The use of GIS in animal disease response

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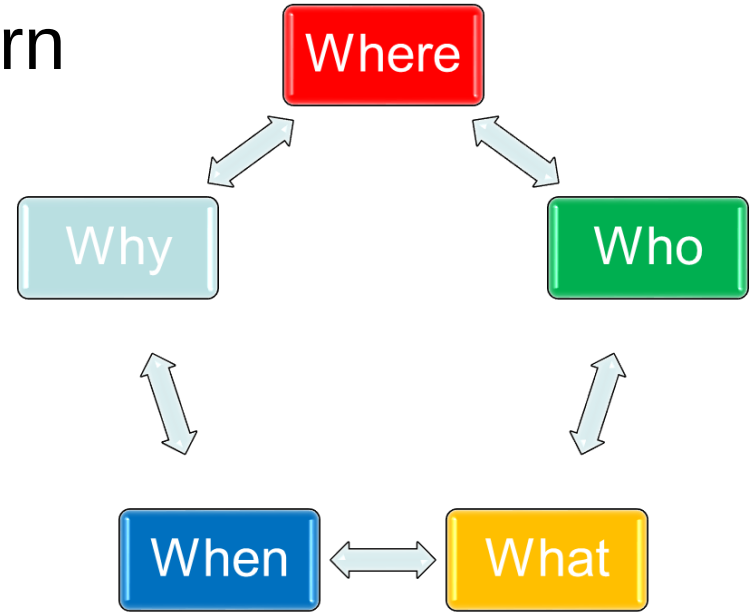
CHINESE ACADEMY OF INSPECTION AND QUARANTINE

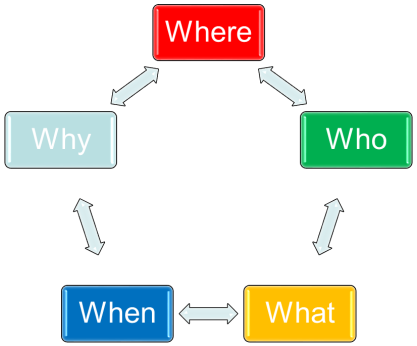
Disease events

The **5W**'s of epidemiology:

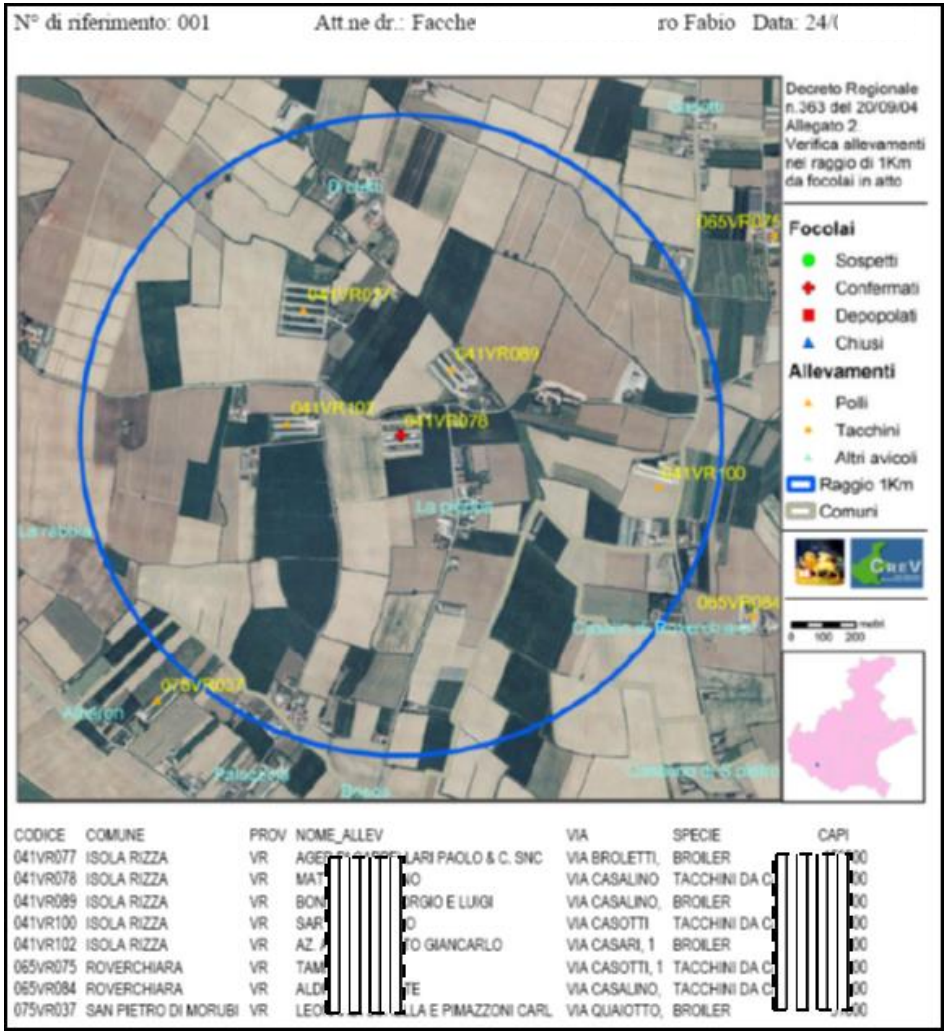
1. What = health issue of concern
2. Who = animals
3. **Where** = location
4. When = time
5. Why/how = causes, risk factors, modes of transmission



Disease events



The spatial component of a disease outbreak has always been a basic element to **identify**, **describe**……. **characterize** = **control** a livestock disease



Disease response

- Identification of the location of an outbreak
- To organise disease control operations (protection and surveillance zones, stamping out, vaccination,..)
- To characterise the area at risk of infection (e.g. DPLA)
- To elaborate the first hypothesis on the origin of the disease(e.g. wet area for AI)

- *Farm code*
- *Address*
- *Animal species*
- *……*

Source:
Farm register database
Ancillary map *(image, street maps)*

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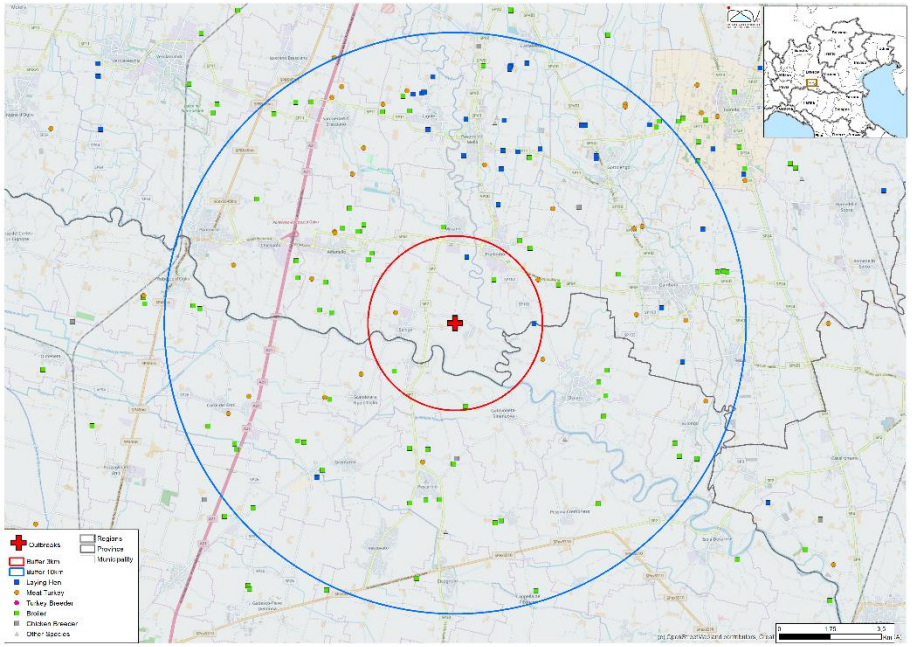

- *Procedures*
- *GIS tools*

Disease response

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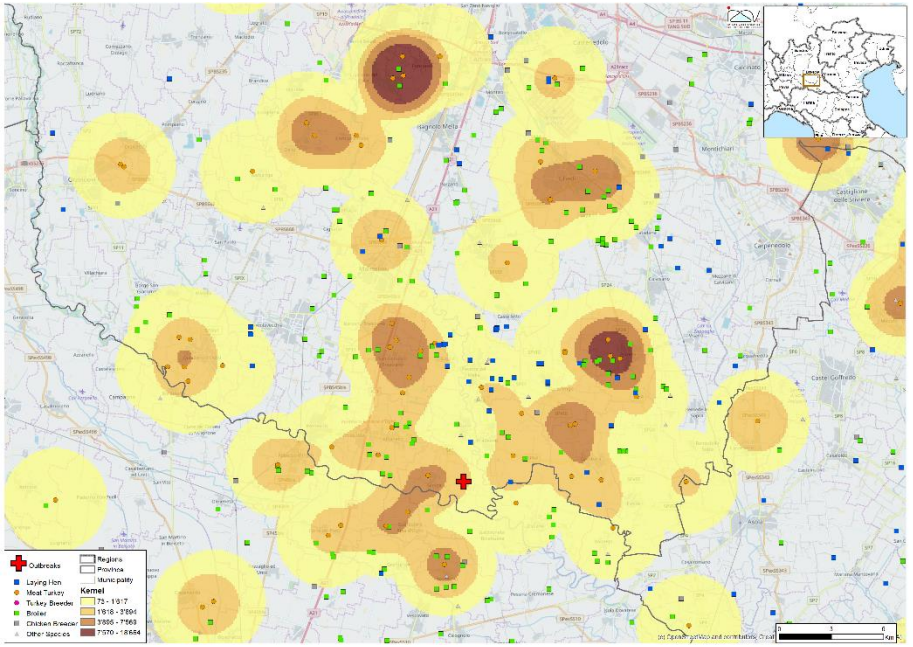

- *Procedures*
- *Exploratory Spatial Data Analysis*

Disease response

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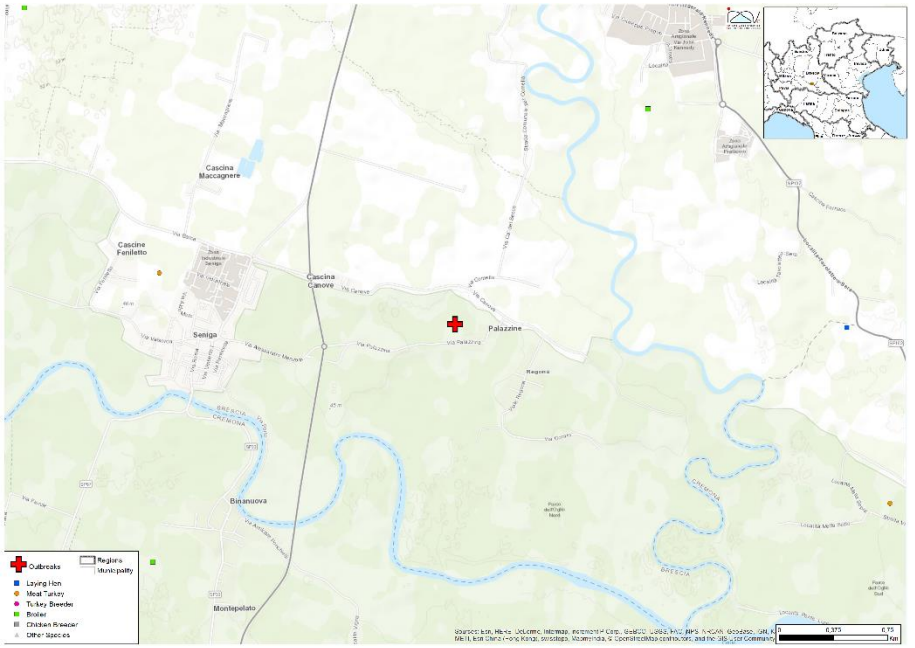
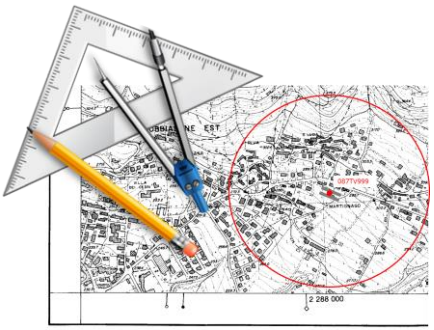
- *Ancillary data*
- *Satellite data*



Disease response – the role of GIS

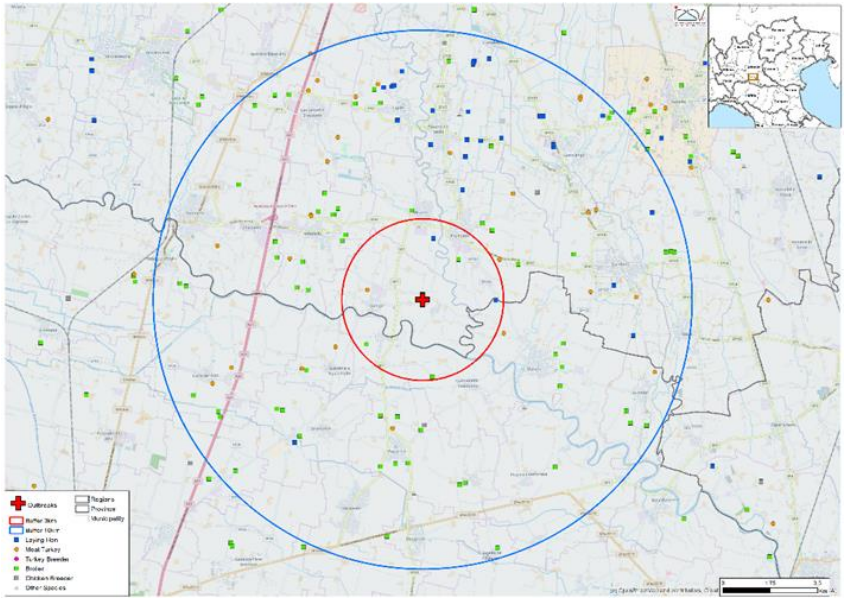


Historically the geographical component of an animal disease response was studied and managed using paper maps

Disease response – the role of GIS

Are procedures based on paper maps still of practical use?

YES = limited number of outbreaks

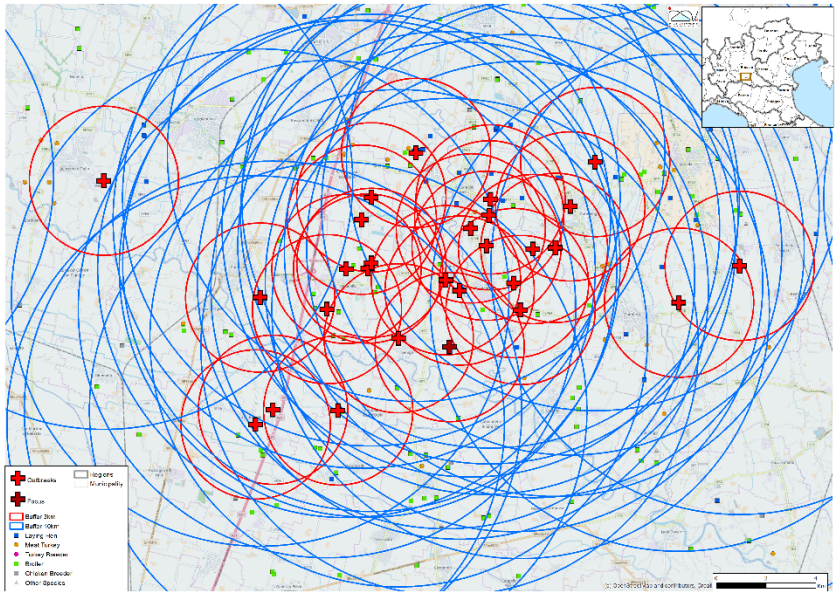


Disease response – the role of GIS

NO = many outbreaks

You MUST guarantee the enforcement of restrictions in areas at-risk:

- disease control
- trade



Disease response – the role of GIS

Why an organisation should invest (money, time, commitment, ..) to build a GIS?

The technological component

Hardware
Software

Know-how

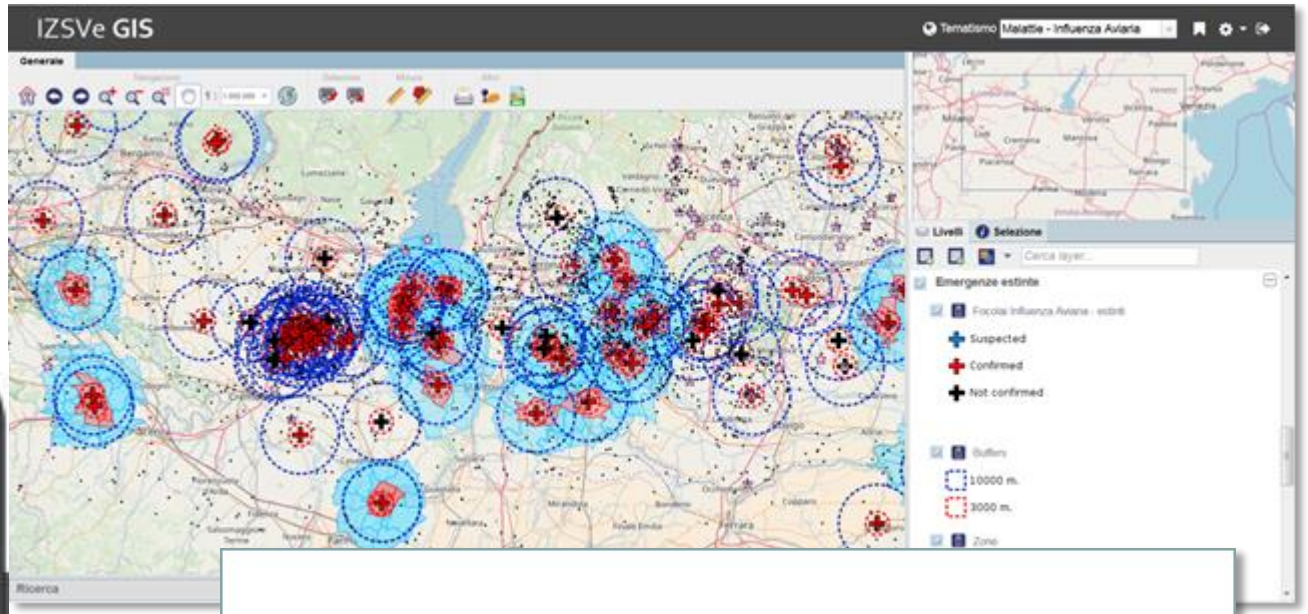
- Datawarehouse
- Data Infrastructure

Cartographic
portal

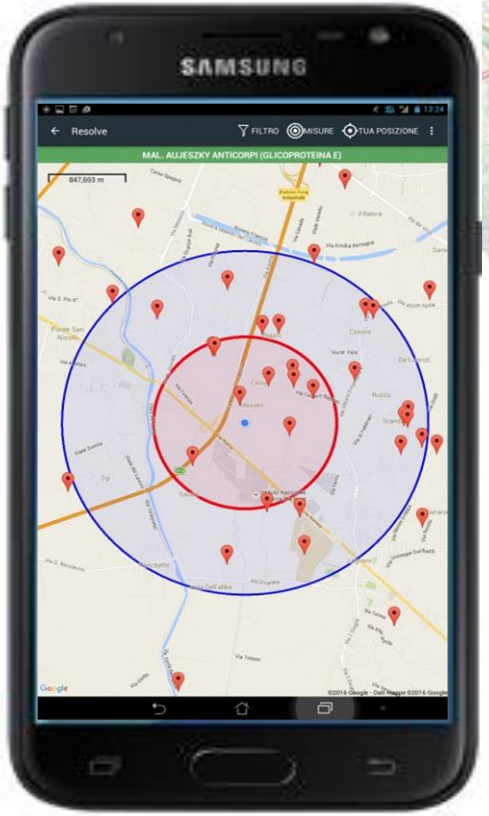
Data

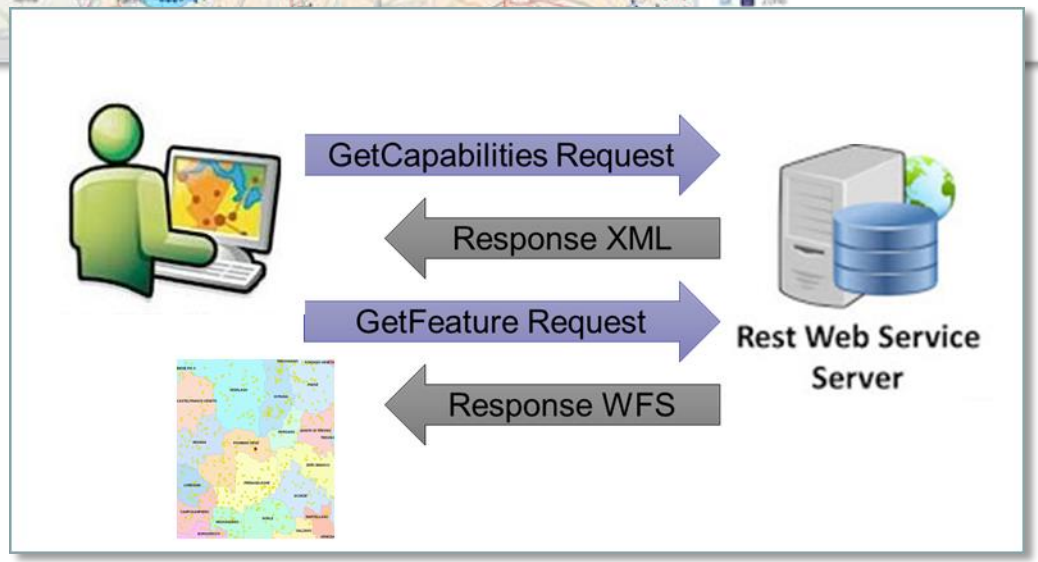
The technological component

WebGIS



App





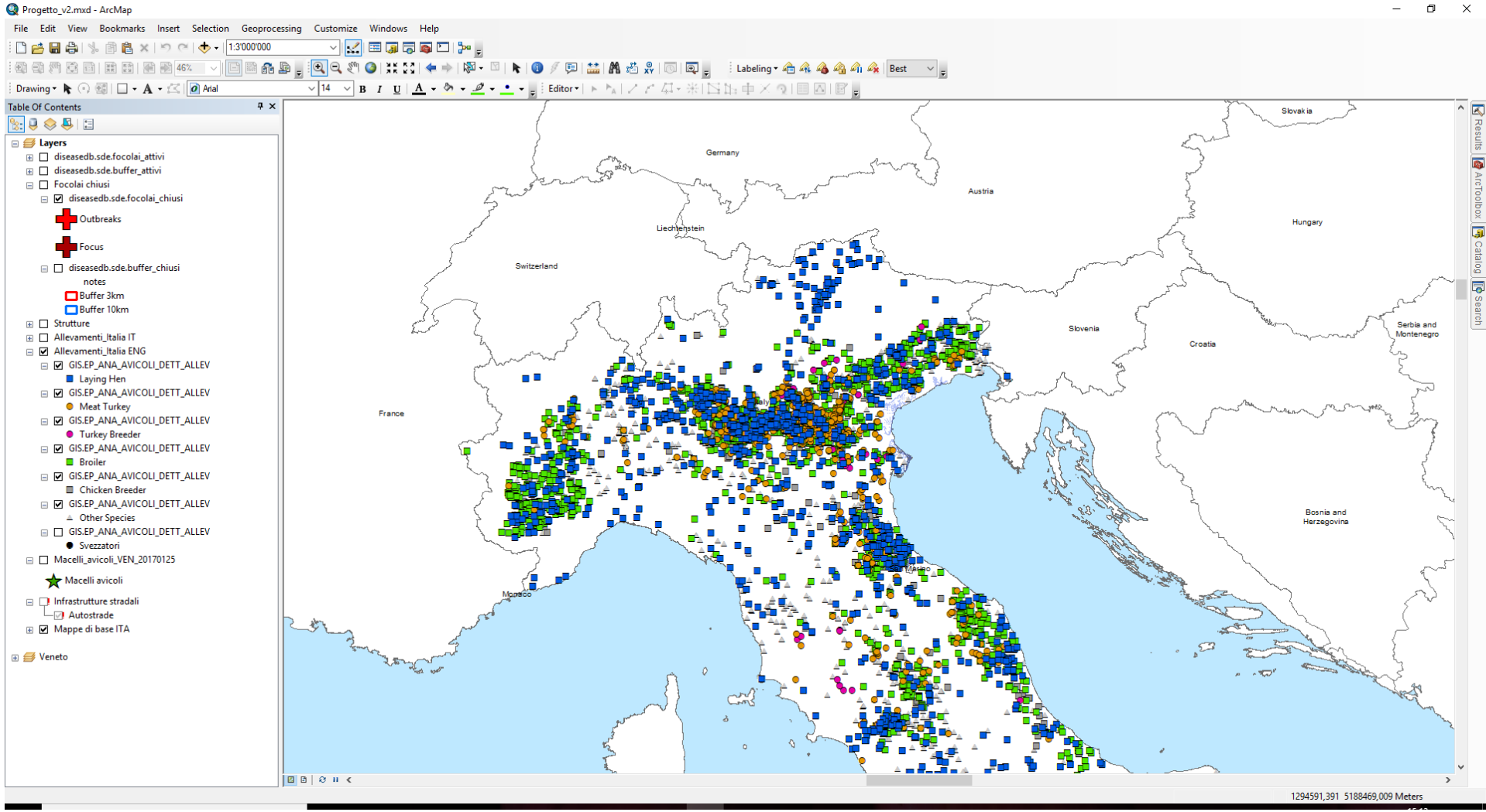
WebServices

Disease events

HPAI

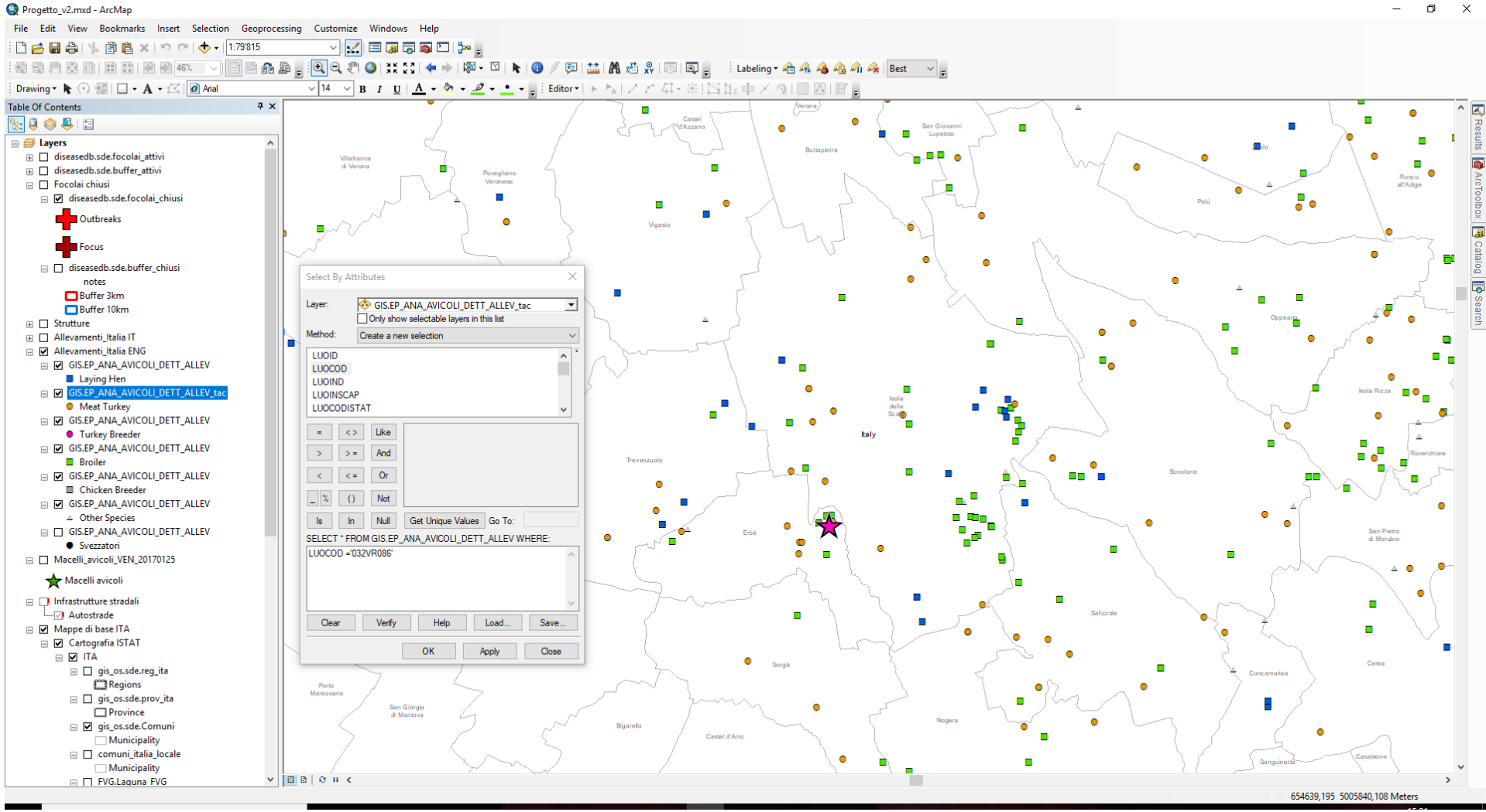
Applications – AI Management – Preparedness

Step 1 – peace time: set up data, procedures and methods



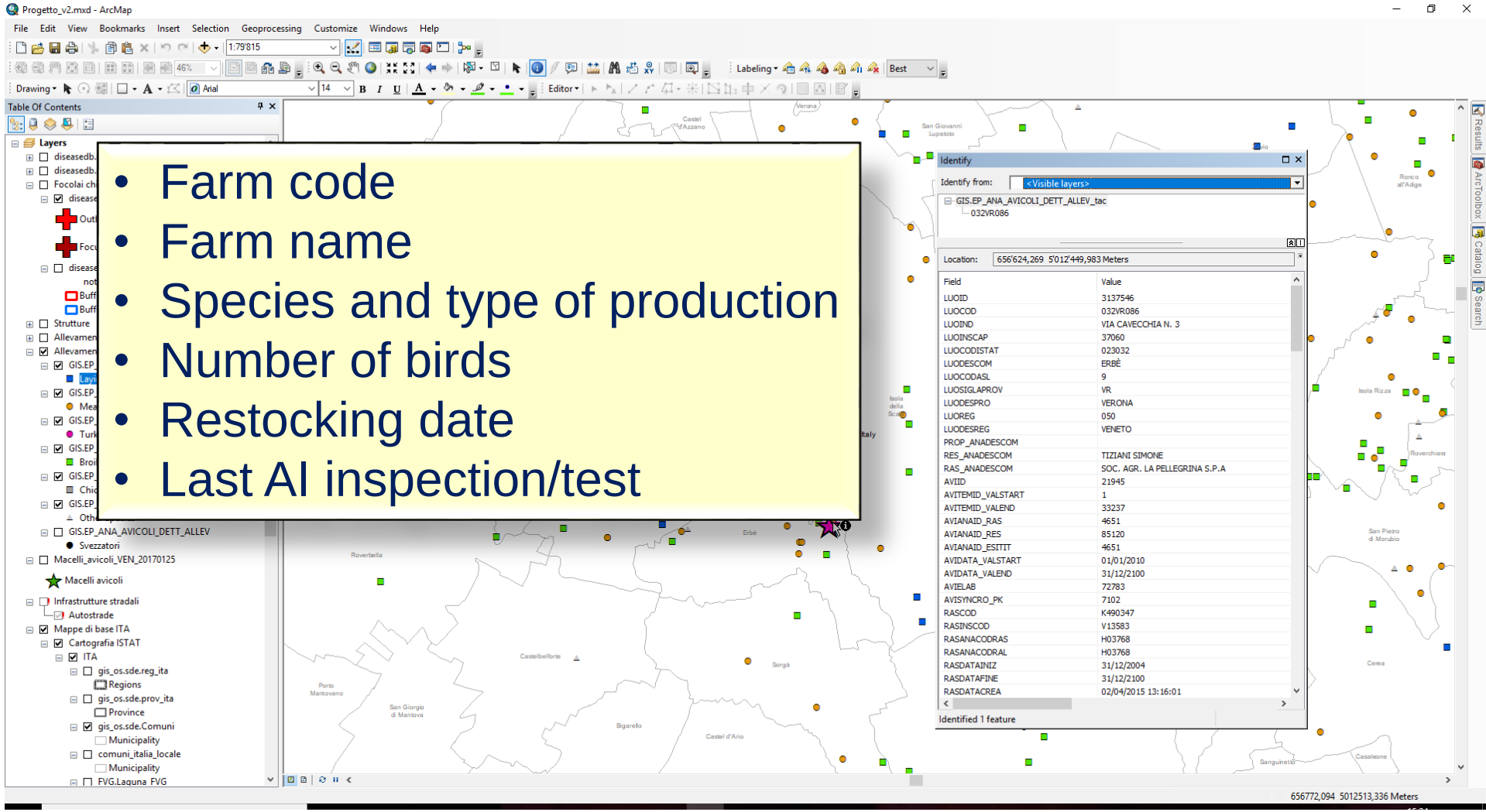
Applications – AI outbreak management

<u>Step 2</u>: to identify the location of the AI affected poultry farm



Applications – AI outbreak management

Step 3: AI affected poultry farm (data check)



- Farm code
- Farm name
- Species and type of production
- Number of birds
- Restocking date
- Last AI inspection/test

Applications – AI outbreak management

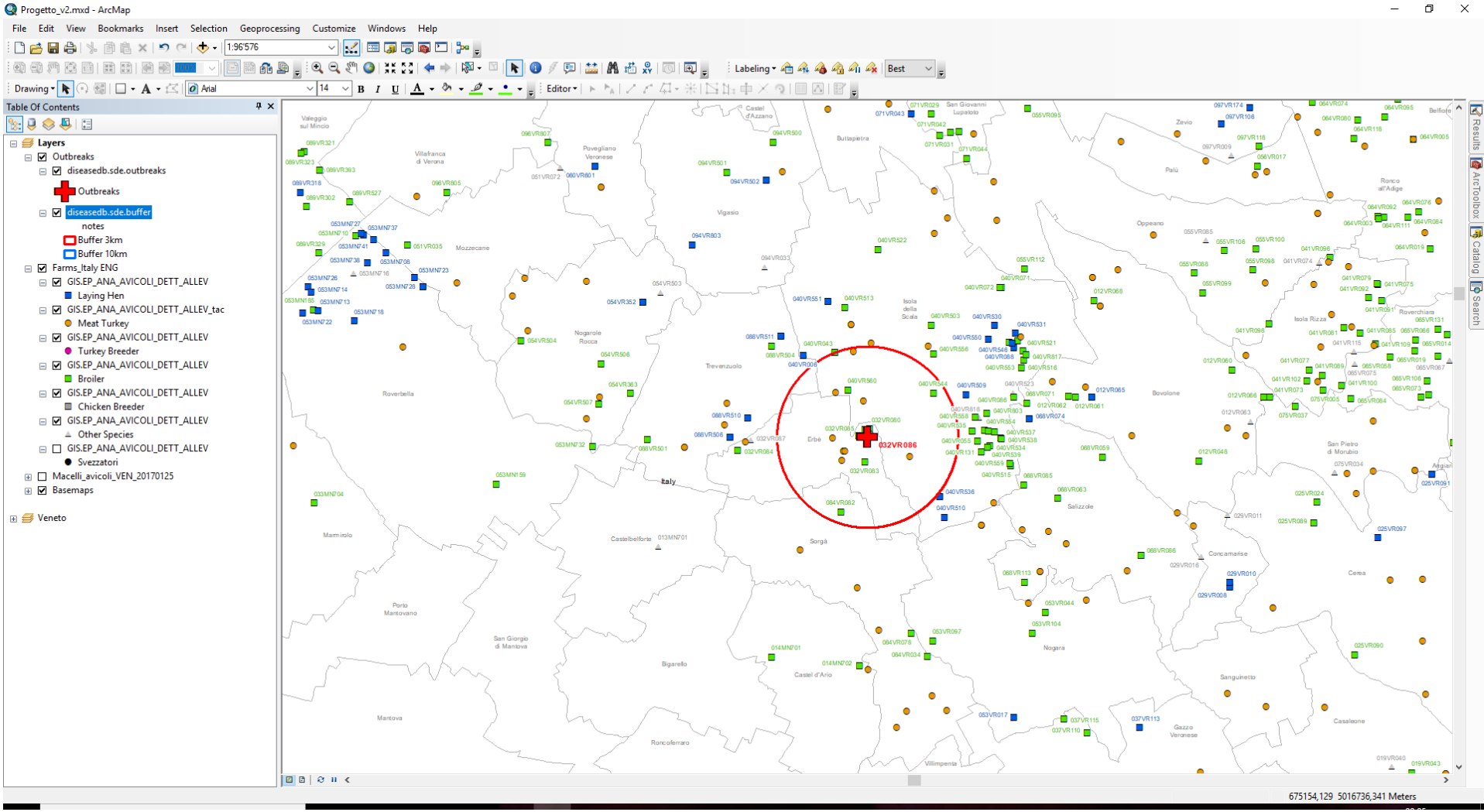
<u>Step 5</u>: restriction zones

Field veterinarians

- Enforcement of restrictions
- Stamping out measures
- Disposal of carcasses
- Cleansing and disinfection

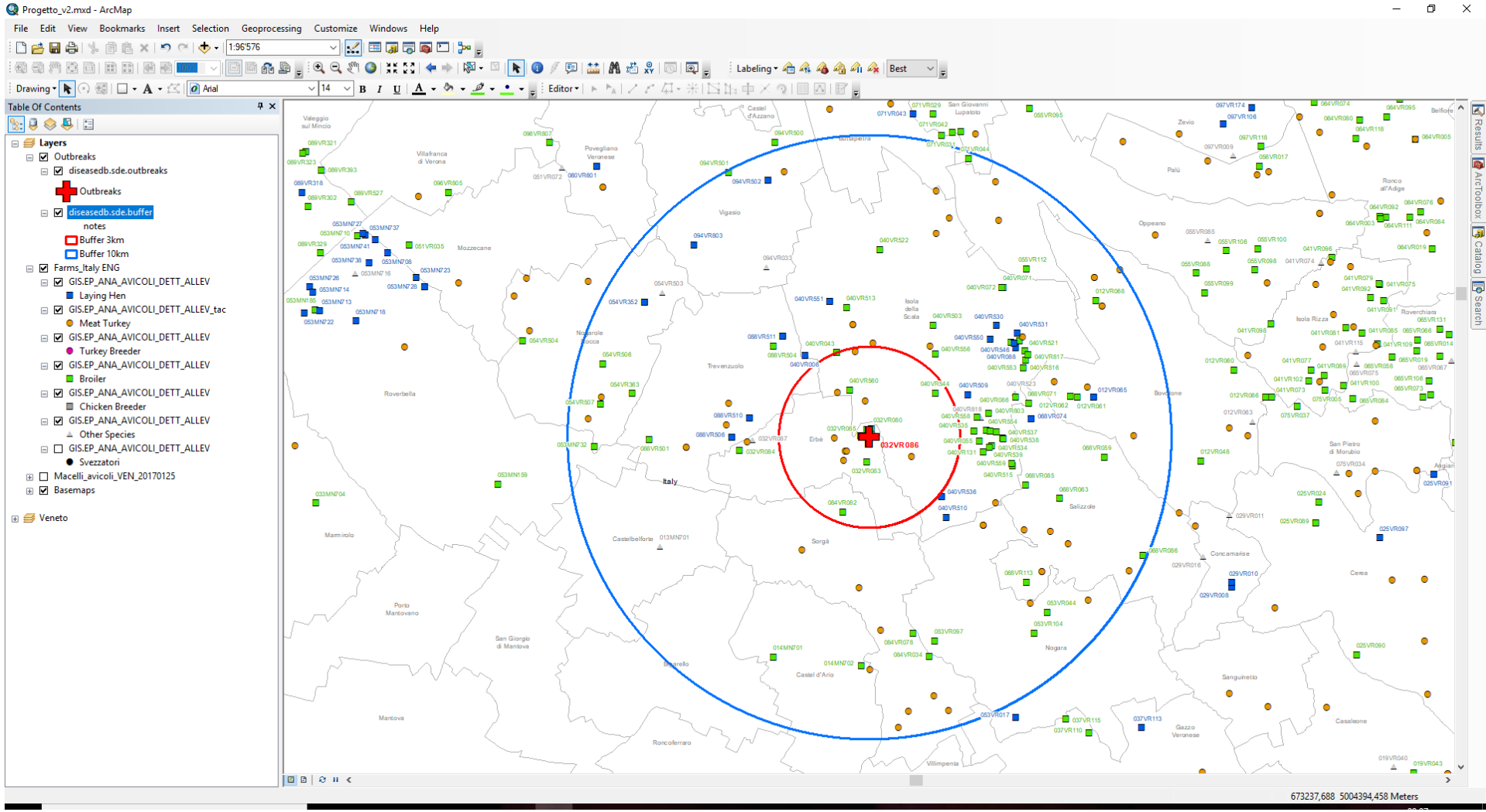
Applications – AI outbreak management

Step 4: protection zone



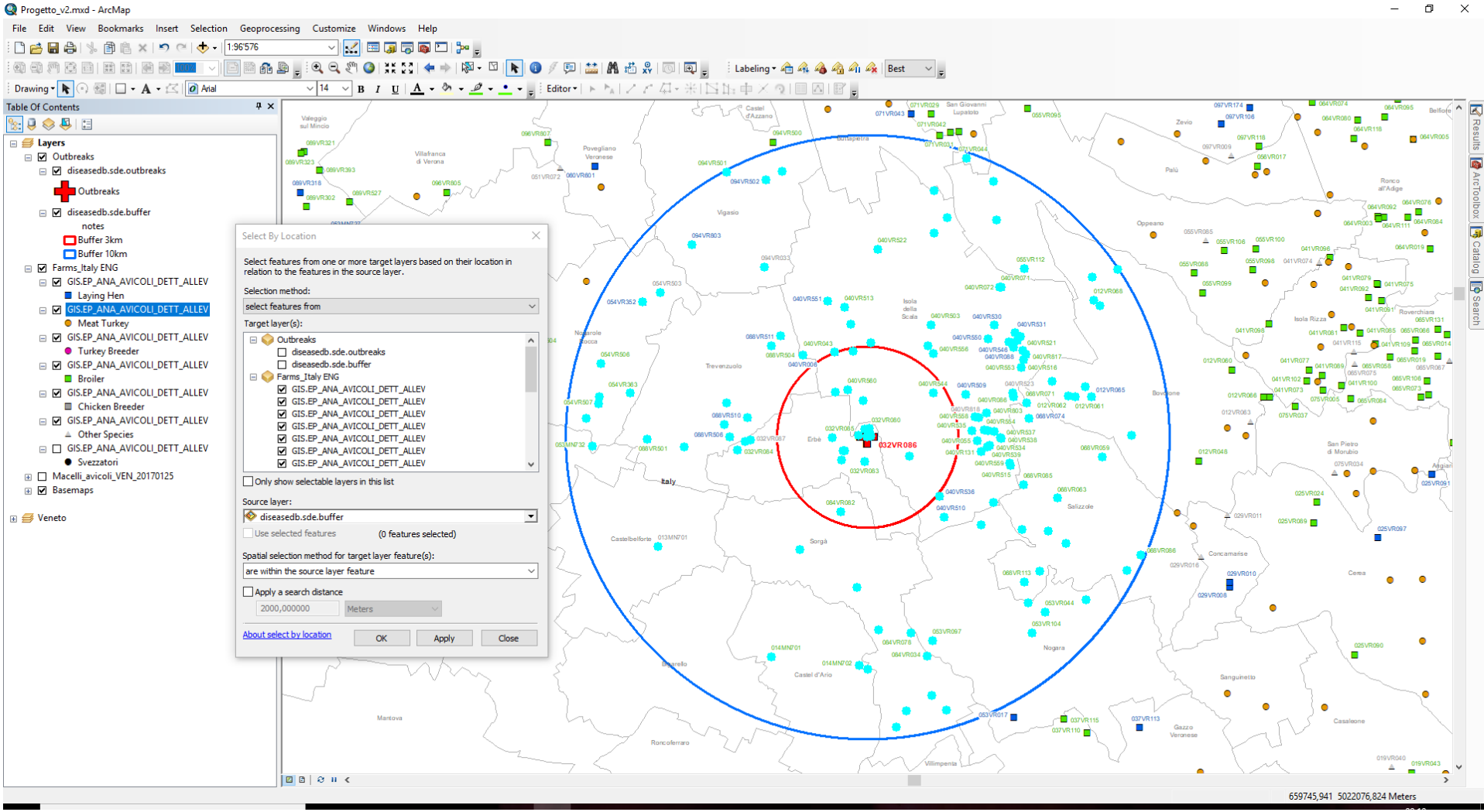
Applications – AI outbreak management

Step 5: surveillance zone



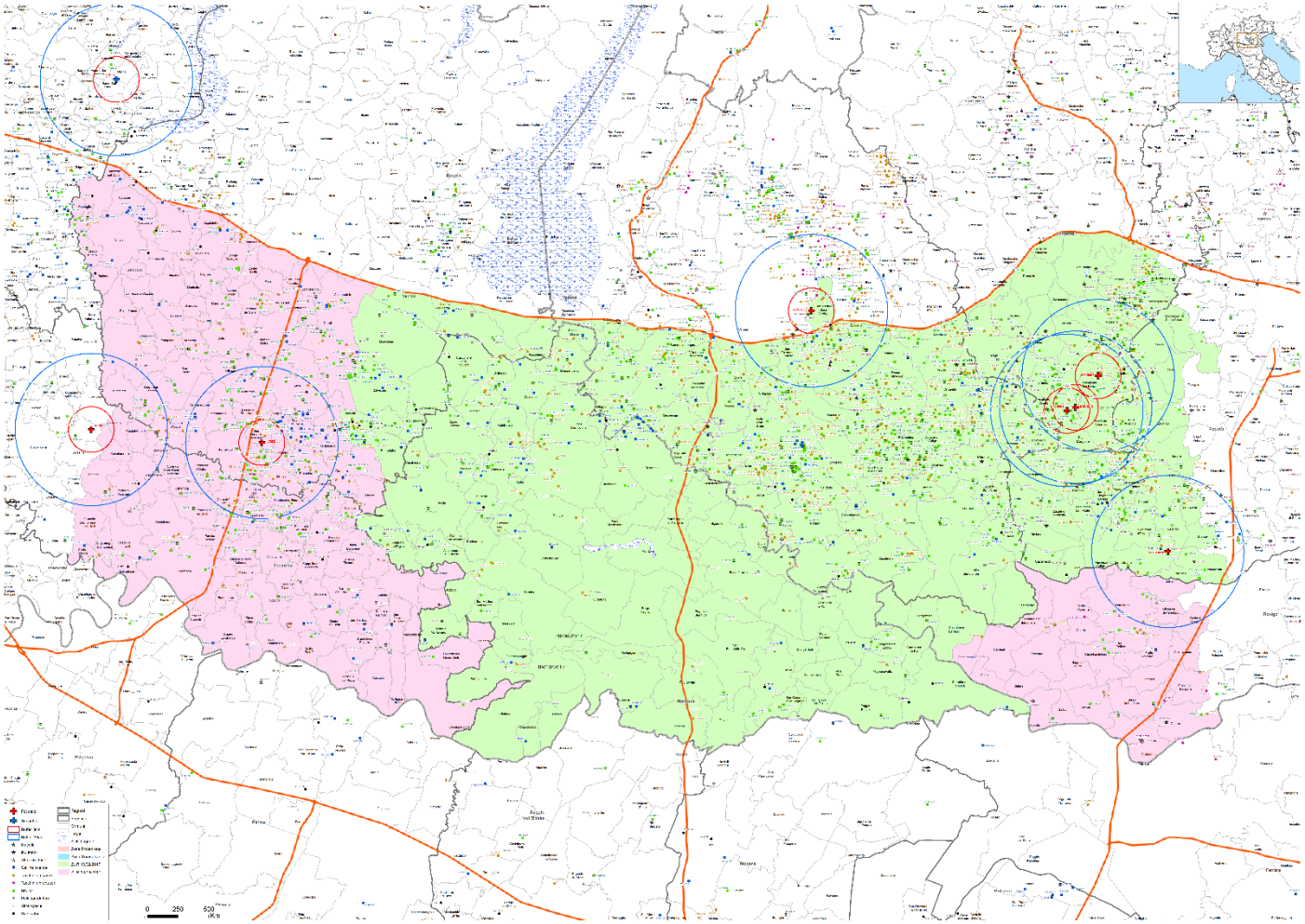
Applications – AI outbreak management

<u>Step 6</u>: list of poultry farms within the restricted areas



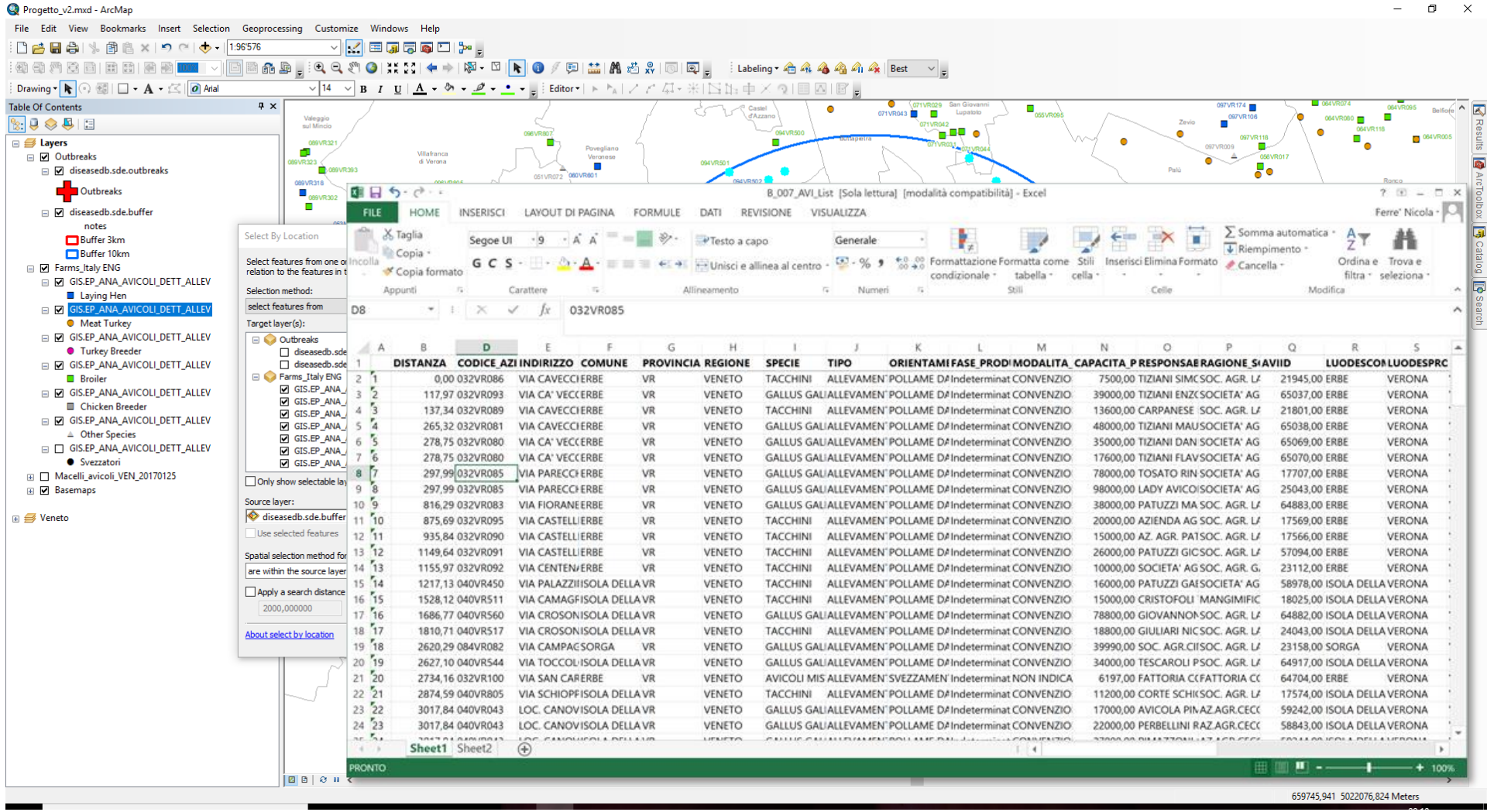
Applications – AI Management

Step 7: Identification of further restricted zones



Applications – AI outbreak management

Step 6: list of poultry farms within the areas – export data

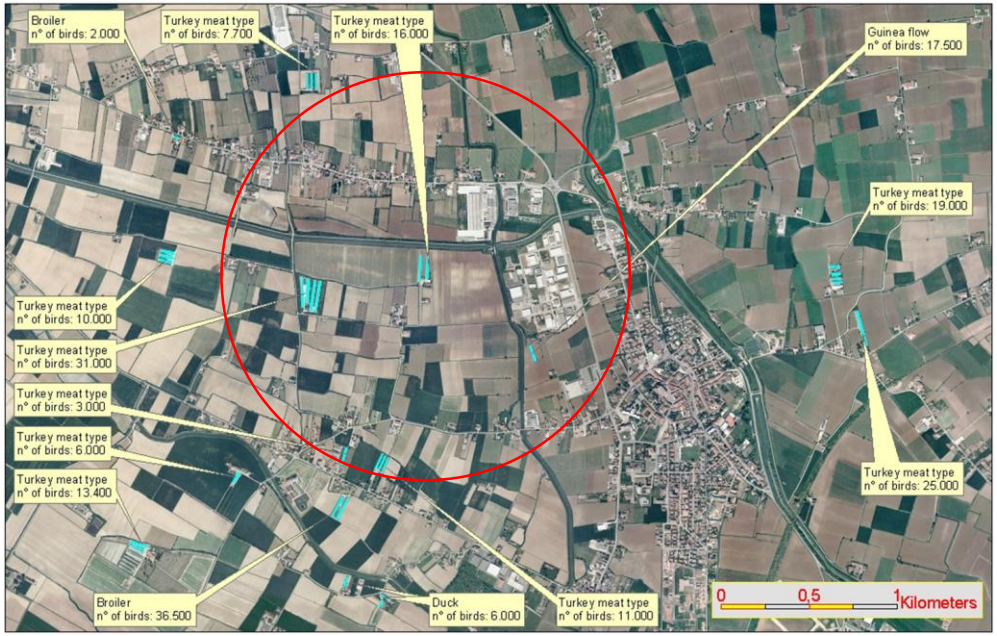


Applications – AI outbreak management

<u>Step 5</u>: restriction zones

Epi-group

- Identification of poultry farms at risk of neighborhood spread
- Surveillance (inspection and testing,….)
- Planning eradication actions (buffer vaccination, pre-empty killing,..)



Applications – AI outbreak management

<u>Step 5</u>: restriction zones

Field veterinarians

- Surveillance
- Enforcement of restrictions and eradication measures

Applications – AI outbreak management

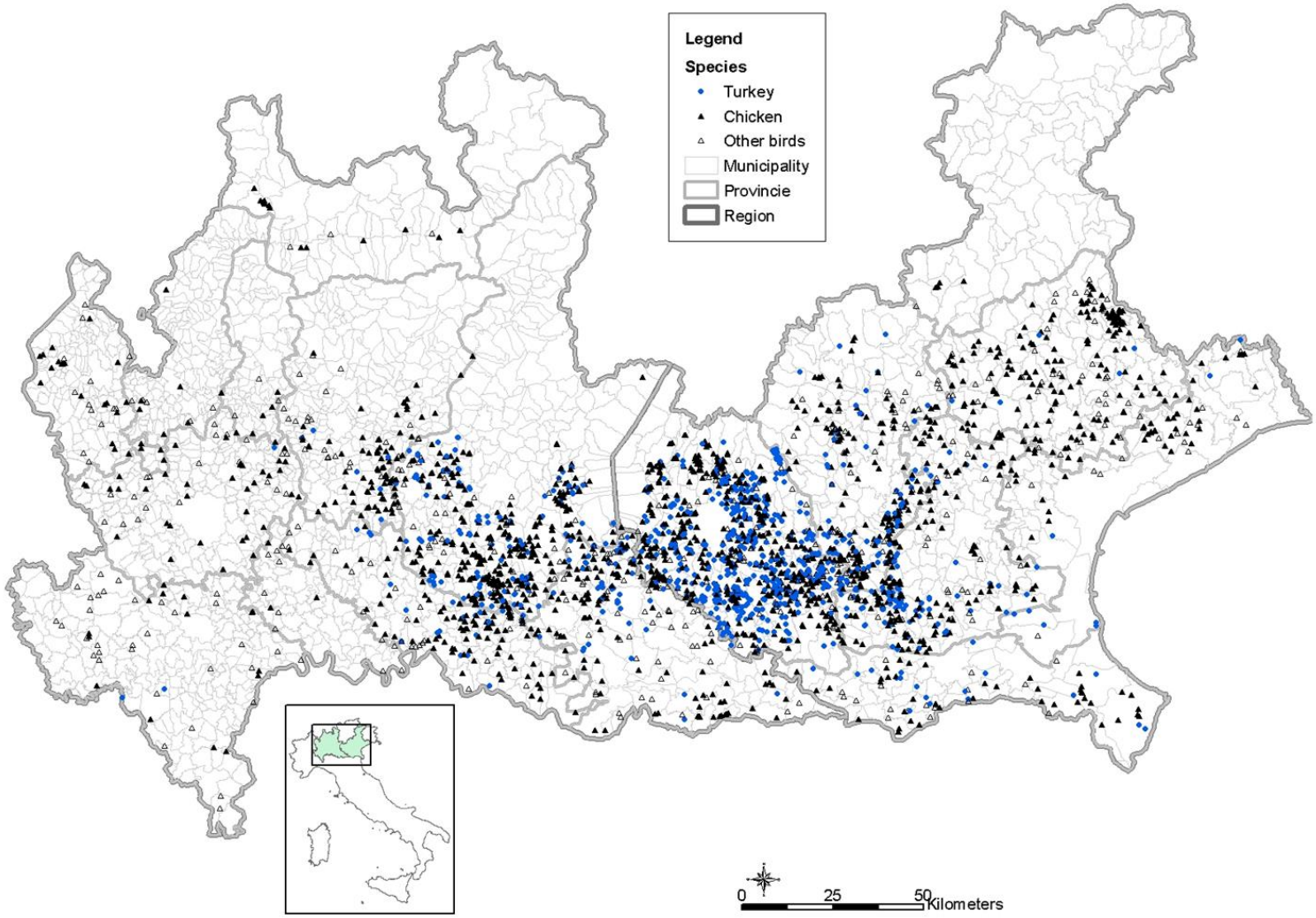
<u>Step 5</u>: restriction zones

Communication

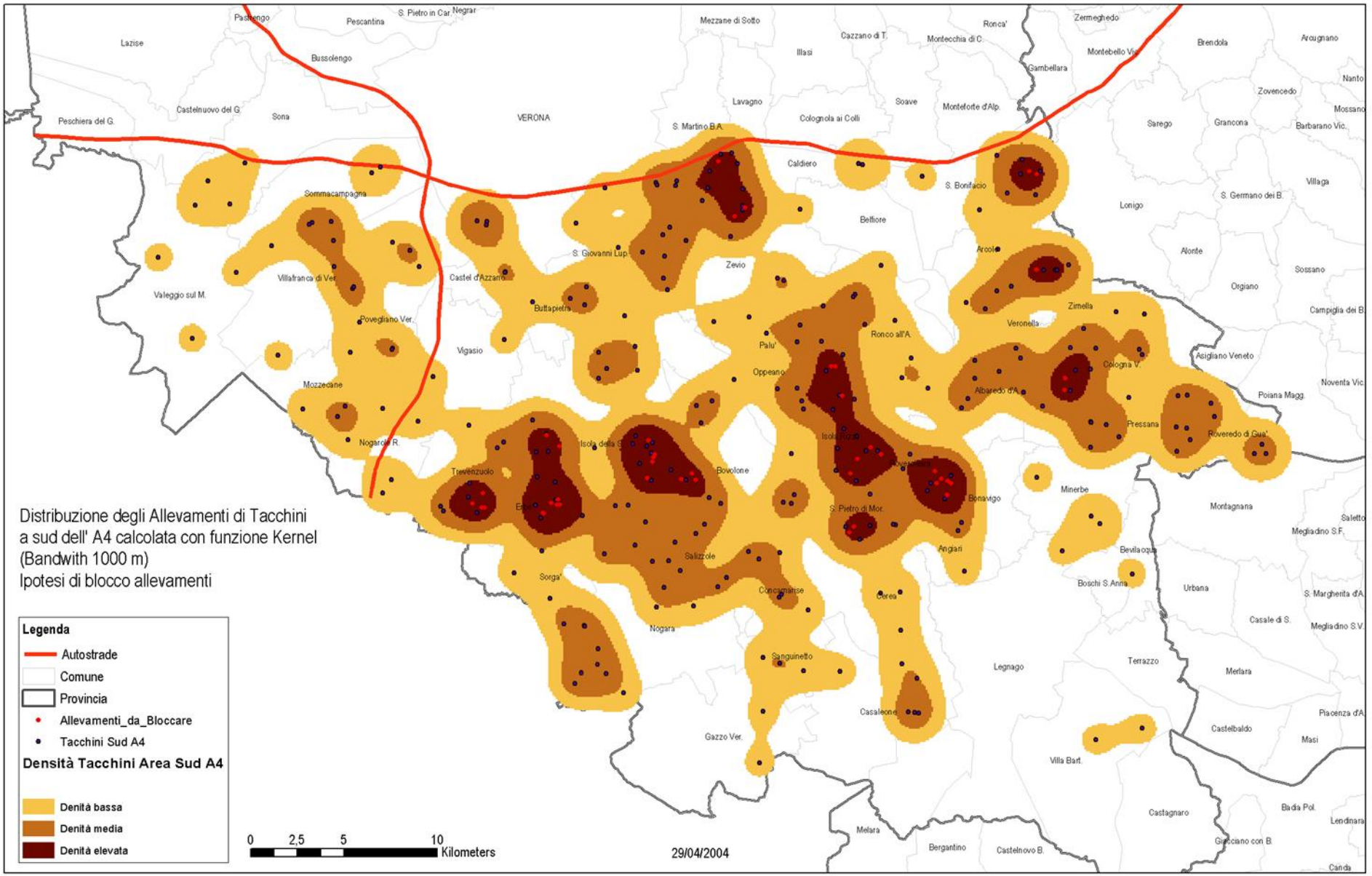
- Other organizations (local, national, international,..)
- Stakeholders
- Media

Increase awareness
Transparency
Proper information to the media
……

Poultry density in Italy



Application - DPPA



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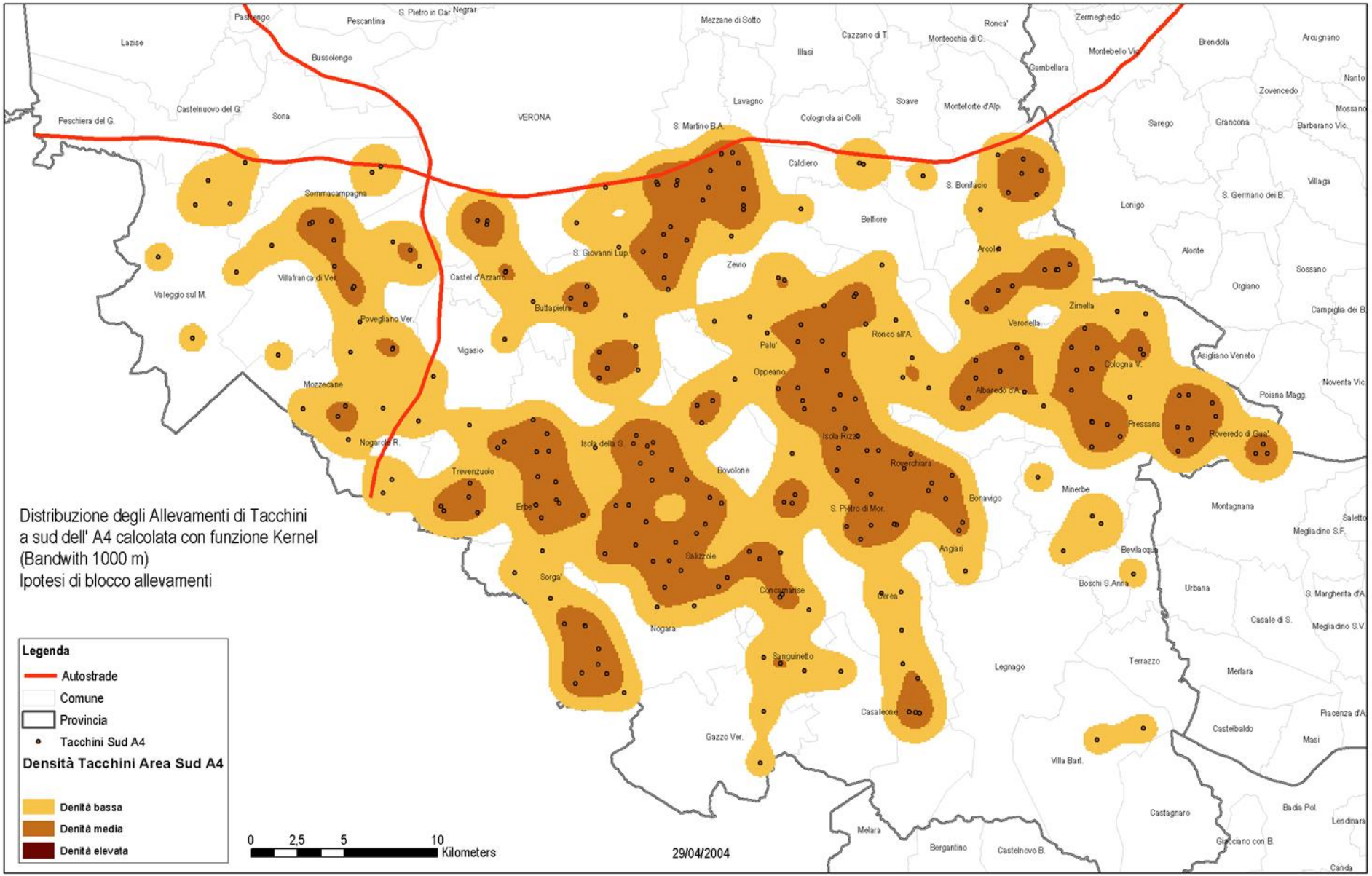
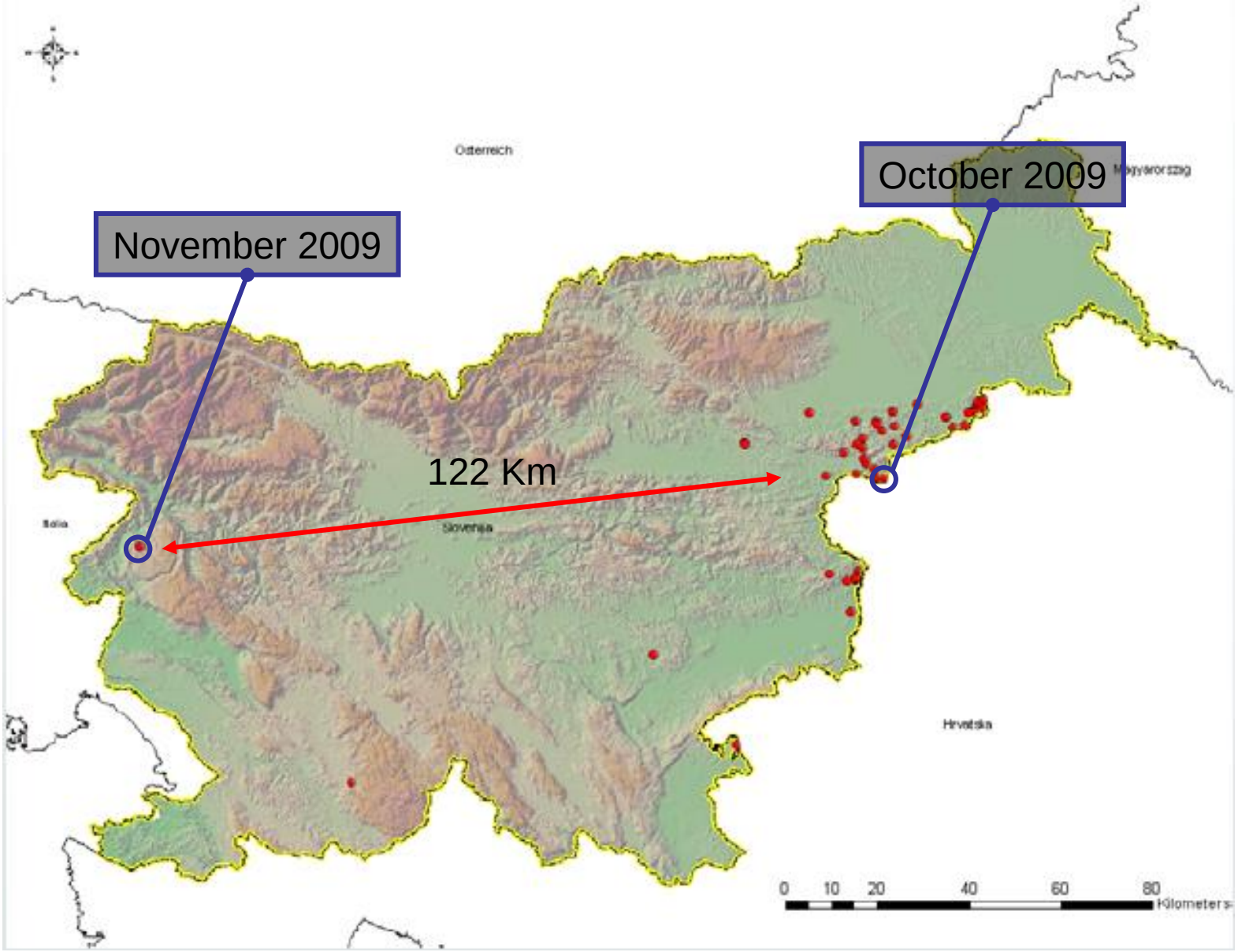


Application – Eradication of sylvatic rabies



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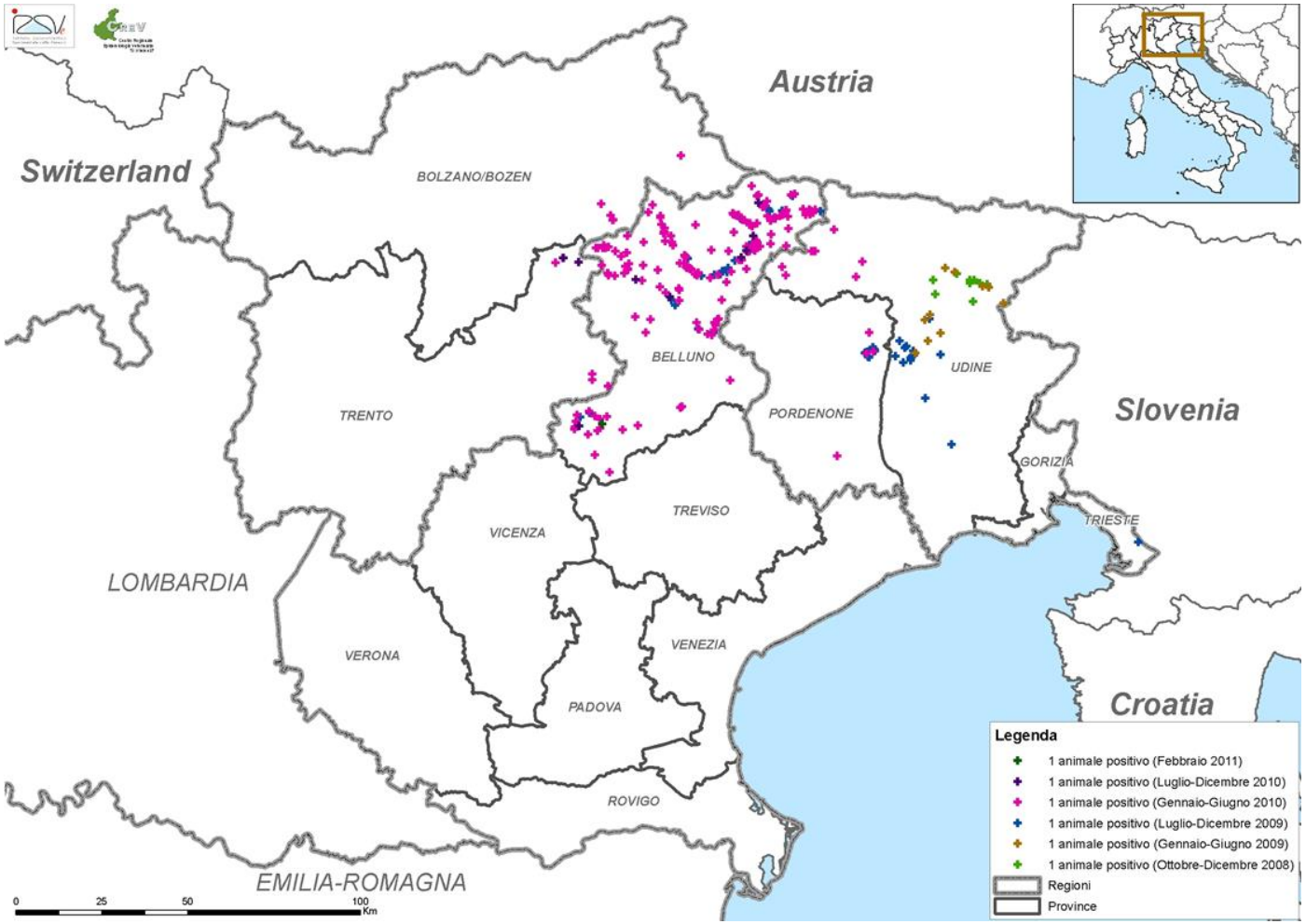
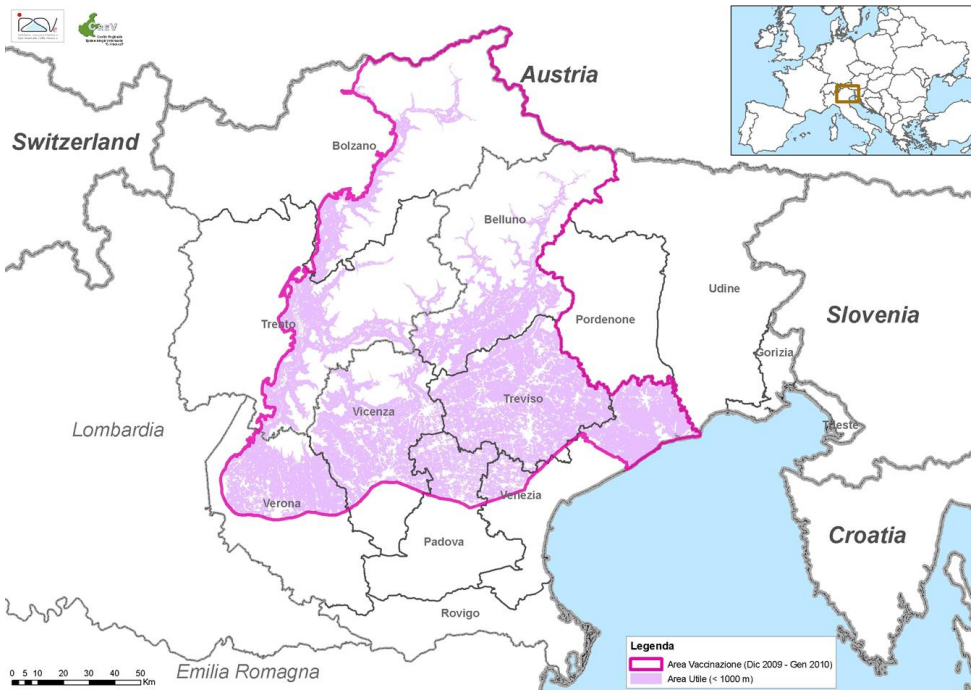


Application – Sylvatic rabies

GIS use in ORV implementation:

Precise definition of the vaccination areas - suitability

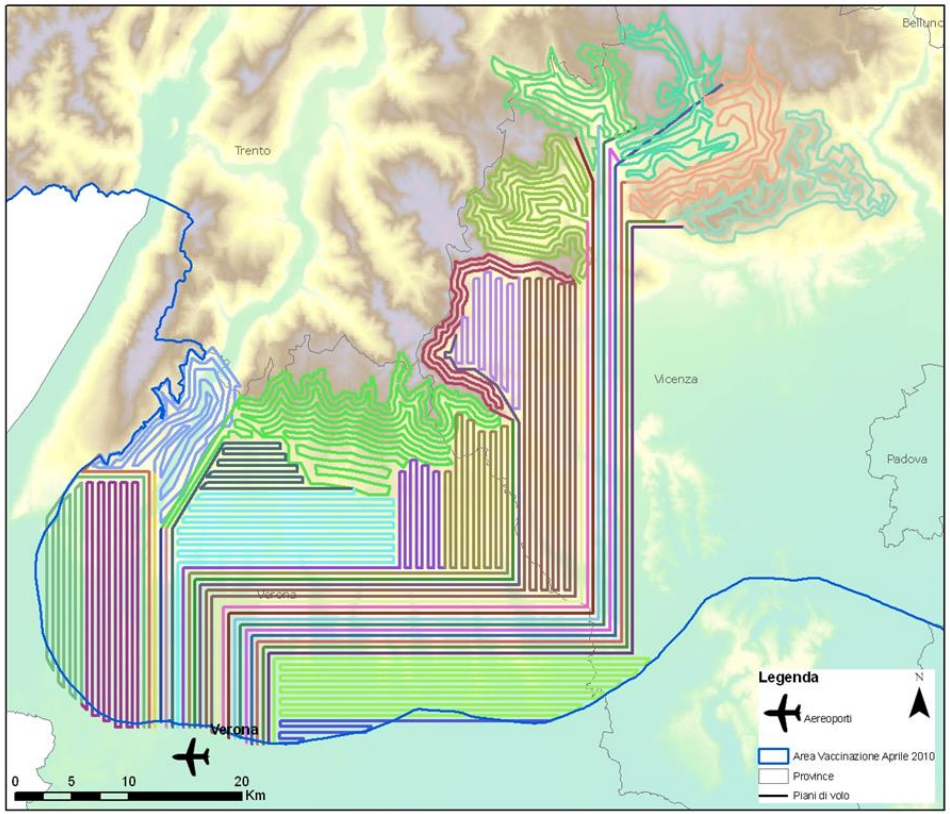
- Zone were foxes where unlikely to be found
- Zones where baits could not be dropped (cities, …)
- Area below an average freezing point

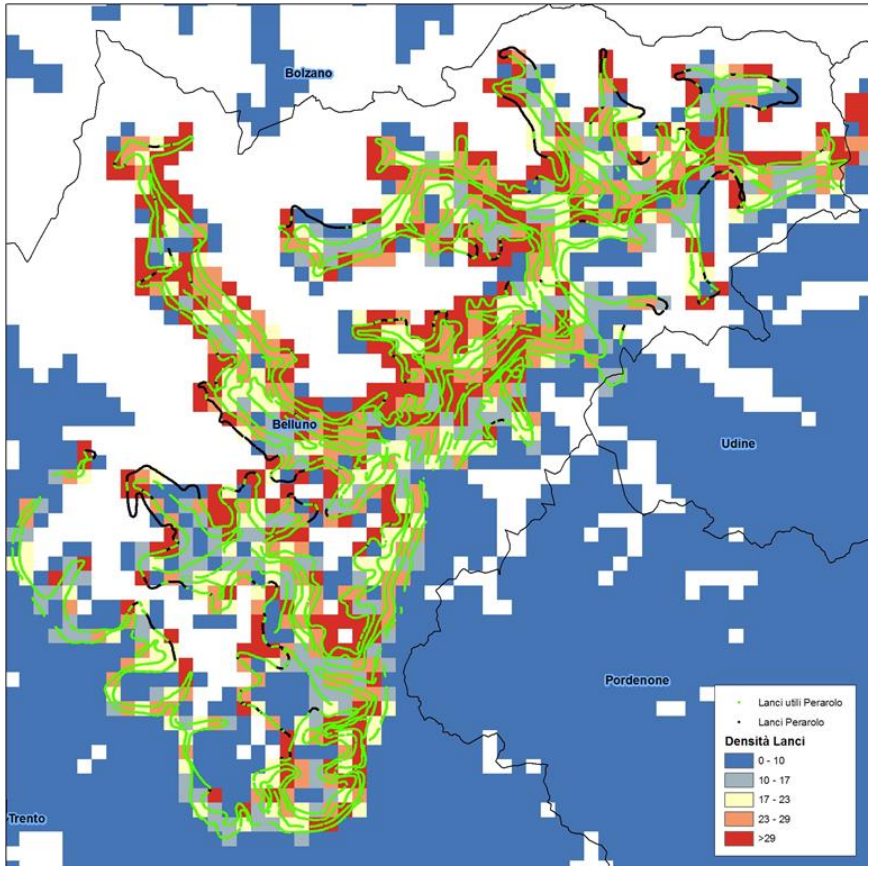


Application – Sylvatic rabies

GIS use in ORV implementation:

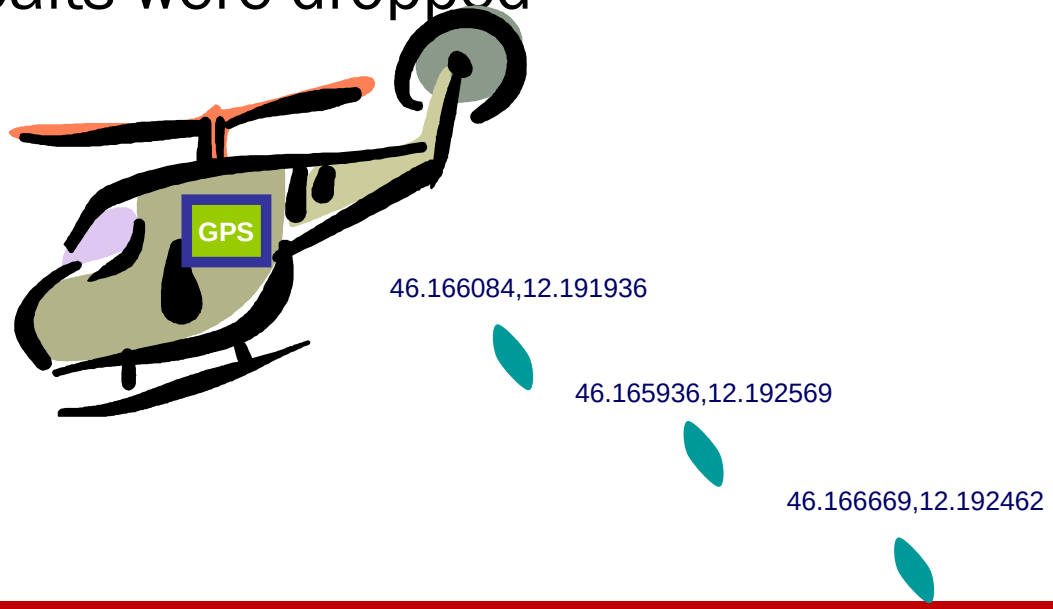
Optimal flight paths for the helicopter





Application - Aerial distribution of vaccine baits

- **Aerial distribution** by helicopters, using a satellite-navigated and computer-supported automatic bait dropping system
- An electronic metronome connected to a GPS allowed the adjustment in dropping and recorded the coordinates where the baits were dropped



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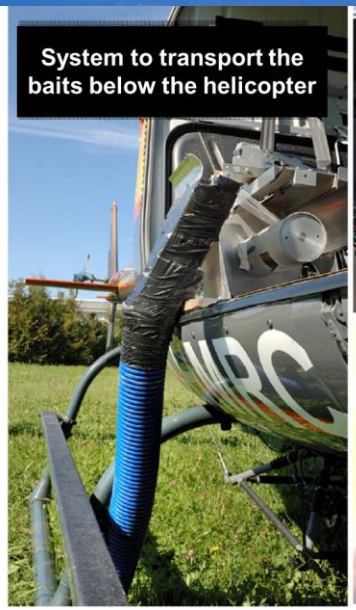
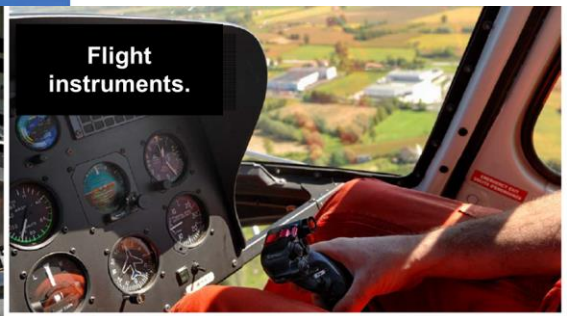


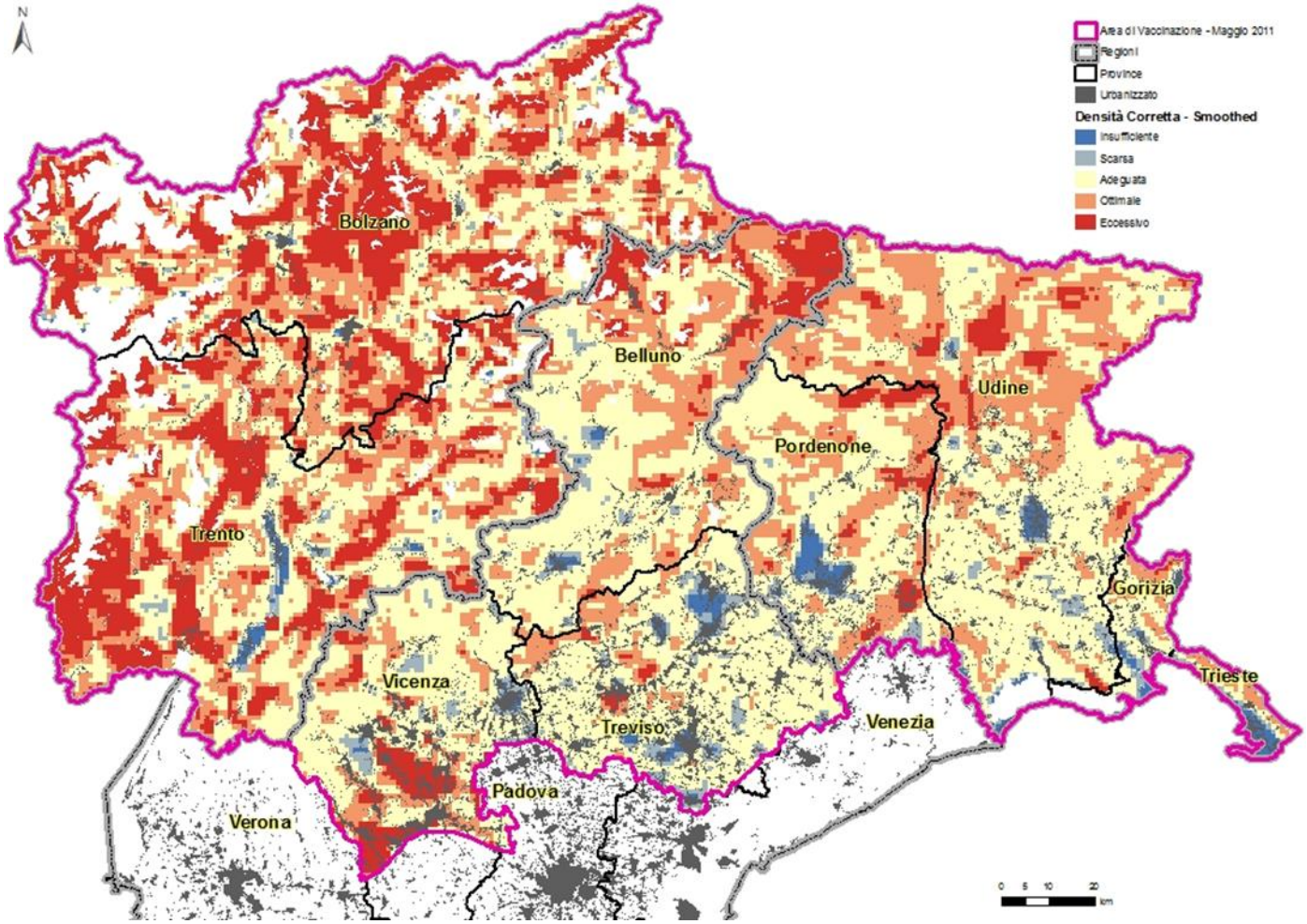


Satellite-navigated computer supported automatic system

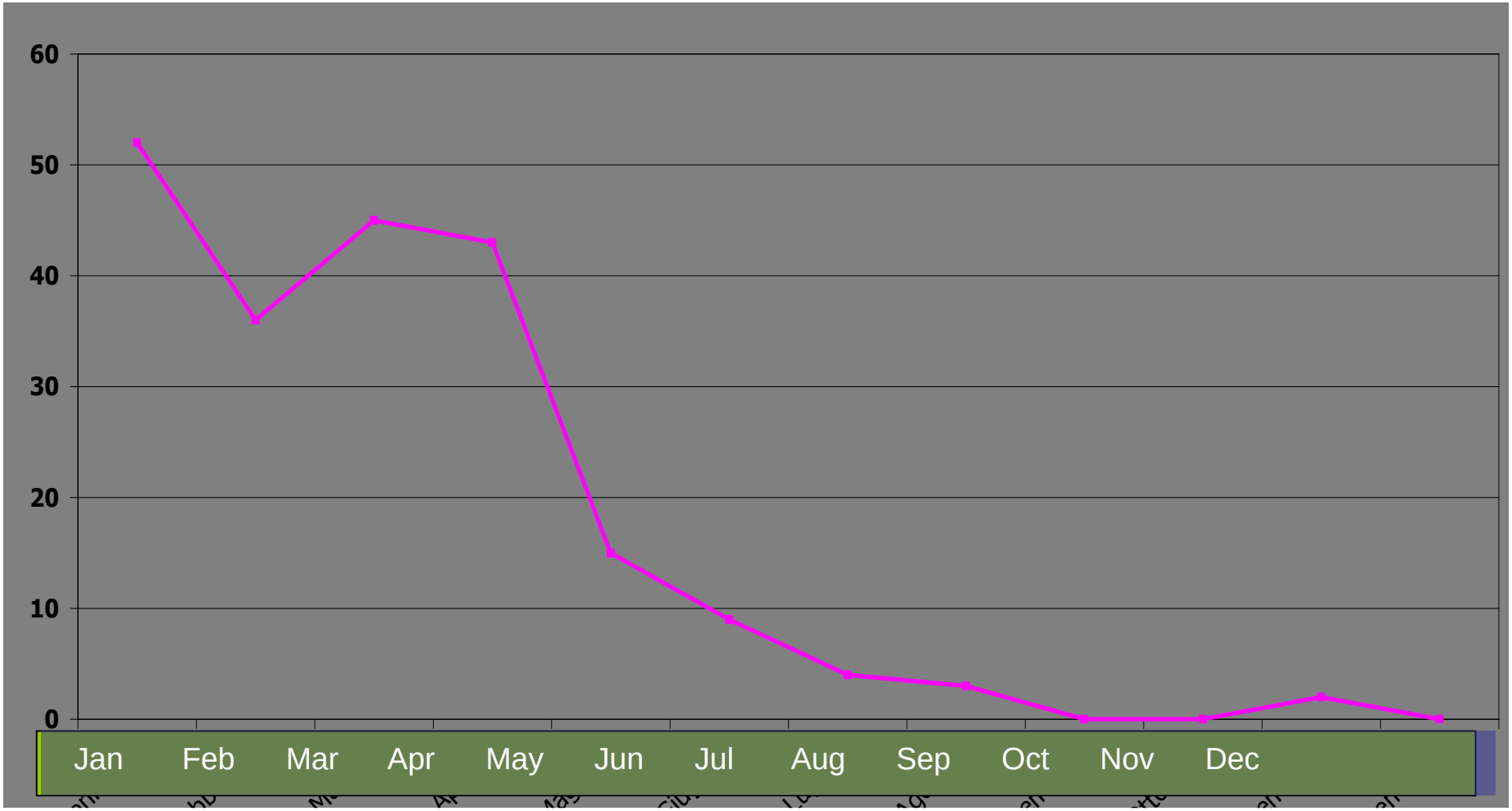
- Constant and homogeneous release of baits
- Precise geographical localization of each dropped bait recorded on a file
- Maps with the precise trace of bait distribution

Application – Evaluation of vaccine bait distribution

Application – Sylvatic rabies



Monthly number of infected foxes – 2010

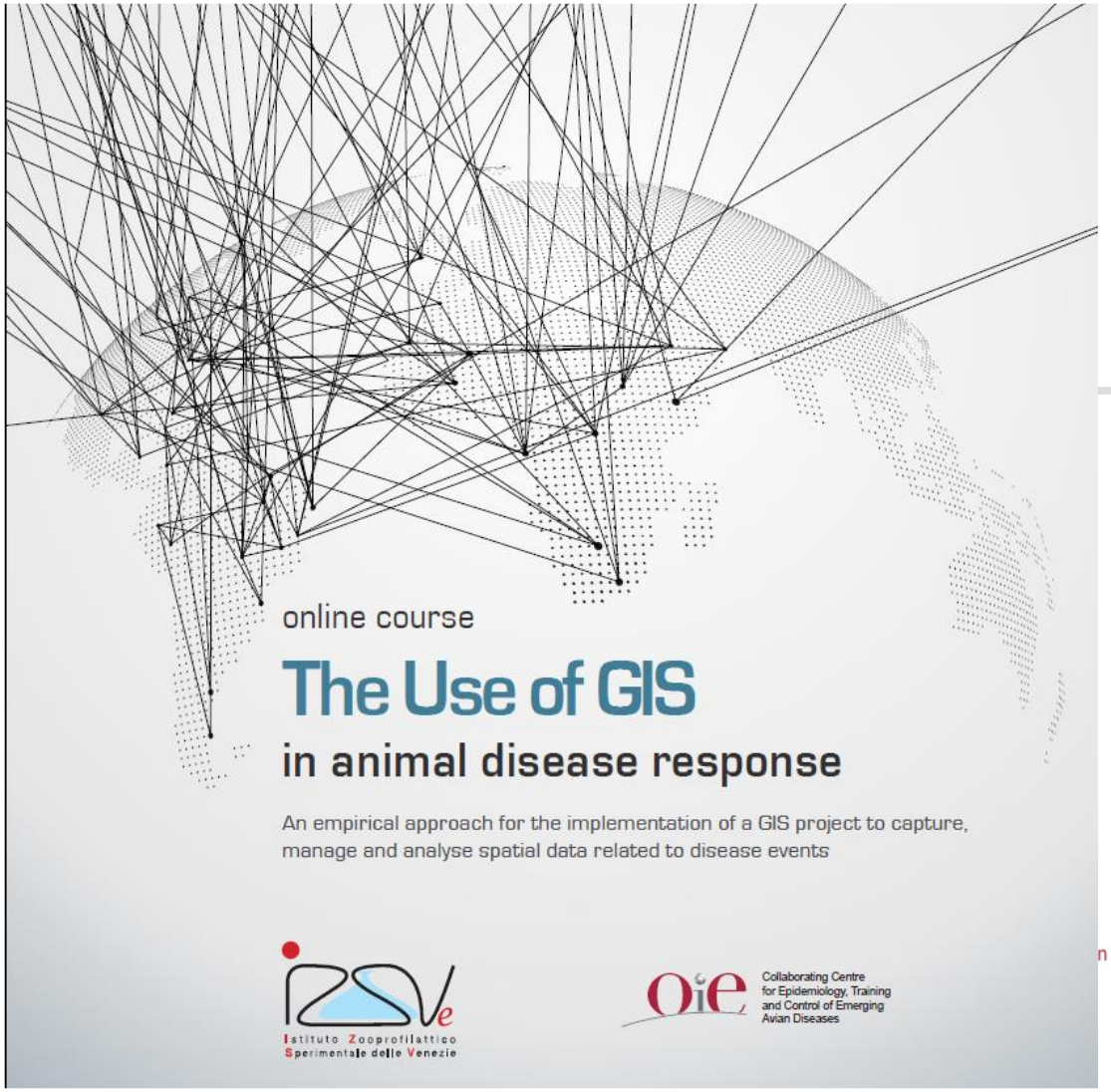


GIS - Conclusions

Historically the geographical component of an animal disease response was studied and managed using paper maps

Currently the technology to implement a GIS is readily available (limited investment)

Know-how for GIS use in the veterinary sector is well established



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