

GIS applications to support entry-exit inspection and quarantine activities

the framework of a strategy and the process for developing a spatial decision support systems for risk analysis of the quarantine station for animal import-export in China

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The context

- Animal import/export
 - World Trade Organisation (WTO)
 - World Organization for Animal Health (OIE)
- Framework of the Agreement on the Application of Sanitary and Phytosanitary (SPS)
 - free trade
 - protection of human and animal health



The spatial domain

China

- Export
 - More than 300 farms located in 20 provinces
 - Principal destinations
 - Hong Kong
 - Macao
 - Trade volume each year: \$ 580 million
- Import
 - Principal providers
 - Australia
 - Canada



Problem statement

- Assess risks associated with trade in animals and their products
 - Protecting public health
 - Protecting animal health
 - Avoid trade bans
- Release assessment

description of the biological pathway(s) necessary for an imported commodity to 're-lease' pathogenic agents into a particular environment



Problem statement

- Animal quarantine station

establishment under the control of the veterinary authority where animals are maintained in isolation with no direct or indirect contact with other animals
- Adequate separation of housed animals from the surrounding environment
 - [..]
 - Managerial
 - **Location**
 - Biosecurity
 - [..]



Problem statement

How a spatial decision support system can assist with the evaluation of a candidate animal quarantine station performance?

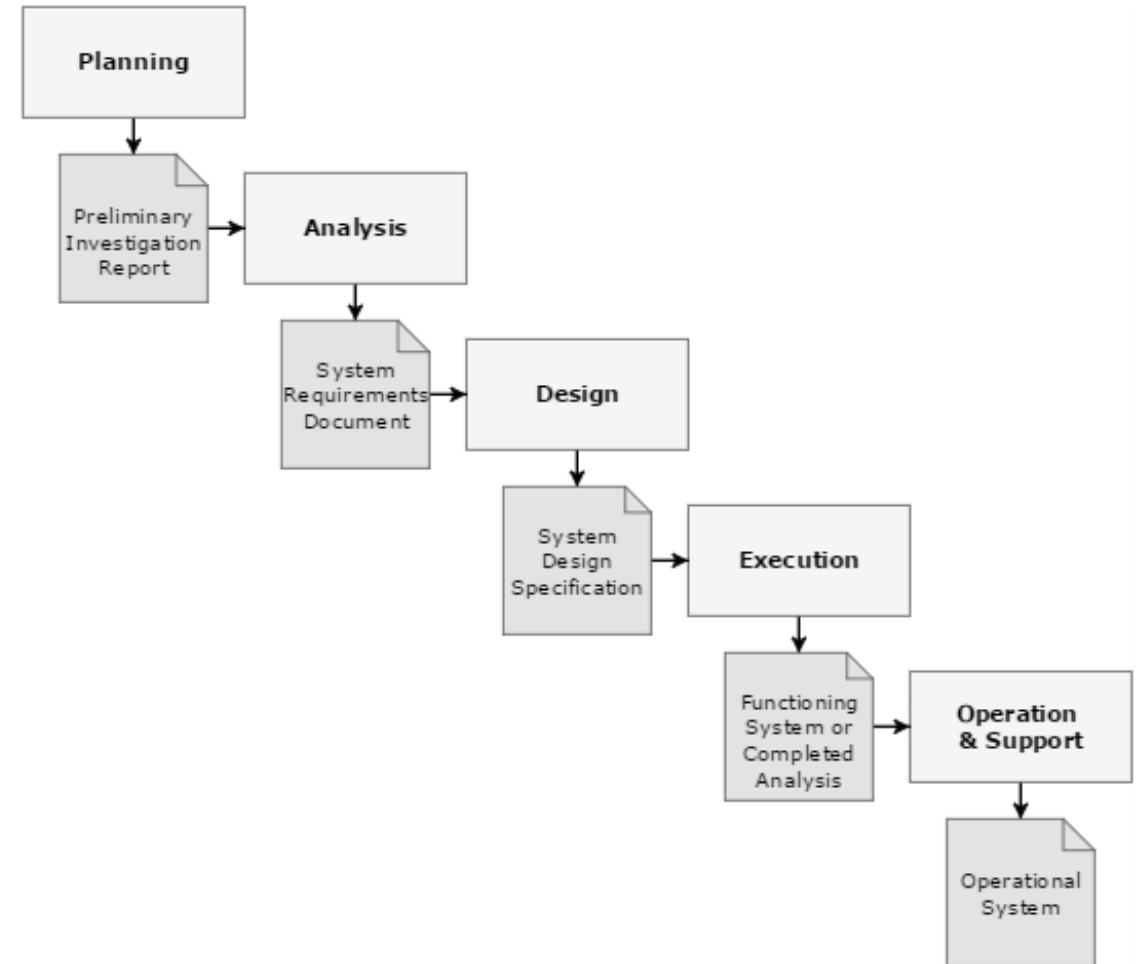
- Spatial nature
- Complex multi-dimensional and heterogeneous data
- Multiple participants with different and often conflicting interests
- Multiple categories of knowledge involved



Method

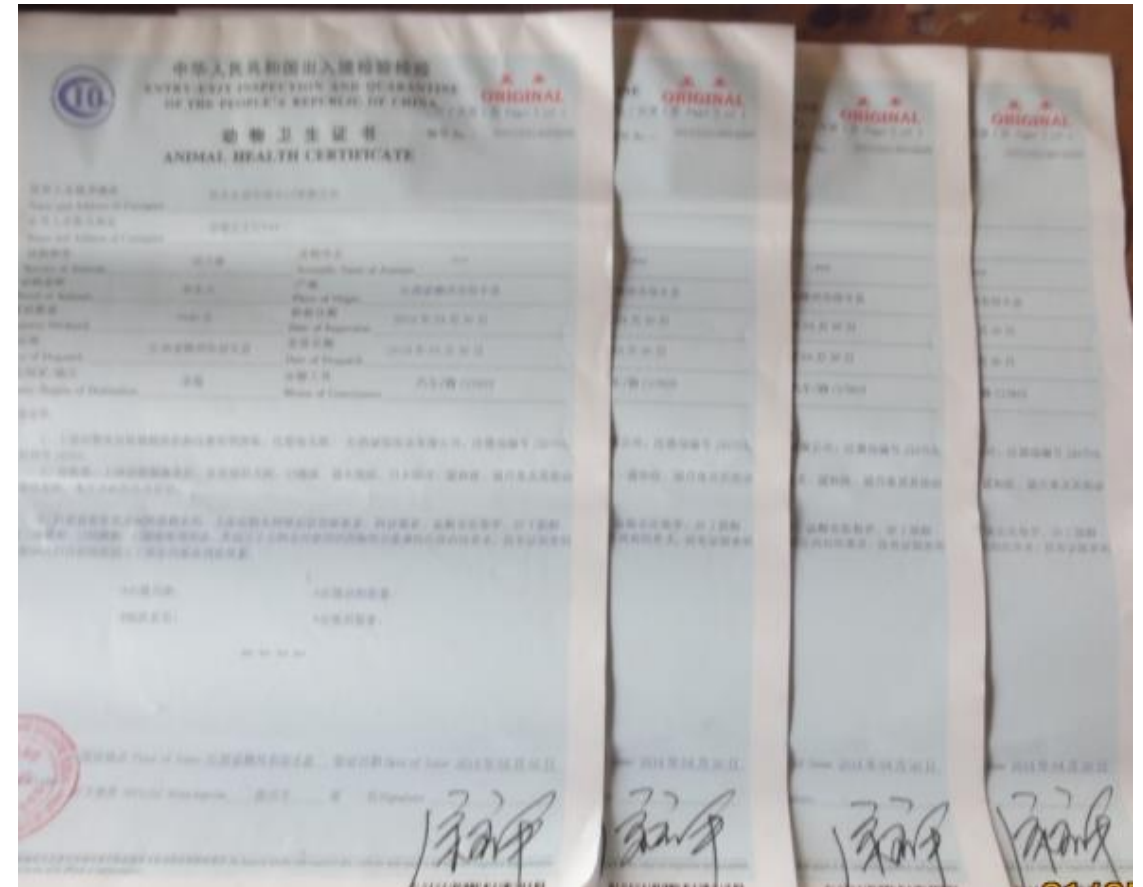
Constraints:

- GIS maturity
- Engage stakeholders
- Design complexity
- Inventory condition



The Analysis step

- Improve the level of informatisation
- Improve the geodata quality and management
- Integrate the location information in the risk analysis evaluation



The Design step

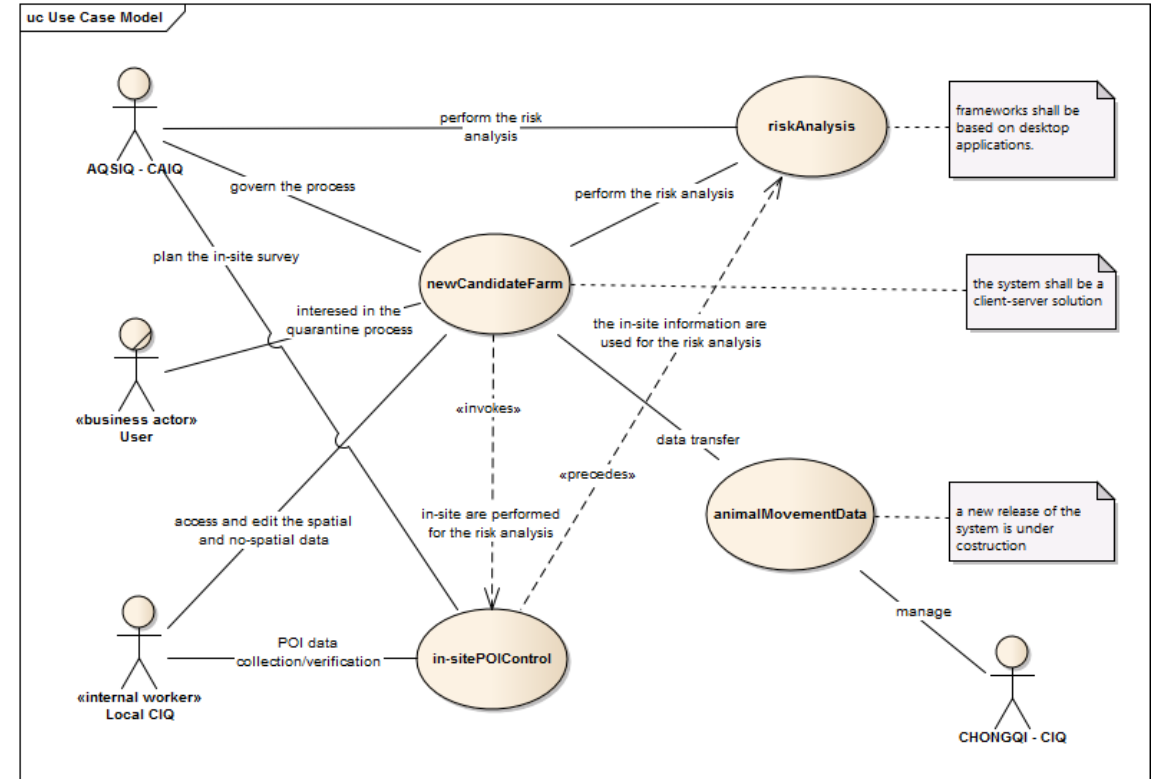
- New protocol for geodata collection.
- WebGIS for data editing and presentation.
- New protocol for data analysis.



The Design step - Protocol for geodata collection

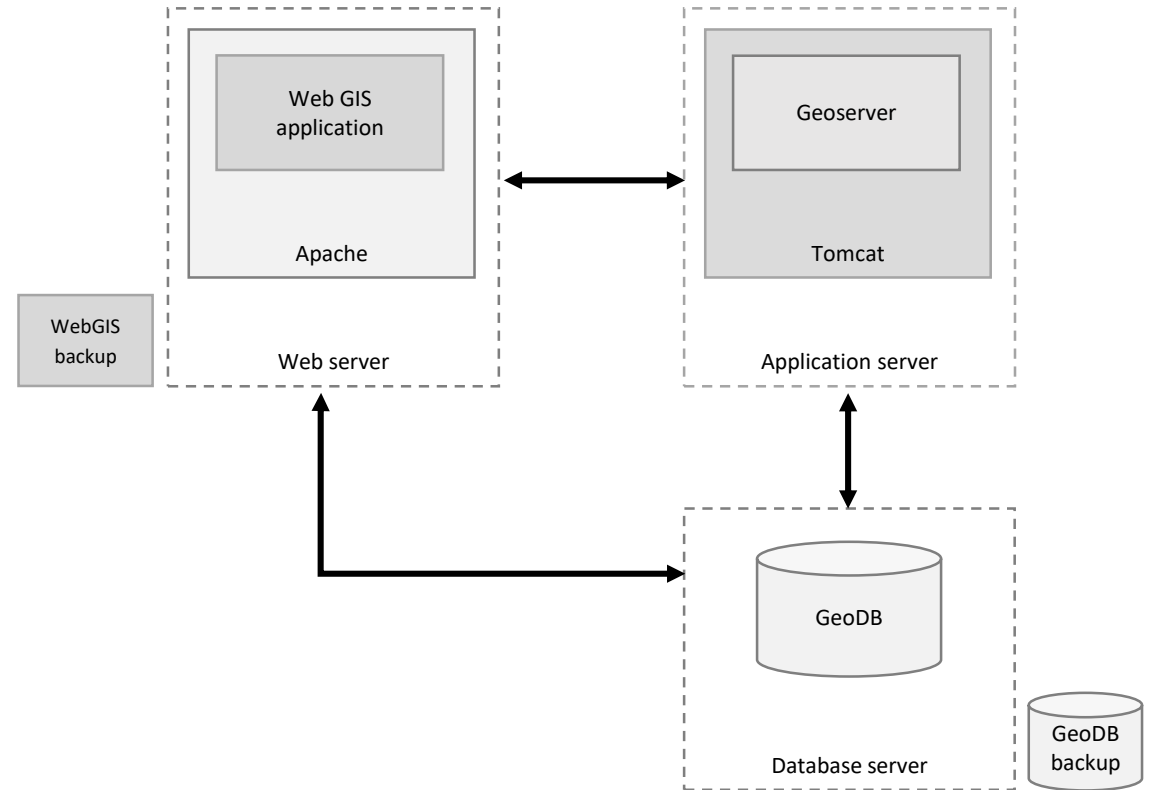
Decentralisation

data capture should be performed on a specific survey plan, and based on a well defined framework that shall include a tailored training session for the local CIQ



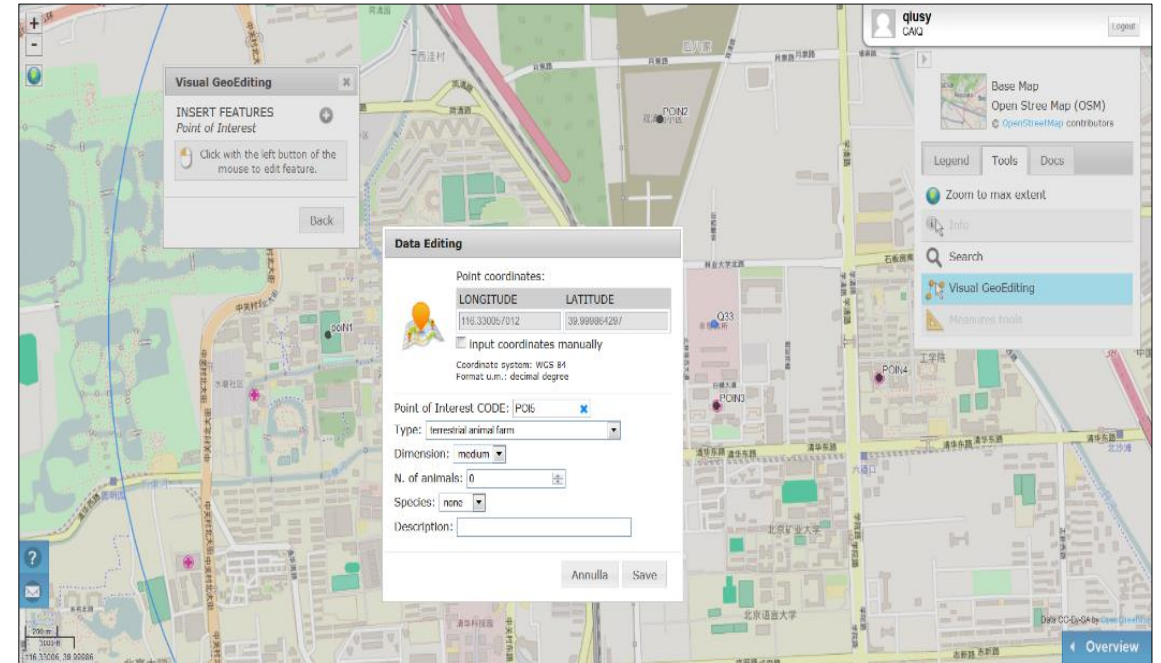
The Design step – webGIS for data editing and presentation

- Linux 12.04 LTS 64 bit
- Apache HTTP Server 2.2
- Apache Tomcat 7
- PostgreSQL version 9.1 + POSTGIS 2.0
- Geoserver 2.4



The Design step – webGIS for data editing and presentation

- Server side: PHP 5
- Client side: Javascripts code
+ JS Libraries (i.e. JQuery)
+ OpenLayers 2.12



The Design step – risk analysis

To evaluate the impact in the **premises** exposed to the risk of animal introduction in the area

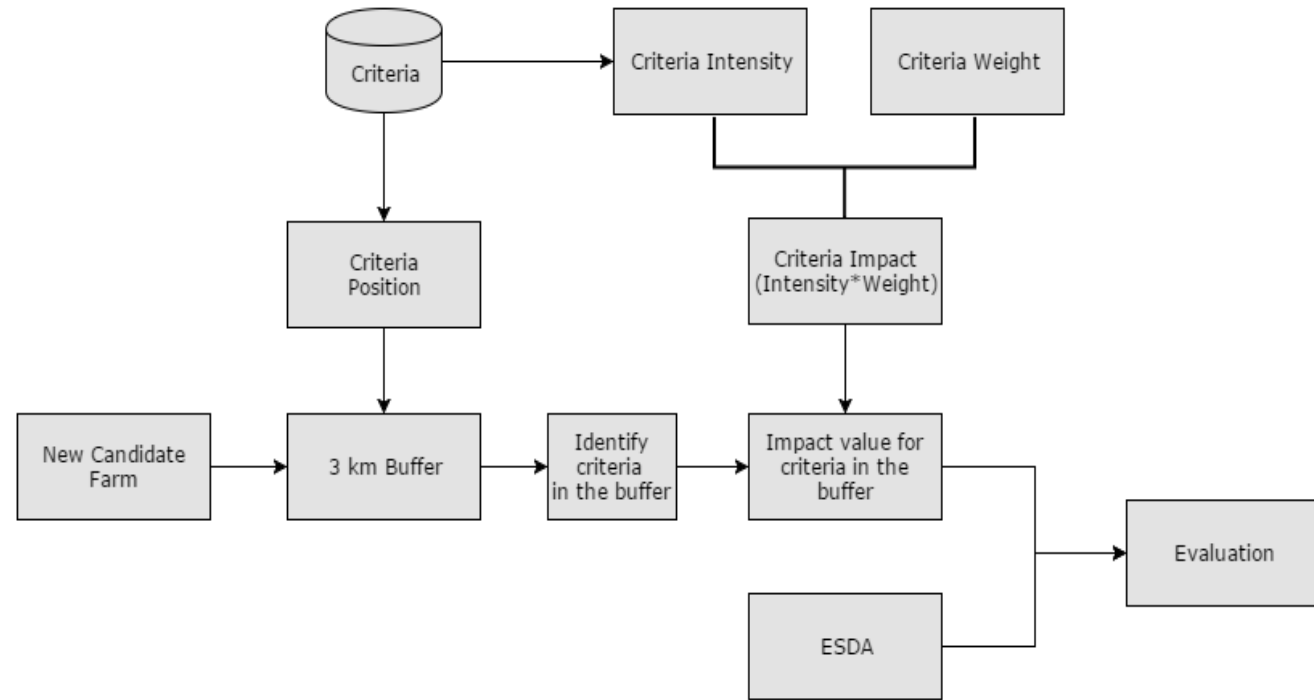


Simple Additive Weighting Method

To evaluate **physical** or **spatial factors** that affect the performance of the quarantine station



Exploratory Spatial Data Analysis

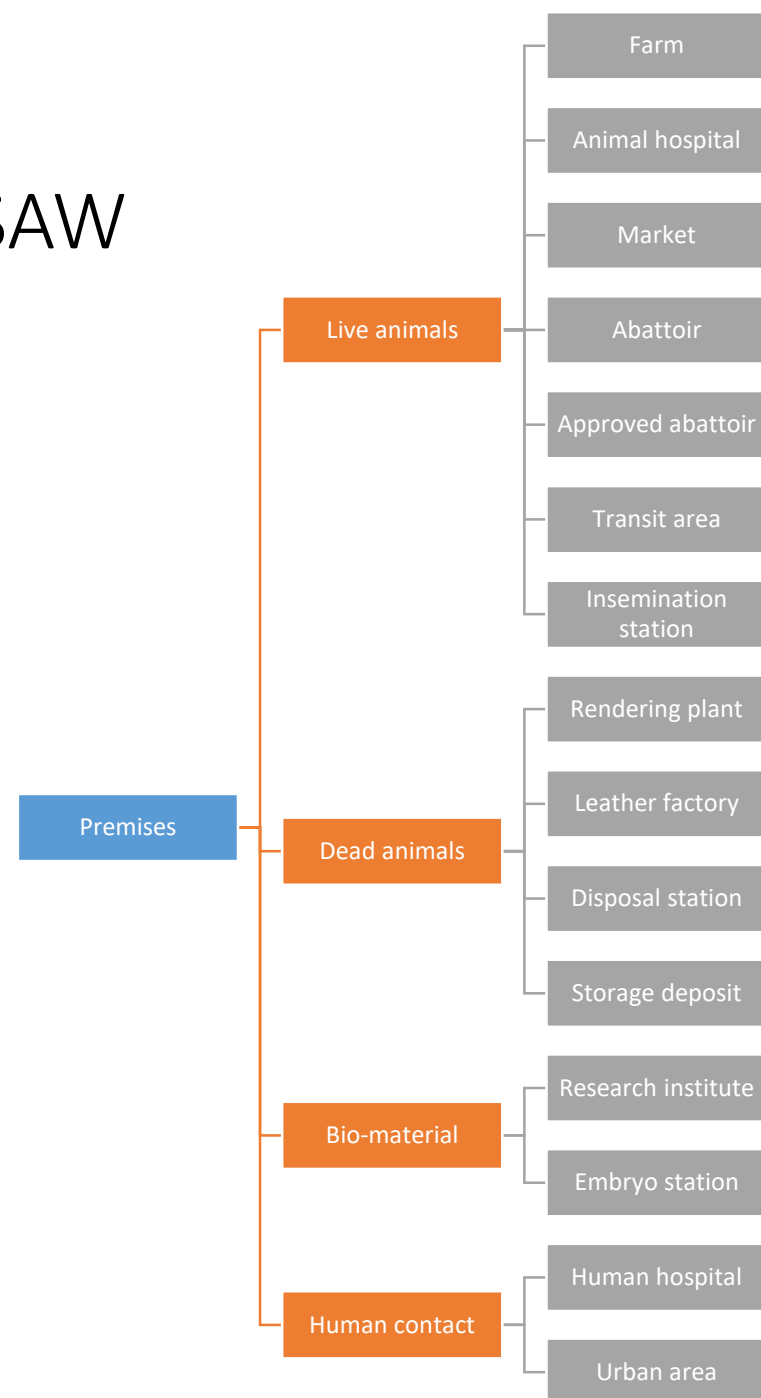


The Design step – risk analysis - SAW

$$Total\ Impact = \sum w_i x_i \times \prod c_j$$

Criteria

premises that directly or indirectly can be exposed to a disease problem derived from the presence of animals in the quarantine station (e.g.: flocks, herds, abattoir)



The Design step – risk analysis - SAW

$$Total\ Impact = \sum w_i x_i \times \prod c_j$$

x_i = is the **intensity** of the observed i Criteria
the intensity is a quantifiable measure and represents the dimension of the criteria.

Example of intensity:

- Farm= number of housed animals
- Abattoir= number of slaughtered anim.

The values are re-classified



The Design step – risk analysis - SAW

$$Total\ Impact = \sum w_i x_i \times \prod c_j$$

w_i = is the **weight** for the i Criteria type

c_j = Boolean constraint.

*It takes into account the “critical criteria”.
The critical criteria are the class of criteria
that shall not be near a quarantine station*

Importance of the premises that directly or indirectly can be exposed to a disease problem derived from the presence of animals in the quarantine station.

Comparisons [Show variables/Criteria](#)

Please complete the following comparisons.

Criteria 1	Scale	Criteria 2
Live Animals	absolutely more important moderately more important same importance moderately more important absolutely more important	Dead animals
Live Animals	absolutely more important moderately more important same importance moderately more important absolutely more important	Bio Materials
Live Animals	absolutely more important moderately more important same importance moderately more important absolutely more important	Human contacts
Dead Animals	absolutely more important moderately more important same importance moderately more important absolutely more important	Bio Materials

RApache + R scripts

The Design step – risk analysis - ESDA

- Field survey
 - Natural barriers
 - Artificial barriers
 - Wild animals sites

Land cover data (?)

Base map layers (?)



Conclusion

- First example of a documented SDSS for import-export veterinary inspection and quarantine activities
- Better decision-making
- Improved communication



Credits

OIE Cooperation Project “Capacity development for implementing a Geographic Information System (GIS) applied to surveillance, control and zoning of avian influenza and other emerging avian diseases in China”

- Istituto Zooprofilattico Sperimentale delle Venezie
- Chinese Academy for Inspection and Quarantine



The screenshot shows the homepage of the OIE Cooperation Project website. At the top is a dark navigation bar with links: Home, Cooperation project, Involved Insitutes, Reports, Documents & materials, Participants, and a small flag icon. Below this is a large red banner with the text "OIE COOPERATION PROJECT" in white, followed by "Capacity development for implementing a Geographic Information System (GIS) applied to surveillance, control and zoning of avian influenza and other emerging avian diseases in China." Below the banner is a white section with two logos: the IZSVe logo (Istituto Zooprofilattico Sperimentale delle Venezie) and the Chinese Academy of Inspection and Quarantine (CAIQ) logo. Below the logos is the heading "Project description" followed by a paragraph of text. At the bottom of this section is a red button that says "Go to the Cooperation project page".

Home Cooperation project Involved Insitutes Reports Documents & materials Participants 

OIE COOPERATION PROJECT

Capacity development for implementing a Geographic Information System (GIS) applied to surveillance, control and zoning of avian influenza and other emerging avian diseases in China.

Home

Project description

The Istituto Zooprofilattico Sperimentale delle Venezie - OIE Collaborating Centre for Epidemiology and Training on Emerging Avian Diseases (IZSVe) and the Chinese Academy for Inspection and Quarantine (CAIQ), have started on 27th October 2014 an OIE (World Organisation for Animal Health) Cooperation Project entitled “Capacity development for implementing a Geographic Information System (GIS) applied to surveillance, control and zoning of avian influenza and other emerging avian diseases in China”. The main objective of the project is to allow CAIQ to acquire expertise to introduce and design GIS applications for surveillance, disease control, and zoning. To achieve this objective capacity building activities on GIS management techniques, spatial statistical analyses and spatial models integrated with GIS applications will be developed during the two years project.

[Go to the Cooperation project page](#)

Thankyou for your attention

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