NARRATIVE WEB MAPPING FOR THE RESTITUTION OF A MODELING WORK OF ANIMAL MOBILITY AND ASSOCIATED RISKS OF INFECTIOUS DISEASE TRANSMISSION

Sponsors:

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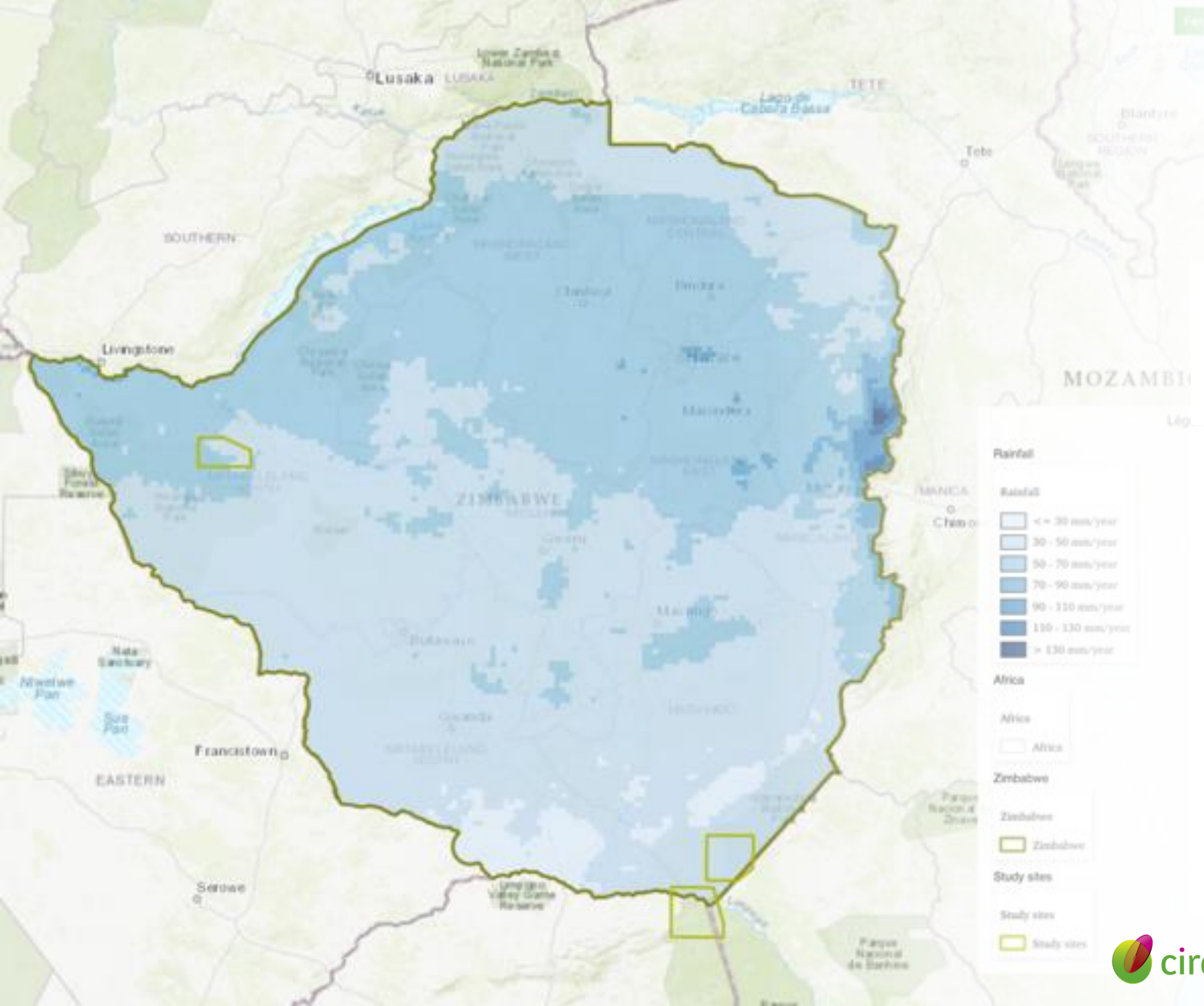

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❑ Internship project:

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- Conclusion

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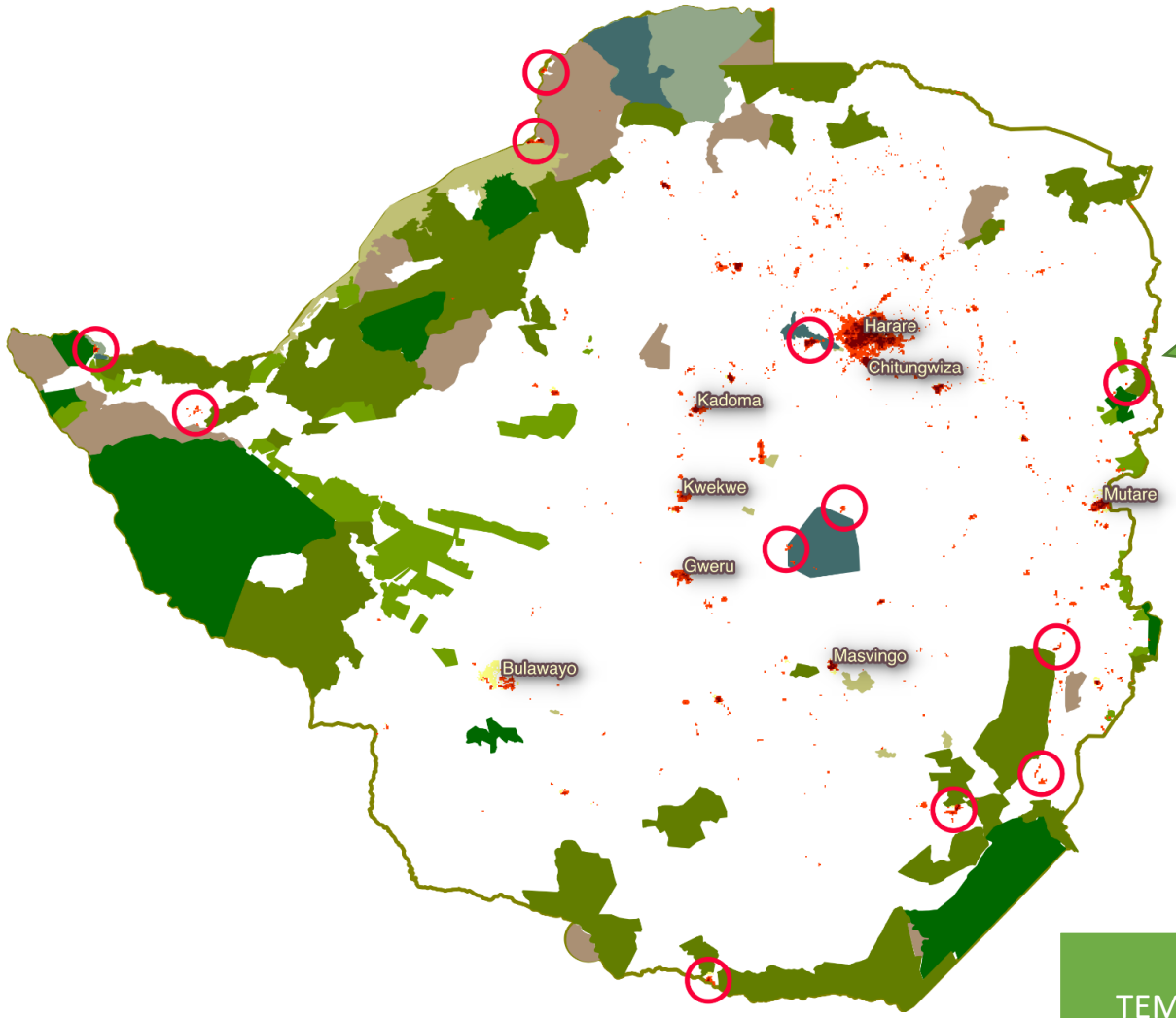
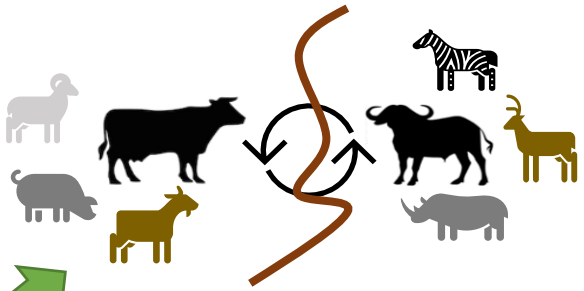
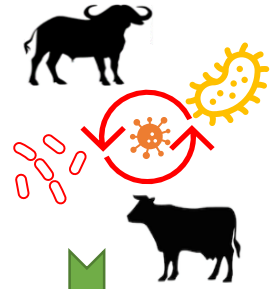
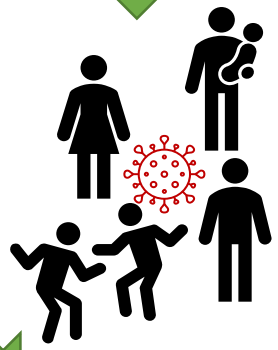
TEMPO PROJECT
CONTEXT & OBJECTIVE









That may impact:

- Biodiversity conservation,
- Livelihoods,
- Local development

Better understand the emergence of zoonotic disease to:

- Undertake a risk assessment,
- Plans response and control

From 2018 to 2021,
TEMPO project modeled animal mobility in landscape with environmental key drivers to better understand how pathogen transmission it driven

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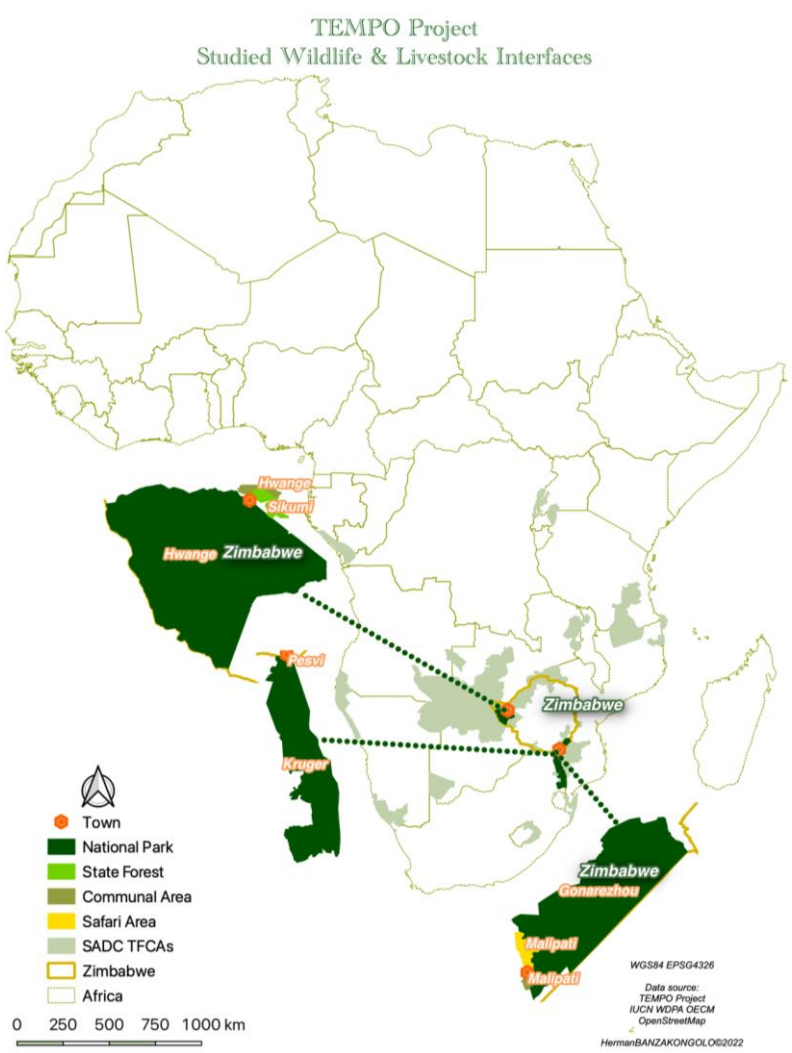
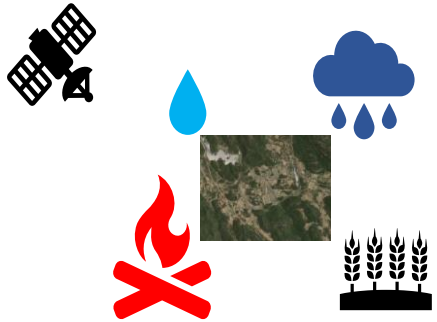
TEMPO PROJECT
METHODS & OUTCOMES

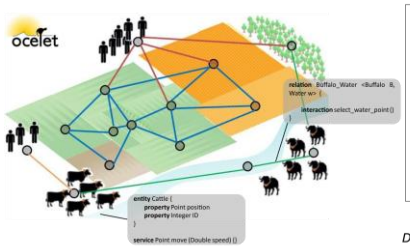


Use satellite image to characterize animal mobility environmental key drivers



Use telemetry data to characterize animal mobility behavior

Modeling animal mobility & contact



1. Based on interaction graphs
2. Integrate spatial entities *(vector + raster)*
3. Simulate spatio-temporal dynamics

cirad tetis

Developed by ***P. Degenne & D. Lo Seen***

ocelet.fr

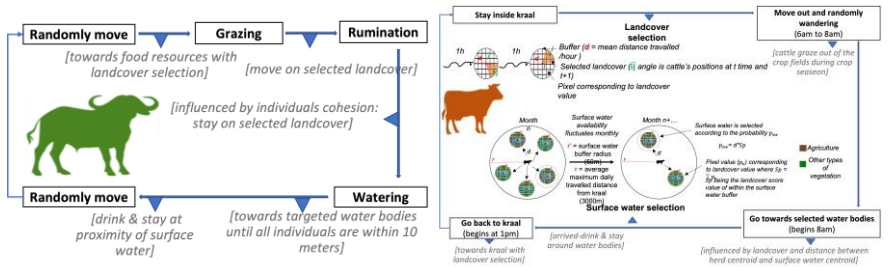
A mechanistic approach based on a swarm model

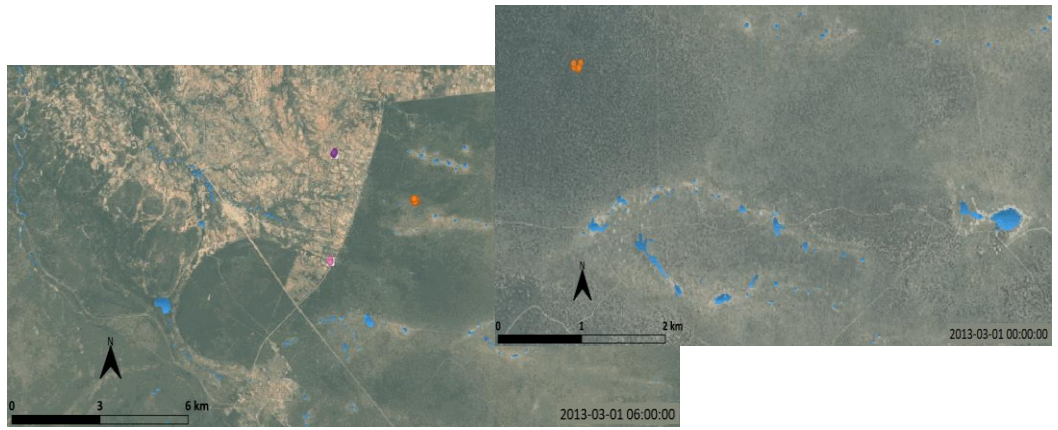
Angle | alignment | cohesion | noise

$$\theta_i^{t+1} = \left\langle \alpha \sum_{j\sim i} \vec{v}_j^{\,t} + \beta \sum_{j\sim i} \vec{f}_{ij} \right\rangle + \eta_i^t$$

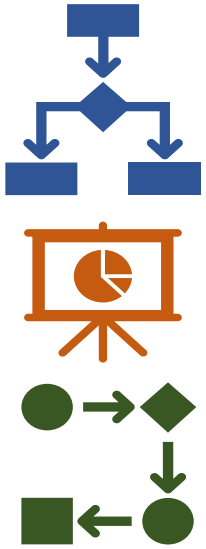
Control the relative importance of alignment and cohesion forces

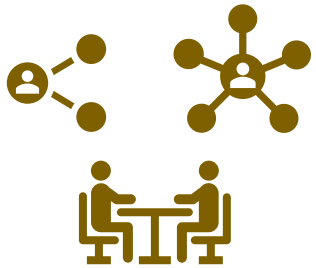
Uncertainty

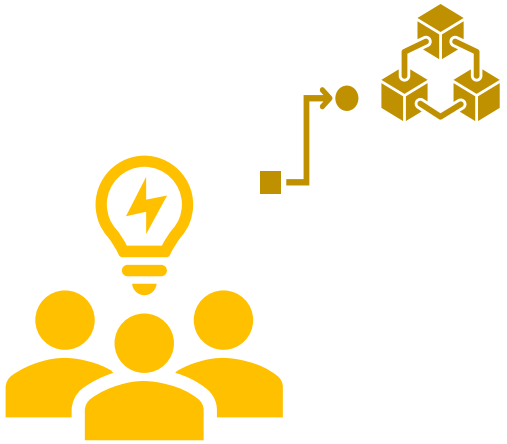




INTERNSHIP OBJECTIVE



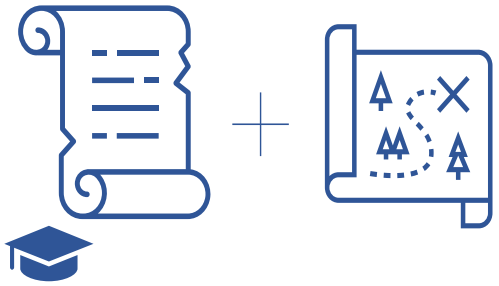




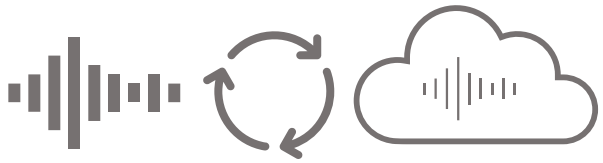
To restitute the TEMPO project outcomes - To the project stakeholders - Through implementing interactive narrative webmap application

To improve understanding of the environmental and climatic drivers and their impacts on wildlife/domestic contacts
To promote improved herding practices and the implementation of best wildlife and livestock management practices

TEMPO GEOWEB PLATFORM SPECIFICATIONS

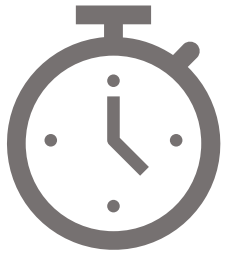


Combine the narrative to related maps



Synthetic & exhaustive to inspired work

Interactive & intuitive

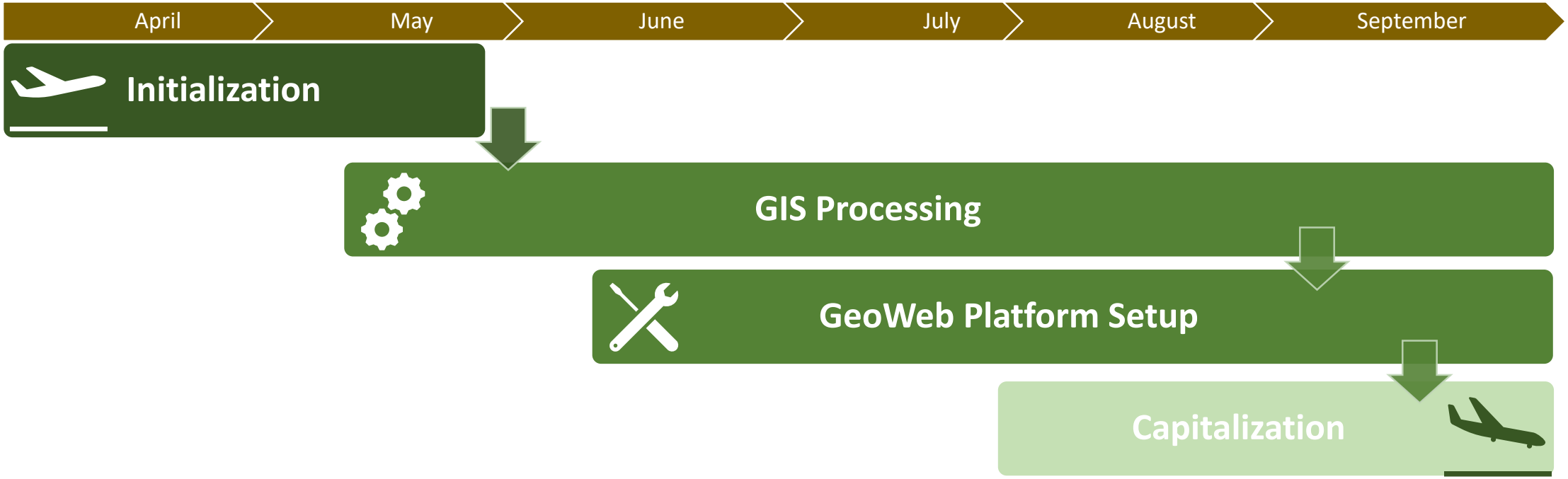


Perennial

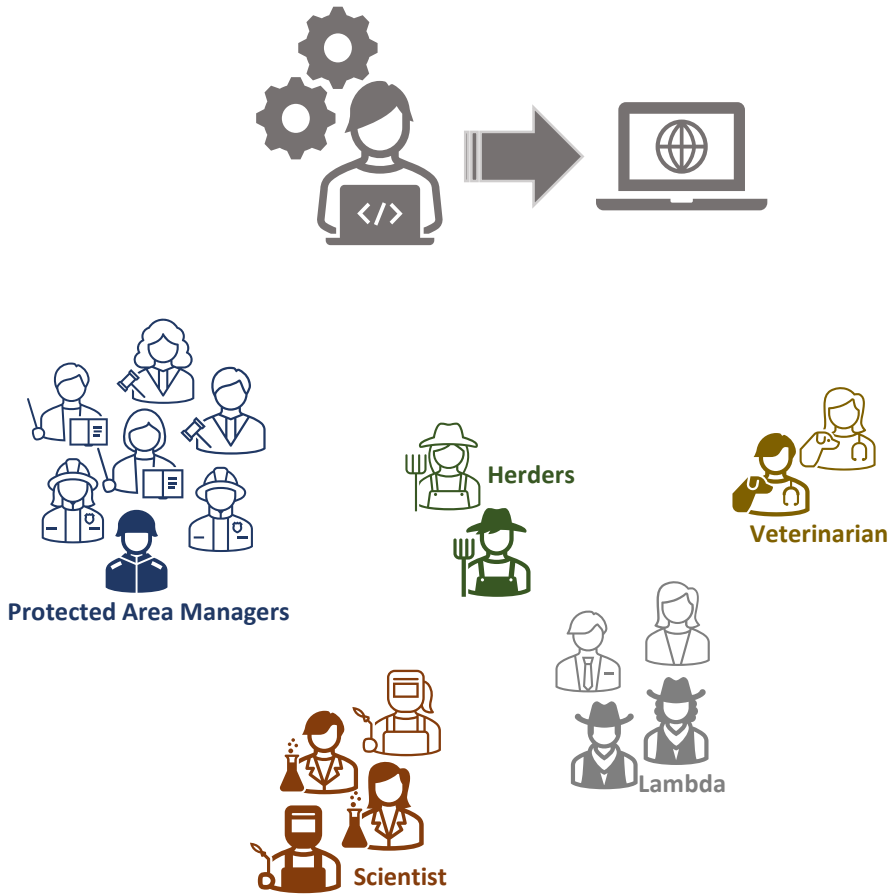
Free & open-source to be:
Reproducible & re-writable

PROJECT MANAGEMENT

- Define the framework for the implementation and
- Ensure project success within the deadline and sponsor conditions



GEOWEB PLATFORM IMPLEMENTATION



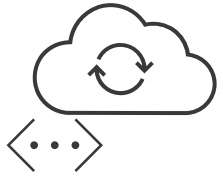
Aims to provide the GeoWeb platform for the project

APPROACH

Narrative story elaboration

Cataloguing, collecting data

GIS data processing



GIS project web publishing

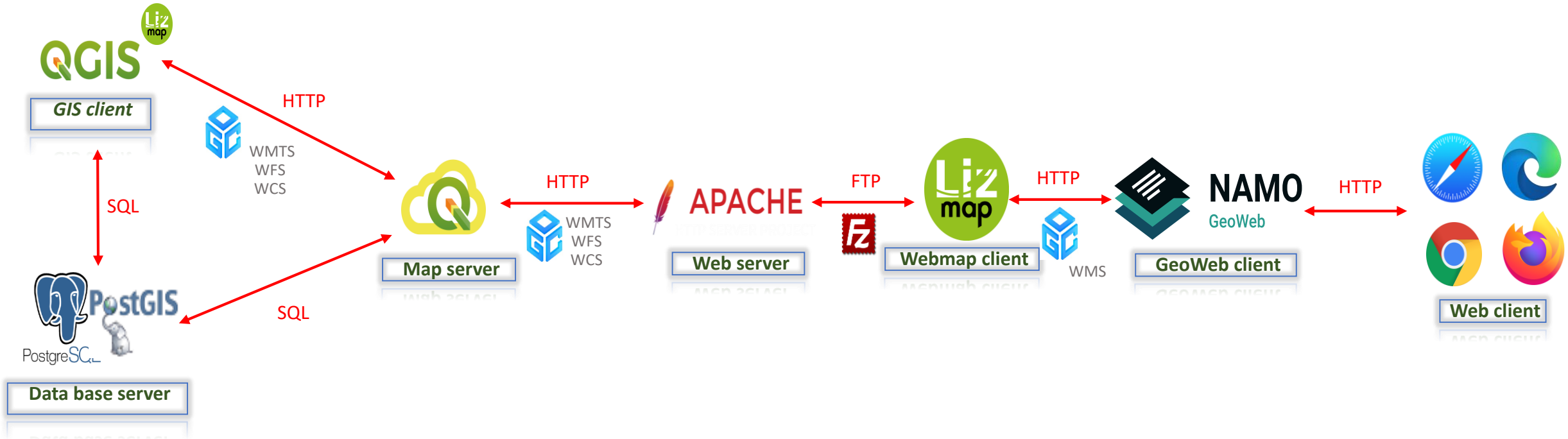
Set up GeoWeb platform

GeoWeb platform validation

Review

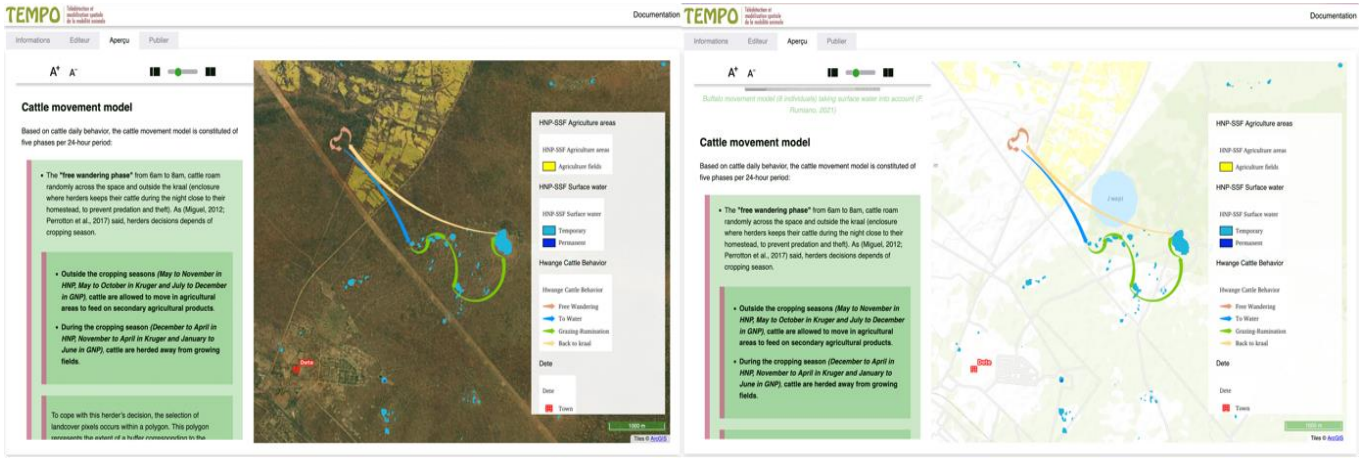
DATA

SOFTWARE & WEBMAP ARCHITECTURE



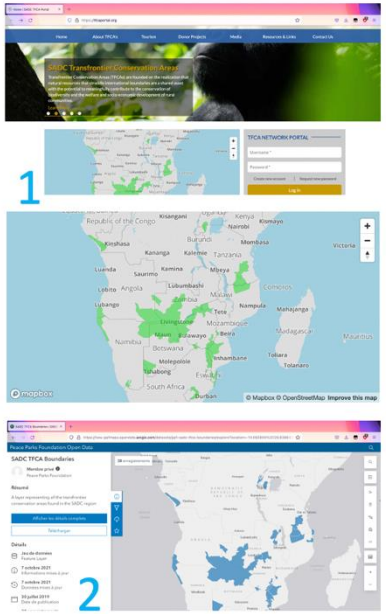
WEBMAP DESIGN CHALLENGES

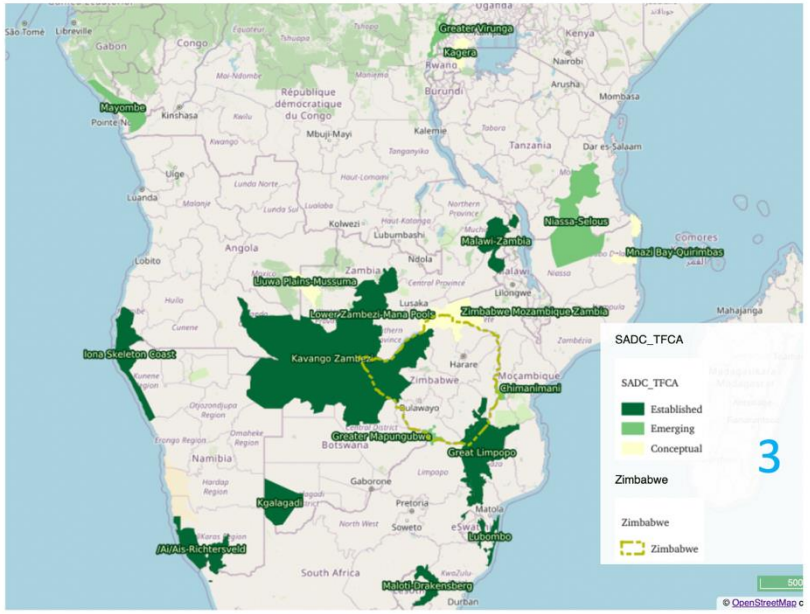
Multibackground semiology compatibility



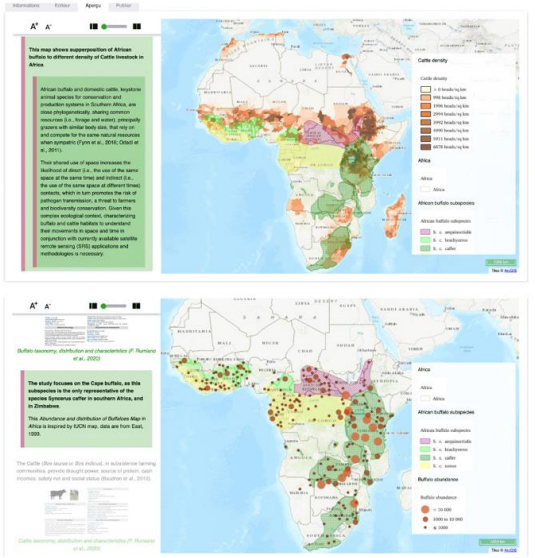
Anonymization of sensitive data

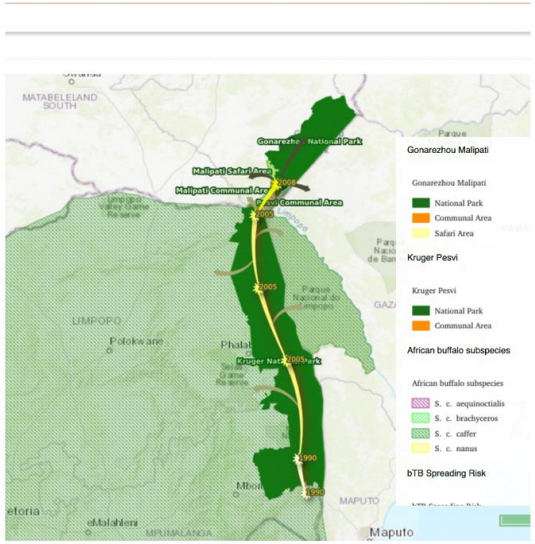
Detailed semiology





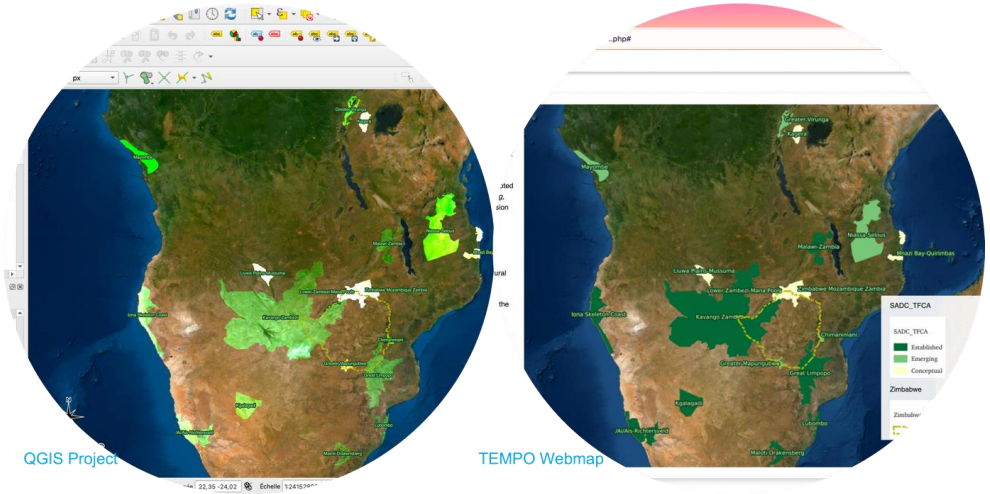
Multi overlay compatibility

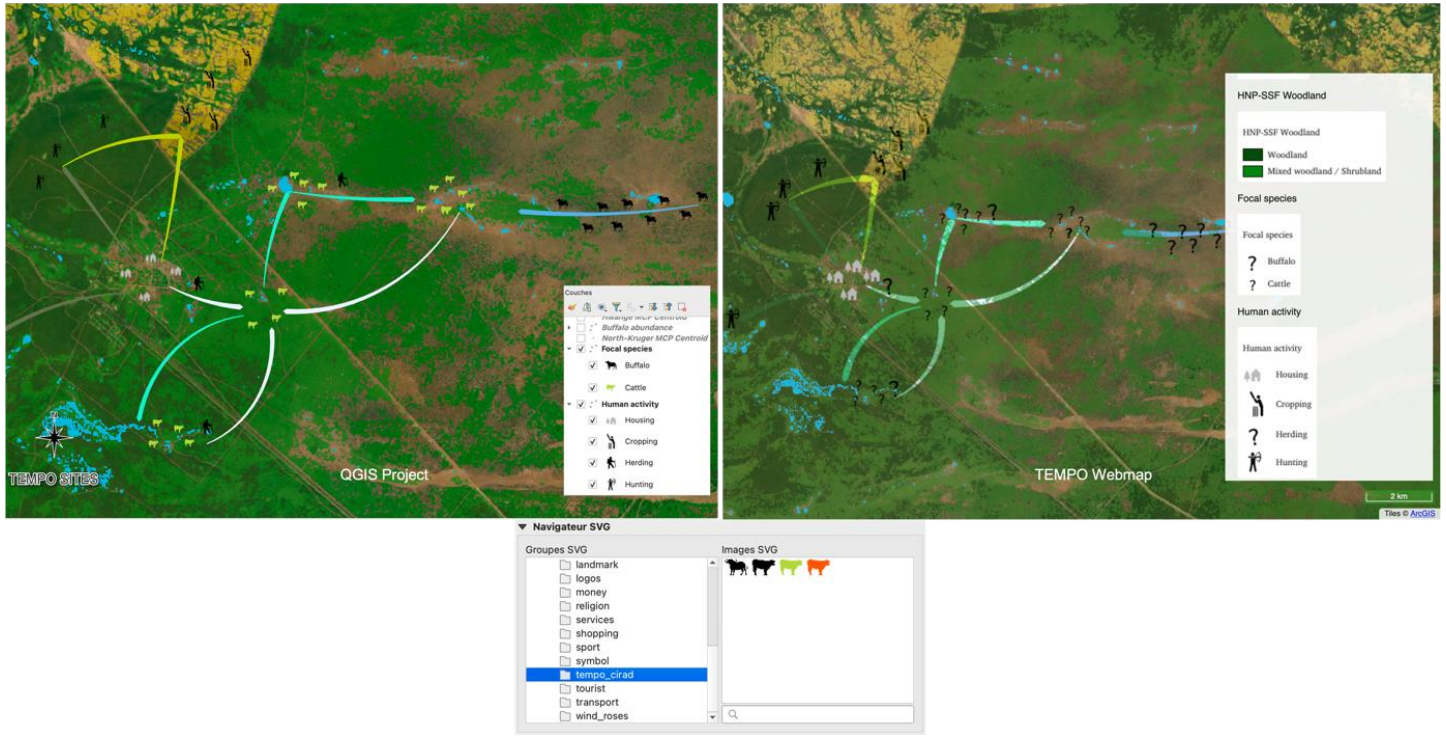




WEBMAP DESIGN ISSUES

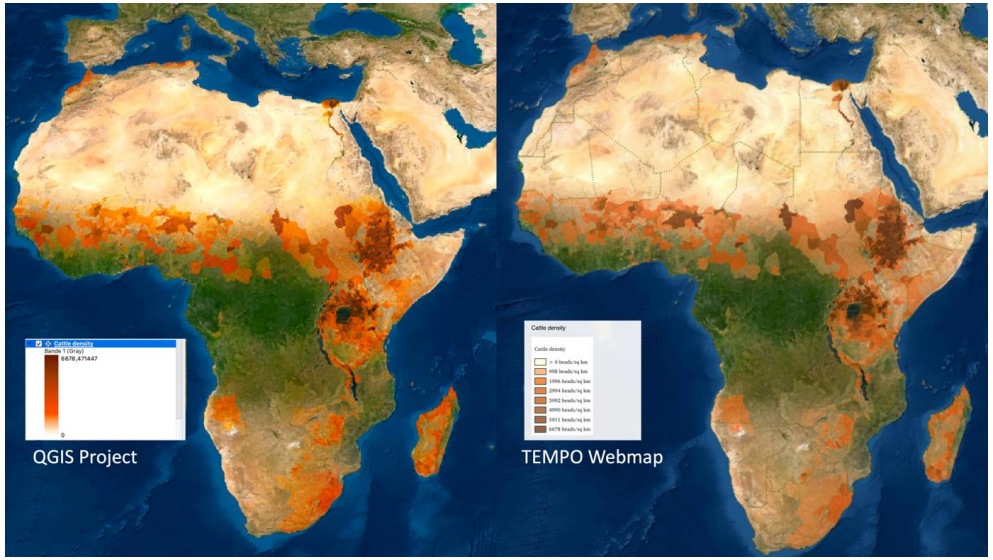
Brightness renders





QGIS created symbols vs native symbols

Interpolated symbol label



RESULTS

TEMPO Télédétection et modélisation spatiale de la mobilité animale

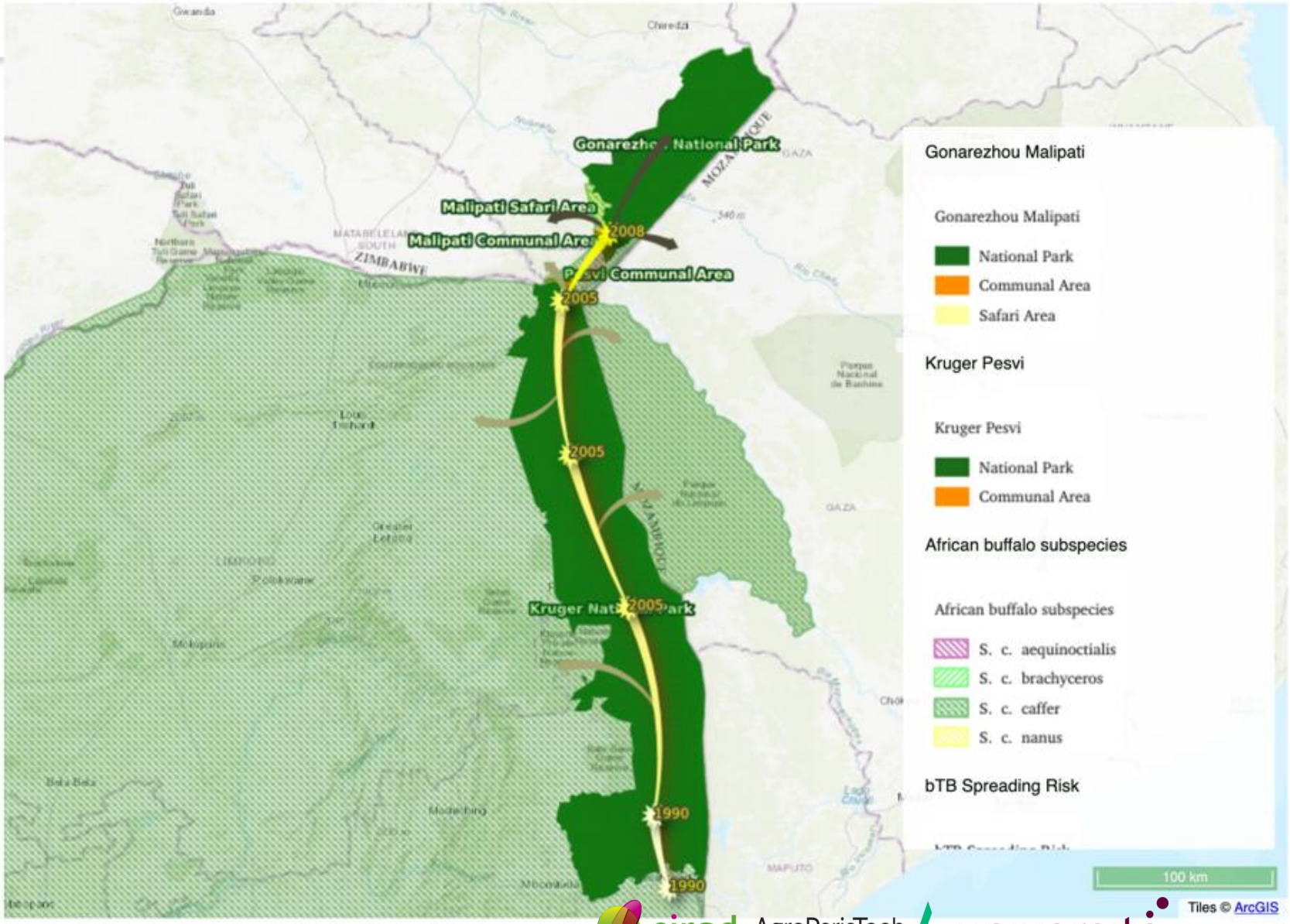
Documentation

Informations | Editeur | Aperçu | Publier

https://tempo.teledetection.fr/map/storytool.php#

Concerning potential epidemiological implications and disease transmissions, results indicate that interspecific contacts are clustered and driven by the seasonality of natural resources (Guerrini et al., 2019) and herding practices at the three studied Wildlife/Livestock Interfaces. This information provides opportunities to improve pathogen management by controlling access to key natural resources (i.e., forage and surface water) or adapting livestock and/or wildlife management practices to reduce the frequency of buffalo-cattle contacts. However, pathogen circulations amongst hosts vary along a gradient from direct to indirect transmission (Altizer, Harvell, and Friedle 2003). Therefore, the definition of what is a relevant contact regarding pathogen transmission varies according to the pathogen of interest and the considered space-time windows (Wielgus et al., 2021) that define potential infectious contacts between focal animal species. The temporal and spatial scales from which contacts are characterized will determine the potentiality of a spatialized movement and contact model, such as the one developed in this study, to be of used to pathogen transmission assessments. Indeed, pathogen dynamics are different depending on whether we consider a direct transmission pathogen such as foot and mouth disease (FMD) or a vector-borne pathogen such as Rift Valley Fever (RVF) for example.

To explain what is said above, this map show spread and risk of spread of bovine tuberculosis (bTB) and bTB transmission route over time through buffalo



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RESULTS

41 interactive maps with 95 overlaps layers

Map dictionary

31 figures and 2 animations

Figure list

365 detailed layers in 1352 rows

Data dictionary

82 URLs in 7 themes displayed 204 times

Link list

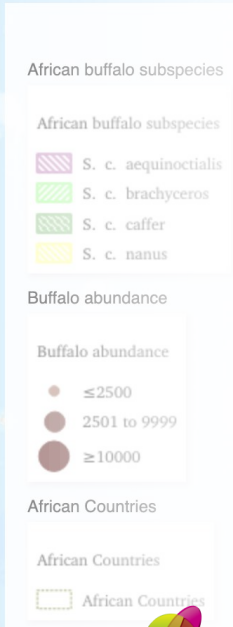
11 External Geographic data sources

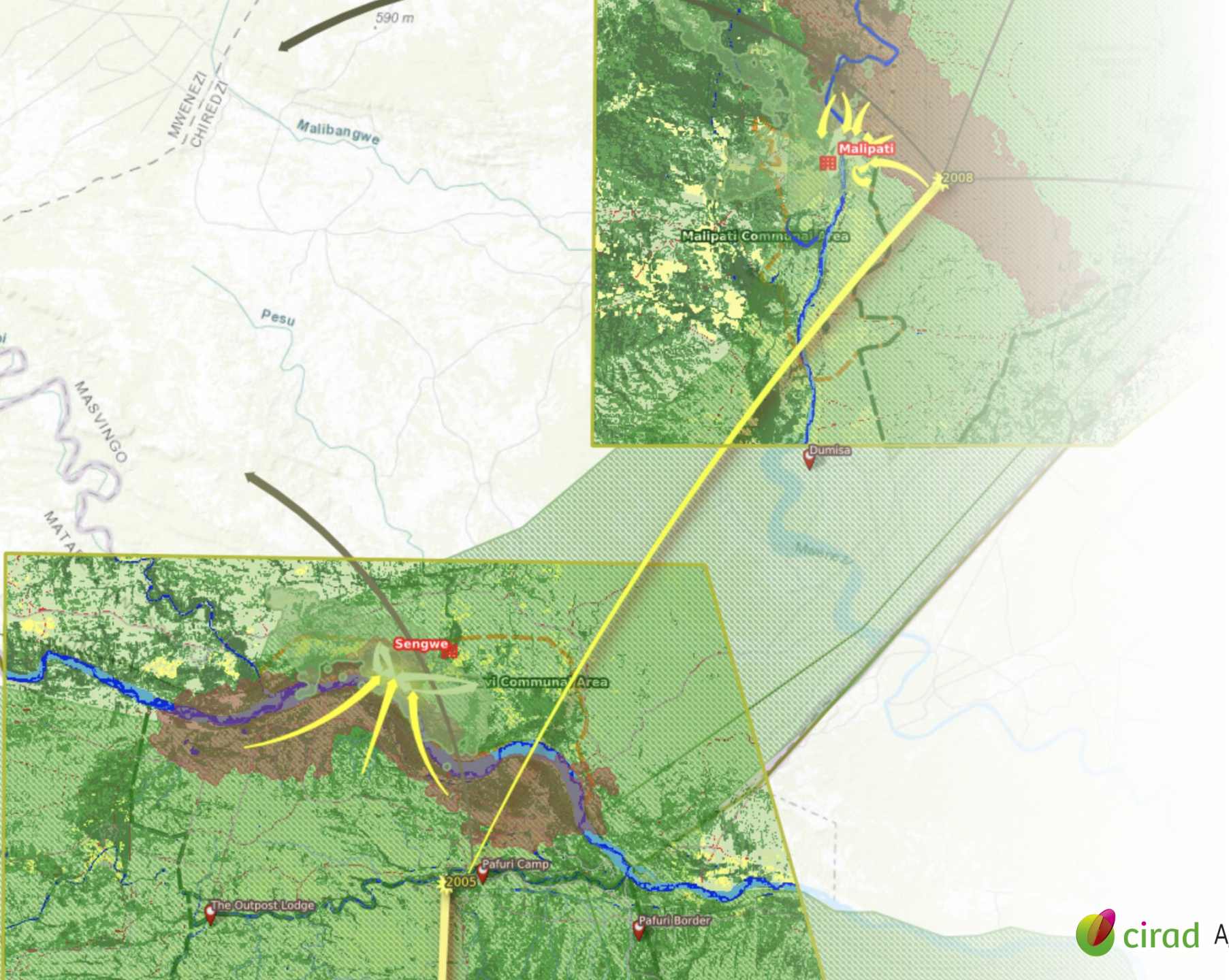
3 Satellite images

47 acronyms

Acronym list

16 Scientific study & 7 reports





Modeled buffalo and cattle mobility and contact

by F. Rumiano 2021

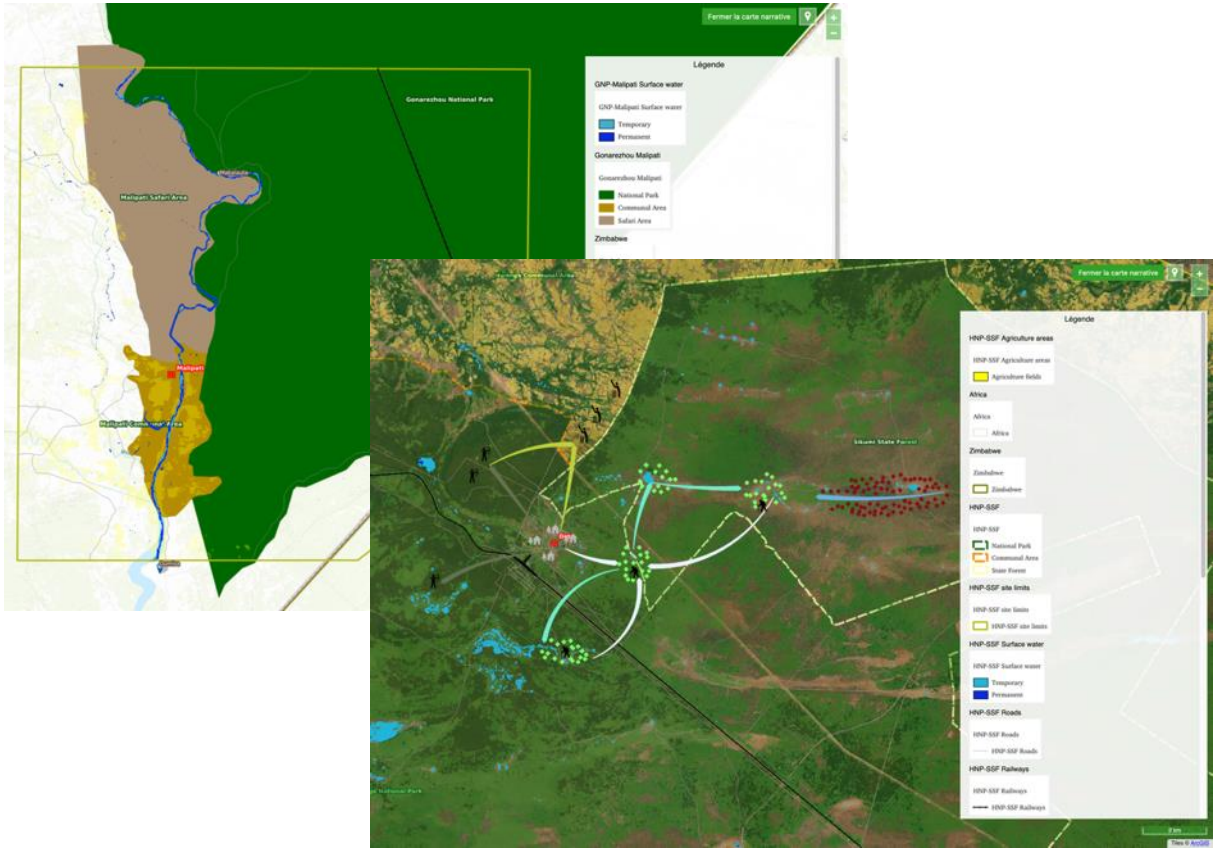
&

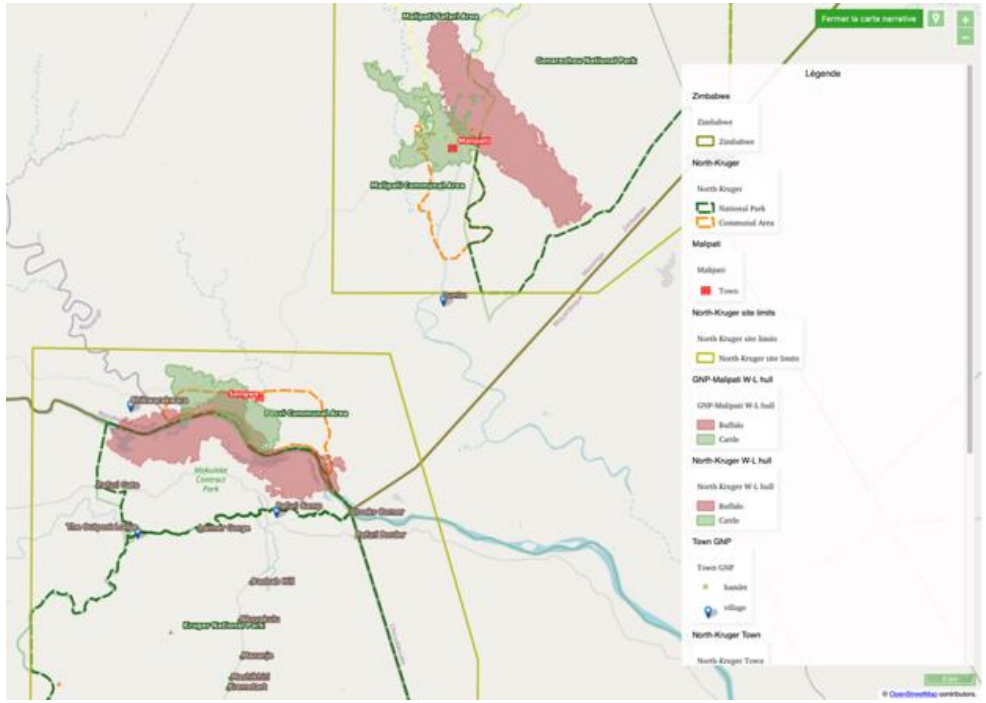
bTB spread and spreading risk

by A. Caron, 2010

CONCLUSION


Herders
Protected Area Managers

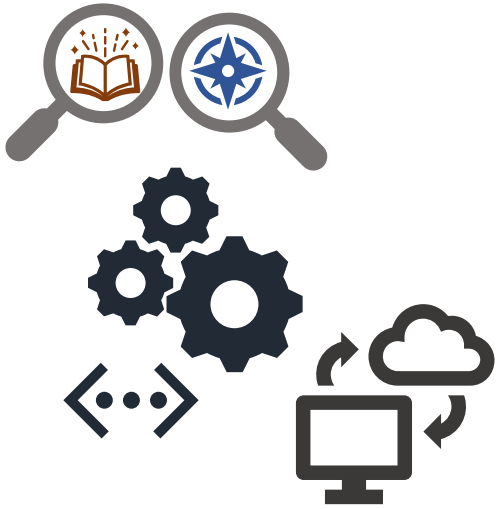

Légende
GNP-Malipati Surface water
Gonarezhou Malipati
Zimbabwe
Légende
HNP-SSF Agriculture areas
Africa
Zimbabwe
HNP-SSF
HNP-SSF site limits
HNP-SSF Surface water
HNP-SSF Roads
HNP-SSF Railways


Légende
Zimbabwe
North-Kruger
Malipati
North-Kruger site limits
GNP-Malipati W-L hull
North-Kruger W-L hull
Town GNP
North-Kruger Town

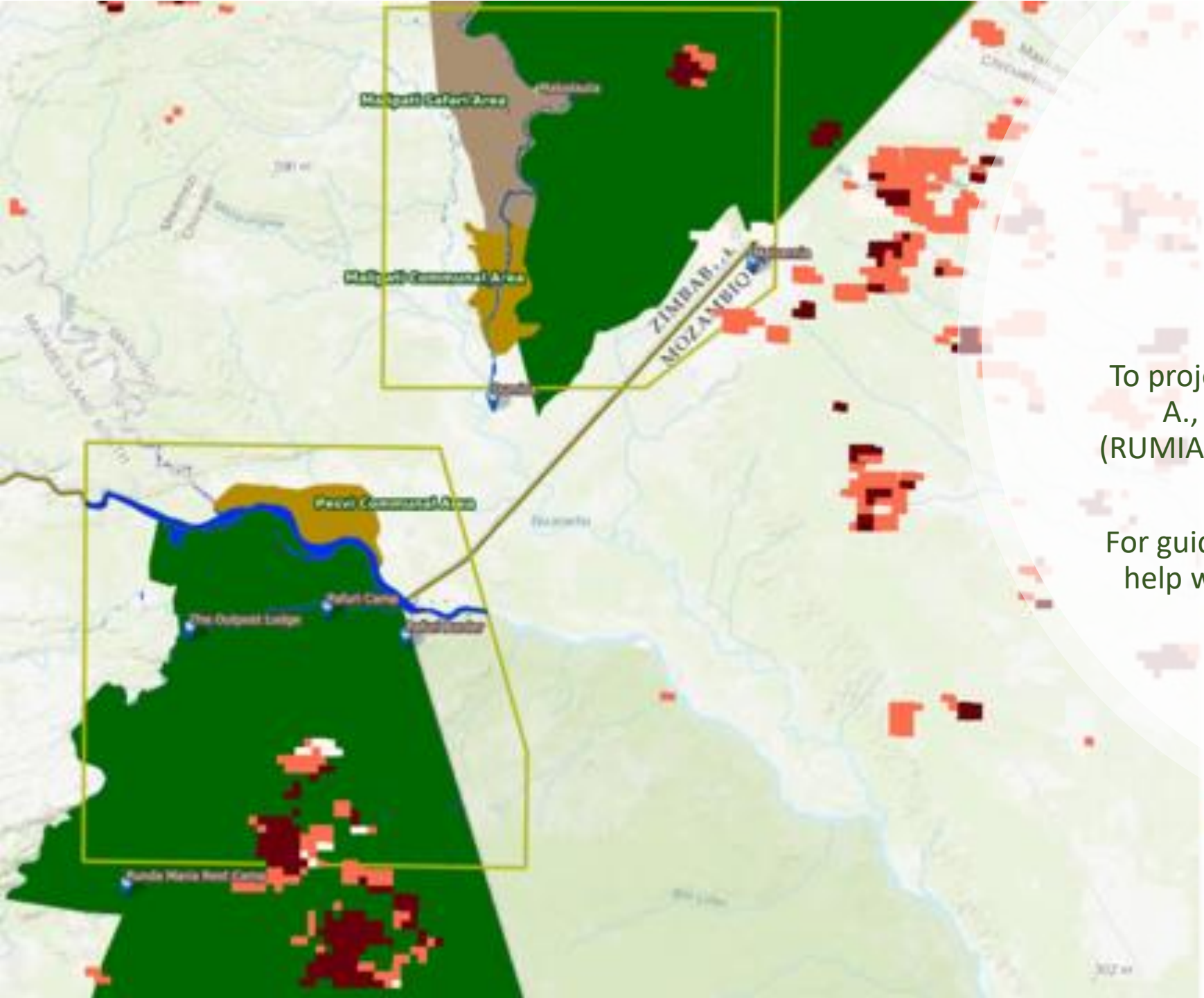
CONCLUSION

Improved skills:

Project management skills



Geomatics skills



Thanks

To project team, support team (CLOPES A., GRADELER M.), contributors (RUMIANO F., BOUVIER R., CARON A.), ...

For guidance, support, contribution and help which makes this work achieved