in the contaminated environment within a certain period of time.¶

In the Redgrave HPAI outbreak in the UK in November 2007, the evidence suggested that poor biosecurity measures and movement of personnel resulted in the virus being spread to another associated premise (National Emergency Epidemiology Group, 2007a) which was approximately 11 km apart from the index premises. These data again demonstrated that the mechanical transmission could occur in local conditions and result in the transmission of the virus from several meters to several kilometers.¶

As described above about 18 people are involved in handling the transiting wild birds. From those staff working directly with transiting wild birds, only one is reported to keep poultry at home. The other risk that shall be considered with staff is the possibility of contact with poultry in their way home. Though assessment was not made, as the staffs were assumed to live in the inner city (cargo supervisor) and the poultry population in this part of the city is very few, possibility of contact with poultry population in their way home was considered insignificant.¶

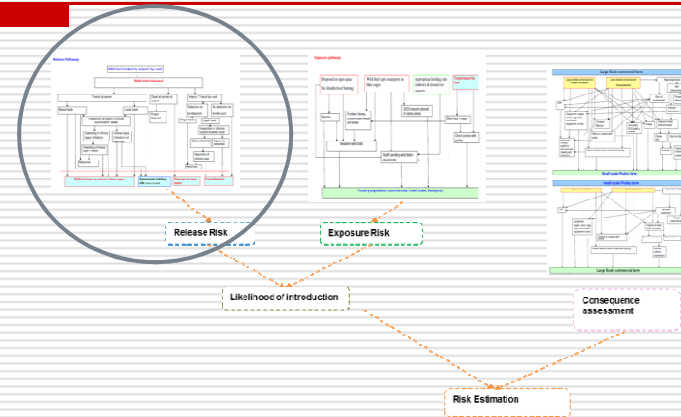
¶ Interpretation¶

Given the capacity of the virus in the faeces to survive up to four days in 25-32C, it can be transported infective to the homes of the airport attendants handling transiting wild birds along with their boots and clothing and remains infective for some time. As one of the staff has poultry in his home, a possibility that he/she would transmit the disease to his/her poultry exists, and could lead to the disease then being disseminated to other farms. However, as the number of staff possessing poultry in their home is low, and the poultry population on the way home to other staff may not be significant to be considered as risk, the probability of contact with poultry is low and therefore the

		Parameter 2 / Exposure risk category					
		Negligible	Very Low	Low	Medium	High	Very High
Parameter 1 / Release risk category	Very High	N	VL	L	M	H	VH
	High	N	VL	L	M	H	H
	Medium	N	VL	VL	L	M	M
	Low	N	N	VL	VL	L	L
	Very Low	N	N	VL	VL	VL	VL
	Negligible	N	N	N	N	N	N

4. Qualitative risk assessment

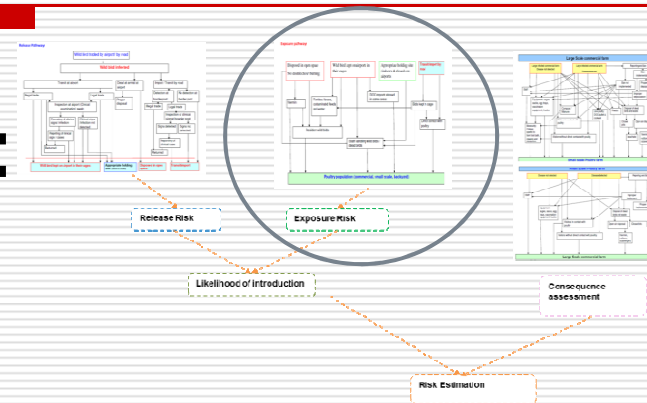
□ Release assessment:



	Risk Pathway	Risk	Uncertainty
Release	A wild bird transiting in Ethiopia being infected with H5N1 HPAI virus.	Very low	Medium
Release	Detection of the infected	Very high	medium
Release	Biocontainment of the virus within the facility of the border inspection point should undetected infection from the transiting wild birds be present.	High	Medium
Overall risk estimate for the release		Very Low	Medium

4. Qualitative risk assessment

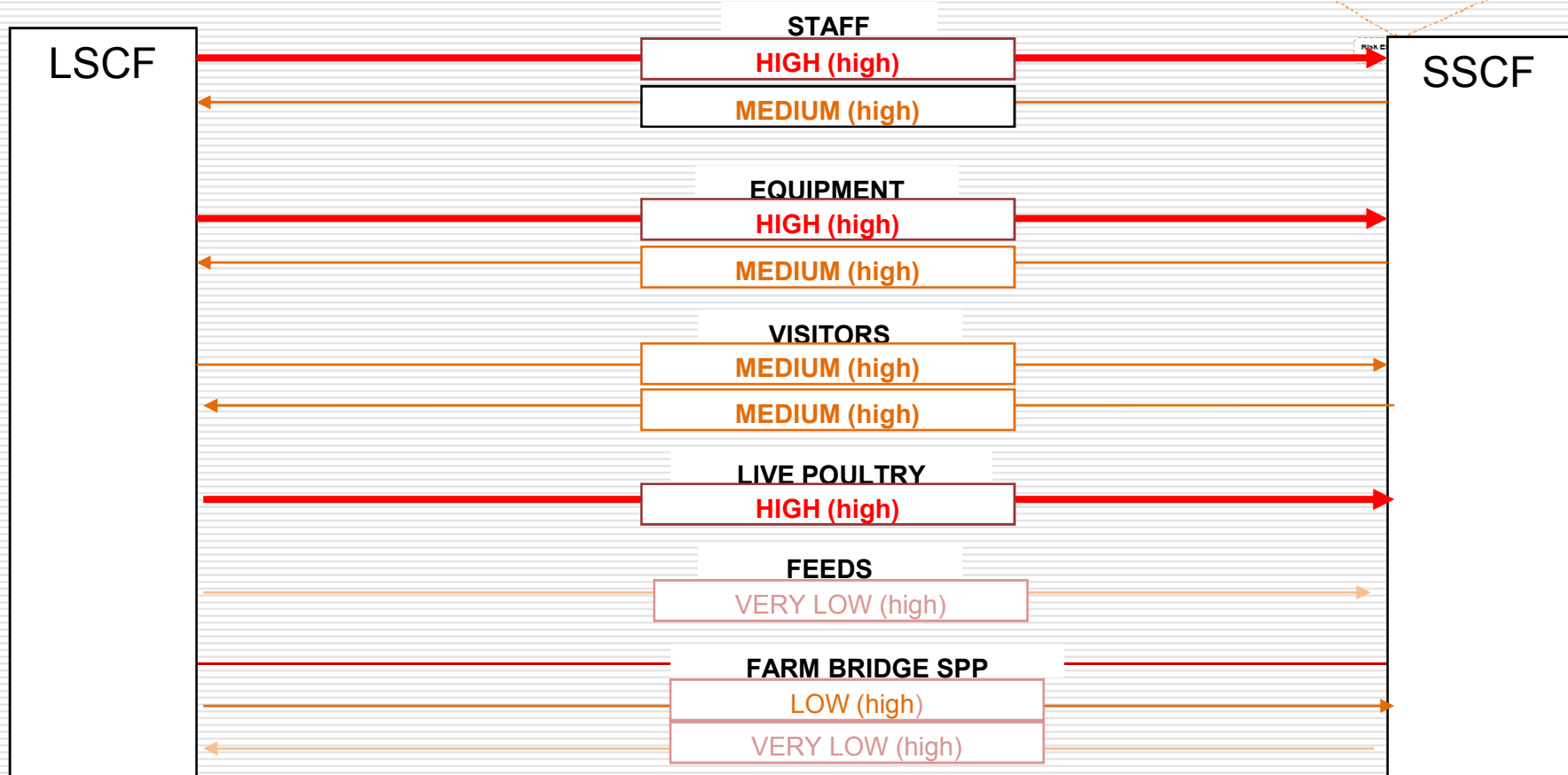
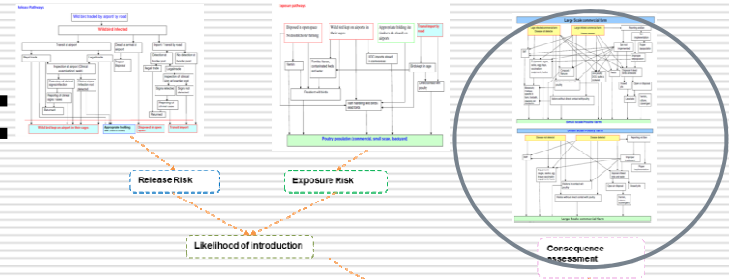
□ Exposure assessment:



	Risk Pathway	Risk	Uncertainty
Exposure	Probability of infection of resident wild birds after exposure to H5N1 HPAI from wild birds on trade transit and transmitting the virus to poultry population	Medium	High
Exposure	Probability that staff handling live and dead wild birds on trade transit get contaminated with H5N1 HPAI and transmit to poultry population	Low	high
Exposure	Probability that vermin (rodents) get contaminated with H5N1 HPAI and transmit the virus to poultry population	Negligible	Medium
Exposure	Probability that wild birds on transit kept at airport infect DOC imports stored in the airport and the DOCs transmit H5N1 HPAI to the poultry population.	Negligible	Medium
Overall risk estimate for the exposure		Medium	High

4. Qualitative risk assessment

□ Consequence assessment:

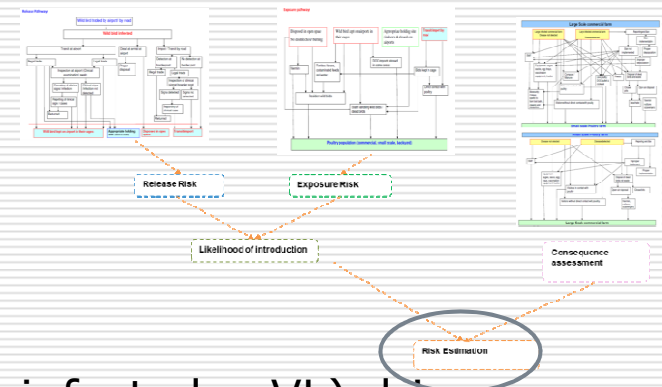


4. Qualitative risk assessment

- **Probability of occurrence of HPAI (H5N1) in poultry population of Ethiopia as a result of wild bird trade transiting in Ethiopia:**

VL x M = VL (High unc.)

VL x M/H = VL/L (High unc.)



- Risk of release (risk of wild bird traded being infected = VL) drives the overall risk
- BUT: note that if an infected wild bird on trade transits through Ethiopia, release likely:
 - no reliable veterinary check at the airport
 - no appropriate holding facilities, no protective measures by staff=> critical control points where appropriate prevention measures can be applied.
- Exposure pathways at higher risk of occurrence:
 - resident wild birds
 - staff handling transiting birds.
- Consequences pathways at higher risk of occurrence:
 - Staff (movement between farms)
 - Shared equipment (incl. trays, vehicles, etc.)
 - Live poultry (from large to small-scale farms)

5. Recommendations

- A number of recommendations were made to reduce the risk of introduction and spread of HPAI H5N1:
 - Release & exposure:
 - transit permit from OIE member countries + animal health certificate guaranteeing pre-import observations & practices
 - Check at BIP by vet or trained staff
 - Appropriate holding facilities and handling practices
 - Consequences:
 - Increase biosecurity in large commercial farms, investigate factors affecting compliance (KAP assessment, cost-benefit analysis...)
 - Investigate possibility of exam / flock health certificate before sale
 - Future research:
 - HPAI H5N1 in wild bird being traded, Farming systems and practices, surveillance and reporting practices (quest. data suggests high level of non-compliance with regulations)
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General conclusion

Qualitative risk assessment following OIE framework:

- Team effort – different expertise, communication crucial
 - Risk question needs to be well define and understood by all stakeholders
 - Meaningful pathway diagrams are critical to ensure completeness and adequacy of risk assessment
 - Other requirements:
 - Scientific / based on best available evidence
 - Maximise objectivity & transparency
 - Conditionality of pathway components
 - Limitations:
 - How to account for variability and uncertainty?
 - No gold standard for risk categories and matrices
 - Overall risk sometimes hard to compute
 - Some inherent subjectivity: risk perception, experts' biases
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Acknowledgements

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- Collaborators in Ethiopia
 - Collaborators at ILRI & IFPRI
-



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