Kim Stevens

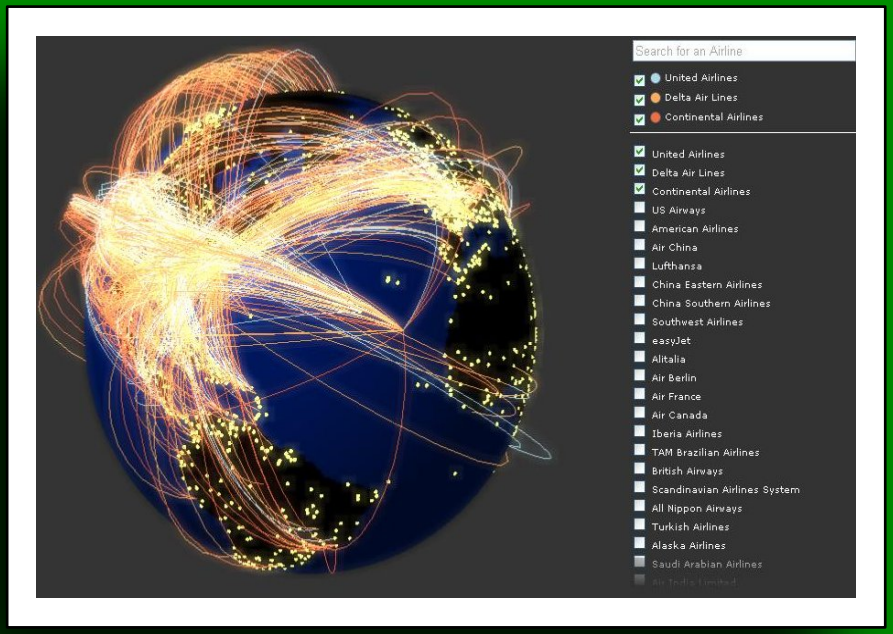
'Last seen wandering vaguely, quite of her own accord…' AA Milne

Assistant Lecture in Epidemiology
Royal Veterinary College, London
kstevens@rvc.ac.uk

Enhanced health decision-making with multicriteria decision analysis

Spatial applications

Mankind has left an indelible footprint on the earth…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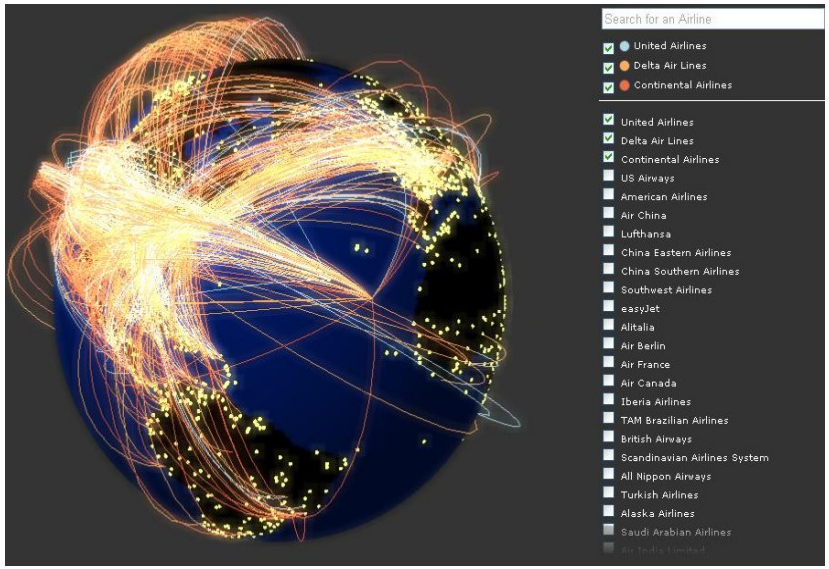
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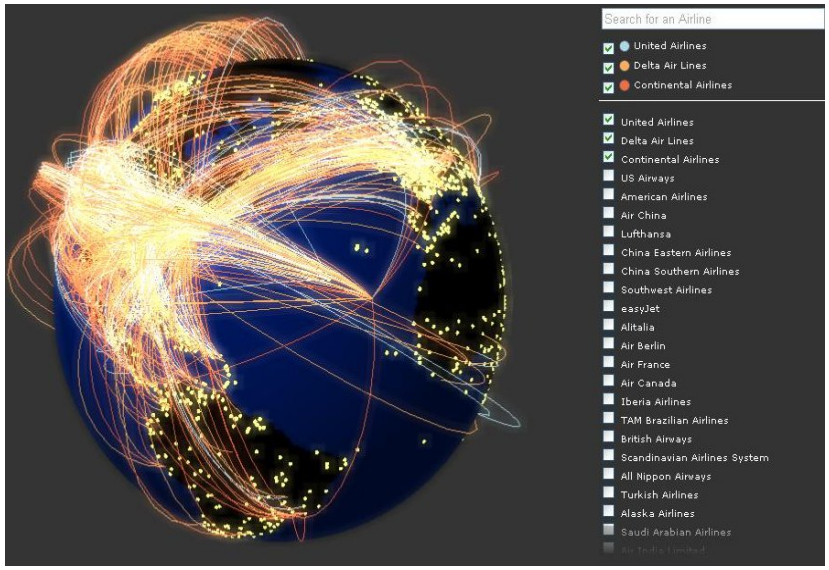
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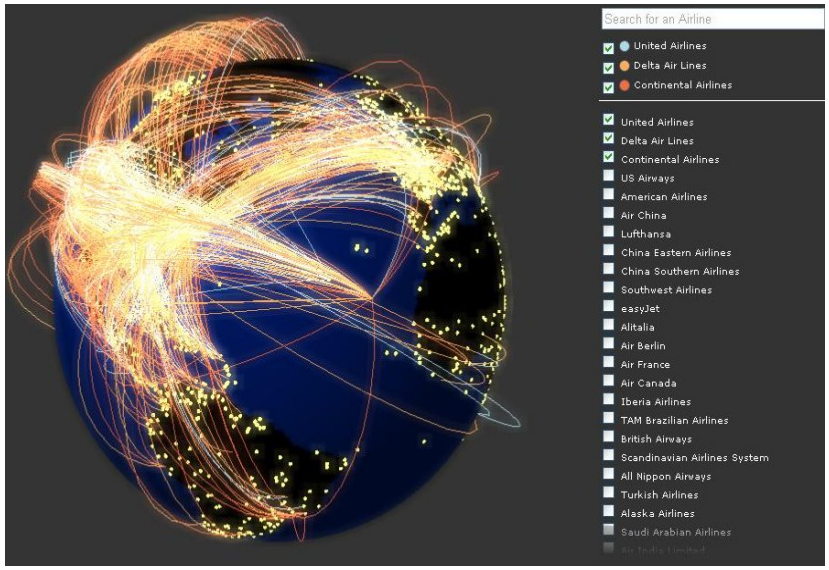
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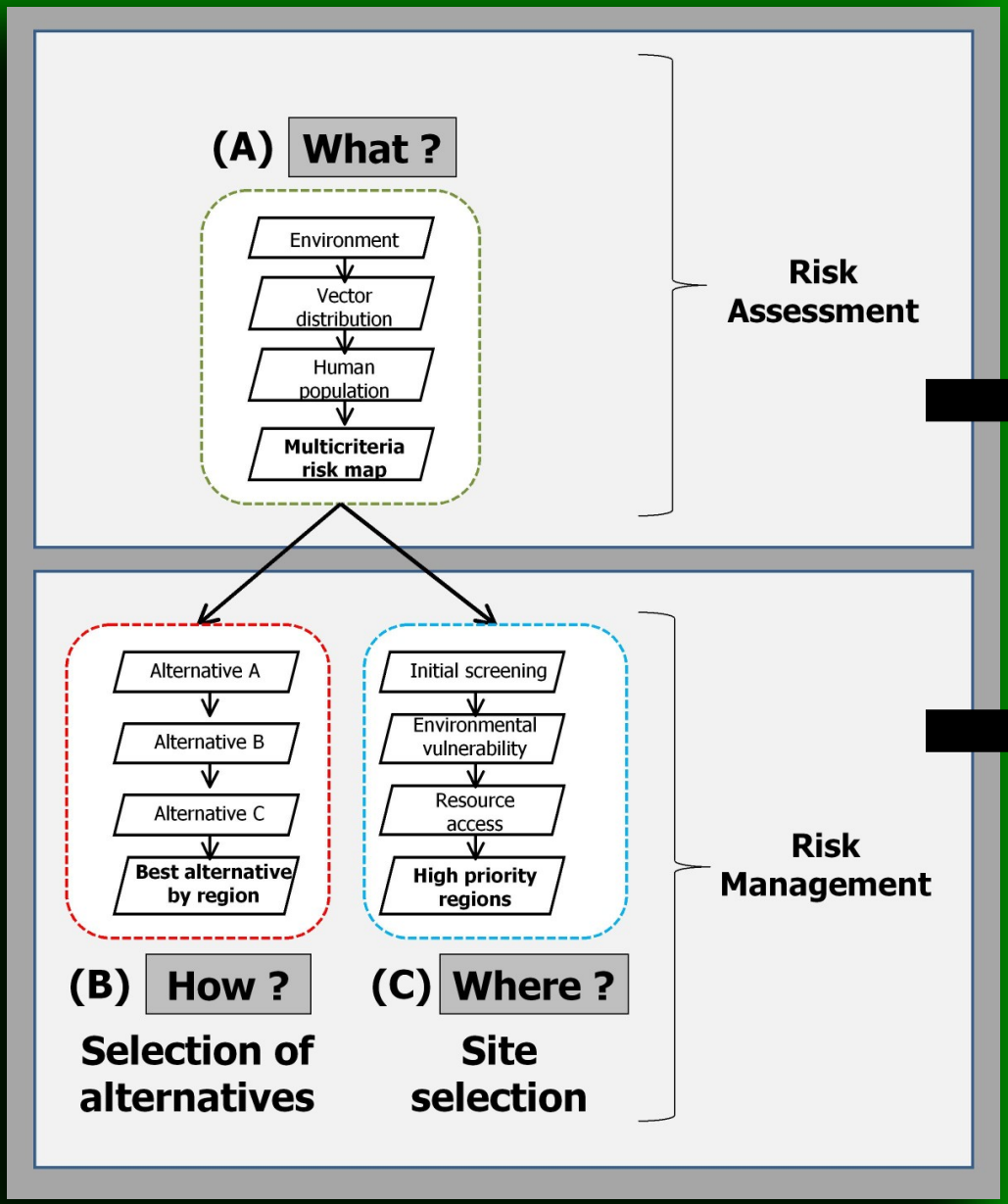
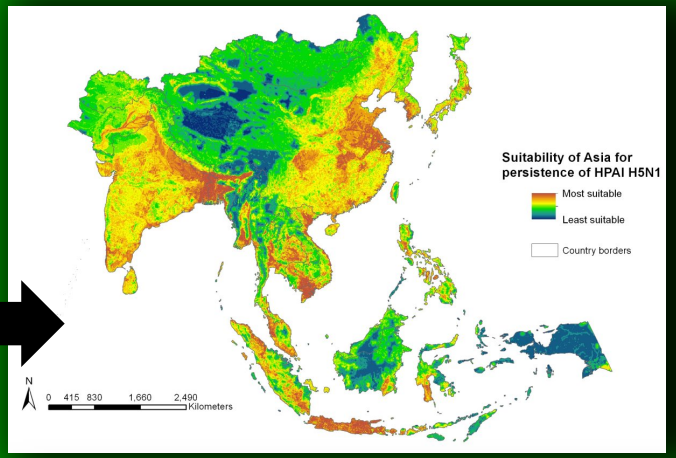
Decisions…

Need something more reliable than a magic 8 ball



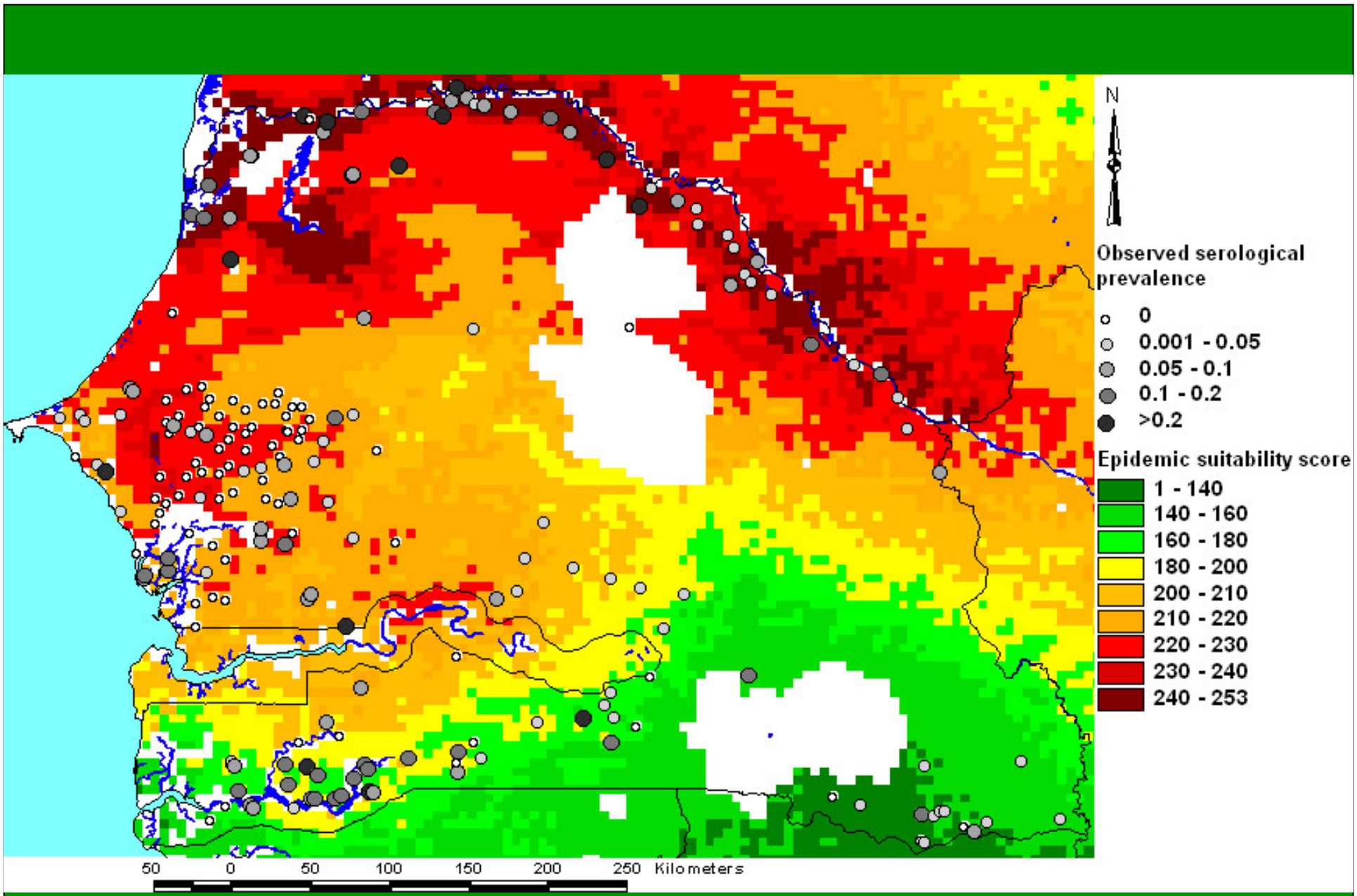


*From: Hongoh, V. et al. Spatially explicit multi-criteria decision analysis for managing vector-borne diseases. Int J Health Geog **10**, 70 (2011)*

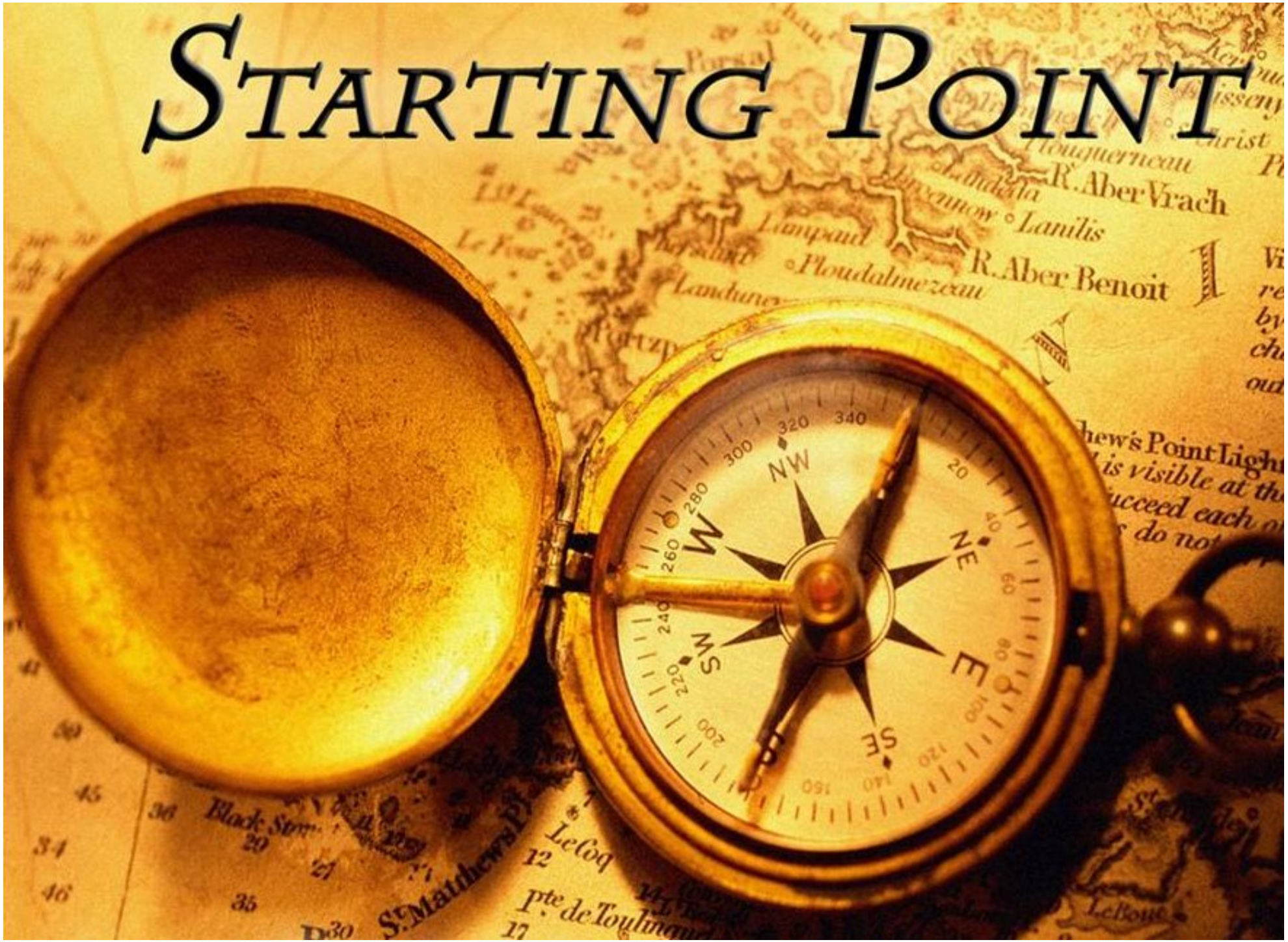
5 applied spatial MCDA health studies published

1	Clements A, Pfeiffer D, Martin V: Application of knowledge-driven spatial modelling approaches and uncertainty management to a study of Rift Valley fever in Africa. International Journal of Health Geographics 2006, 5:57.	2006
2	Rakotomanana F, Randremanana R, Rabarijaona L, Duchemin J, Ratovonjato J, Ariey F, Rudant J, Jeanne I: Determining areas that require indoor insecticide spraying using Multi Criteria Evaluation, a decision support tool for malaria vector control programmes in the Central Highlands of Madagascar. International Journal of Health Geographics 2007, 6:2.	2007
3	Symeonakis E, Robinson T, Drake N: GIS and multiple-criteria evaluation for the optimisation of tsetse fly eradication programmes. Environ Monit Asess 2007, 124:89-103.	2007
4	Sarkar S, Strutz SE, Frank DM, Rivaldi C-L, Sissel B, Sanchez-Cordero V: Chagas disease risk in Texas. PLoS Neglected Tropical Diseases 2010, 4:e836	2010
5	Stevens, K.B. Gilbert, M. Pfeiffer, D.U. Spatial suitability modelling of highly pathogenic avian influenza virus H5N1 occurrence in domestic poultry in Asia using multicriteria decision analysis. *Spatial and spatio-temporal epidemiology* 2013, 4:1-14	2013

How do you test model accuracy when you have no data?



From: Clements A, Pfeiffer D, Martin V: Application of knowledge-driven spatial modelling approaches and uncertainty management to a study of Rift Valley fever in Africa. International Journal of Health Geographics 2006, 5:57


STARTING POINT
R. Aber Vrach
R. Aber Benoit
NW
NE
W
E
SW
SE
St. Matthews
Le Coq
Pte de Toulinguet

Spatial MCDA - preparation

1. Define objective (outcome) of MCDA exercise

2. Identify variables associated with outcome & source maps

3. Define relationship between each variable and outcome (fuzzy membership functions)

4. Standardize all variables for comparison (0 – 255 scale)

5. Derive weight for each variable using pair-wise comparison matrix

6. Determine and account for any correlation between variables by adjusting weights

Spatial MCDA - implementation

7. Combine variable maps and weights using weighted linear combination

8. Rank order all pixels

9. Result divided by the maximum rank to produce map of relative risk

10. Classify land as suitable/unsuitable using different thresholds

11. Overlay map with outbreak & background point locations and determine whether they are TP, TN, FP, FN

12. Run dataset of 0s and 1s through statistical software and calculate area under the receiver operating curve (ROC AUC)

http://clarklabs.org/ Clark Labs -IDRISI GIS and L...

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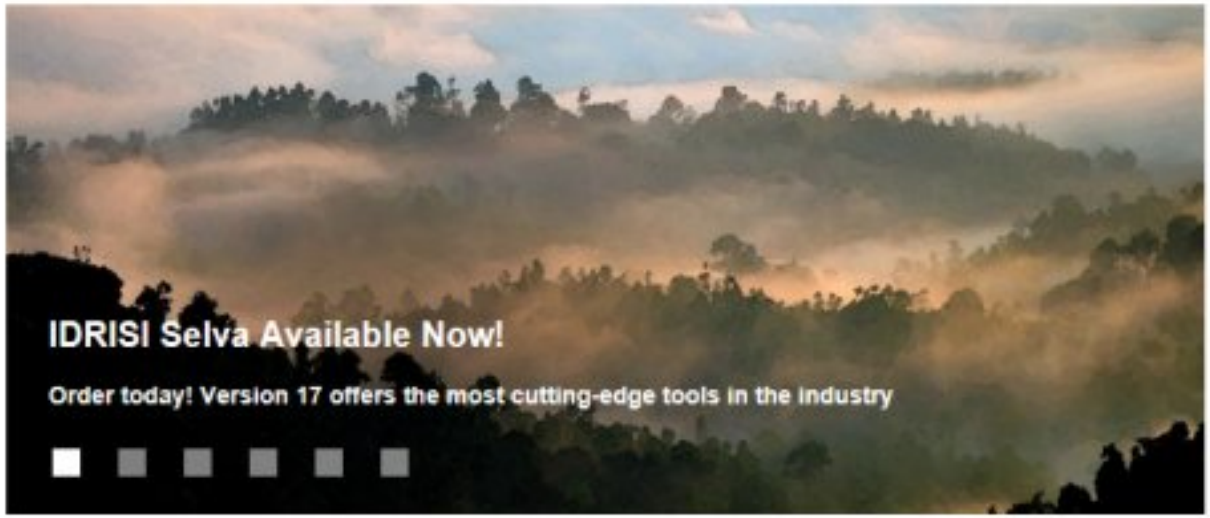
Geospatial software for monitoring and modeling the Earth system



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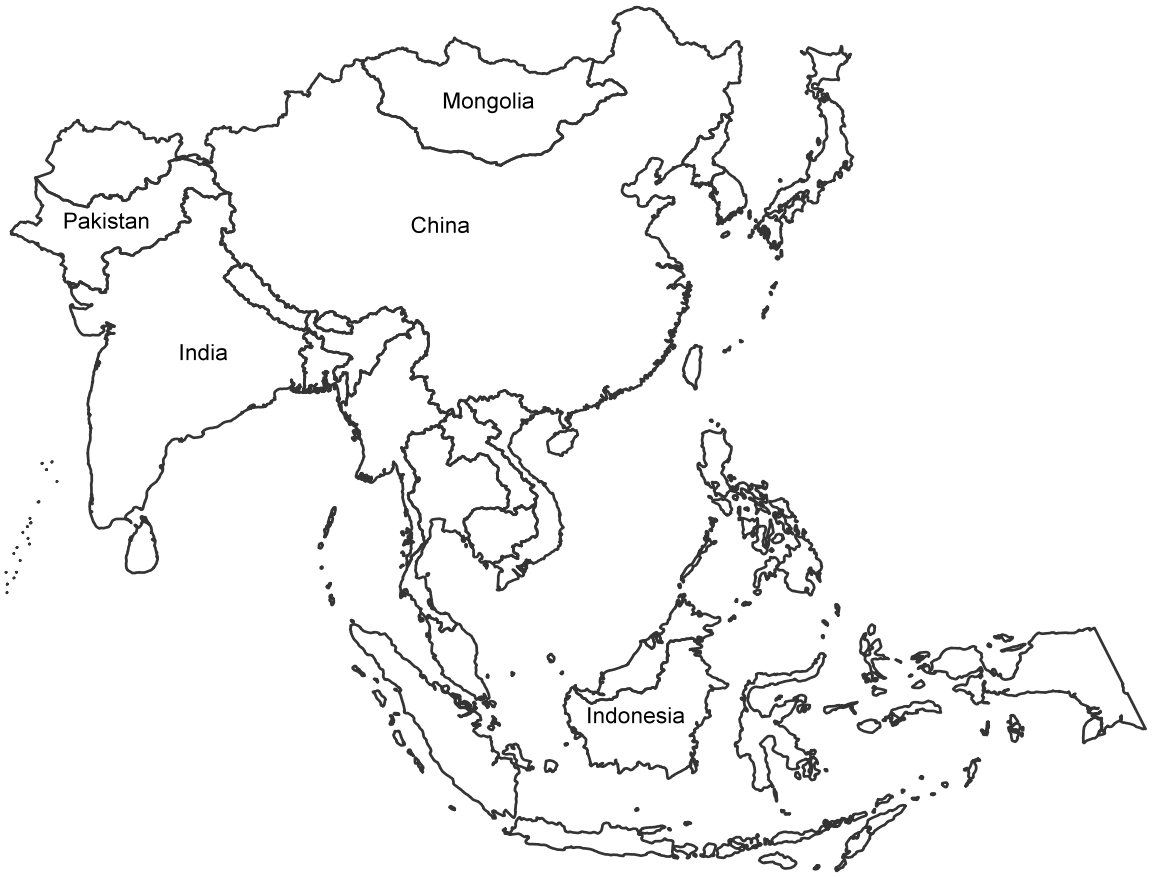
IDRISI Selva Features

IDRISI includes tools for segment-based classification, an approach that classifies remotely

1a. Define objective and study area



To identify areas in Asia suitable for the occurrence of HPAI H5N1 in domestic poultry