HOW TO GENERATE THE INPUT FILES FOR THE ECOSYSTEM SERVICES DASHBOARD

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This document is a guide on how to calculate changes in evapotranspiration and land surface temperature based on scenarios of deforestation and forest degradation within a given group of polygons (e.g., administrative units, natural protected areas, indigenous territories, etc.).

Requirements: ArcGIS license, R (https://www.r-project.org/) and R studio (https://www.rstudio.com/products/rstudio/download/)

All materials are here: --------

A. Count the number of non-forest, intact forest, degraded, and deforested cells per polygon of interest

1. Download the four MTDD rasters located in the "MTDDrasters" folder and place all of them in the same folder (do not rename them).
2. Open the script "1_CelCounts_byFC_DegDefScenarios.py" script using a Python Integrated Development Environment-IDLE (e.g., IDLE ArcGIS pro, PyScripter) and enter the user-defined parameters:

```
################### Set before running the script ######################
pathDBF = r'D:/Yunuen/6PostDoc/Dashboards/DBFCellCounts'
pathMTDD = arcpy.env.workspace = r'D:/Yunuen/6PostDoc/Dashboards/Layers'
polygons= 'D:/Yunuen/6PostDoc/Dashboards/Layers/Tis_TerritoriosIndigenas_sa_greater9sq.shp'
areaPrefix= "IndTerr"
zoneField= "objectid"
########################################################################
```

   i. pathDBF= this is the directory where the output files from this script will be located.
   ii. pathMTDD= arcpy.env.workspace = this is the directory where the MTDD rasters downloaded in step A1 are stored.
   iii. polygons= this is the shapefile containing the polygons for which the scenarios will be calculated.
   iv. areaPrefix= this is an identifier selected by the user to facilitate the identification of the output files.
   v. zoneField= this is the field that contains the values that define each polygon. It is an integer or a string field within the shapefile entered in "polygons".
3. Run the script.
4. Find the output files within the directory entered in step A2i and delete all files except the ones ending in ".dbf".

B. Calculate the evapotranspiration changes based on all possible degradation and deforestation scenarios by polygon

1. Download the four ET rasters located in the "ETrasters" folder and place all of them in the same folder (do not rename them; it can be the same folder as in step A1).
2. Open the script "2_ET_byFC_DegDefScenarios.py" script using a Python IDLE and enter the user-defined parameters:

```
################### Set before running the script ######################
pathDBF = r'D:/Yunuen/6PostDoc/Dashboards/ET/DBFiles'
pathET=arcpy.env.workspace = r'D:/Yunuen/6PostDoc/Dashboards/Layers'
polygons= 'D:/Yunuen/6PostDoc/Dashboards/Layers/Tis_TerritoriosIndigenas_sa_greater9sq.shp'
areaPrefix= "IndTerr"
zoneField= "objectid"
########################################################################
```

   i. pathDBF= this is the directory location where the output files from this script will be located (it has to be a directory different from the one entered in step A2i).
   ii. pathET=arcpy.env.workspace= this is the directory where the ET rasters downloaded in step B1 are stored.
   iii. polygons=this is the shapefile containing the polygons for which the scenarios will be calculated.
   iv. areaPrefix= this is an identifier selected by the user to facilitate the identification of the output files (same as in step A2iv).
   v. zoneField= this is the field that contains the values that define each polygon. It is an integer or a string field within the shapefile entered in "polygons".

3. Run the script.
4. Find the output files within the directory entered in step B2i and delete all files except the ones ending in ".dbf".
5. Open the script "3_ET_scenariosDeg&Def.R" using R studio and enter the user-defined parameters:

```
############################ User-defined parameters ###################################################
# Set study area prefix
prefix<-"IndTerr"
# Set up the working directory where all the .dbf files with the variable values are located
dir.var <- "D:/Yunuen/6PostDoc/Dashboards/ET/DBFiles"
# Set up the working directory where all the .dbf files with the cell counts are located
dir.cellcounts<- "D:/Yunuen/6PostDoc/Dashboards/DBFCellCounts"
#Set the name of the output directory where the results will be stored
dir.out <- "D:/Yunuen/6PostDoc/Dashboards/Output"
#Number of polygons in the shapefile
polNum<- 554
########################################################################################################
```

   i. prefix= this is the same identifier entered in steps A2iv and B2iv.
   ii. dir.var= this is the directory entered in step B2i.
   iii. dir.cellcounts= this is the directory entered in step A2i.
   iv. dir.out=this is the directory where the results will be stored (it can be a non-existant folder, the script will create it).
   v. polNum= this is the number of polygons contained in the shapefile entered in steps A2iii and B2iii.

6. Select all code lines and run the script.

7. Find the .csv output files within the directory entered in step B5iv.

C. Calculate the land surface temperature changes based on all possible degradation and deforestation scenarios by polygon

1. Download the four LST rasters located in the "LSTrasters" folder and place all of them in the same folder (do not rename them; it can be the same folder as in steps A1 and B1).
2. Open the script "2_LST_byFC_DegDefScenarios.py" script using a Python IDLE and enter the user-defined parameters:

```
################### Set before running the script ######################
pathDBF = r'D:/Yunuen/6PostDoc/Dashboards/LST/DBFiles'
pathLST=arcpy.env.workspace = r'D:/Yunuen/6PostDoc/Dashboards/Layers'
polygons= 'D:/Yunuen/6PostDoc/Dashboards/Layers/Tis_TerritoriosIndigenas_sa_greater9sq.shp'
areaPrefix= "IndTerr"
zoneField= "objectid"
########################################################################
```

   i. pathDBF= this is the directory location where the output files from this script will be located (it has to be a directory different from the one entered in steps A2i and B2i).
   ii. pathET=arcpy.env.workspace= this is the directory where the LST rasters downloaded in step C1 are stored.
   iii. polygons=this is the shapefile containing the polygons for which the scenarios will be calculated.
   iv. areaPrefix= this is an identifier selected by the user to facilitate the identification of the output files (same as in steps A2iv and B2iv).
   v. zoneField= this is the field that contains the values that define each polygon. It is an integer or a string field within the shapefile entered in "polygons".

3. Run the script.
4. Find the output files within the directory entered in step C2i and delete all files except the ones ending in ".dbf".
5. Open the script "3_LST_scenariosDeg&Def.R" using R studio and enter the user-defined parameters:

```
#########################################################################################################
# Set study area prefix
prefix<-"IndTerr"
# Set up the working directory where all the .dbf files with the variable values are located
dir.var <- "D:/Yunuen/6PostDoc/Dashboards/LST/DBFiles"
# Set up the working directory where all the .dbf files with the cell counts are located
dir.cellcounts<- "D:/Yunuen/6PostDoc/Dashboards/DBFCellCounts"
#Set the name of the output directory where the results will be stored
dir.out <- "D:/Yunuen/6PostDoc/Dashboards/Output"
#Number of polygons in the shapefile
polNum<- 554
#########################################################################################################
```

   i. prefix= this is the same identifier entered in steps A2iv, B2iv, and C2iv.
   ii. dir.var= this is the directory entered in step C2i.
   iii. dir.cellcounts= this is the directory entered in step A2i.
   iv. dir.out=this is the directory where the results will be stored (thi has to be the same folder as in step B5iv).

v. polNum= this is the number of polygons contained in the shapefile entered in steps A2iii, B2iii, and C2iii.

6. Select all code lines and run the script.
7. Find the .csv output files within the directory entered in steps B5iv and C5iv.

The three .cvs files located in the directory entered in steps B5iv and C5iv (Prefix_ET_ScenariosDegDef.csv, Prefix_LST_ScenariosDegDef.csv, Prefix_FCareas_ET&LSTvalues.csv) plus the polygons shapefile are the input files to create the Ecosystem Services Dashboard.