

Risk Assessment for Wildlife Trade

Dr Helen Roberts

Member of the WOAAH Collaborating Centre for Risk Analysis &
Modelling

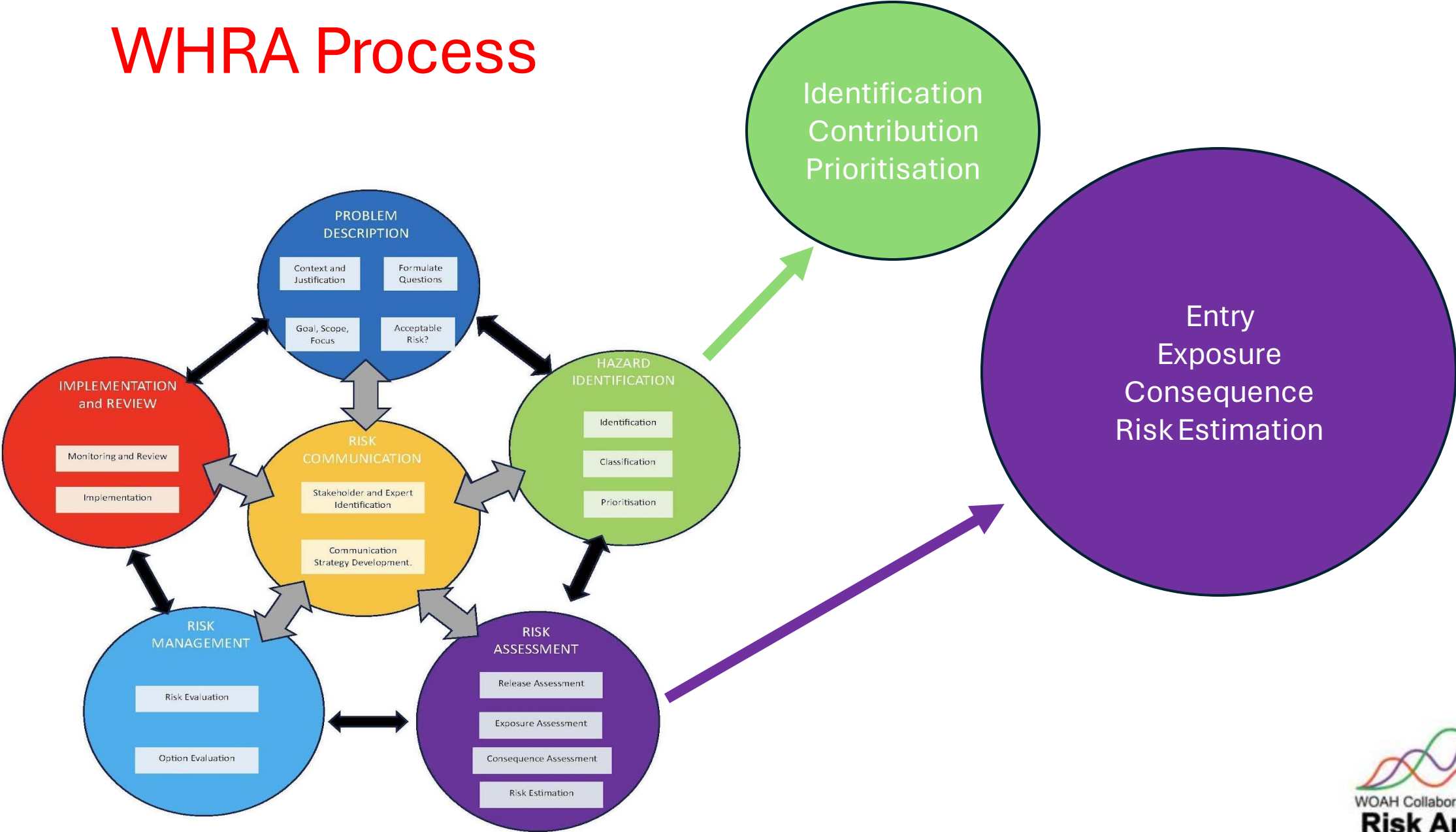
Department of Environment, Food and Rural Affairs, UK

Aims of the workshop

To understand the importance of risk assessment in the risk analysis system for safe(r) trade

How to carry out a risk assessment for trade purposes, focussing on animal and human health

WHRA Process



What is risk assessment?

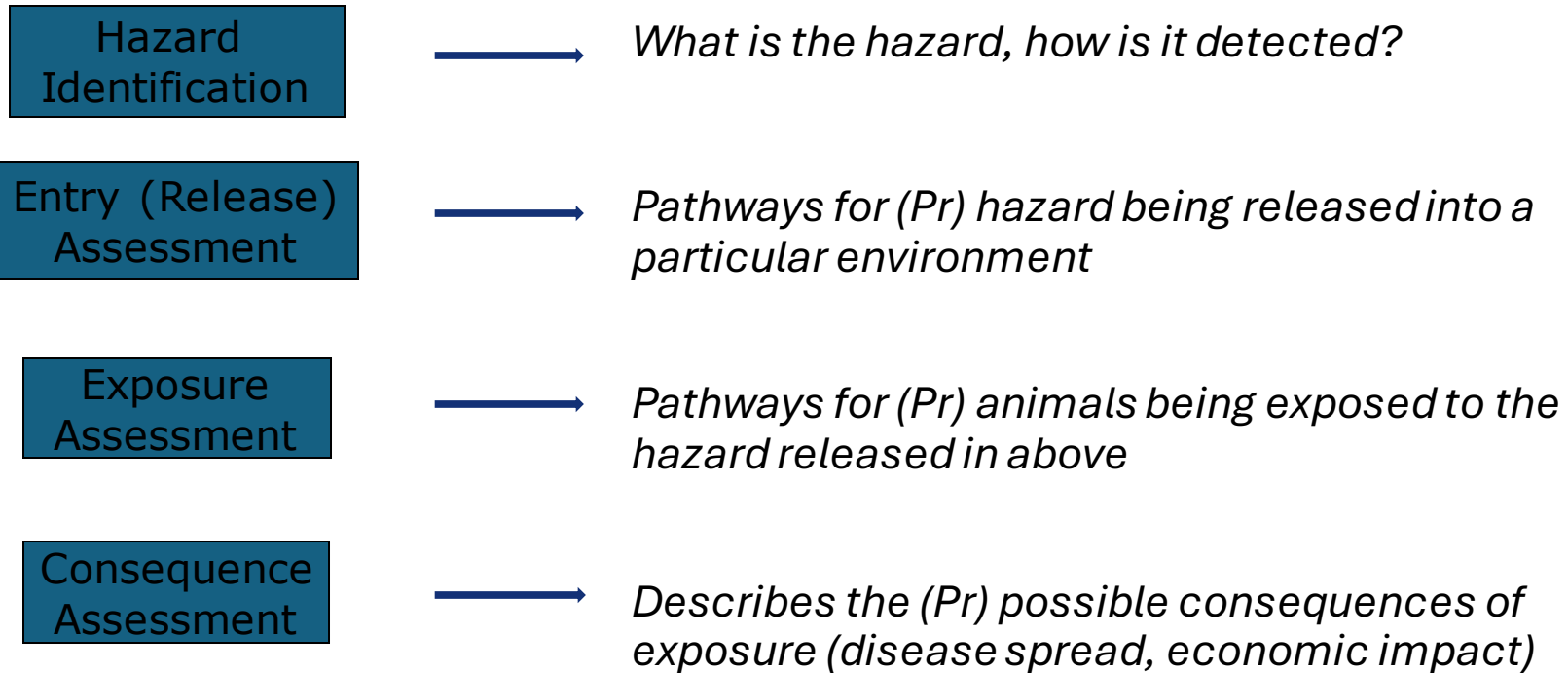
- Conducted on a daily basis
 - Crossing the road
 - Consumption of certain food products
 - Importing cattle
- Structured, transparent process
 - Evaluation & documentation of evidence
 - Provide an estimate of risk from a specific hazard
 - Iterative, transparent
- Import Risk Assessment
 - Standardised format for evaluating the probability and consequences of entry, spread or establishment of agent within an importing country

What sort of assessment?

- **Qualitative or quantitative**
 - Essentially the same process using the same data:
 - Define risk question
 - Describe/quantify risk factors & mitigating factors
 - Estimate (veterinary) consequences
 - Estimate likelihood of occurrence ('risk' in epidemiological terms)
 - Qualitative 'very low' or quantitative 'once every 200 years'
 - Describe the uncertainties and assumptions
 - Can include discussion of veterinary risk management
 - Conclusions (and summary of veterinary advice)



WOAH Guidelines for Import Risk Assessment – animal to animal risk assessment



- Overall risk estimate
 - If non-negligible then risk management/mitigation actions should be considered

Entry Assessment

- A description of the biological pathways needed for import activity to introduce pathogenic agents into a particular environment and estimating the likelihood of the complete process occurring.
- Should also consider how this likelihood would change with certain risk management measures

Exposure Assessment

- A description of the pathways necessary for exposure of animals and humans in the importing country to the hazards and estimating the likelihood of the exposures occurring.
- Estimation of the likelihood according to certain conditions, such as the duration of exposure, infectious dose, routes of exposure, insect bite and susceptibility of the exposed population.

Consequence Assessment

- Description of the relationship between exposure and the consequence
- A cause-and-effect process producing adverse health impacts and possible socio-economic consequences
- The outcome is the potential consequence, *given the exposure*, and the likelihood of it occurring

HAIRS guidelines for animal to human risk (exposure not consumption)

- A simple algorithm which asks a series of questions and a yes/no answer gives a risk level for either likelihood or impact
- Your evidence and the quality of the evidence will help you to answer the questions
- Because risk matrices are difficult to interpret, keep it simple and give both the likelihood and impact answers
- Allows you therefore to apply the assessment to different people, at different steps in the pathway

Outcome of the human health risk assessment

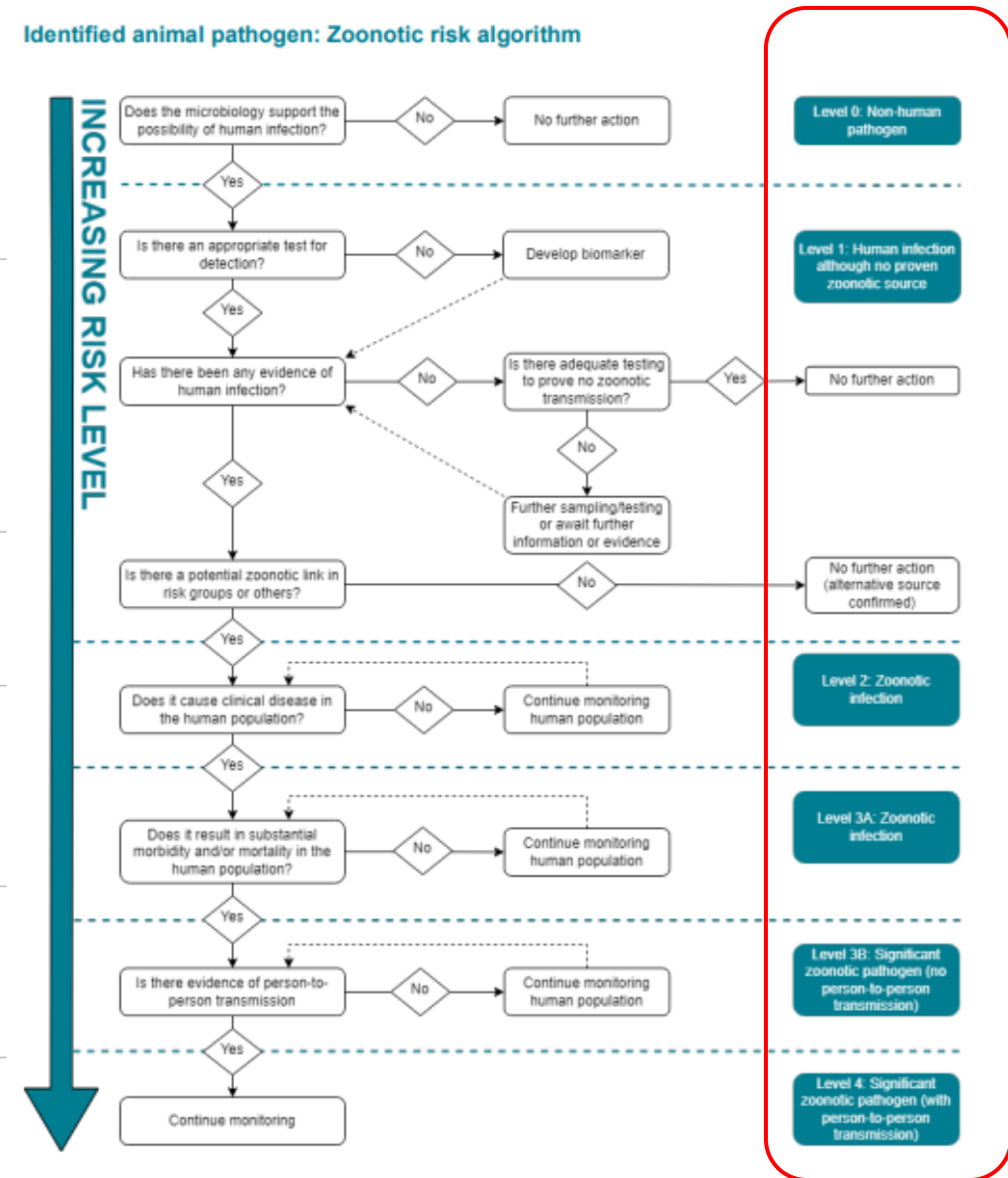
- Where it is known zoonotic pathogen, you need to consider who is being exposed
- Then you can target your risk management at those groups
- If it is an unknown pathogen and the decision tree brings you to a certain level, you can adapt your risk management accordingly



Zoonotic Pathogen

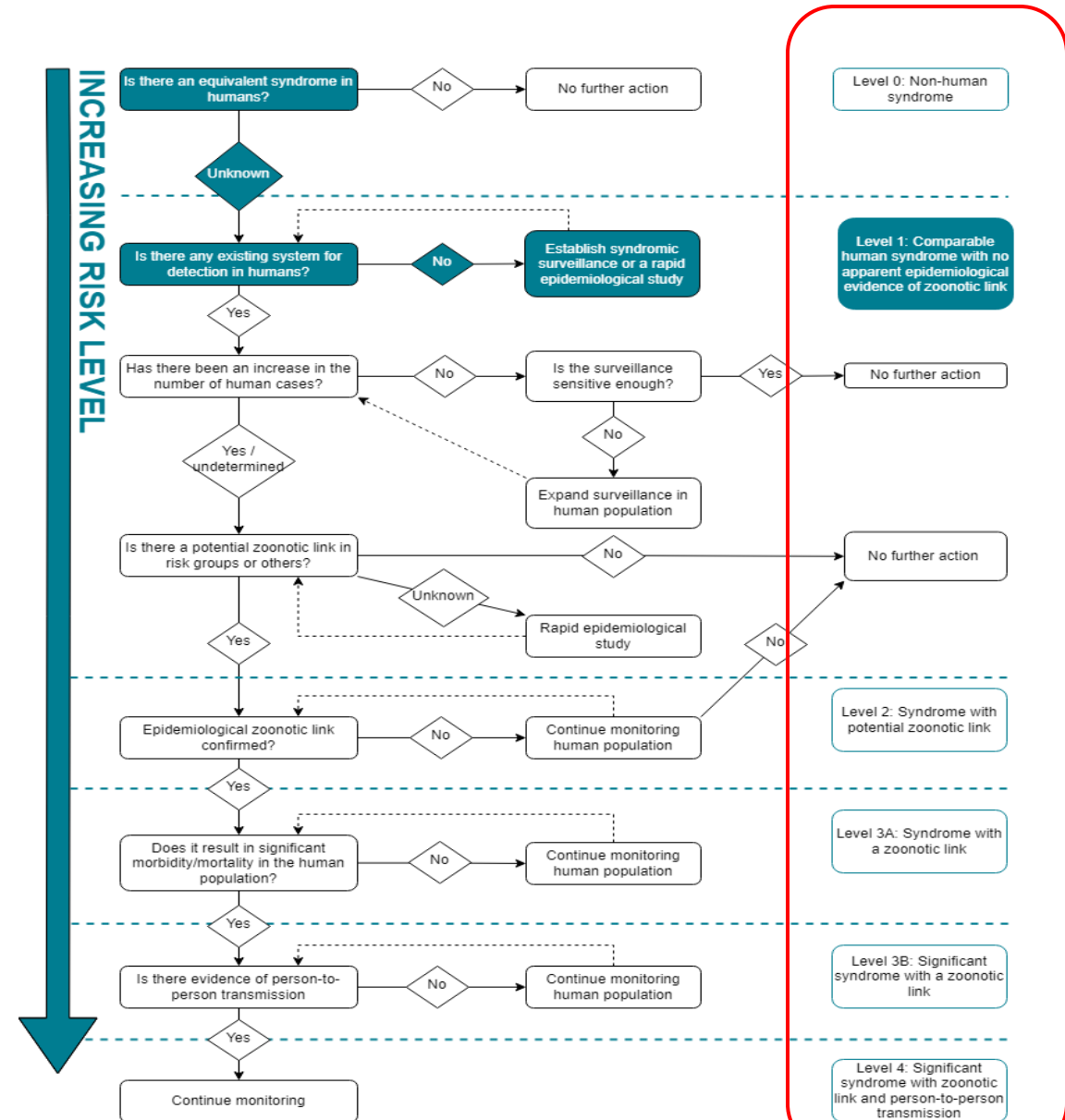
Level	Descriptor	Considerations	Actions
0	Non-human pathogen	At this stage, consider microbiology investigations to establish: <ul style="list-style-type: none"> - RNA/DNA stability - risk of reassortment - virulence factor - phylogenetic relationship - cross-species spread 	Share collated information and output of risk assessment with the AH managers
1	Human infection although no proven zoonotic source	Assess the ability of the surveillance system to detect evidence of infection. Consider expanding the system of detection if necessary. If evidence of infection present but no obvious zoonotic link, consider studies to ascertain exposure risk factors	Share collated information and output from risk assessment with appropriate public health bodies.
2	Zoonotic infection	After zoonotic infection identified, establish how it manifests in humans.	Assess threat to population. Revisit risk assessment if further clinical information becomes available. As above.
3A	Zoonotic pathogen	Assess the severity of infection in humans and establish appropriate clinical disease surveillance	As above. Consider risk communication and methods of reducing exposure of humans to affected animals and potential environmental sources.
3B	Significant zoonotic pathogen no person-to-person transmission	Assess the risk of person-to-person transmission	As above
4	Significant zoonotic pathogen with person-to-person transmission		Assess threat to population. Consider risk communication and methods of reducing person-to-person transmission and as above

Identified animal pathogen: Zoonotic risk algorithm

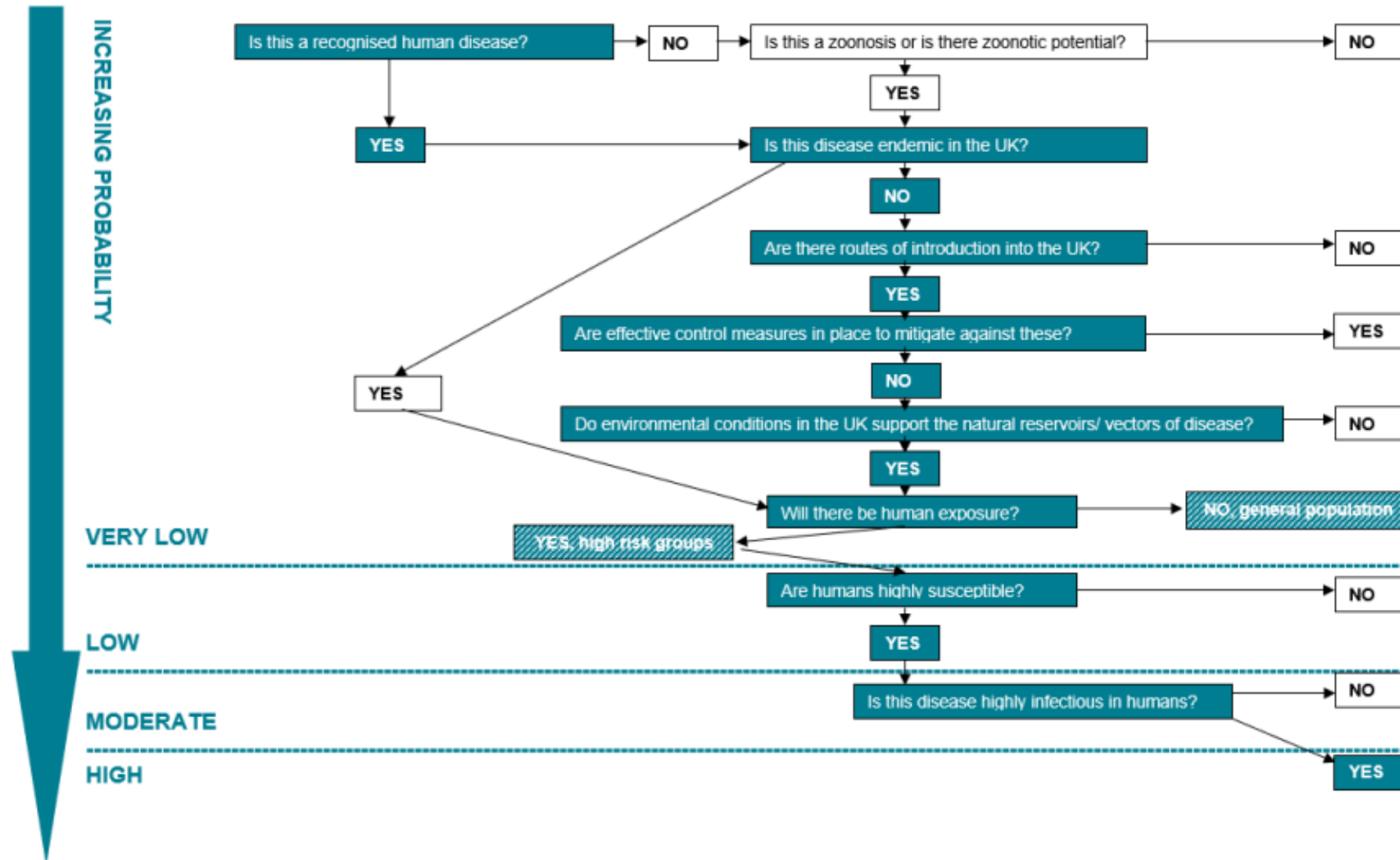


Unknown aetiology

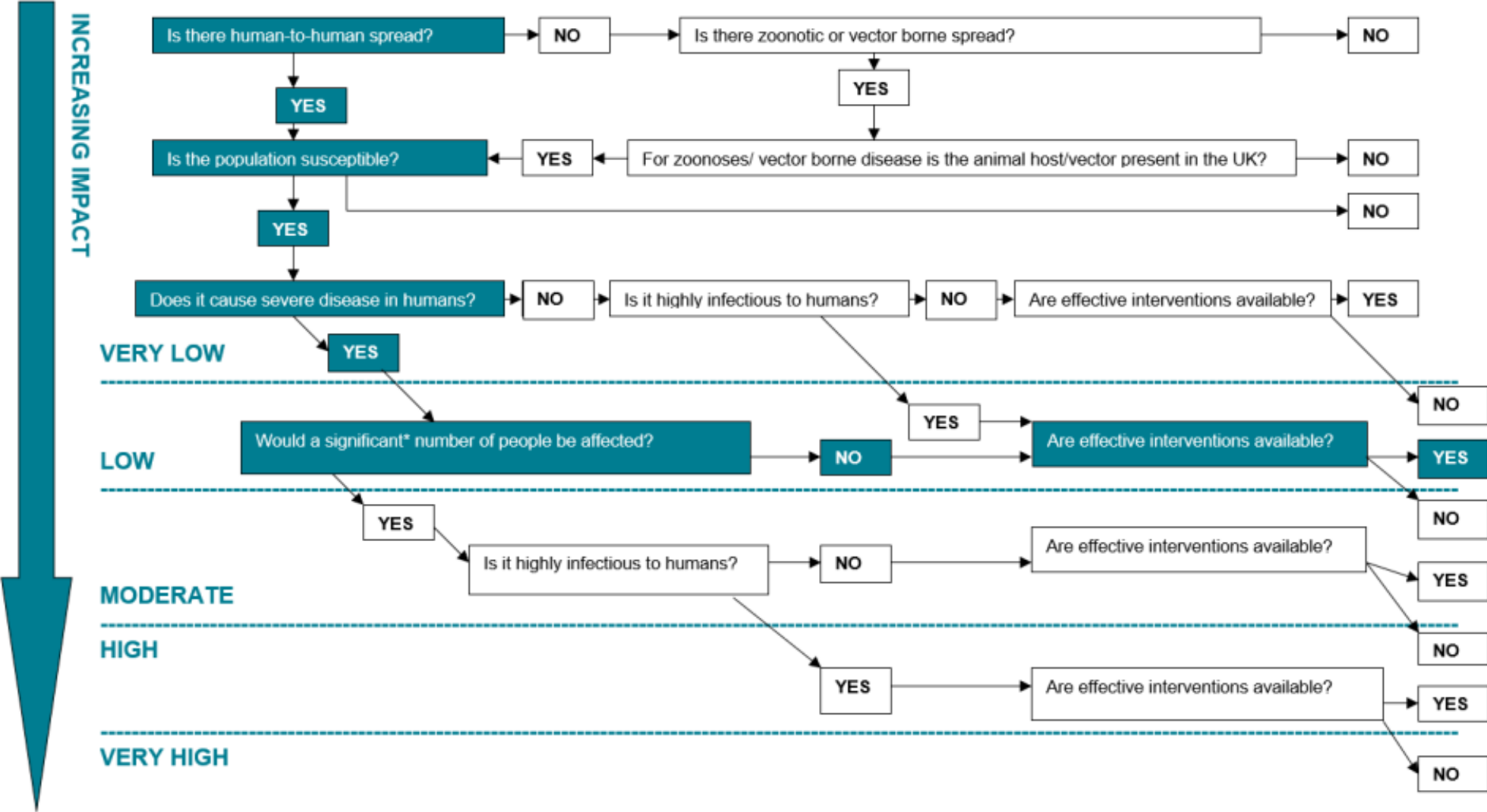
Level	Descriptor	Considerations	Actions
0	Non-human syndrome	Is there any disease in humans that would produce a similar clinical picture to this novel disease.	Share information and output of risk assessment with AH colleagues to consider specific risk assessment and/or management.
1	Comparable human syndrome with no apparent epidemiological evidence of zoonotic link	At this stage, assess the ability of the surveillance system to detect any increase of cases.	Share information and output of risk assessment with AH and PH bodies to consider specific risk assessment and management.
2	Syndrome with potential zoonotic link	Establish any zoonotic link with the disease	Assess threat to population. Revisit risk assessment if further clinical information becomes available. Share output of risk assessment with relevant government agencies.
3A	Syndrome with zoonotic link	Assess the severity of disease in human	As above and consider risk communication and methods of reducing exposure of humans to affected animals and potential environmental sources.
3B	Significant syndrome with zoonotic link	Assess the risk of person-to-person transmission	As above
4	Significant syndrome with zoonotic link and person-to-person transmission		Consider risk communication and methods of reducing person-to-person transmission and as above



Annex A: Assessment of the probability of infection in the UK population algorithm



Annex C: Assessment of the impact on human health algorithm



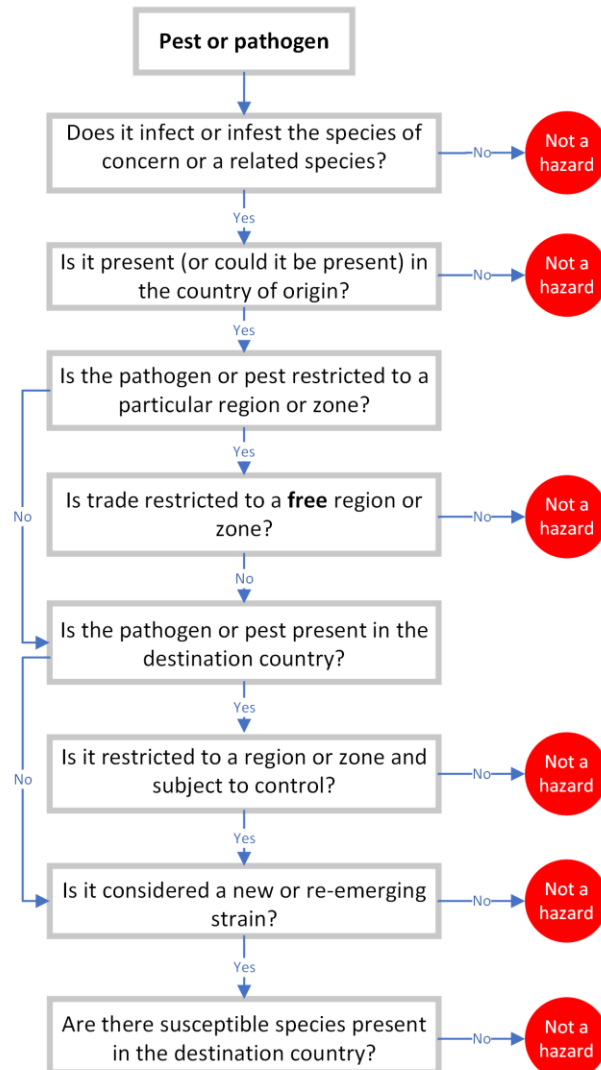
Assemble your risk team using experts in:

- Risk assessment
- Disease
- Epidemiology
- Livestock
- Trade
- Entomologist
- Public health
- Food safety
- Wildlife
- Environment and climate
- Modellers

The risk question

- Frames the entire assessment
- Define the specific hazard to be assessed, reduced or avoided
 - Pathogen(s)
 - Specie(s)
 - Commodities
- Key elements
 - Include a space and time component
 - Be measurable with defined output
- Assessment must answer the question
- Defines what steps to include (e.g. entry, exposure, consequence)

Hazard Identification and Prioritisation

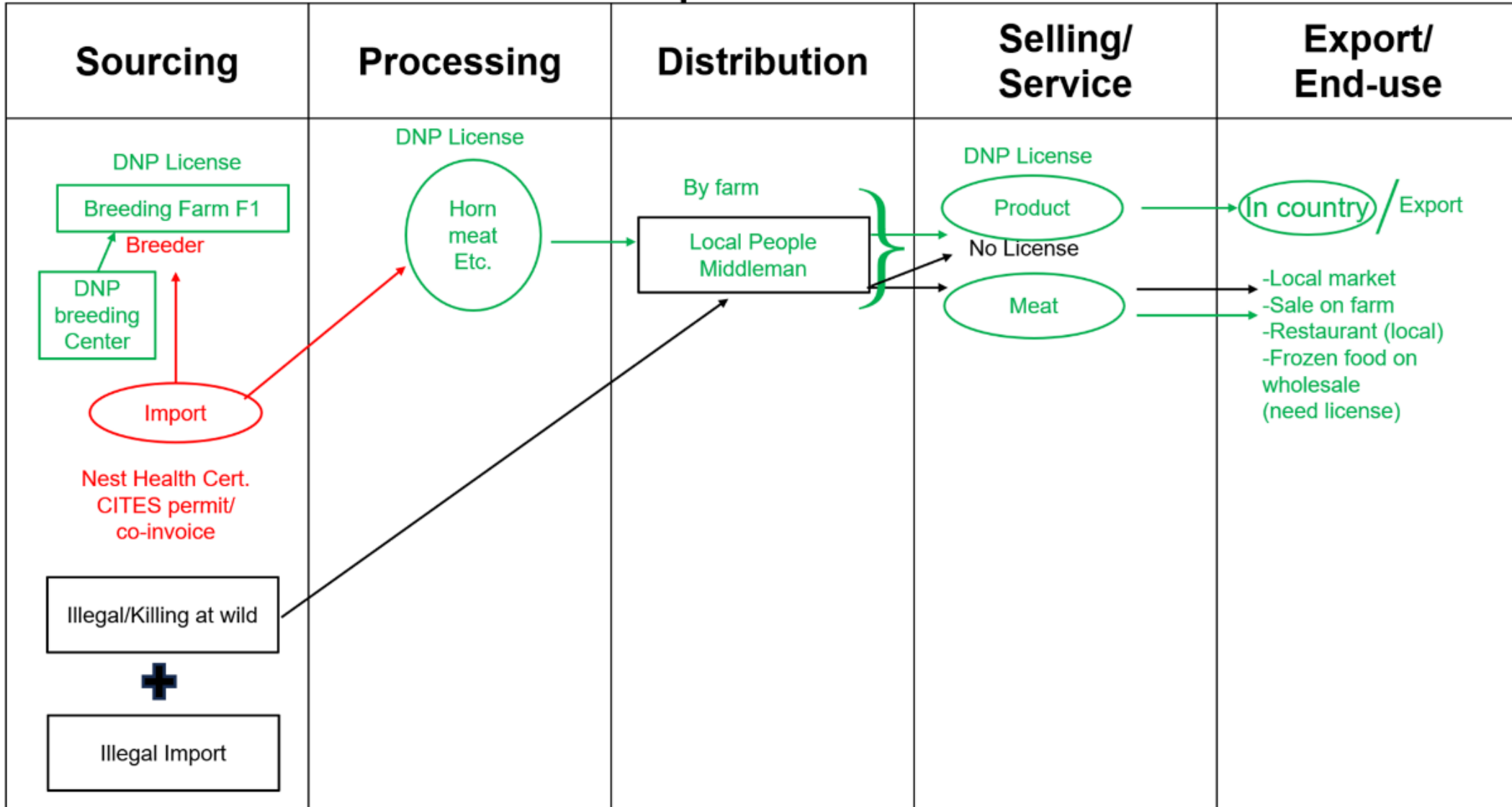


- Is the hazard present in the source country?
- Is the hazard able to affect or infect a relevant species?
- Is it present across the whole country or only in restricted zones?
- If horizon scanning is included, what is the geographic radius to be included?
- Are affected species present at wildlife markets or other trade sources?
- Is the hazard present at the destination?
- Is it endemic, exotic or epizootic?
- Are the strains or species that are present at the destination different from those in the exporting country?
- Is presence at the import destination country-wide or restricted to a few areas?
- Would import of farmed wildlife risk a higher level of contact with humans or livestock than currently present?
- Is the hazard notifiable or under a veterinary surveillance or control program in the target destination?
- If the hazard is a live animal, is the species present? If not, could it establish and negatively affect local biodiversity?
- Could the hazard affect biodiversity in the source or destination country?
- Is the hazard a listed disease, according to the World Organisation for Animal Health?
- Could the hazard be a vector for diseases, and are these diseases of concern to human health, agriculture and/or local wildlife?

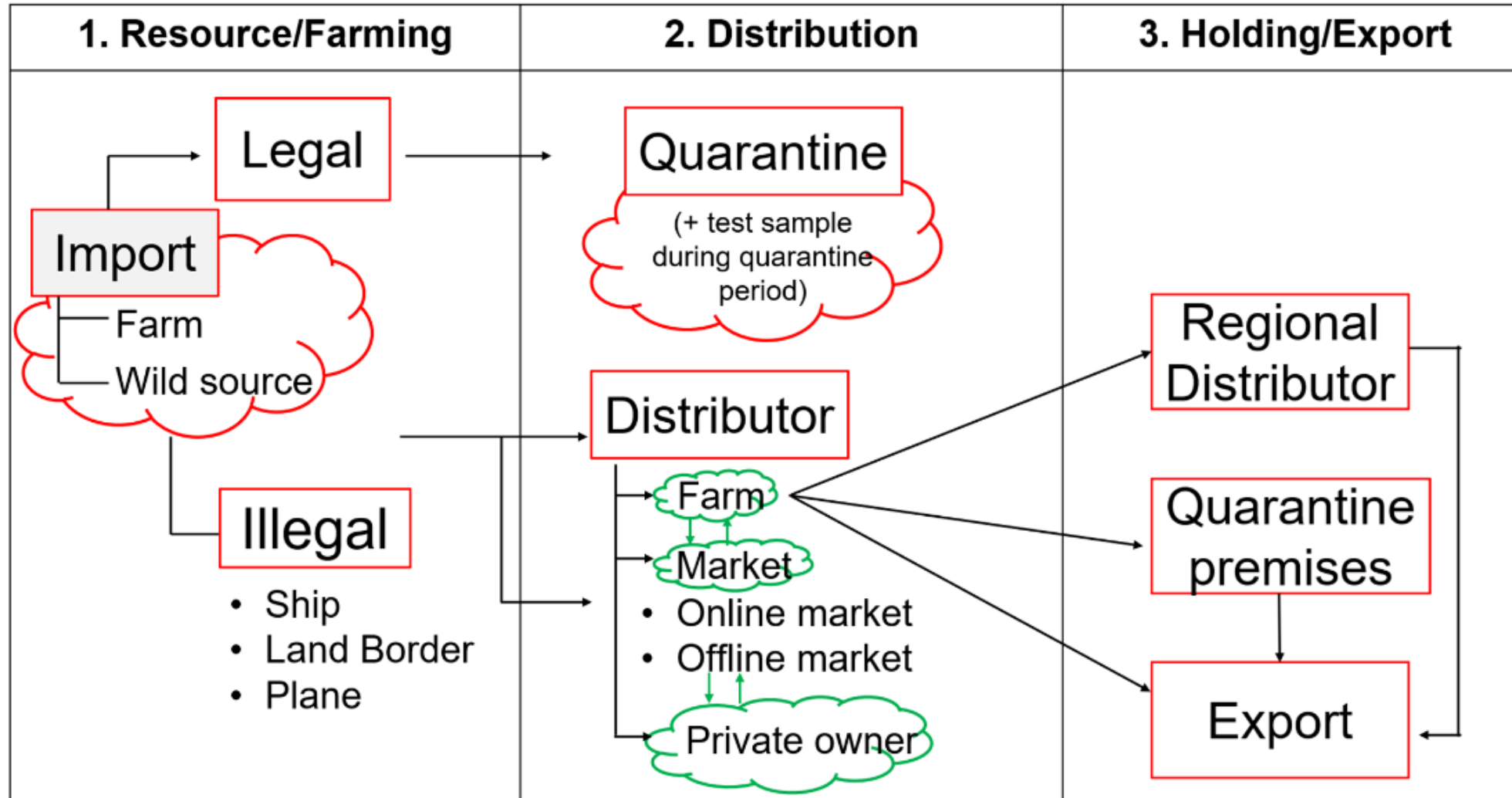
Risk Pathway

- Useful way to assemble the initial thoughts
- Schematic outlining steps required for unwanted outcome to occur
 - Relates to risk question
- Framework for data requirements (inputs)
- May require discussion and expert input so assemble your team carefully
- At each step, you are considering the contacts of the source of the hazard with other animals or products in the same consignment, with people or with new animals/vectors and direct indirect transmission

Group 1: Deer Meat



Group 2: International trade of Birds



Group 3: Monkey (Long-tailed macaques) for biomedical research

Sourcing	Processing	Distribution		Export/ End-use
Monkey Habitat in forest border	1. Legal e.g. University asks Permit from DNP, Primate center	National Primate Center AFRIMS etc	Drug, Vaccine, (Disease)	maybe export??? Foreign Biomedical Research Facility
	2. Illegal -catch parent wildlife And breed them in Neighboring farms at the border -capitalist hire villager to catch animals from forest (in TH and other country)	National Border	From neighboring country farms to destination countries to be lab animals	Laboratory facility

For example

- I want to bring bison (large wild cattle) into my country to have a wild population
- I find out that cattle can carry multiple pathogens, and I am most worried about foot and mouth disease and brucellosis (a zoonotic disease) because my country is free
- These are also dangerous wild animals and can harm other co-grazing species as well as humans.
- I am taking them from a very small population in another country and I will breed this small population to grow the herd.

- What is the risk of introducing wild caught bison from country X to my country for impact on animal health, public health or biodiversity?
- The animals are wild caught – what surveillance is done, are the animals tested when caught, do they go to quarantine? Who is handling them and can they cause danger to the transporters. Can diseases such as Brucellosis be transmitted to humans in contact? Will FMD virus spread from the animals during transport?
- When they arrive, what or who will they be in contact with? Can they escape from their compound? Can they be caught and tested?
- When it comes to breeding, will a genetic bottleneck happen in either the country of origin (removing breeding animals) or in the new herd?
- How many animals are being moved?

Outcome of the risk assessment

- The animals are not tested for FMD or Brucellosis and the country of origin is endemic (with 50% of wildlife testing positive). No quarantine is applied.
- Therefore, the likelihood of at least one of the animals being infected is **high** and the likelihood of other animals in the same consignment being infected is also **high**. [Manage with testing]
- They will be exposed to native cattle on arrival, therefore there is a **high** likelihood of FMD being transmitted, but only a **low** likelihood for Brucellosis, as exposure is quite different. [Manage by preventing contact or testing sentinels]
- The animals will not be going into the food chain so the human health risk of Brucellosis is **very low**, if not negligible. [No management]
- The biodiversity of the bison herd both at origin and at destination will be impacted in the future through genetic bottlenecks but this can be reversed by adding new animals. [Long term management]
- Consequence is high for animal health, low for public health, high for public safety (limited population) and medium for biodiversity

Assessing the risk – Qualitative scores

Qualitative level	Definition	Quantitative bounds
Negligible	So rare that it does not merit to be considered	Indistinguishable from 0
Very low	Very rare but cannot be excluded	$<10^{-4}$, except 0
Low	Rare but does occur	$10^{-3} - 10^{-4}$
Medium	Occurs regularly	$10^{-2} - 10^{-3}$
High	Occurs often	$10^{-1} - 10^{-2}$
Very high	Event occurs almost certainly	$>10^{-1}$, not 1

- Using qualitative definition of risk (WOAH, EFSA, IPPC, Codex)
- Translate (Pr) to Qual statement
- Anything **non-negligible** requires further communication and possible management
- Depends on acceptable level of risk (ALOR)

Combining likelihoods and consequences into risk estimation

- To combine the two qualitative outcomes of a risk assessment – likelihood and consequence – you can use a matrix
- But caution should be used, because of the step-wise basis to a matrix rather than continuous data
- Or keep it simple and provide two statements relating to the likelihood and consequence

Probability 2	Probability 1					
	Negligible	Very Low	Low	Medium	High	Very High
Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Very Low	Negligible	Very low	Very Low	Very Low	Very Low	Very Low
Low	Negligible	Very Low	Low	Low	Low	Low
Medium	Negligible	Very Low	Low	Medium	Medium	Medium
High	Negligible	Very Low	Low	Medium	High	High
Very High	Negligible	Very Low	Low	Medium	High	Very High

Putting it together

- Hazard Identification, prioritisation and prevalence at origin
- Entry assessment
 - How can the animal become infected and will it still be infectious?
- Exposure assessment
 - At each step, consider the contacts - animal and human
 - May be complex and numerous
 - Account for epidemiological factors for spread
- Consequence assessment
 - Consideration of possible consequence(s) of interest
 - Infection of a single animal, epidemic, economic impact
- Risk estimate
 - Non-negligible – actions may be required

Key Points

- Have a clear question
- Address the question using best available information in line with current scientific thinking
- Well documented and referenced
- Audience should logically follow thought processes and conclusions
- If insufficient data use expert opinion, worst-case assumptions, precautionary principle
- Make clear what assumptions made and, ideally, impact on risk estimate

Risk management and Communication

- You should be communicating at each stage of the assessment.
- What is your risk level and what is an acceptable level of risk?
- What is the potential impact over the next five years or next twenty years?
- What do you have to do to manage the risk?
- Who do you communicate this to?

Workshop Introduction

- You have already developed the wildlife trade system
- Prioritise the hazards
- Develop the risk question
- Consider the risk pathway for entry and exposure
- Estimate a likelihood for each step in the pathway
- Think about your risk communication

Workshop Introduction

- Either consider the risk to animal health or to public health
- One of the three wildlife trade systems per group
 - Primates destined for research
 - Deer meat for human consumption
 - Wild birds for captivity
- Two groups work on each system, considering the risk for either animals or humans
- One person from each group to report back to the workshop!