

WESTERN EUROPE HEALTH & AIR QUALITY

Monitoring Mosquito Abundance and
Distribution to Assist Vector-Borne Disease
Management in Western Europe

Gia Mancini
Douglas Gardiner
Victor Lenske
Sara Lubkin, PhD

Helen Plattner
Luisa Silva
Alison Thieme
Aaron Warga

Maryland - Goddard

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Vector-borne Illness



- ▶ 17% of infectious diseases
- ▶ 1 million deaths per year
- ▶ Common vectors:
 - ▶ Mosquitoes
 - ▶ Ticks
 - ▶ Blackflies



Image Credit: Pixabay

Mosquito-borne Disease



Image Credit: Free Stock Photos

Common Diseases:

- ▶ Zika
- ▶ West Nile Virus
- ▶ Chikungunya
- ▶ Malaria
- ▶ Dengue
- ▶ Yellow fever

- ▶ Global Mosquito Alert Consortium
 - ▶ The Woodrow Wilson International Center for Scholars
 - ▶ Citizen Science Association
 - ▶ European Citizen Science Association
 - ▶ Wageningen University
 - ▶ Sapienza Università Di Roma
- ▶ Institute for Global Environmental Strategies



Image Credit: Max Pixel

Partner Concerns



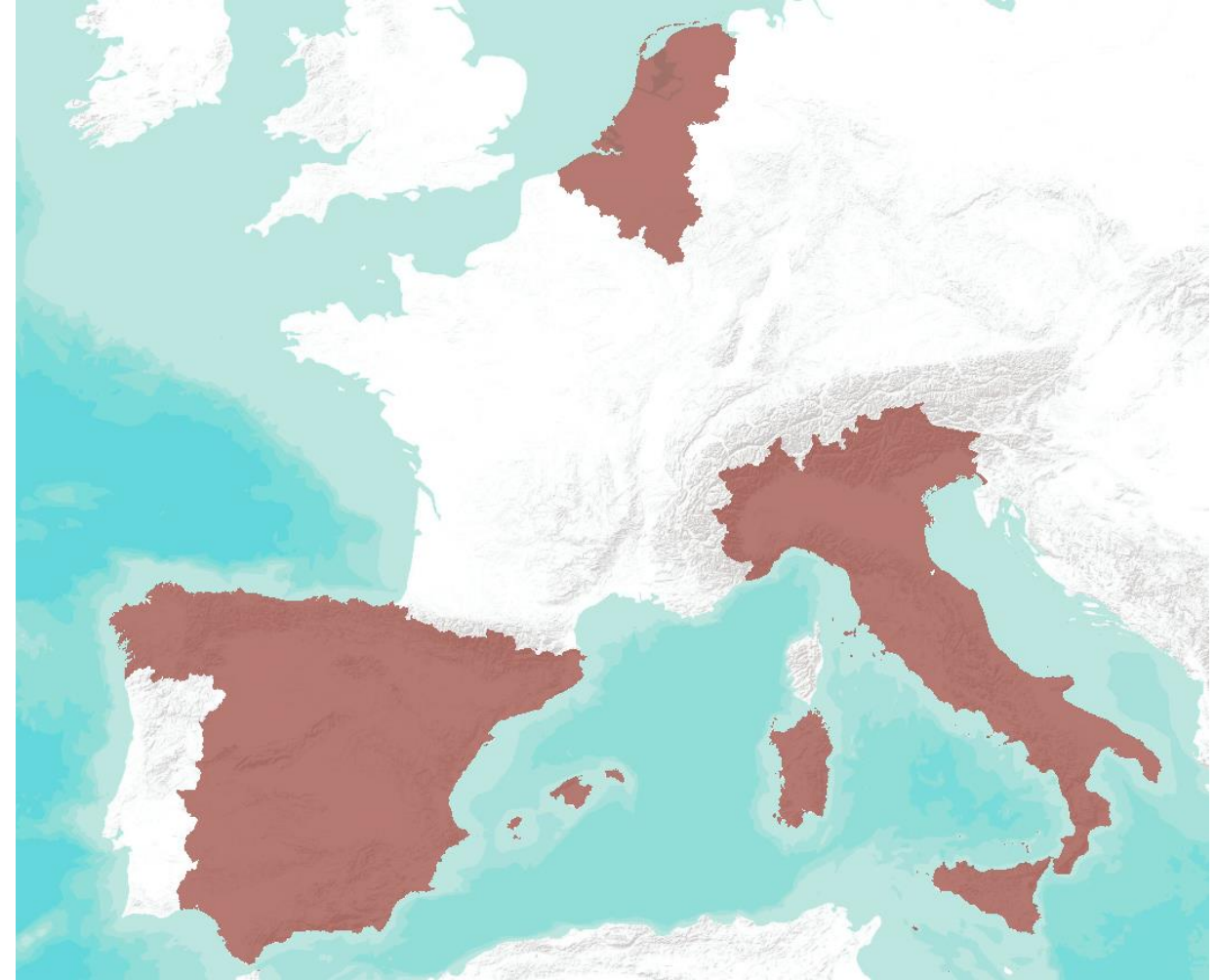
- ▶ Rising temperatures **expand** mosquito population range
- ▶ **Spread** of vector-borne diseases
- ▶ Integrating citizen science data from **multiple countries**



Study Area: Western Europe

Study Period:

June 2016 – September 2017





Study Area: Western Europe



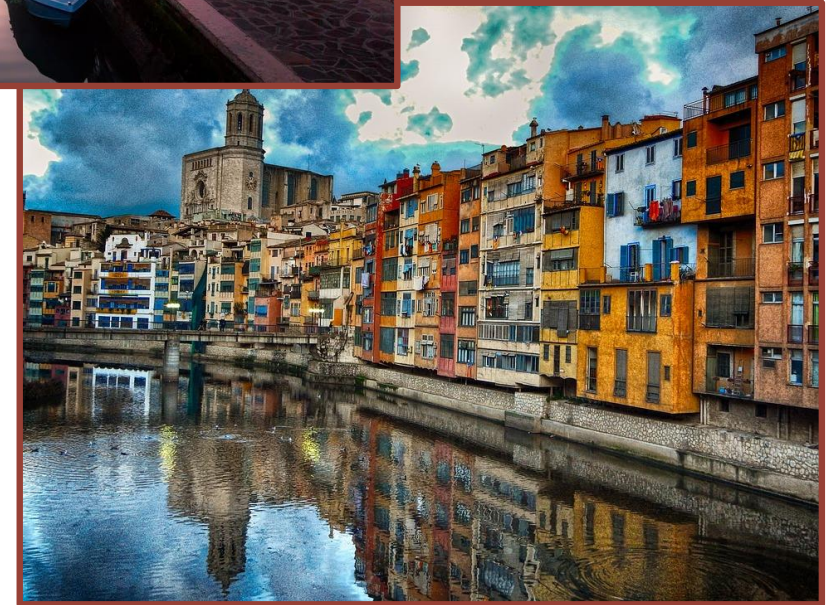
Belgium



Italy



The Netherlands



Spain

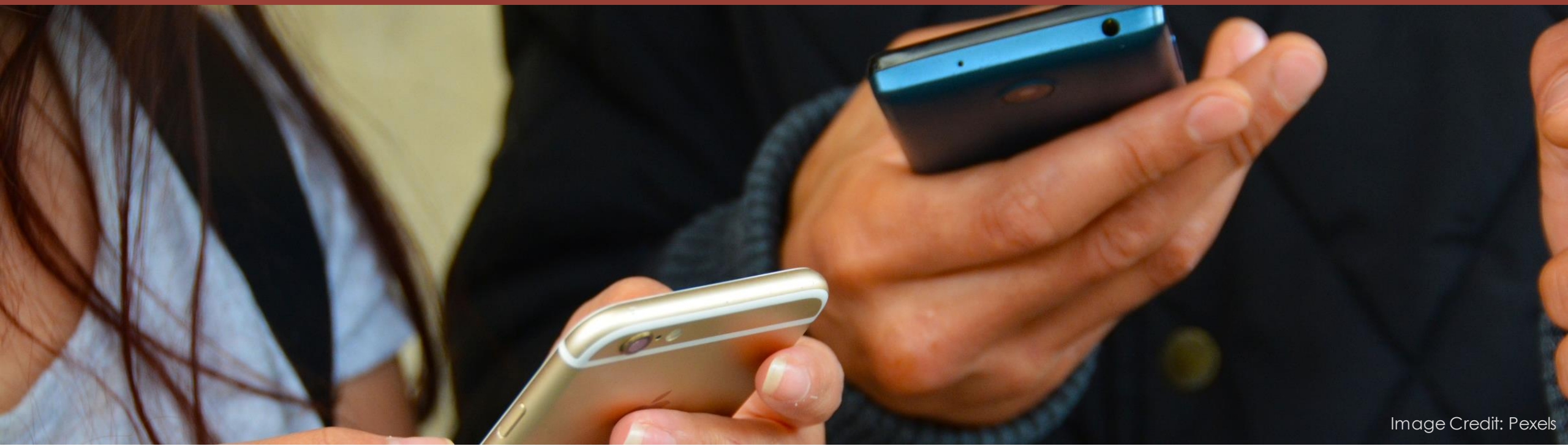


Image Credit: Pexels

Citizen Science in Europe



- ▶ Research collected by citizens
- ▶ Geo-capable mobile apps
- ▶ Questionnaires when exposed to mosquitoes

Pros:

- ▶ Community involvement
- ▶ Convenience

Cons:

- ▶ Unreliable
- ▶ Awareness

Objectives

- ▶ Combine citizen science data with **NASA's remote sensing** capabilities
- ▶ Identify key **environmental factors** that signal prime conditions for mosquitoes
- ▶ Create a methodology to **incorporate additional countries** in the Global Mosquito Alert Consortium

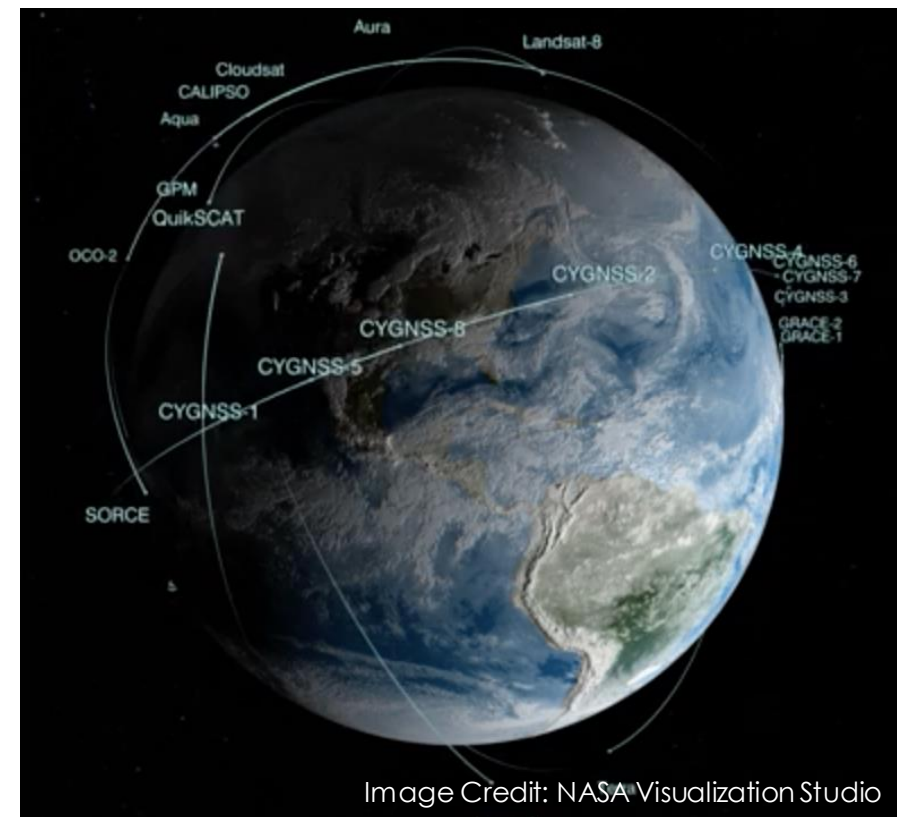




Image Credit: CDC/ James Gathany



Environmental Factors



- ▶ Elevation
- ▶ Land Surface Temperature



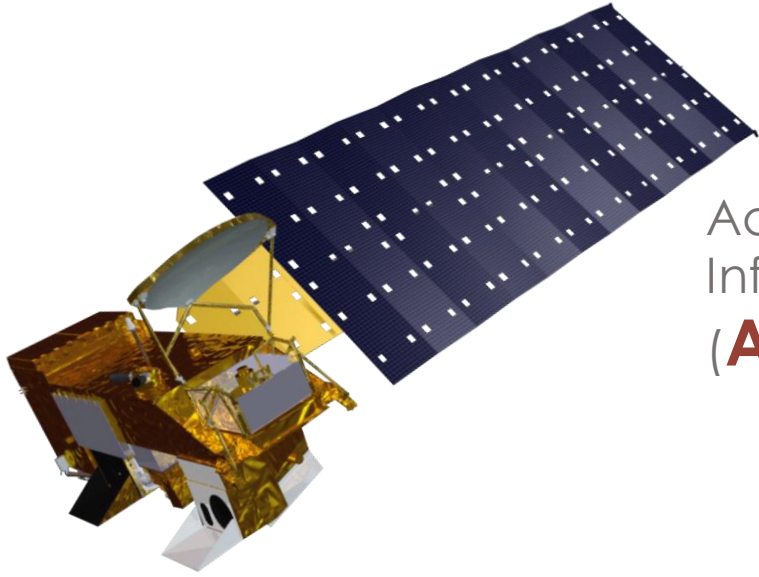
- ▶ Precipitation
- ▶ NDVI



- ▶ Soil Moisture
- ▶ Humidity



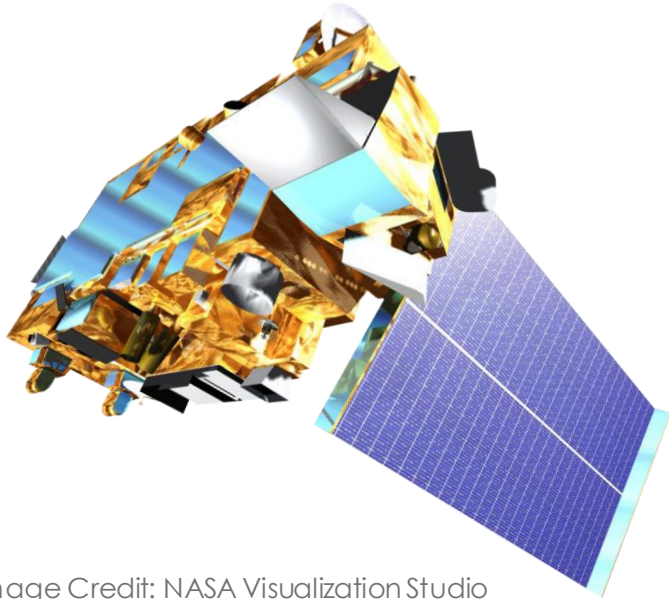
NASA Earth Observations



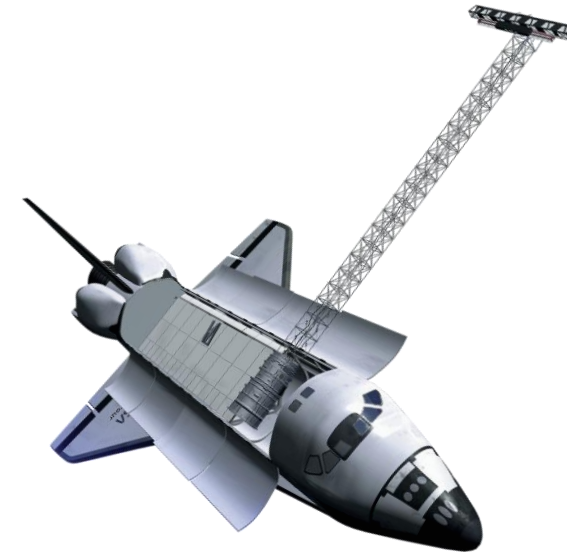
Aqua Atmospheric
Infrared Sounder
(**AIRS**)



Global
Precipitation
Measurement
(**GPM**)



Terra Moderate
Resolution Imaging
Spectroradiometer
(**MODIS**)



Shuttle Radar
Topography
Mission
(**SRTM**)

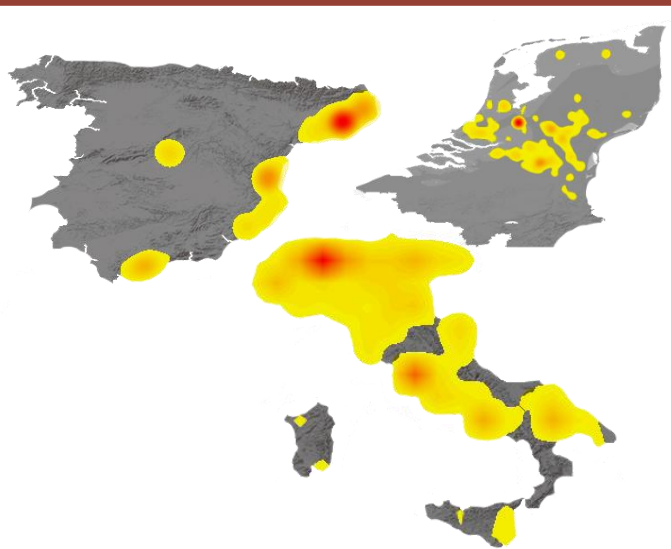
Methodology



Citizen Science Data

Hotspot Map

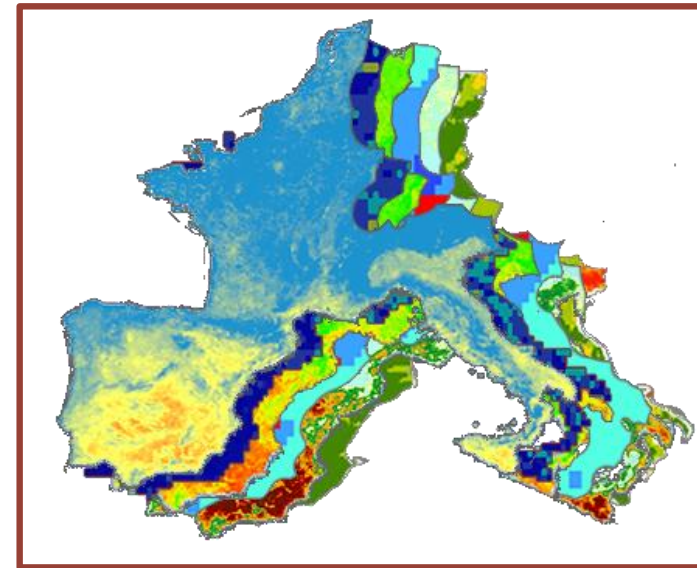
Western
Europe:
Belgium
Italy
The
Netherlands



Mosquito
Activity
Density
Hotspot

Environmental Factors

NASA Earth Observations

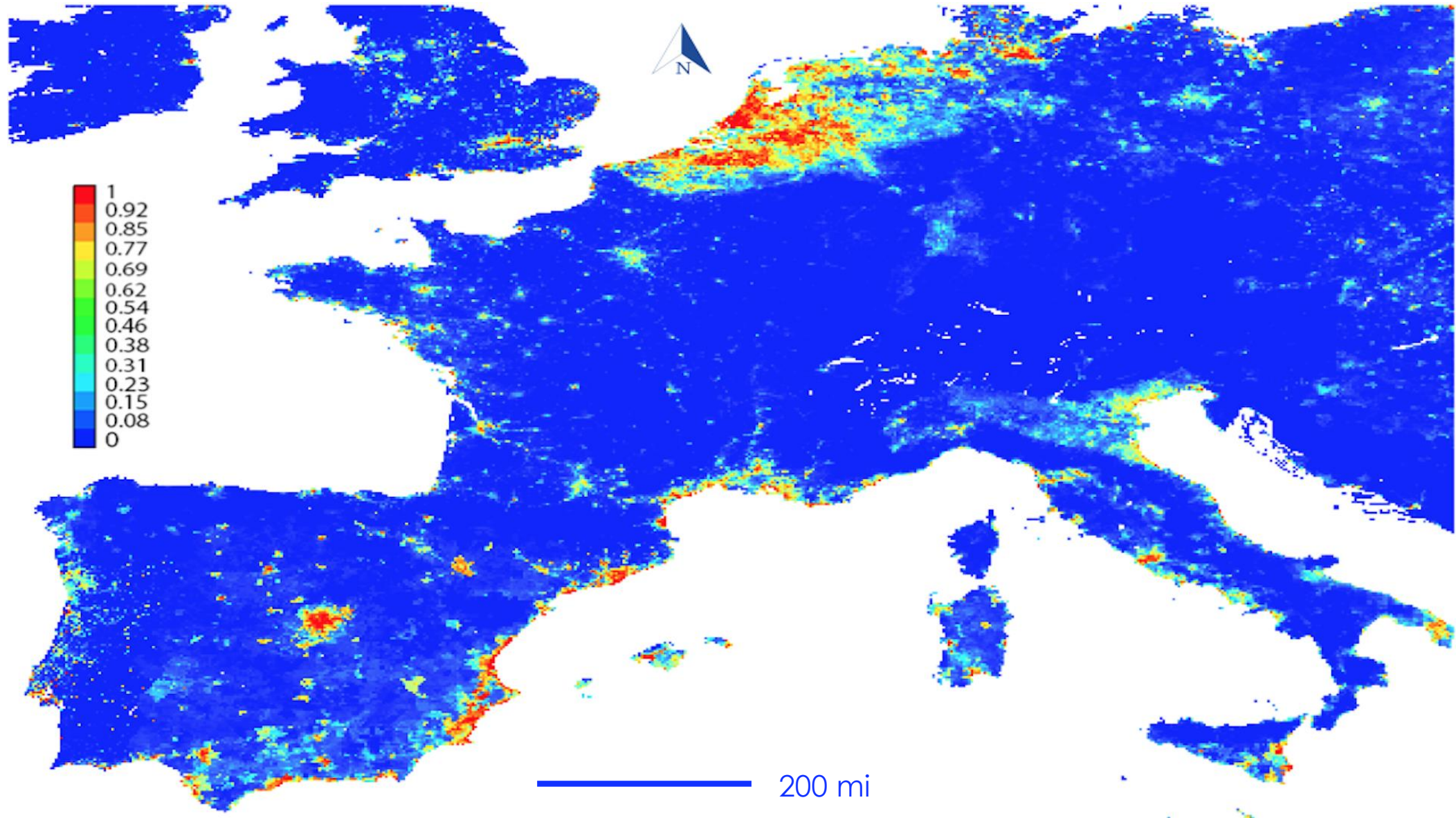


Land Surface
Temperature
Soil Moisture
NDVI
Humidity
Elevation
Precipitation

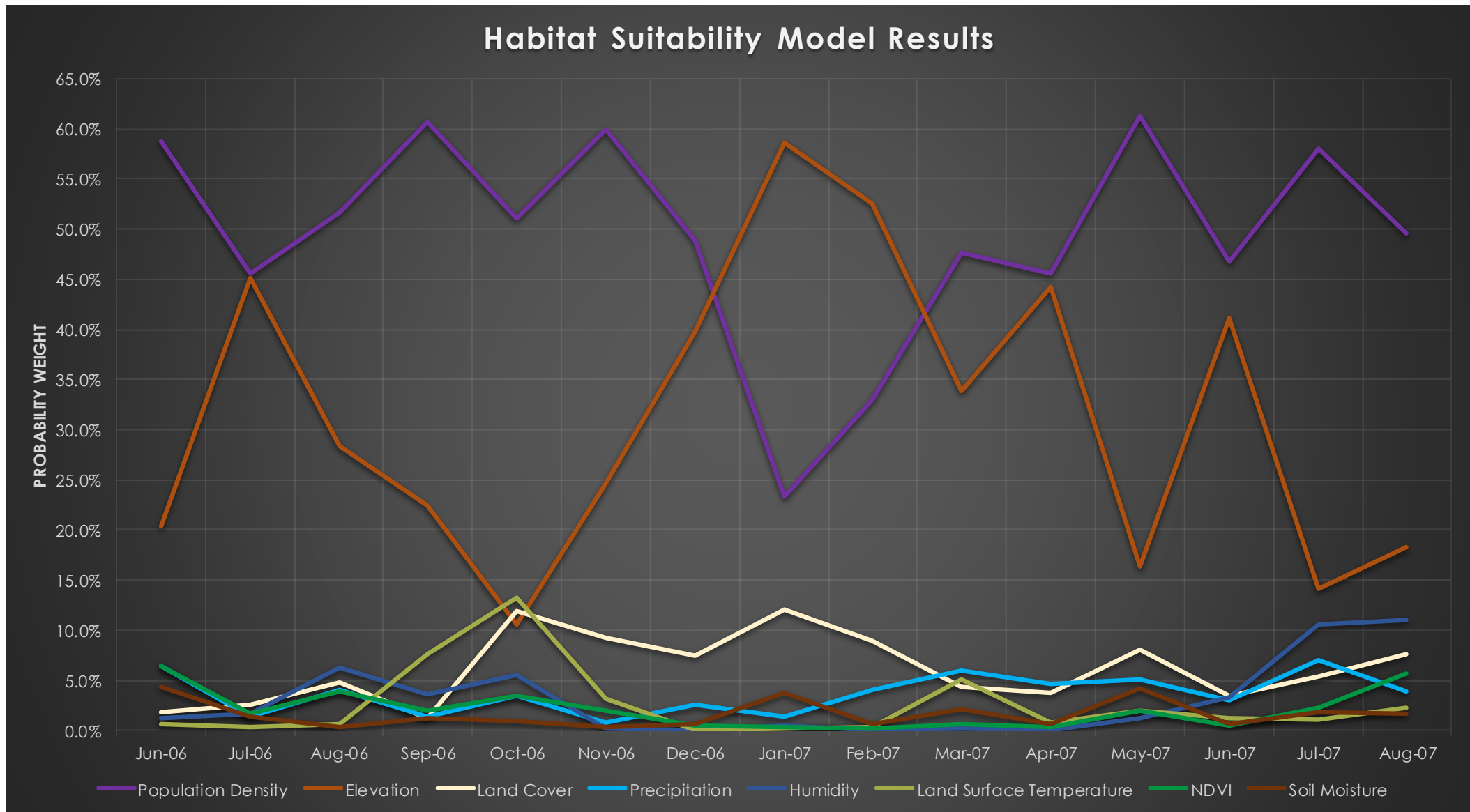
TERRA
AQUA
GPM
SRTM

MaxEnt Habitat Suitability

Results: Habitat Suitability Map



Results: Habitat Suitability Data



Conclusions

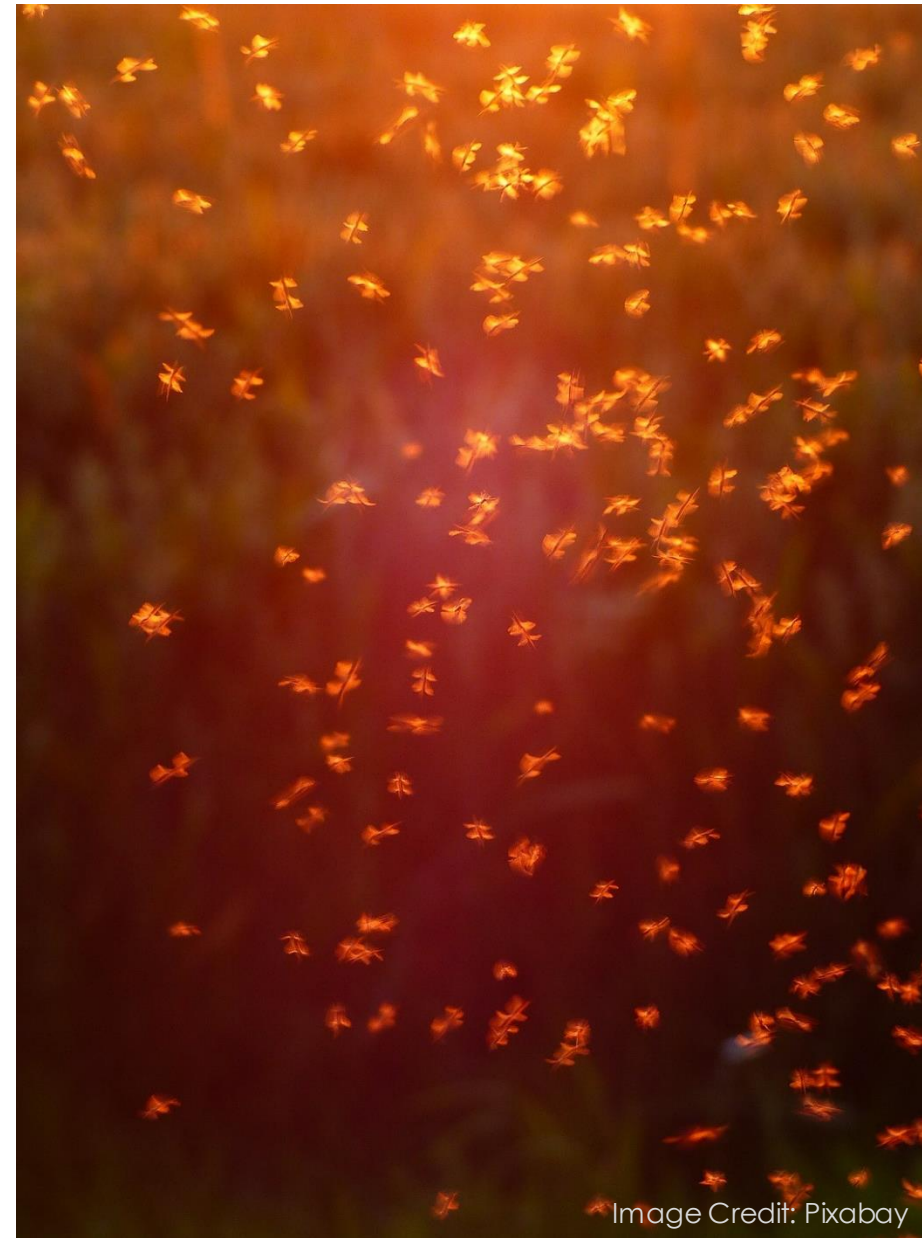
- ▶ Mosquito activity occurrence is correlated with areas of **high population density and low elevation**.
- ▶ Mosquito activity increases and is **more widespread** during the summer months.
- ▶ The Global Mosquito Alert Consortium and participating organizations would benefit from **standardizing** citizen science data collection questionnaires in order to readily **compare datasets** across time and space.



Image Credit: PEXELS

Future Work

- ▶ This project will continue on for a second term
- ▶ Products will be implemented as an interactive map
- ▶ Open-source platform
 - ▶ Google Earth Engine





Acknowledgements

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