IENE 2020 INTERNATIONAL CONFERENCE

Using remote-sensing to map suitable road verges for a rare small mammal, the Cabrera vole (*Microtus cabrerae*)

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CLC 2018 (Portugal)

Lisbon

Évora
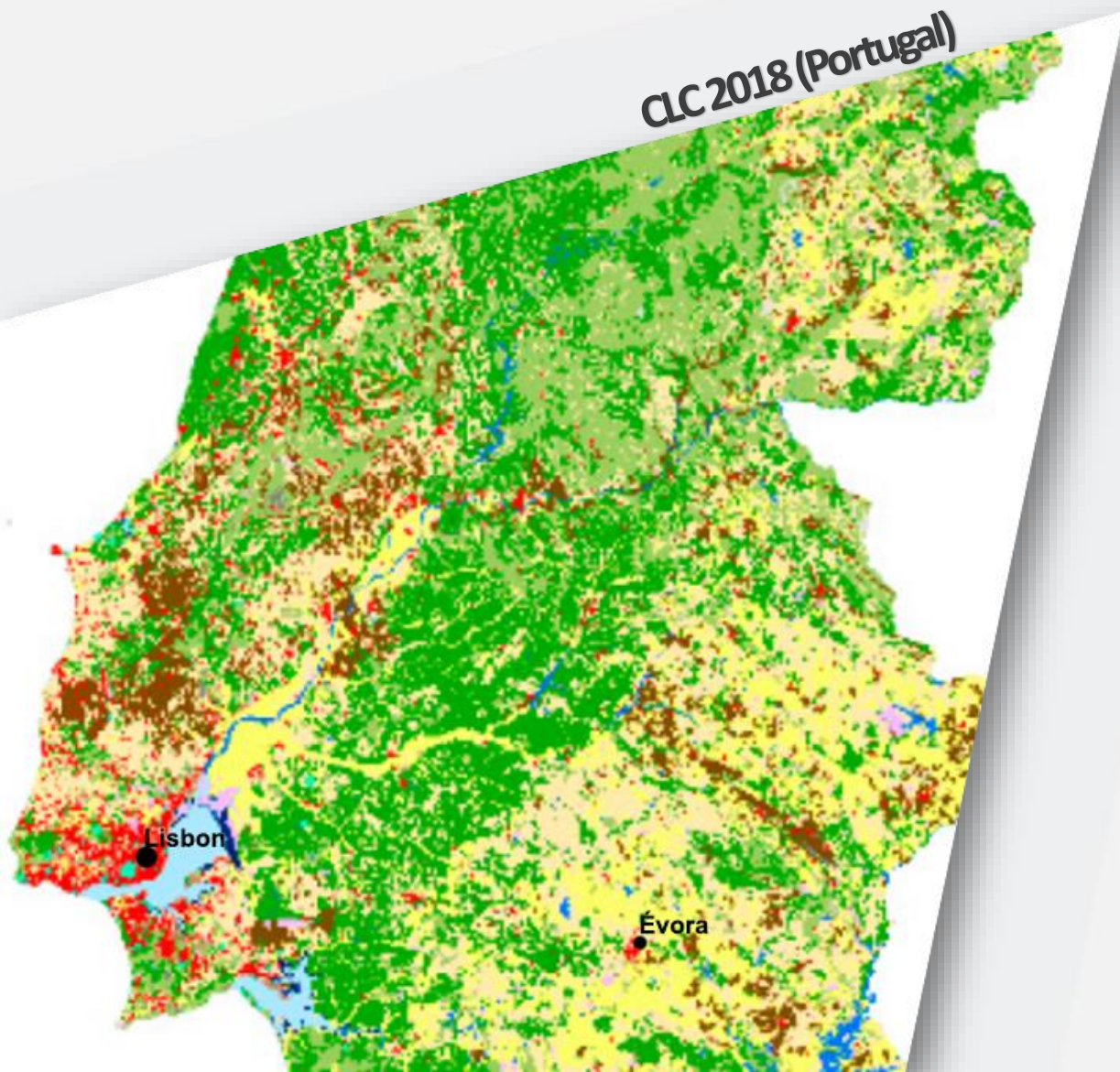
**Pros:**

- Easy to obtain
- Large extension

**Cons:**

- Relatively low spatial detail
- Low temporal detail
- Main habitat classes

# OVERVIEW

**Land Cover Maps**

-» Conservation Biology

-» Support decision making
(e.g. protected areas delineation,
impact assessment, ...)

ROAD VERGES OFFER OPPORTUNITIES

(Ascensão et al. 2015)
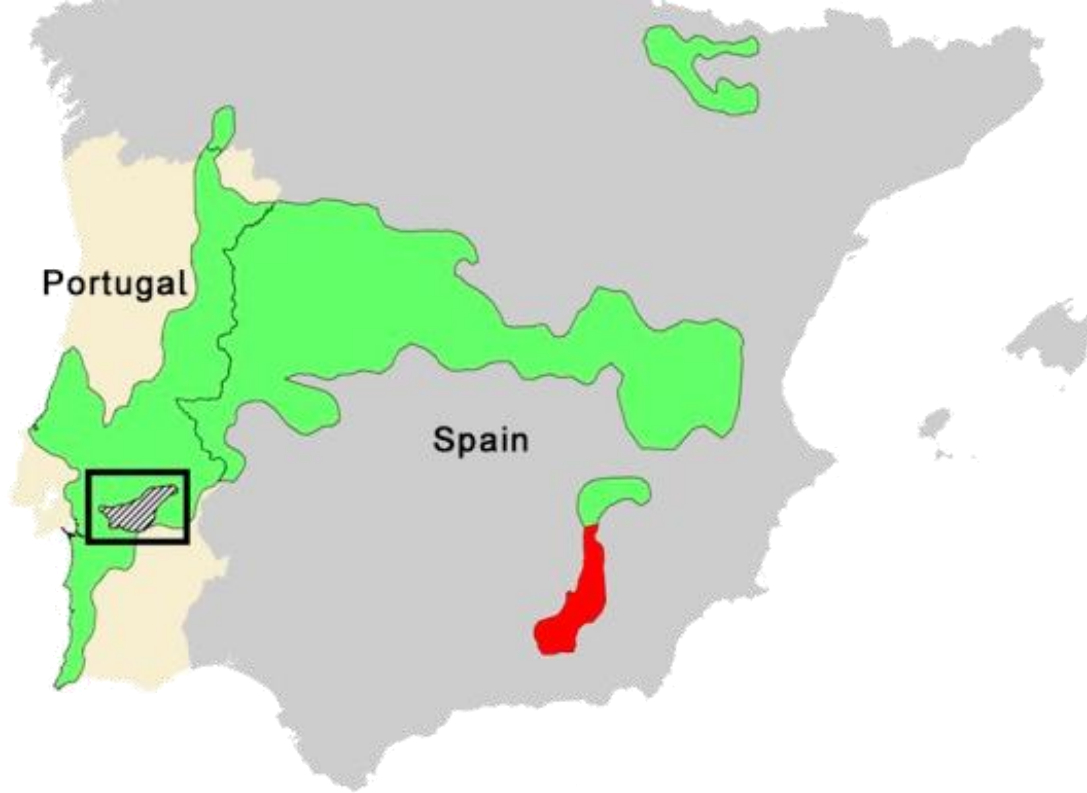
Road verges

Habitat/corridors

Plant diversity

Pollinators

© Ben Phillips

Study area
Resident
Extinct

POPULATION TREND
Decreasing

# Cabrera Vole

HABITAT AND ECOLOGY
Forest, Grassland, Wetlands (inland), Artificial/Terrestrial

Habitat and ecology in detail

| NOT EVALUATED | DATA DEFICIENT | LEAST CONCERN | NEAR THREATENED | ‹VULNERABLE› VU | ENDANGERED | CRITICALLY ENDANGERED | EXTINCT IN THE WILD | EXTINCT |
|---|---|---|---|---|---|---|---|---|
| NE | DD | LC | NT | | EN | CR | EW | EX |

RED LIST

**High resolution:**
- Spatial (up to 10 m)
- Temporal (each five days)
- Spectral (13 bands)
- Radiometric (12 bits)

**sentinel-2**

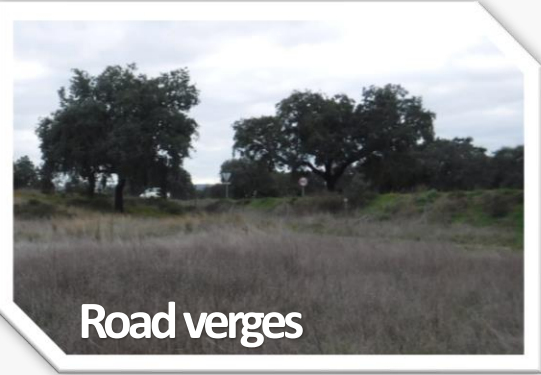**Copernicus**
Europe's eyes on Earth

**esa**

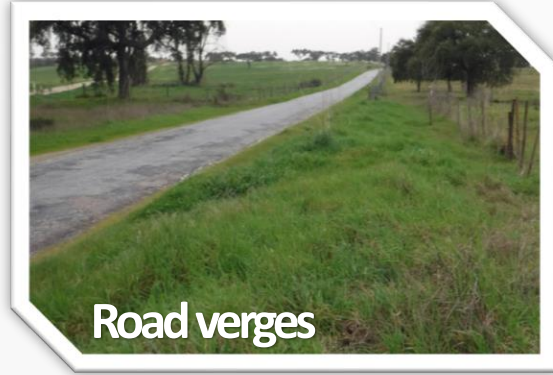**European Space Agency**

# MISSION

- Quantify the importance of Sentinel-2 derived predictors relative to more conventional predictors in predicting vole microhabitat suitability.

- Identify which Sentinel-2 derived predictors best explain vole distribution at fine spatial scales.
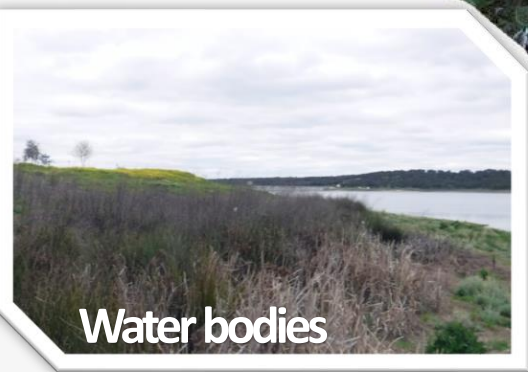
# Species data



Road verges

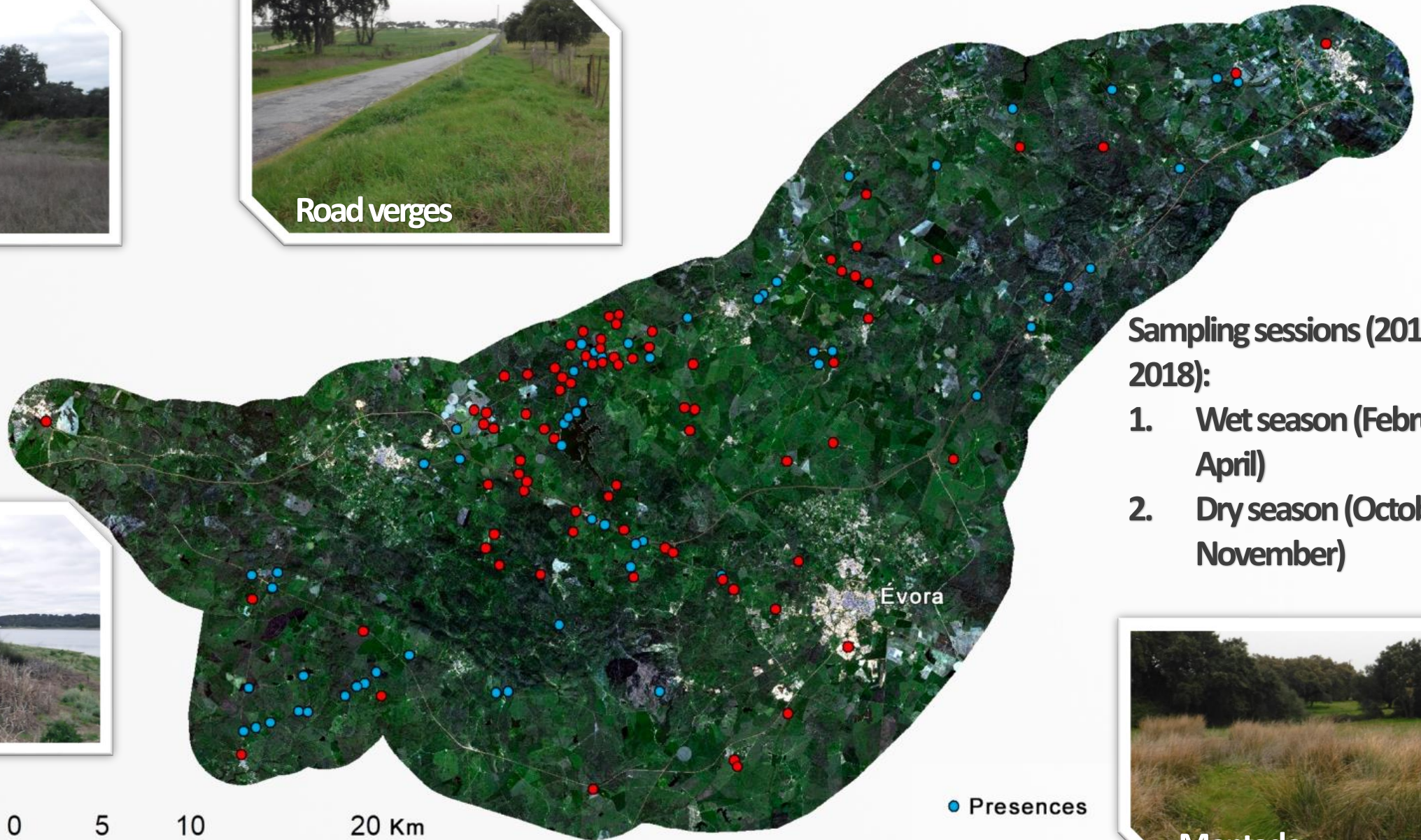Road verges

Water bodies

Montado

Sampling sessions (2017-2018):

1. Wet season (February-April)
2. Dry season (October-November)

Évora

- Presences
- Absences

0   5   10         20 Km

# Predictors (67)

Super resolution

SNAP

Passive

Sentinel-2A
(MSI Level-1C)

Spectral Bands

Spectral Bands

Wet season

Dry season

Active

ASTER
(GDEM)

Topography

Inference

e.g. Altitude

e.g. Distance from roads

Spectral Indices

Vegetation Biomass Indices

Senescent Vegetation Indices

Vegetation Water Content

Textural and Diversity Indices

Co-occurrence matrix

Diversity index
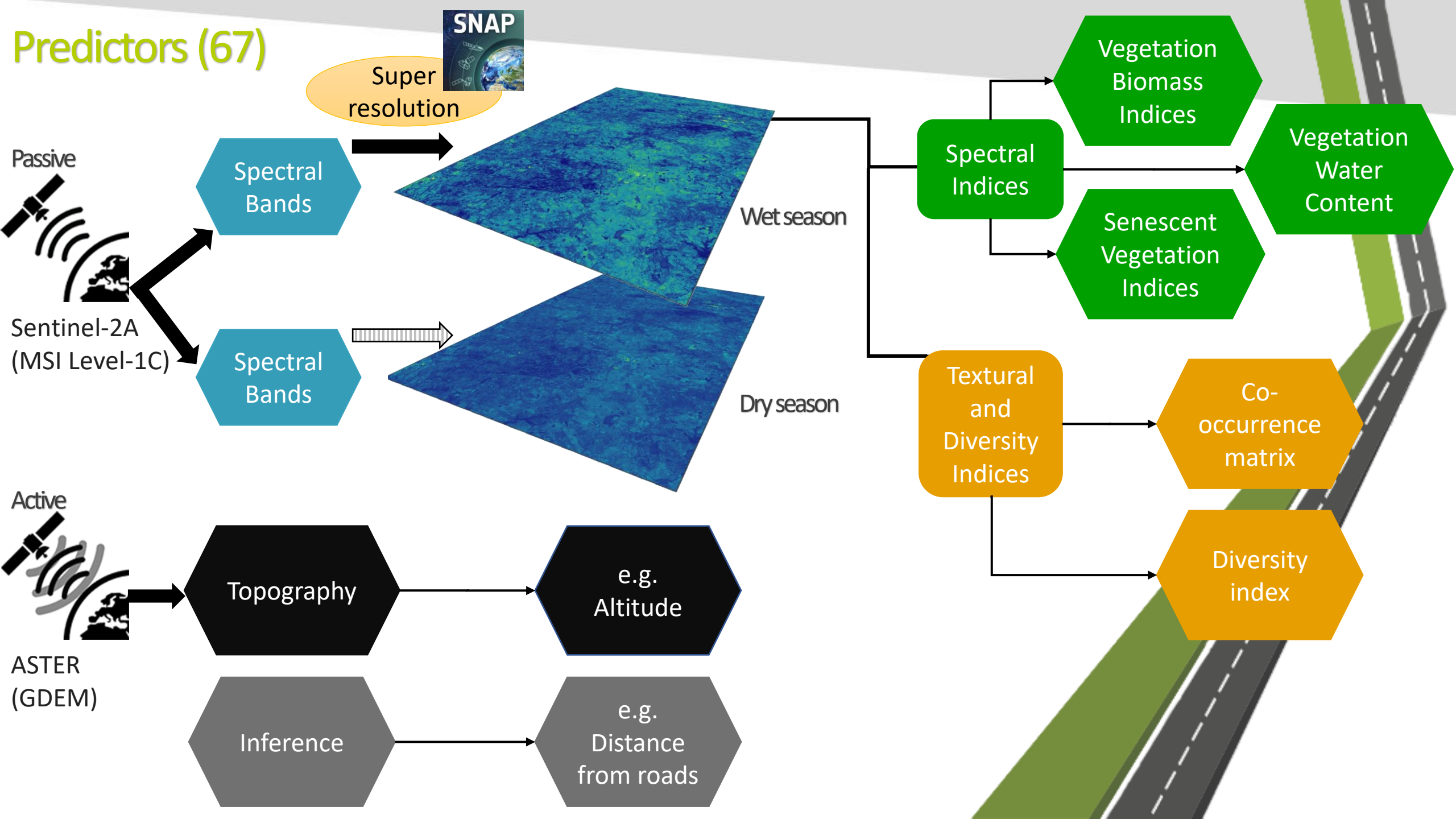
# SPECIES DISTRIBUTION MODELS (SDMs)

## Random Forest

- Presence/absences= response variable

- Remote sensing products= explanatory variables

## Parametrization

- maxRuns = 2000

- ntree = 2000

- p value = 0.01

## Model fit

- Area under the curve of receiver operating characteristic (AUC)
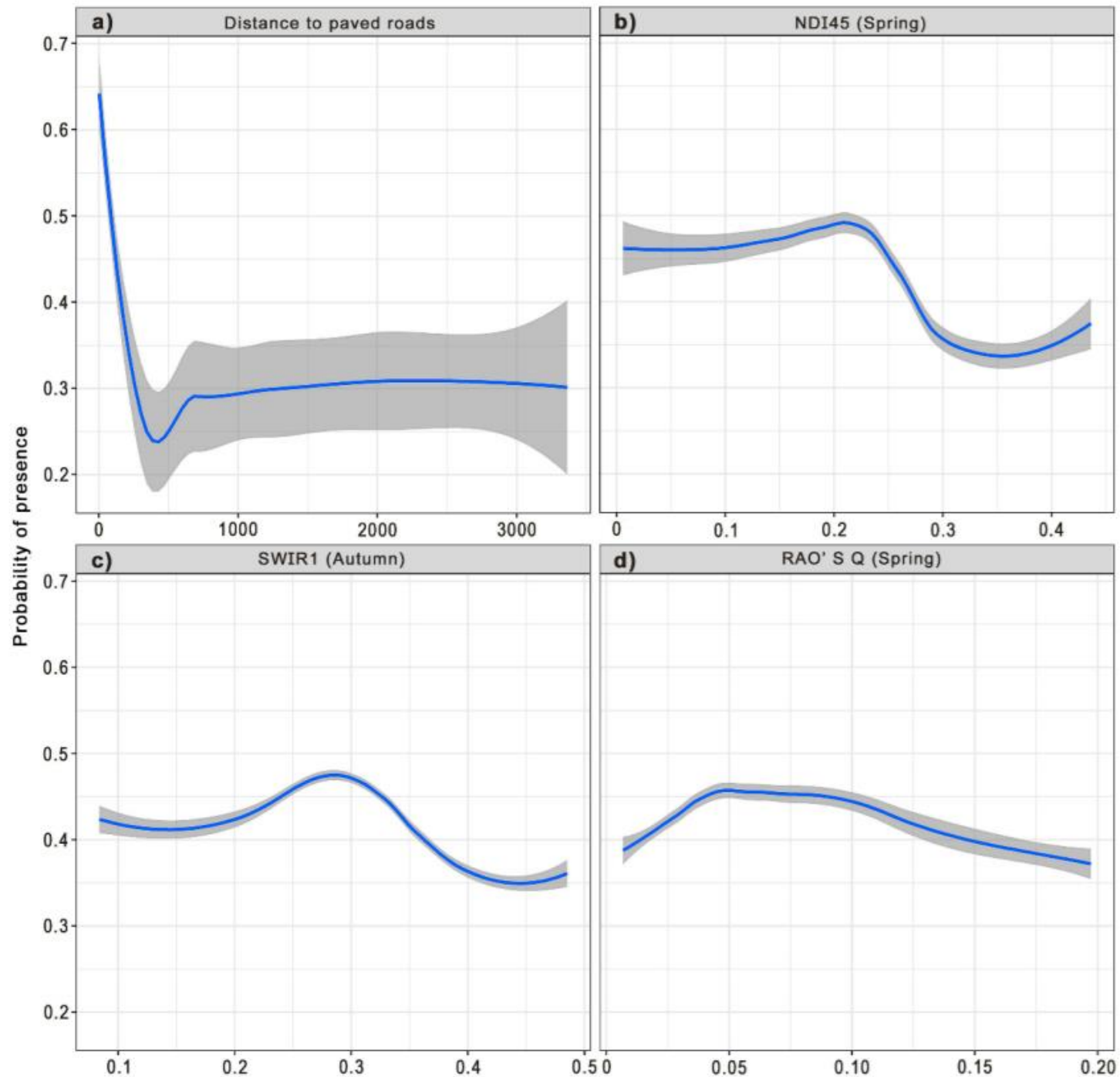
- Sensitivity

- Specificity

- Error rate (%)

(Leitão and Santos 2020)
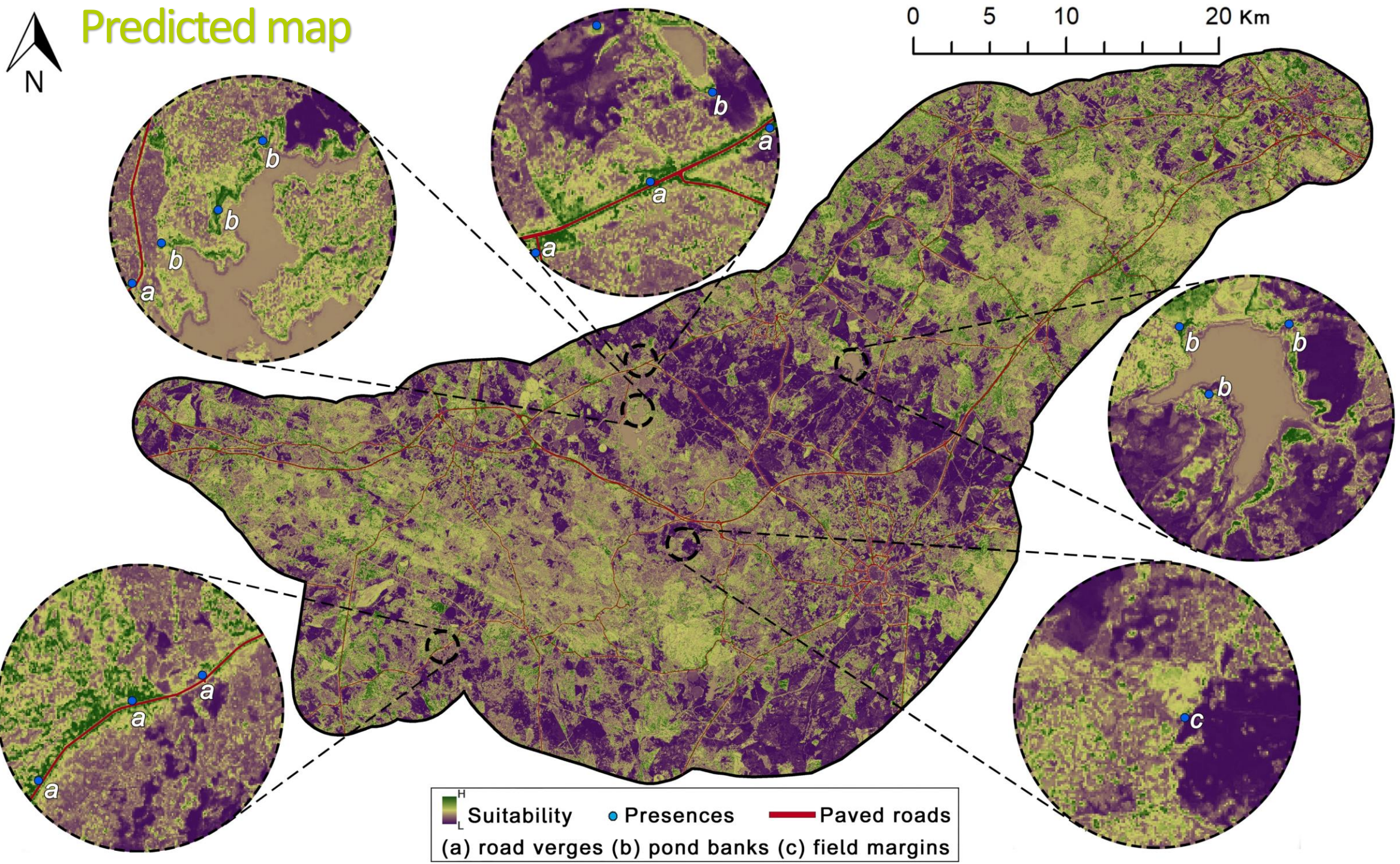(Franklin 2010)

Performances:

AUC (High score)
0.904

Sensitivity
0.73

Specificity
0.778

Error rate
19.15%

Predicted map

Suitability (H–L) — Presences — Paved roads

(a) road verges (b) pond banks (c) field margins

**FOR MORE DETAILS:**

- We demonstrated that the use of Sentinel-2 data support the identification of linear habitats (road verges, pond banks, field margins) for small and elusive species in humanized landscapes.

- This is useful for fine-scale conservation planning and population monitoring of small and rare species, but also for the biological and ecological assessment of habitats adjacent to linear infrastructures.

- Valerio, F., Ferreira, E., Godinho, S., Pita, R., Mira, A., Fernandes, N., & Santos, S. M. (2020). Predicting Microhabitat Suitability for an Endangered Small Mammal Using Sentinel-2 Data. *Remote Sensing*, 12(3), 562. https://doi.org/10.3390/rs12030562