Description of scripts used for the master thesis

This description does not contain the following scripts but they should be mentionend

- modifiedgpxextraction.R (20, contains a function called by another script)
- function_file.R (493, contains functions called by other scripts)
- marginal_nemo.R (unfinished script to create marginal effects on NEMO for large posterior samples, e.g. 10000).
- plot_sexualseggregation.R (preliminary checks of the effect of sexual seggregation)

x. = A what step should this script be executed?

x. name_of_a_script.R (lines of code)

INPUT	OUTPUT
What does this script?	What is the purpose of this script?

WHERE WAS THIS SCRIPT EXECUTED (LOCAL MACHINE, NEMO, GOOGLE EARTH ENGINE)?

1. createafrica_shape.R (20)

GADM → africa-shapefiles

create a shapefile with countries and continent from GADM data

clipping of datasets within GEE and visualization

LOCAL

2. harmonize_RSOD.R (363)

GEC xlsx.files (RSO-sheets) → GEC_points.shp, GEC_points_eleonly.shp

handles the differences in layout and observation codes of GEC spreadsheets

If not given, utc-times of observations are calculated from the local date or estimated

Positions are converted from utm to longlat if neccessary

Convert all observations to a standardized format

Return a point-shapefile of all observations including carcasses with observation times („GEC_points.shp“).

LOCAL

3. CmbTransects_segmentize.R (247)

GEC_points.shp → segments_4326.shp

Reads GEC_points.shp and the transects.shp from the GEC raw data.

Fields of observation parallel to the transect line are generated

Transects are extended to become a multiple of 2,500m

Spatial subunits (2,500m) of the fields of observation are generated

Generating consistent spatial subunits from transects for all GEC sites

Returns segments_4326.shp

LOCAL

4. datesfromgpx.R (140)

INPUT	OUTPUT
Assign times to spatial subunits, if possible from .gpx-file or – if not available – from RSO and FSO data Accesses the modifiedgpxextraction.R (37) script	Generating consistent spatial subunits from transects for all GEC sites Returns segments_GEE.shp fit for uploading to the GEE

LOCAL

5. extract_COUNT-HT.R (117)

GEC_points_eleonly.shp → REPS.csv, HT.csv, COUNT.csv

Assign observations (including the observation code) to the (spatially) closest spatial subunit.

Omit observations that are more than 14 days or 2,000m distant to the spatial subunit

Return csv-files of the number of detections within one spatial subunit and the herd type and count

These data can now be merged with predictors to generate the dataset for model calibration

LOCAL

6. preprocessing_GLW_creation.R (29)

africa_continent.shp, GLW tifs → TLU.tif

Clip the global GLW layers of sheeps, goats and cattle

Combine them in a single layer, by weighting densities of the different species by their TLU coefficient

The raster of African TLU can now be uploaded and processed within GEE

LOCAL

7. saltwatermask.py (49)

GEE archive → africa_1500_iwbuffer

Generate the outline of the african continent and create an inward buffer (size = 1,500m).

Salt water included by the GSW has to be excluded, before calculating the distance to water

GOOGLE EARTH ENGINE

7. extract_HD.py (52)

segments_GEE, GEE_archive

HD.csv

Extract human density (mean, 5000m buffer) and export it to google drive

Generate predictors

GOOGLE EARTH ENGINE

8. extract_LD-AD-PA-NB-TV.py (126)

segments_GEE, GEE_archive, WDPA, GLW → LD.csv, AD.csv, PA.csv, NB.csv, TV.csv, SI.csv

Extract livestock density (LD -1500m, mean),

agricultural density (AD - 1500m, mean),

protected areas (PA - no buffer, max),

slope (NB - no buffer, mean),

ruggedness (TV - no buffer, sd of slope),

altitude (SL - no buffer, mean)

And export it to Google Drive

Generate predictors

GOOGLE EARTH ENGINE

9. extract_AR.py (85)

segments_GEE, GEE_archive, gRoads

AR.csv

Calculate accessibilitiy from roads (AR) by multiplying the MODIS land cover product with the respective coefficients of Weiss et al. (2018). Buffer size is 1,500m (aggregation level: mean). Export it to Google Drive

Generate predictors

GOOGLE EARTH ENGINE

10. extract_SC.py (80)

segments_GEE, GEE_archive

SC.csv

Calculate the accumulated 120-day (4-month) precipitation from 3 hourly resoluted reanalysis data. So, 960 layers of precipitation are summed for each individual day of observation. Buffer size is 10,000m (aggregation: mean)

Export the result to Google Drive

Generate predictors

GOOGLE EARTH ENGINE

11. extract_SS.py (35)

segments_GEE, GEE_archive, ASG → NA.csv

Extract the sodium in soils (old name NA, new name SS) with a 1,500m buffer (mean).

Generate predictors

GOOGLE EARTH ENGINE

12. extract_TC.py (71)

segments_GEE, GEE_archive → **TC.csv**

Maximum temperature at a certain of observation (buffer size 10,000m, aggregation level: mean)

Generate predictors

GOOGLE EARTH ENGINE

13. extract_TD.py (34)

segments_GEE, GEE_archive → TD.csv

Extract tree density for individual years (no buffer, aggregation level: mean)

Generate predictors

GOOGLE EARTH ENGINE

14. extract_VD.py (51)

segments_GEE, GEE_archive → VD.csv

Extract vegetation densities for 16-day intervals (no buffer, aggregation level: max)

Generate predictors

GOOGLE EARTH ENGINE

15. extract_WA.py (106)

segments_GEE, GEE_archive → WA.csv

Extract distance to water for monthly intervals (no buffer, aggregation level: mean), perform a gap-fill by using monthly occurence rates

Generate predictors

GOOGLE EARTH ENGINE

16. check_datasets.py (59)

segments_GEE, GEE_archive → VD.csv

Perform a quality check of the VD extraction – MODIS data have respective flags.

Generate predictors

GOOGLE EARTH ENGINE

17. season_change.py (247)

segments_GEE, GEE_archive → SC.csv, VD.csv, WA.csv, TC.csv

Extract SC, VD, WA, TC for the first of each month of 5 years (2010 to 2014). Aggregate the data from 5 months by the median.

Generate predictors of seasonality

GOOGLE EARTH ENGINE

18. climatechange_SC.py (134)

segments_GEE, GEE_archive → TC_cc.csv, SC_cc.csv

Extract SC and TC as described before, but using predictions from climate models (first day of each month in 1950, 2015 and 2100).

Generate predictors (climate change)

GOOGLE EARTH ENGINE

19. accessGoogleDrive.R (65)

csv files in GEC folder in google drive → yxtable.csv

Download the most recent versions of all predictors create within GEE

Do some unit conversions

Create a csv with predictors and response and additional information (ID…) – predictors are not transformed yet.

LOCAL

20. seasonality.R (252)

csv files in 5years and climate_change folder in google drive

→

yxtable_season.csv

Download the most recent versions of all predictors created within GEE (5 years period for seasonality and climate models)

Do some unit conversions

Create a csv with predictors and response – predictors are not transformed yet

Save the extracted values from the climate change model indivdually

Some plots (supplement: seasonality, climate change)

LOCAL

21. transform_scale.R (181)

yxtable_season.csv, yxtable.csv

Transformed and scaled tables, sheets for backtransformation

Transform (box-cox) and scale predictors, uses modifed_cormat.R (90)

Transformed and scaled predictors are beneficial for the modeling process.

LOCAL

22. create_singlelikelihood_nemo_input.R (126)

segments.shp, yxtable_scaled_transformed.csv → Input_data for INLA run on NEMO

Select sites, the type of cross-validation (if any), the extent of the besag-neighborhood, the model family…

Prepare a input dataset for a model run using NEMO HPC (full model or validation steps)

LOCAL

23. run_function.R (38)

Input_data for INLA run on NEMO → **Output_data of INLA run on NEMO**

Automatically select the newest input data and perform a cross-validation or full model run.

Neighborhood-file is created based on the name of the input data

Bayesian interference using INLA

24. seasonal_HS.R (38)

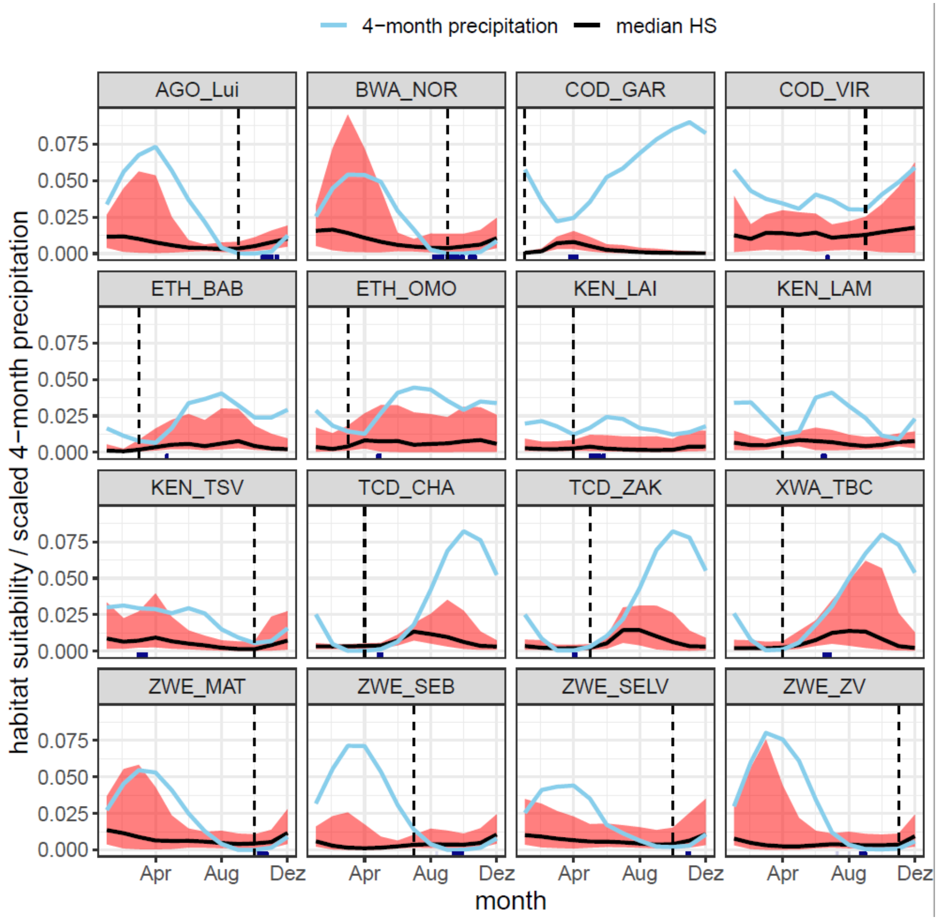
Output_data of INLA run on NEMO

xytable_minHS.csv

Predict seasonal variation of HS

Get month of minimum 3-month accumulated HS

Export dataset that depicts predictors at this month



LOCAL

24. createbufferedsegments.R (19)

segments_GEE.shp

buffered_segments.shp

Create a merged buffer of 5,000m around each spatial subunit

Buffers are the boundaries of the interpolated spatial predictions.

LOCAL

25. model_check_spatial_predictions.R (414)

Output_data of INLA run on NEMO, segments.shp, xytables (minHS…)

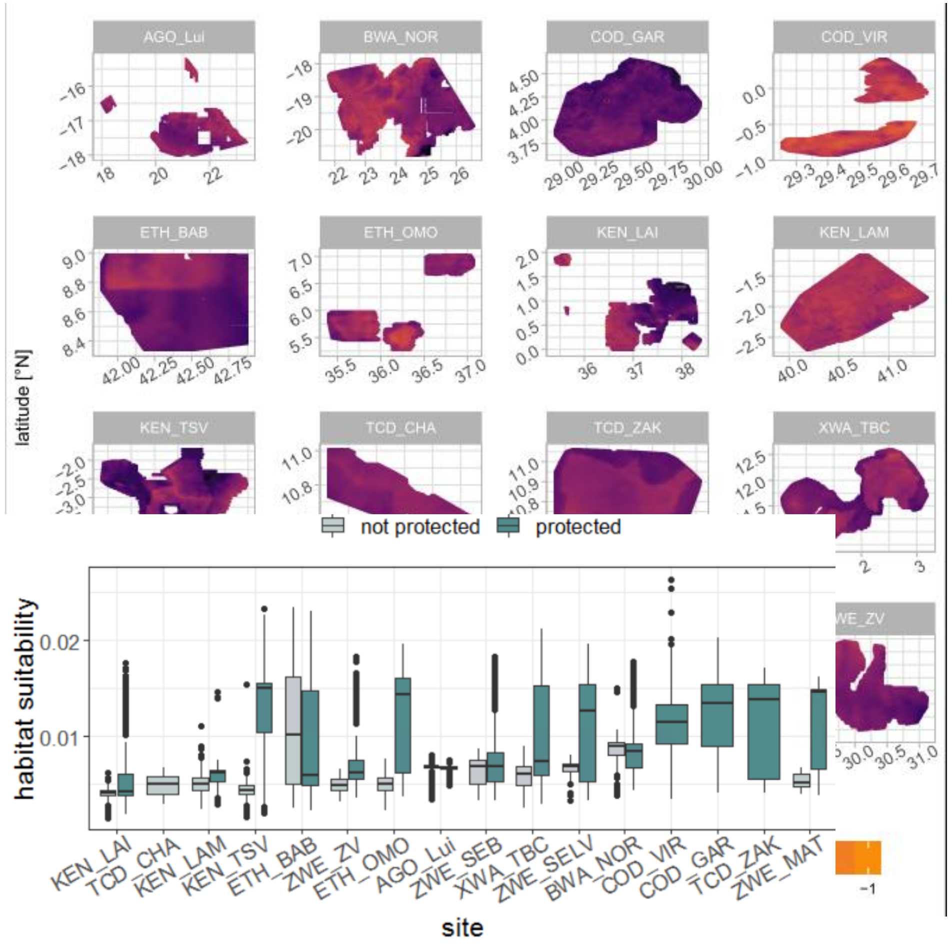
Maps, anthropogenic impact, sensitivities

Perform

Predict HS at the time of observation, at the month of minimum HS …

Predict anthropogenic impact

Predict sensitivities



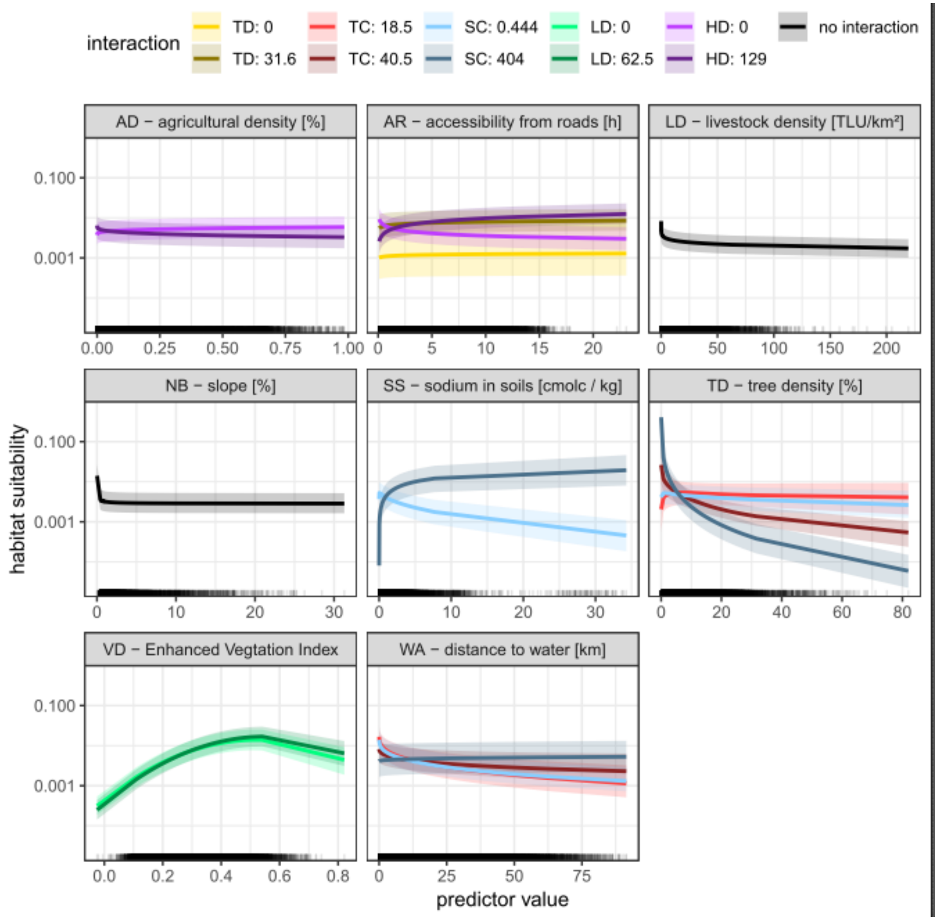
LOCAL

26. inla_effect_plots.R (271)

Output_data of INLA run on NEMO, transform sheets

Marginal effect plots

Create marginal effect plots that include interactions



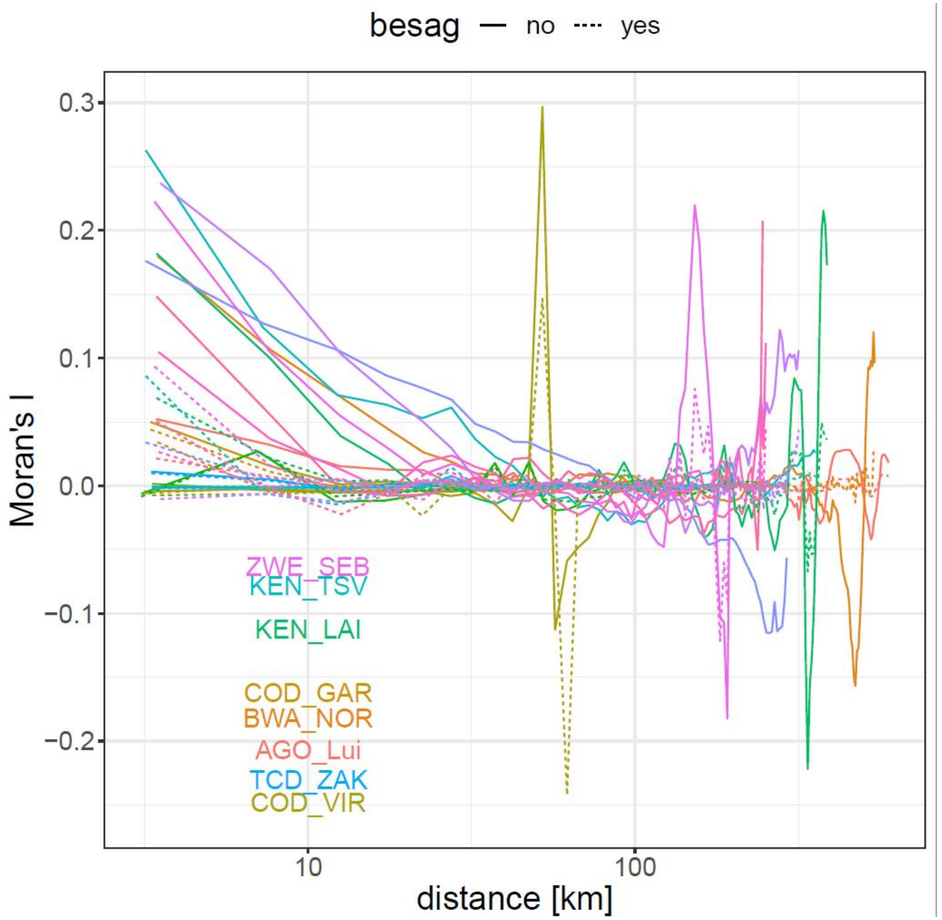
LOCAL

27. sac.R (71)

Output_data of INLA run on NEMO

correlogram

Calculate Moran‘s I from residual with and without CAR model



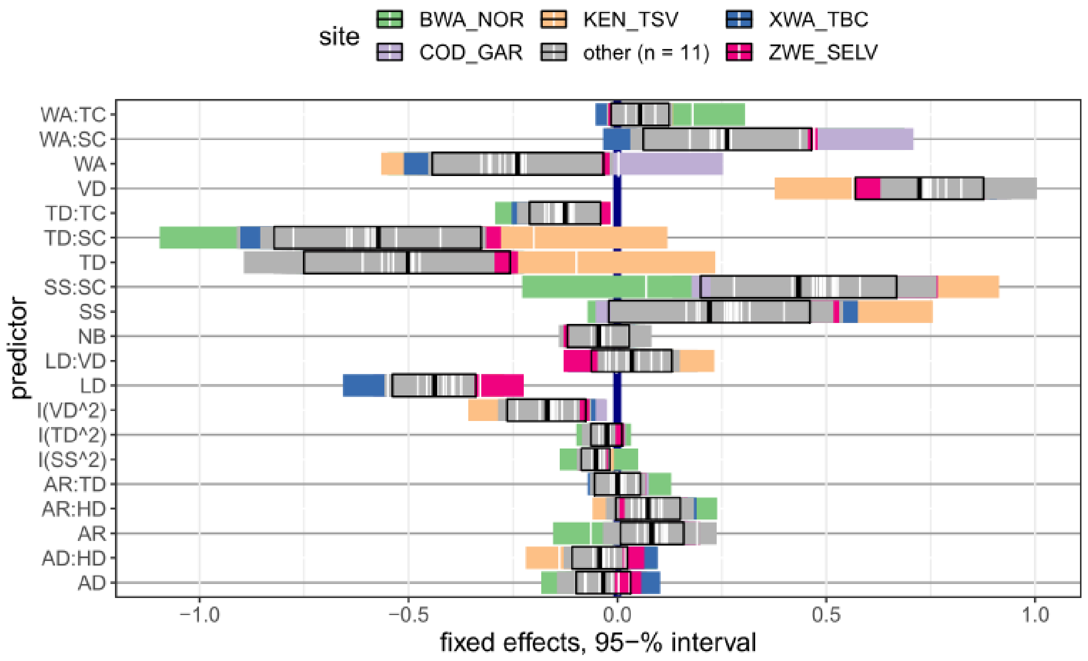
LOCAL

28. xval.R (73)

Output_data of INLA run on NEMO (including LOSO runs)

CI of fixed effects plot

Compare the CI of fixed effects of full model and LOSO runs



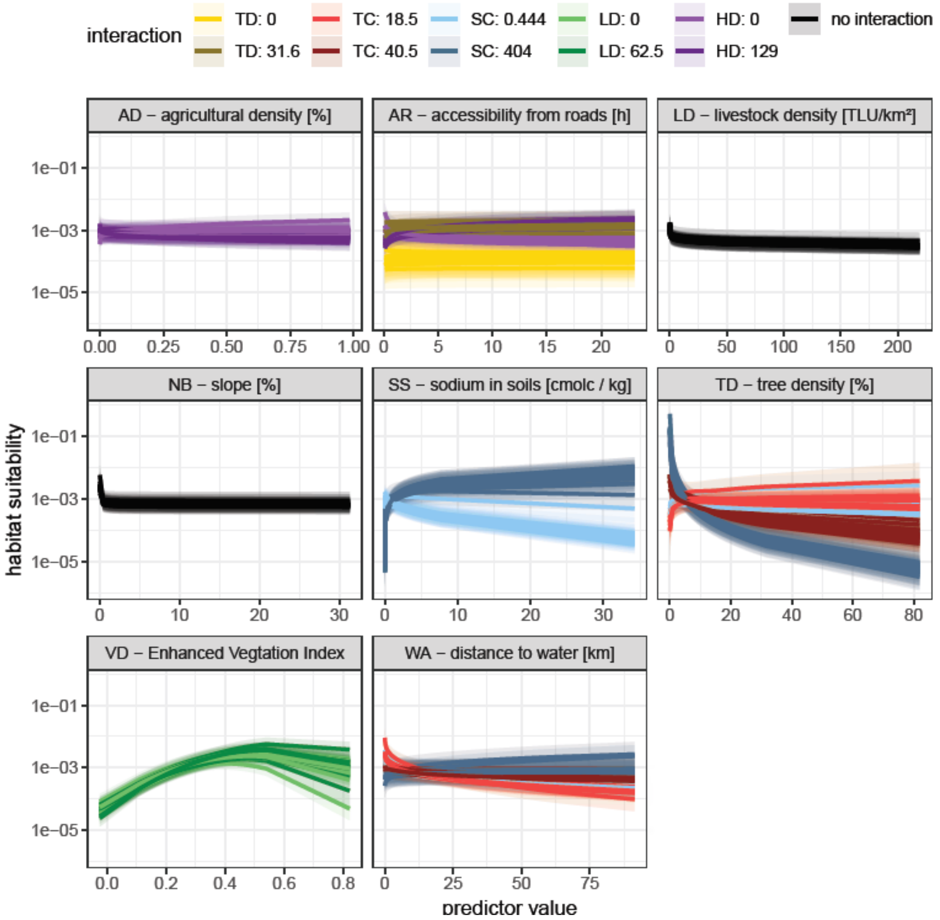
LOCAL

29. xval_effectplots.R (212)

Output_data of INLA run on NEMO (including LOSO runs)

CI of fixed effects plot

Generate effect plots of LOSO runs



LOCAL

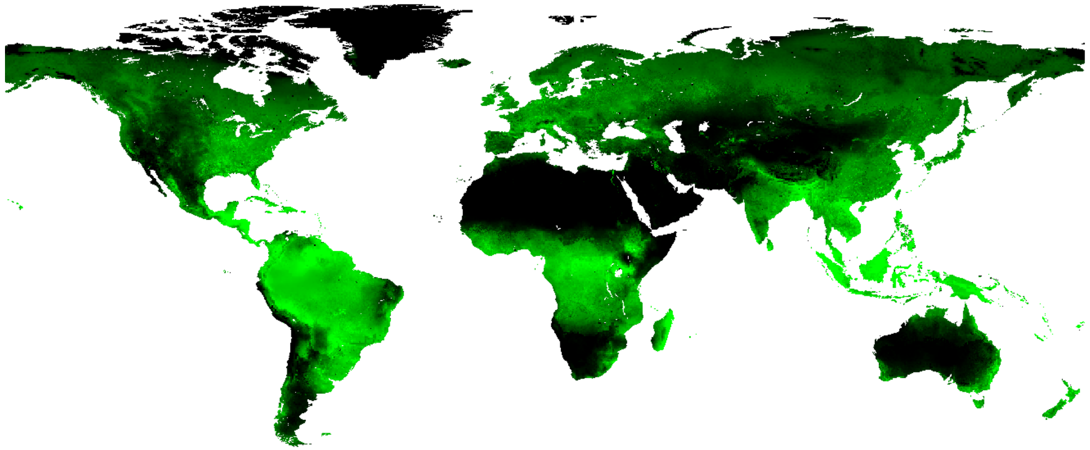
30. nc2tif (71)

IMAGE 3.0 (Stehfest et al., 2015) .nc-files

Tifs (example: NPP)

Convert .nc-files to tifs for the years 2015, 2050 and 2100.

NPP, land cover, biomass…



LOCAL

30. extract_IMAGE_rasters (57)

IMAGE 3.0 .tifs → Extracted data for spatial subunits

Extract the data of all .tif-files by spatial subunits

Extracted serves for the assessment of LUCC 2015 – 2100

LOCAL

30. create_scenarios.R (34)

IMAGE 3.0 .tifs → LUCC scenario dataframe

Combine extracted data to dataframe (change 2100 – 2015)

LOCAL

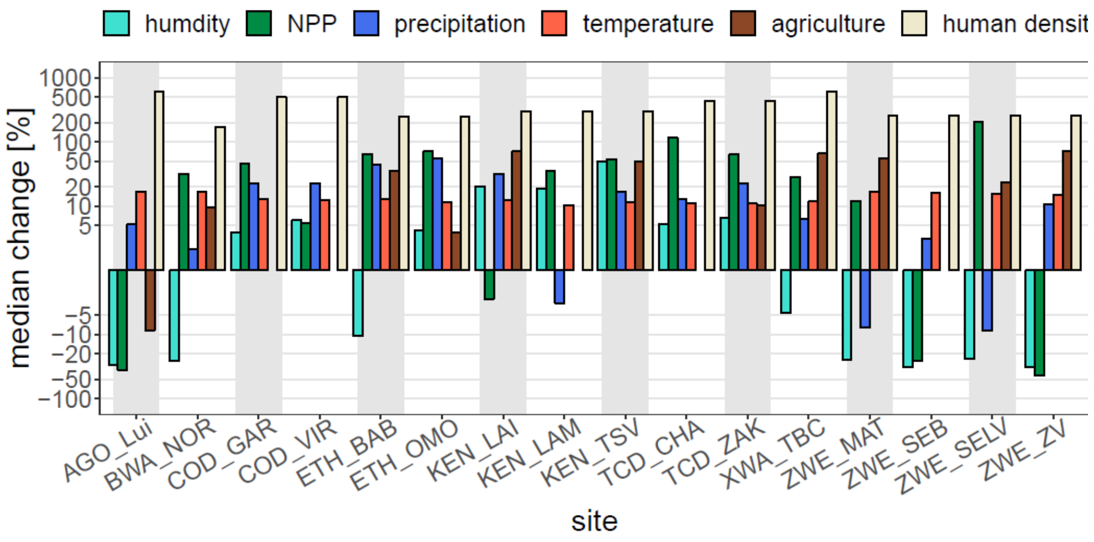
30. model_predictors_from_scenarios.R (127)

Extraction CC / LUCC

Environmental change

Combine predictions from LUCC and CC scnearios and plots change trajectories

(here I tried to model predictors from LUCC and CC scenarios – this, however, failed)



LOCAL