MID-TERM REPORT ON DATA COLLECTION FOR ECOLOGICAL NICHE MODELING OF THE THREE TARGET SPECIES

- **Occurrence data collection**

In addition to presence data for the three vulnerable species collected through this project and our previous grants (IFS, RUFFORD), additional records were obtained from GBIF (https://www.gbif.org) and the BIEN platform integrated into R software via Wallace. The collected occurrence data covered West Africa (Figure 1). Furthermore, we projected these coordinates on Google Earth v.7.1 to verify they matched the target locations (Table 1).

Table 1 : Data sources used for modeling

Source	*A. africana*	*K. senegalensis*	*V. doniana*
ITTO	226	218	310
RSG	140	321	285
FIS	15	31	8
GBIF	158	179	283
BIEN	34	44	44
TOTAL	**673**	**793**	**930**

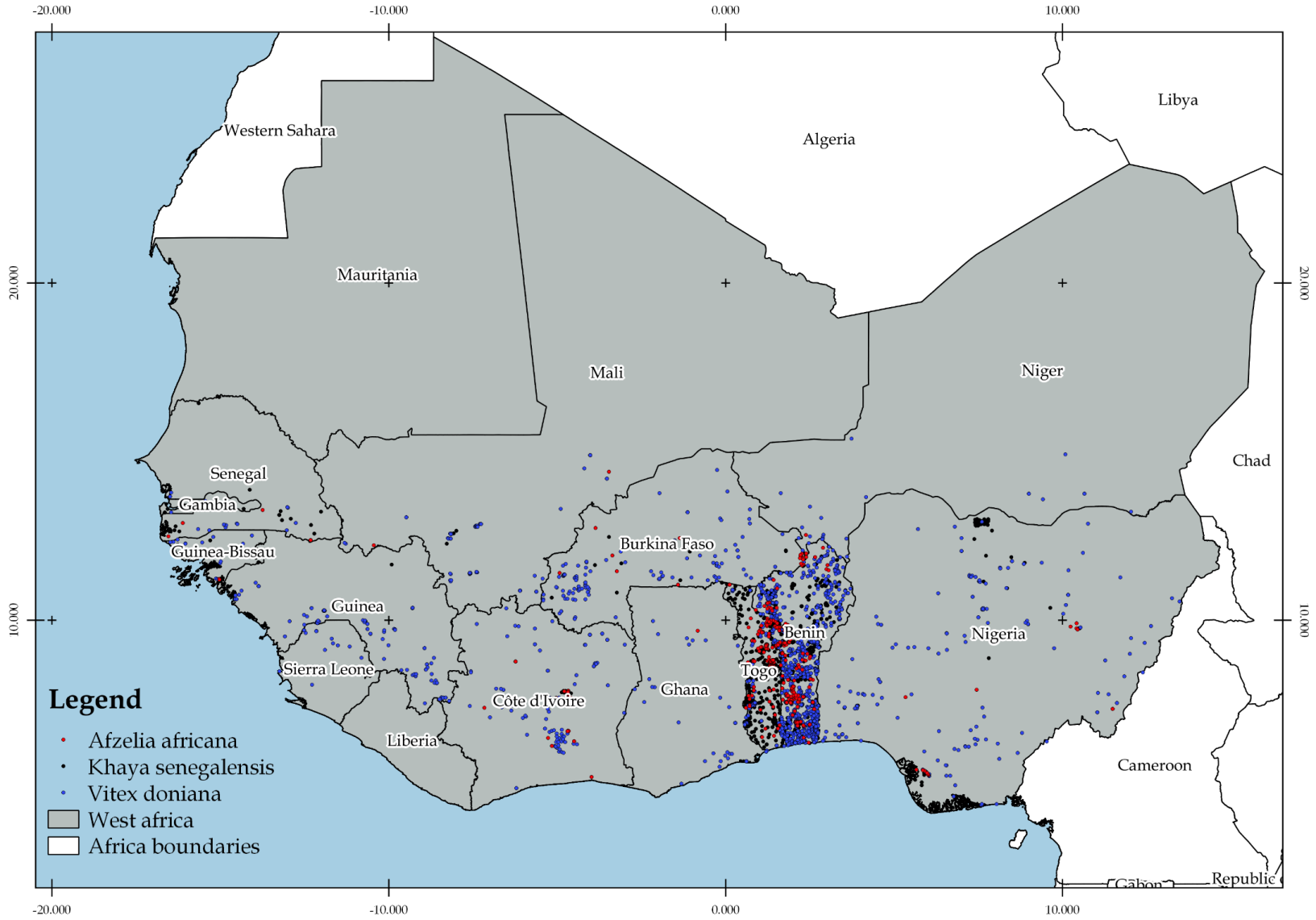

Figure 1 : Occurrence data of the target species selected for modeling

- **Collection of bioclimatic and environmental variables**

Plant distribution is mainly influenced by precipitation and temperature. Thus, the environmental variables used to train the plant distribution model are strongly linked to precipitation and temperature. The variables available at https://www.worldclim.org/data/worldclim21.html have been downloaded and integrated into Wallace v2. The climate data are high-resolution climate projections more suited to the African ecological context. A total of 19 environmental and bioclimatic variables were downloaded (Table 3) using a 30 arc-second resolution grid (~ 1km x 1km) and then converted to ASCII files using ArcGIS 10.4 software.

Table 2: Environmental and bioclimatic variables used in the model

Code	Environmental and bioclimatic parameters
Bio 1	Mean annual temperature (°C)
Bio 2	Mean daily temperature variation (monthly mean) (°C)
Bio 3	Iso thermality (%) (Bio 2/Bio 7) (* 100)
Bio 4	Temperature seasonality (°C)
Bio 5	Maximum temperature of warmest month (°C)
Bio 6	Minimum temperature of the coldest month (°C)
Bio 7	Annual variation in temperature (°C) (Bio 5 - Bio 6)
Bio 8	Average temperature of the wettest quarter (°C)
Bio 9	Average temperature of the driest quarter (°C)
Bio 10	Average temperature of the warmest quarter (°C)
Bio 11	Temperature of the warmest quarter (°C)
Bio 12	Annual precipitation (mm)
Bio 13	Precipitation in wettest month (mm)
Bio 14	Precipitation in driest month (mm)
Bio 15	Precipitation seasonality (coefficient of variation) (%)
Bio 16	Precipitation in wettest quarter (mm) (mm)
Bio 17	Precipitation in driest quarter (mm)
Bio 18	Precipitation in warmest quarter (mm)
Bio 19	Precipitation in coldest quarter (mm)

- **Assessing the Ecological Niches of Three Vulnerable Woody Plant Species**

For each target species, ecological niche modeling was performed using the workflow outlined in Figure 2. Species occurrence records were imported and processed through the "Wallace" package interface in R.

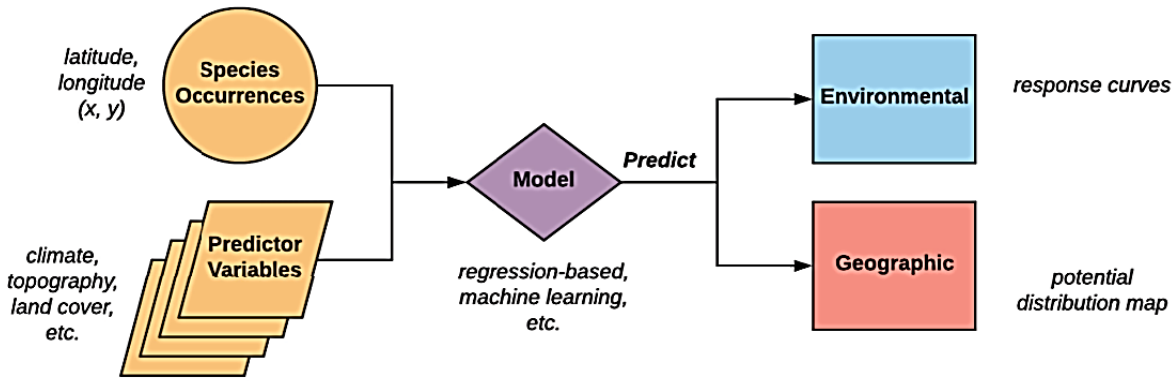

Figure 2 : Methodology for Ecological Niche Modeling (NASA-ARSET)

Our methodology incorporated spatial thinning (1 km minimum distance between occurrences using the spThin package) to address sampling bias, followed by iterative MaxEnt model development with parameter optimization through regularization multipliers (0.5 to 4 with 0.5 increments) and feature class combinations (L/Q/P/T/H). Models were evaluated via jackknife cross-validation (ENMeval package) and selected hierarchically:

- by highest test AUC (retaining only models with AUC > 0.8),
- by lowest omission rate (based on minimum training presence threshold), and finally
- by smallest AICs value when ties occurred.

The optimal model projected habitat suitability for 2040 and 2060, with outputs processed in ArcGIS for area quantification (pixel counting) and classification into four suitability categories (Table 3) using defined threshold values.

Table 3 : Habitat Suitability Classification

Threshold Value Range	Habitat Classification
0 ≤ p < 0,25	Unsuitable Habitat
0,25 ≤ p < 0,5	Marginally Suitable Habitat
0,5 ≤ p < 0,75	Moderately Suitable Habitat
0,75 ≤ p ≤ 1	Highly Suitable Habitat