



Development of decision models for assessing the risk of diseases in The Great Limpopo Transfrontier Conservation Area (GLTFCA): The case of FMD

Jori F₁, Brahmabhatt D₂, Kriek N_{3, 4}, Vosloo W₅
and Gummow B₃.

1. UPR Epidemiology, CIRAD, France
2. Texas A&M University, USA
3. Faculty of Veterinary Science, University of Pretoria.
4. Peace Parks Foundation.
5. Onderstepoort Veterinary Institute

Introduction

- TFCA's increase interactions between different components at the human-livestock-wildlife interface.
- Spread of disease from wildlife to domestic herds can impact on food security in the region
- Examples
 - FMD outbreaks around KNP
 - ASF outbreaks into Mozambique
- Accurate management of diseases is required to minimize this impact.

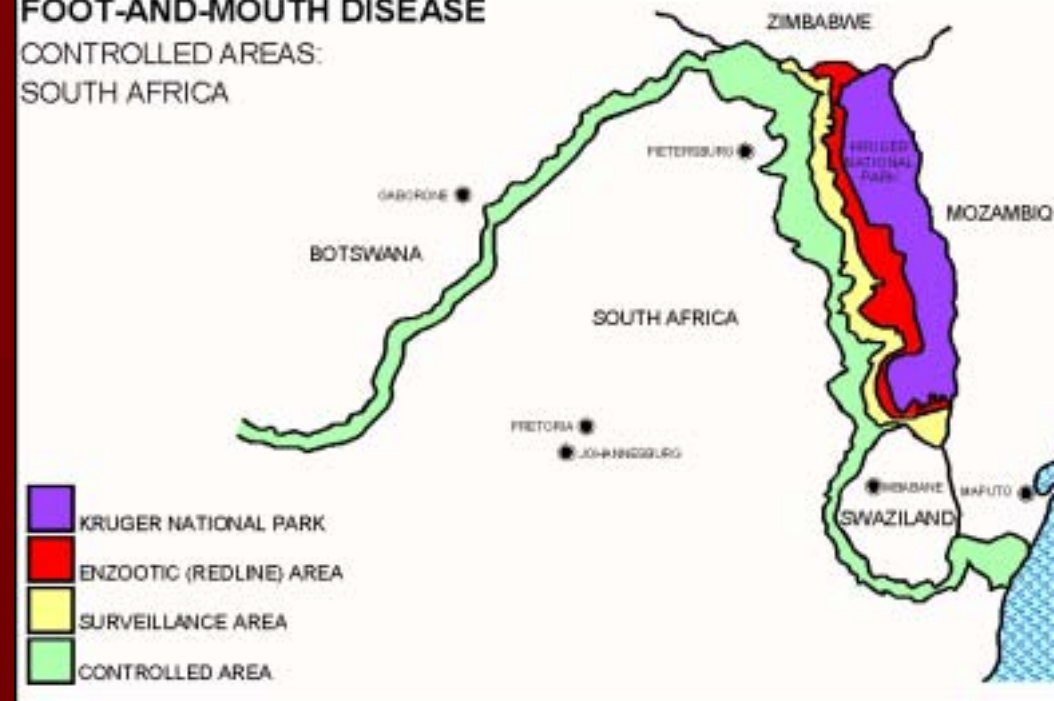


FMD context in RSA

- Endemic in KNP
- Efficient control measures:
 - Fence
 - Systematic vaccination
 - Regular surveillance
 - Movement control
- No Outbreaks of FMD since 1957: Free status by OIE since 1995
- At least 5 declared outbreaks since 2000

FOOT-AND-MOUTH DISEASE

CONTROLLED AREAS:
SOUTH AFRICA



What has gone wrong ?

How to improve the control system and where?

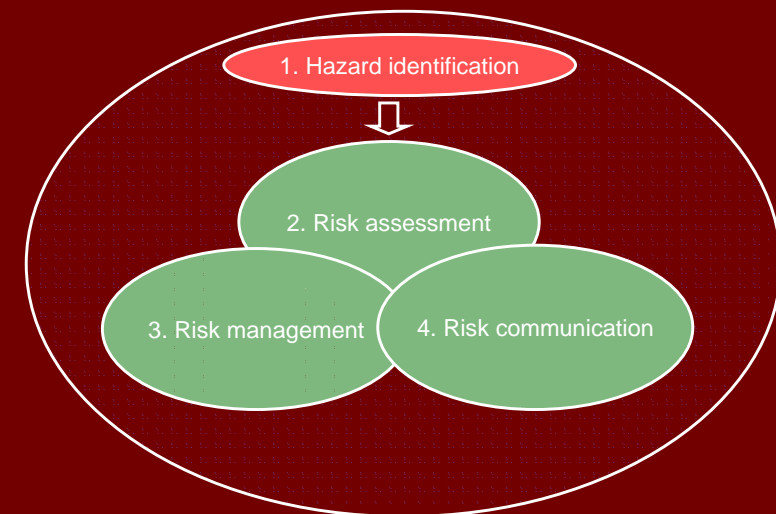
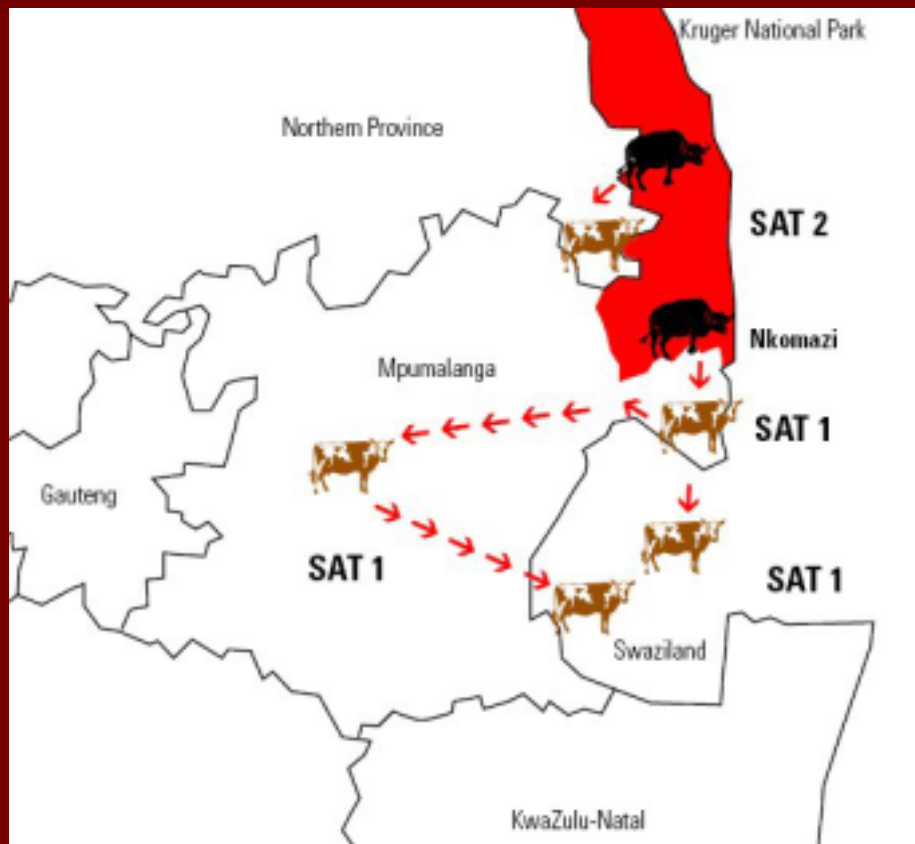
What is risk analysis?

- Systematic approach to deal with risks
- Tool to assist the decision makers:
 - What can go wrong?
 - How likely is it to go wrong?
 - What are the consequences of it going wrong?
 - What can be done to reduce the likelihood of it going wrong?



1. Hazard identification

- In our case, the hazard is represented by FMD virus maintained in wildlife populations escaping from the KNP premises and getting in contact with susceptible cattle.

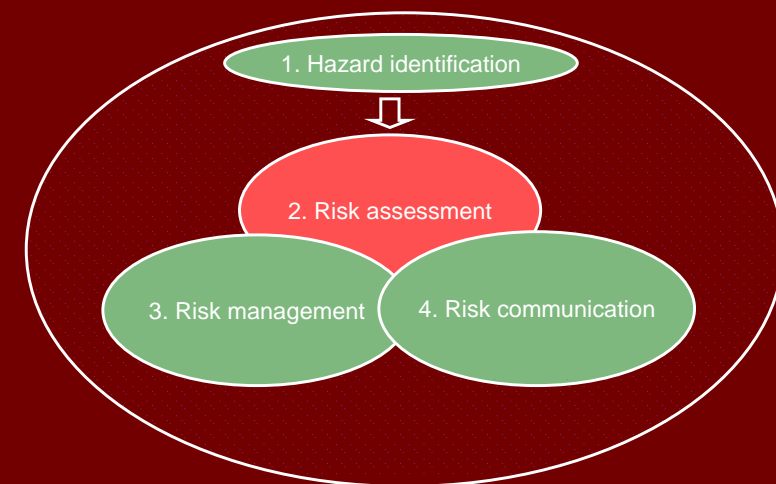


2. Risk assessment

- Process of evaluating the risk resulting from a hazard
- Takes into account release and exposure to the hazard and its consequences
- Risk estimation will give a overall idea of the occurrence of the hazardous process
- Qualitative or quantitative

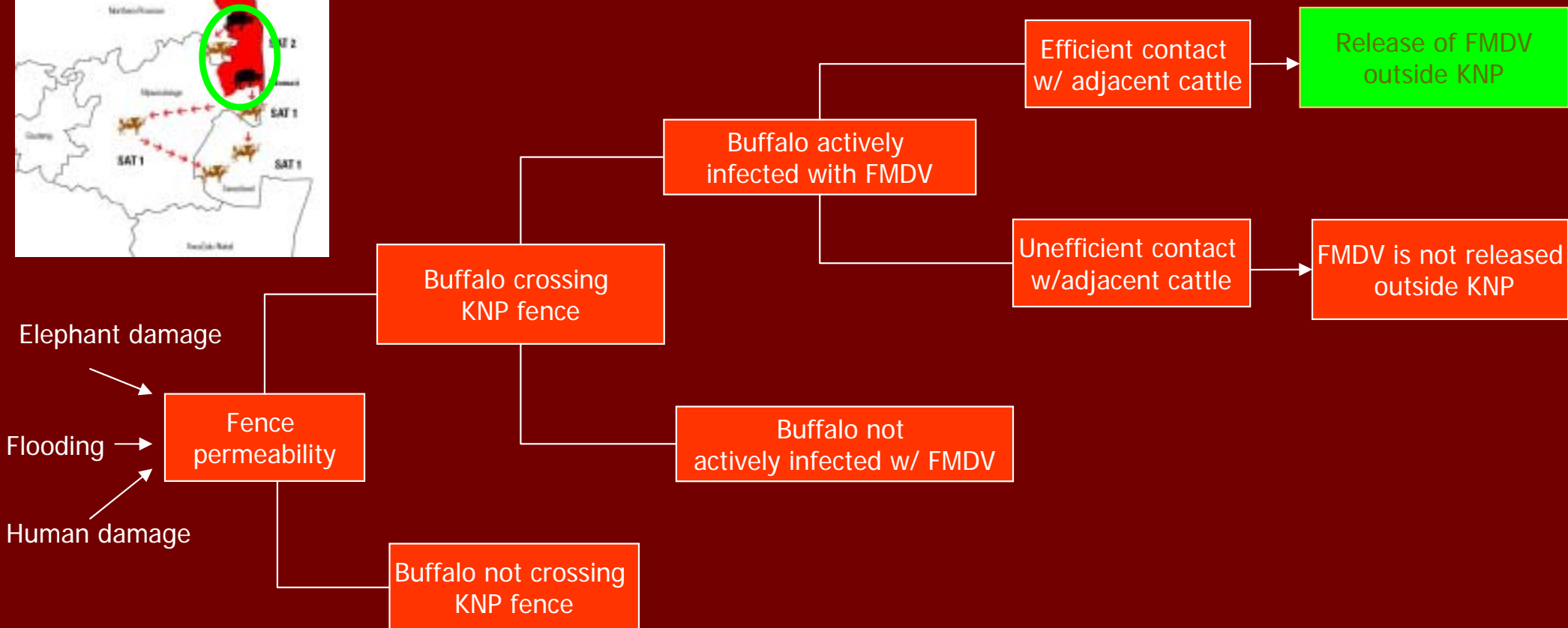
Stages of a risk assessment:

- A. Release assessment
- B. Exposure assessment
- C. Consequence assessment
- D. Risk estimation



A. Release assessment

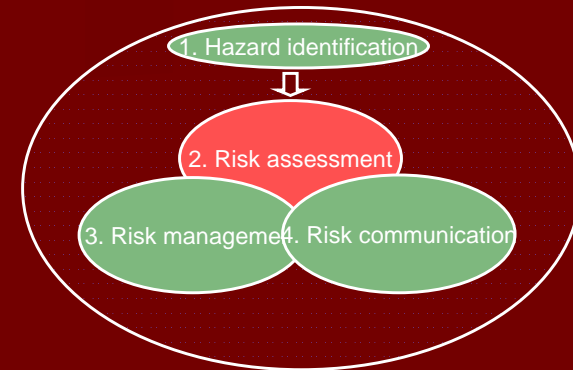
- Process of describing the biological pathway(s) necessary for the release of FMD virus outside the KNP, and estimating the likelihood, of that complete process occurring



B. Exposure assessment

Stages of a risk assessment:

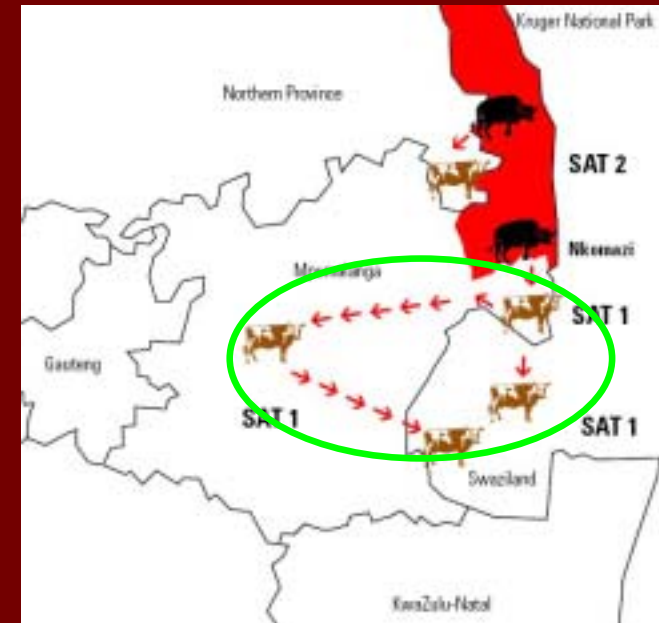
- A. Release assessment
- B. Exposure assessment**
- C. Consequence assessment
- D. Risk estimation



- Describe the biological pathway(s) necessary for animals to be exposed to the FMDV
- Estimate the likelihood of these exposures occurring
- Estimate the likely dissemination of the hazard in the susceptible population

B. Exposure assessment

- Factors to be considered :
 - Human and animal demographics
 - Cultural practices
 - Geographical characteristics of the area
 - Direct contact in cattle farms (communal and commercial)
 - Vaccination coverage
 - Veccine efficiency
 - Efficiency of surveillance practices
 - Specificity and sensitivity of diagnostic tests



C. Consequence assessment

Describes the consequences of a given exposure to a hazard. In the case of FMD, basically economic consequences:

- Direct
 - Production losses
 - Cost of disease control (culling, vaccination)
- Indirect
 - Control and eradication costs
 - Fence management and maintenance
 - Surveillance and monitoring costs (Diptank management)
 - Change in consumer demand, related industries
 - Trade losses (impaired movement, embargoes, sanctions)

D. Risk estimation

- Process of integrating results from previous steps (release, exposure and consequence assessment) to produce overall measures of risks associated with the hazards identified.
- Estimates must be transparent and report each step taken.
- All available information and reasoning should be presented.
- Can be carried out quantitatively or qualitatively.

D. Qualitative Risk estimation

- It is always recommended to carry out a qualitative RA before doing a quantitative RA
 - **Negligible**: probability of event sufficiently low to be ignored or event only possible in exceptional circumstances
 - **Low**: occurrence of event is a possibility in some cases
 - **Moderate**: occurrence of event is a possibility
 - **High**: occurrence of event is clearly a possibility
- These scales of risk are combined in order to get a general estimation of risk.

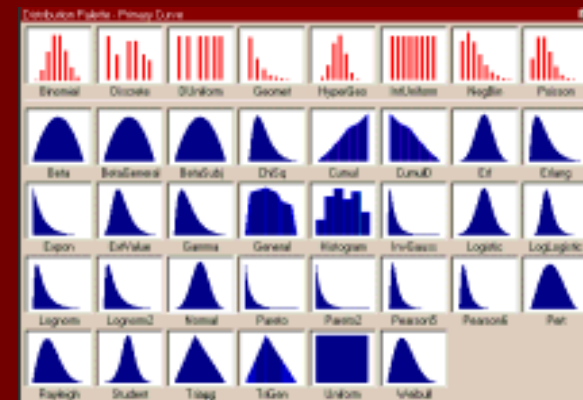
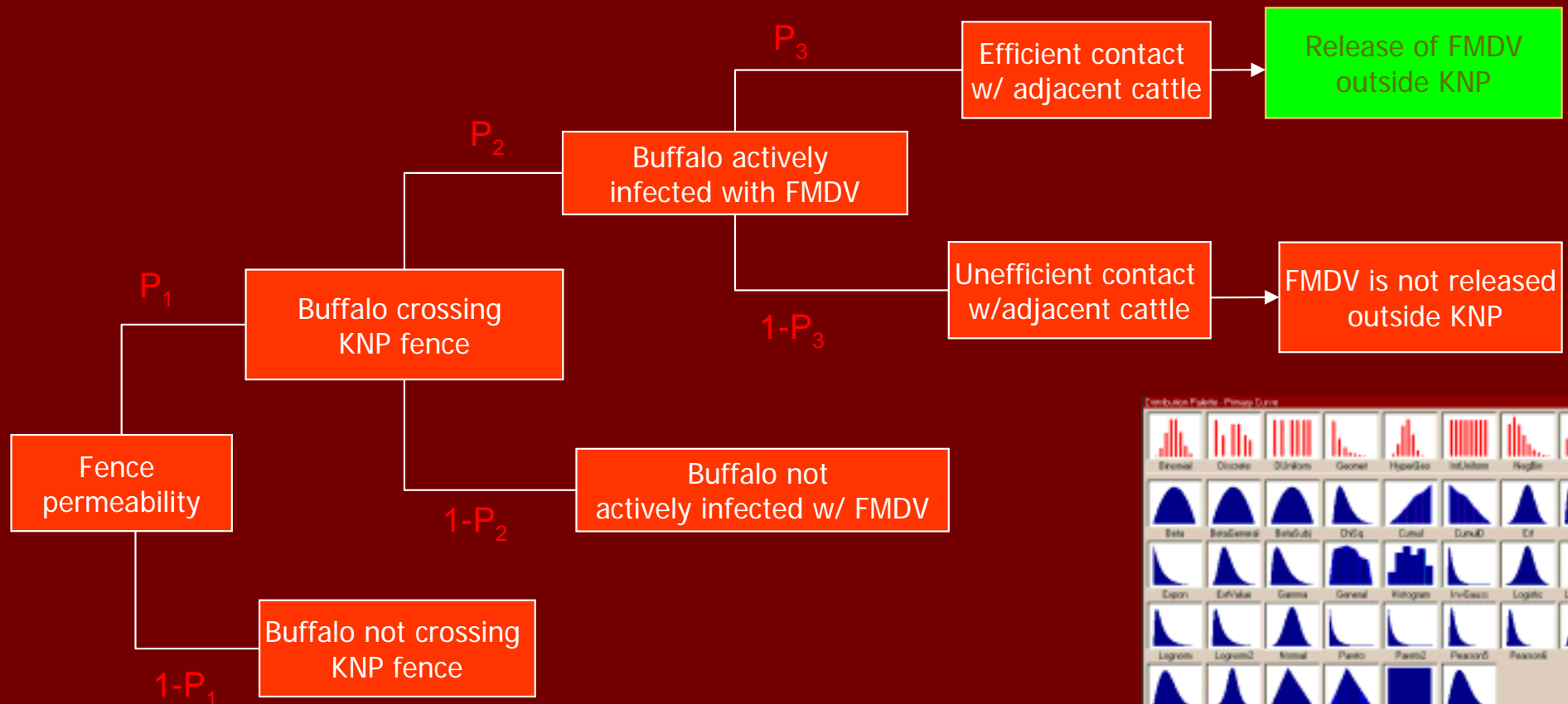
D. Qualitative Risk estimation

- These scales of risk are combined in order to to get a general estimation of risk.

	<i>Exposure</i>			
<i>Release</i>	Negligible	Low	Moderate	High
Negligible	Negligible	Low	Low	Moderate
Low	Low	Low	Moderate	Moderate
Moderate	Low	Moderate	Moderate	High
High	Moderate	Moderate	High	High

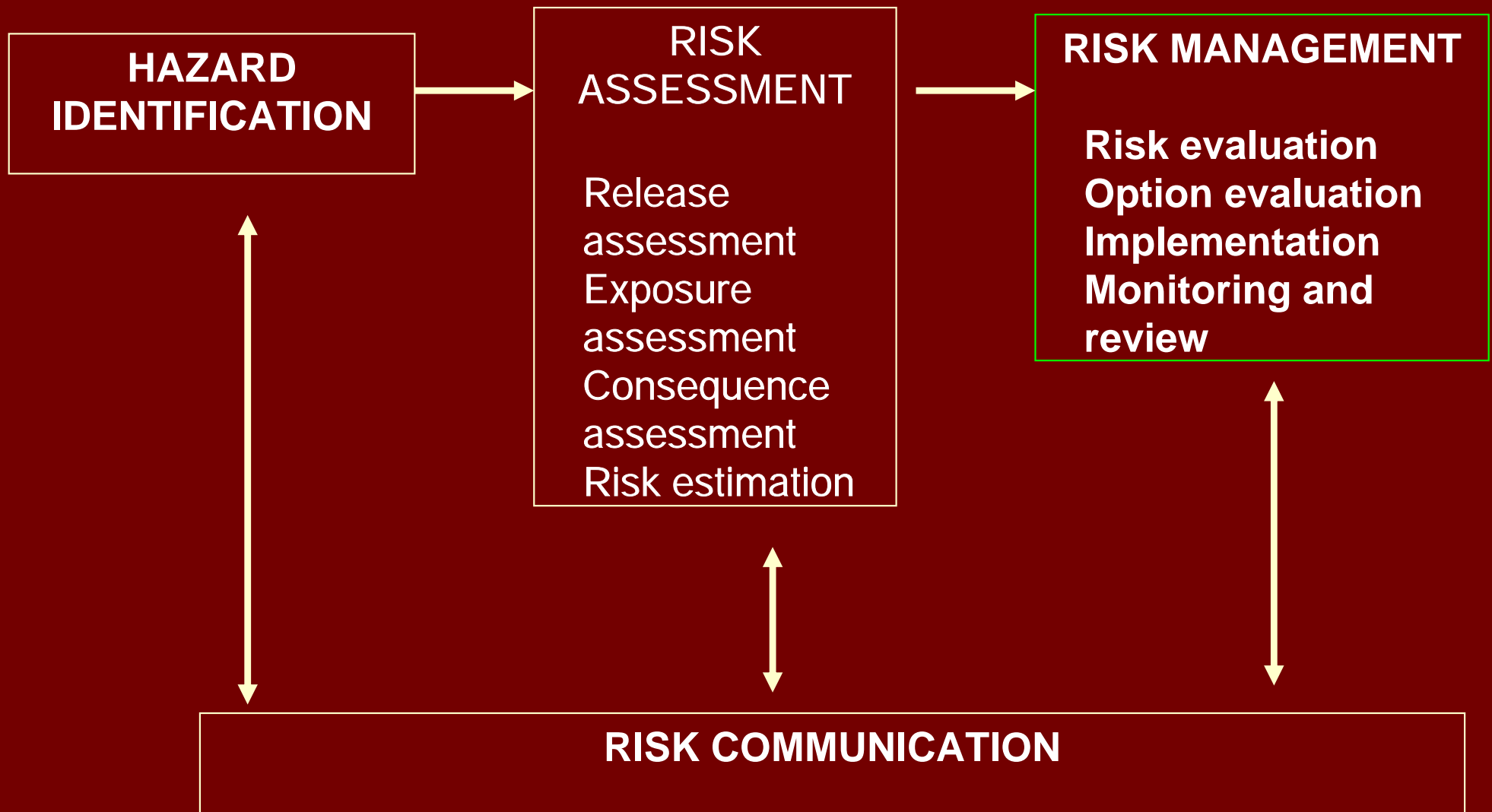
D. Quantitative Risk Estimation

- Risk is expressed by a mathematical probability (P)
- P are calculated/ estimated from epidemiology data



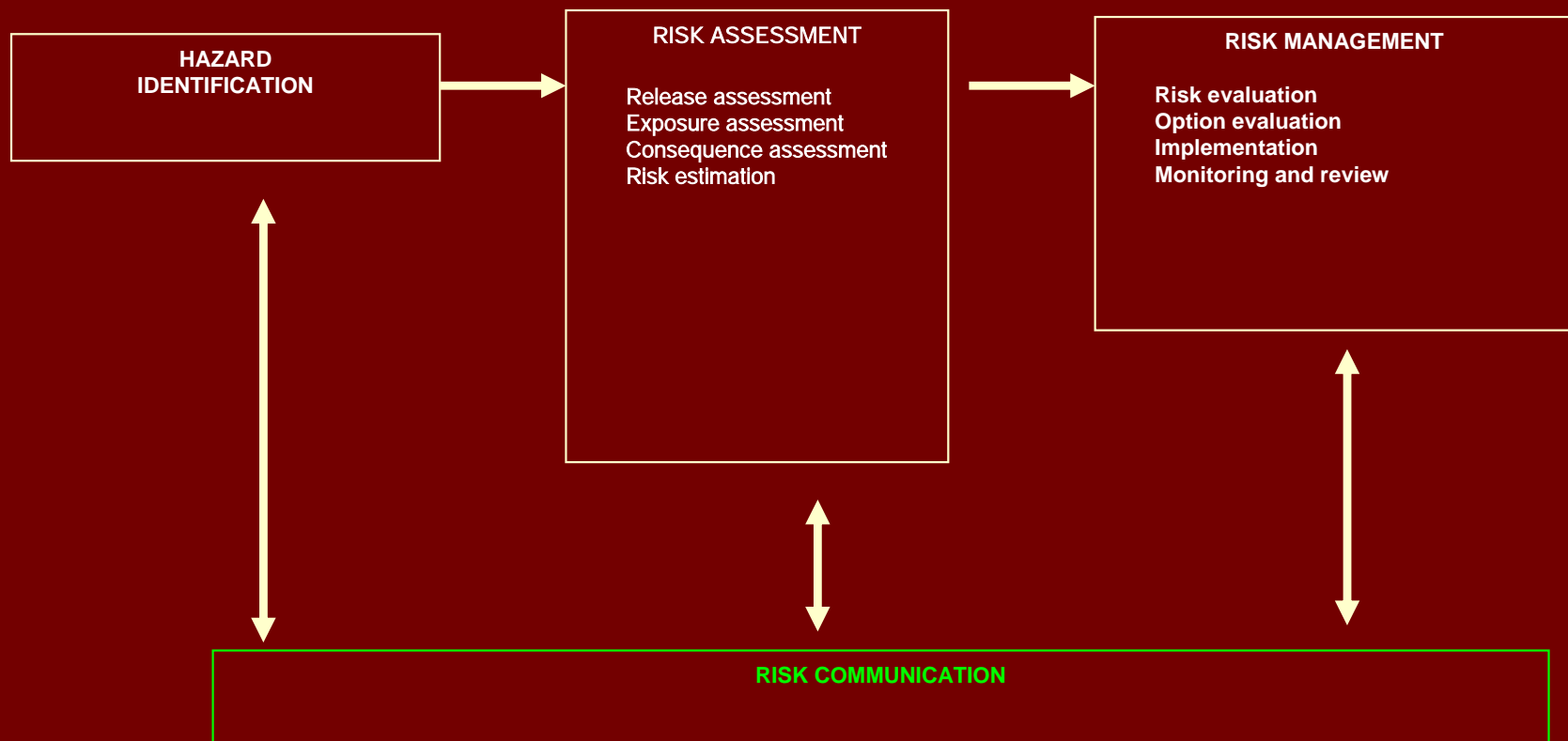
- P_x is the probability of outcome of the introduction of FMD virus outside KNP. $P_x = P_1 \times P_2 \times P_3$

Risk Management



4. Risk communication

- Interactive exchange of information on risk among risk assessor, risk managers and other interested parties.
- Should start at the beginning of the RA to ensure that all stakeholders are provided with an opportunity to become involved in the process.



What data sources are available?

- Laboratory results (OVI): Serology, Vaccine efficiency, viral strains and topotypes
- Fence incidents, stray buffalo (KNP/ SanParks/State Vets)
- Animal population figures and distribution data
 - Wildlife: KNP
 - Domestic stock: Ministry of Agriculture
- Diptank and surveillance data (State Veterinarians in Limpopo and Mpumalanga Provinces)
- Gaps of information :
 - Field questionnaires
 - Expert opinion
 - Litterature review

Discussion

- RA requires a multidisciplinary and participatory approach (epidemiologists, virologists, climatologists, wildlife managers, mathematicians, field vets..)
- Needs to include variability of scenarios and uncertainty.
- To be accepted, needs to be transparent and include all stakeholders.
- Can be applied to different diseases and contexts

Conclusions

- Development of RA models can provide a useful tool to:
 - assist decision makers(including wildlife managers) in policy decisions to reduce animal health related risk in TFCAs.
 - alert decision makers about areas where deficiencies in data exist
 - improve control measures to reduce risk in identified weaknesses in the control process (“Risk based surveillance”)
- create a collaborative network within the TFCAs region for future studies on disease investigation.



Thank you very much for your attention

