



Advanced GIS Virtual Training Course- Introduction to Spatial Risk Assessment

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Roadmap for presentation

- Overview of SRA applications
- Application of MCDA in SRA

Overview

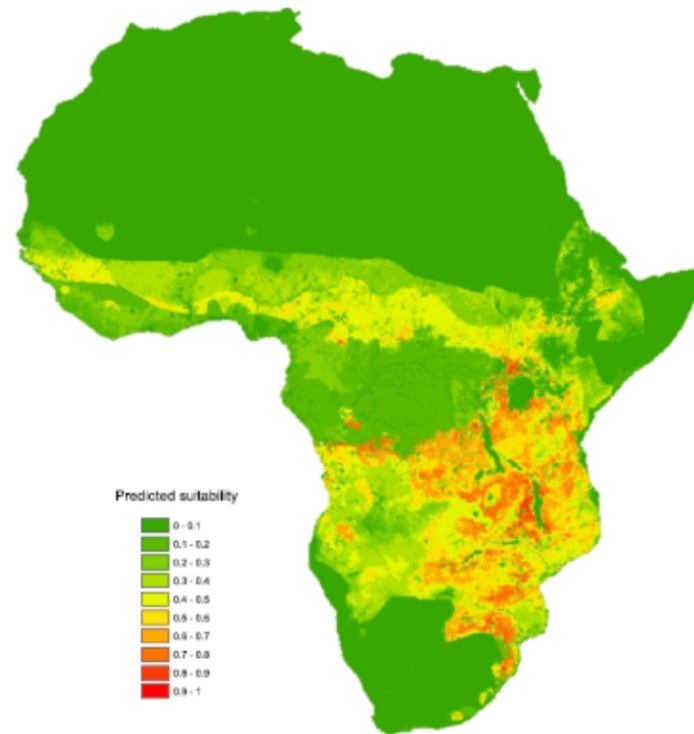
RESEARCH ARTICLE

Open Access

Spatial multi-criteria decision analysis to predict suitability for African swine fever endemicity in Africa

William A de Glanville^{1,3*}, Laurence Vial², Solenne Costard^{1,4}, Barbara Wieland¹ and Dirk U Pfeiffer¹

- ASF endemic in several African countries (wild animal hosts)
- Risk to pig industries continent-wide
- ASF reporting infrequent & epi studies rare-
 - Data-driven models inadequate
- Instead used spatial MCDA-GIS methods to predict suitability of areas for persistence of ASF to target surveillance/control



Risk assessment map for suitability of persistence of ASF in Africa- from deGlanville et al. 2014 BMC Vet. Res.


Received: 10 May 2018 | Revised: 11 January 2019 | Accepted: 14 January 2019

DOI: 10.1111/bed.13136

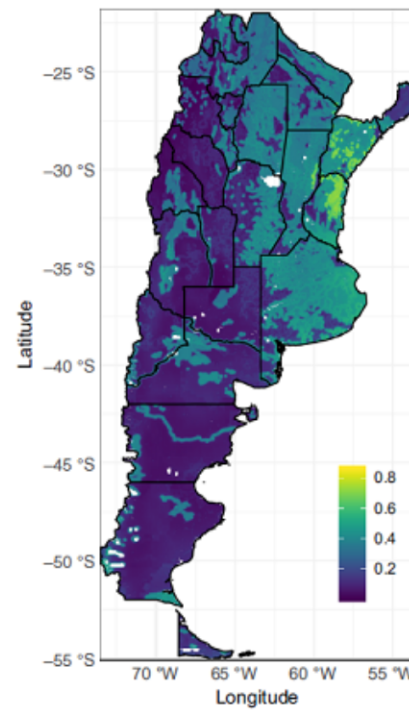
ORIGINAL ARTICLE

WILEY  *Emerging Infectious Diseases*

Spatial modelling for low pathogenicity avian influenza virus at the interface of wild birds and backyard poultry

Luciano F. La Sala¹  | Julián M. Burgos² | Daniel E. Blanco³ | Kim B. Stevens⁴ |
Andrea R. Fernández⁵ | Guillermo Capobianco^{6,7} | Fernando Tohmé⁶ | Andrés M. Pérez⁸

- LPAI endemic in wild birds and poultry in Argentina
- Concern about threat of mutation of LPAI to HPAI
- Used MCDA, expert opinion elicitation, ecological niche modelling
 - Mapped disease incursion risk to target surveillance



Risk assessment map for the occurrence of low pathogenic avian influenza in Argentina- from La Sala et al. 2019 Transboundary and Infectious Diseases

SCIENTIFIC REPORTS

OPEN

Quantitative assessment of a spatial multicriteria model for highly pathogenic avian influenza H5N1 in Thailand, and application in Cambodia

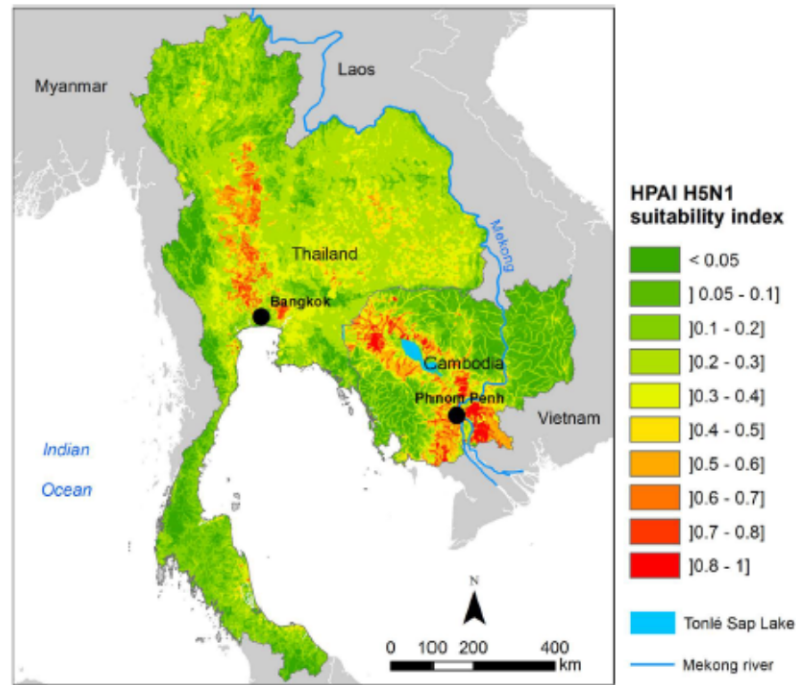
Received: 06 April 2016

Accepted: 13 July 2016

Published: 04 August 2016

Mathilde C. Paul^{1,2,3}, Flavie L. Goutard^{1,4,5}, Floriane Roulleau^{1,2}, Davun Holl⁶,
Weerapong Thanapongtharm⁷, François L. Roger^{1,4,5} & Annelise Tran^{1,8}

- Risk mapping very important for disease control
- Challenging in absence of reliable data on disease occurrence
- Used spatial MCDA to create risk maps for introduction of HPAI to target control (vaccination)



Suitability map for occurrence of HPAI H5N1 in domestic poultry in Thailand and Cambodia- from Paul et al. 2016 Nature Scientific Reports

What is spatial risk assessment modelling?

- Combination of
 - Multi-criteria decision aiding (or analysis) techniques (MCDA)
 - - GIS methods
- Suited where incomplete or poor quality data (especially on disease occurrence)
- Is knowledge-driven rather than data-driven
- Connection between MCDA and GIS
 - MCDA creates weighted risk factors for GIS methods to incorporate in map
 - These plotted to visualise **relative** spatial variations in risk

Multi-criteria decision aiding

Background

- Developed originally for operations management e.g. resource planning
- Substantial literature and methodology
- Purpose:
 - To assist decision-makers to
 - Understand often complex data involved
 - Advance towards a solution
 - Not to search for some kind of hidden truth
- Consists of 4 steps (possibly iterative)

1. Define or situate the problem

- Identifying the stakeholders (actors):
 - Government agencies responsible for national animal health management
 - Veterinary academics and consultants
 - Non-governmental animal health organisations
 - Farmer representative organisations
- Define the goals and how the final decision should be reached

2. Formulate the problem

- Decide how to manage the multiple DM's and their different perspectives
 - Facilitated focus group often used
- Define the decision alternatives and their criteria for selection
 - In our case study- define risk factors and their relationships with disease occurrence
- Type of decision problem
 - In our case study- ranking of selected risk factors from greatest to least risk

Case study of steps 1 & 2- Incursion and spread of FMD in Myanmar

- Spatial risk assessment process at the OIE-GIS course for Animal Health, Nay Phi Taw, October 2019
- Hypothetical problem used as a training exercise during the course
- Participants from several South-East Asian countries and OIE were the 'experts'

OIE Sub Regional Training Course, 2017



- Acknowledgements
 - Mark Stevenson (University of Melbourne) & Daan Vink (Royal Veterinary College, London)

MCDA (1) Defining the problem

- FMD is endemic in Myanmar
 - Outbreaks financially damaging to farmers
 - Adversely affect animal welfare
- Reporting of FMD outbreaks likely incomplete & unreliable
 - Can't use outbreak data to assess the variation in spatial risk of FMD
- Authorities need to
 - Decide which areas of Myanmar are at increased risk of outbreak (target surveillance)
 - Scrutinise locations where would expect more FMD occurrence from model but possibly under-reported

MCDA (1) Defining the objectives

- Create a SRA map of Myanmar that displays the relative risk of incursion and spread of FMD virus
- Validate the predictions of this SRA map by comparing it against known locations of case villages
- Evaluate the SRA and its utility for decision-making

MCDA (2) Formulate the problem

- Identify the decision alternatives (risk factors) and their relationships with FMD occurrence
 - Undertaken in country team focus group discussion
- Define the criteria for choosing among the risk factors
 - Have spatial feature that can be mapped
 - e.g. swill feeding -> pig population density

Exercise- Identify risk factors for FMD occurrence in your own country

- Use the template in FMDRiskFactorMatrix.docx
- Downloadable from the home page for Spatial Risk Assessment on the Stream Course Site

Exercise- Record your findings from the exercise

Kahoot!

Discussion of findings