Metis – Cheat Sheet

https://github.com/JGCRI/metis

Metis Cheat sheet

Extended Examples

Install

Metis is an R package. The code in this cheat sheet are all meant to be run in R.

Install R: https://www.r-project.org/
Install R Studio: https://www.rstudio.com/

```
install.packages("devtools")
devtools::install_github("JGCRI/rgcam")
devtools::install_github("JGCRI/metis")
```

Note: The first time installation can take a while to get the required packages and data.

UBUNTU additional steps:

```
sudo add-apt-repository ppa:ubuntugis/ppa
sudo apt-get update
sudo apt-get install libudunits2-dev libgdal-dev
libgeos-dev libproj-dev libmagick++-dev
```

MAC OSX additional steps:

```
brew install pkg-config
brew install gdal
brew install imagemagick@6
```

metis.readgcam

metis.readgcam() reads data from a GCAM database and formats it for metis charts and maps

Key Inputs:

- gcamdatabase **OR** dataProjFile (try exampleGCAMProj)
- scenOrigNames (Optional) (Subset scenarios)
- regionsSelect (Optional) (Subset regions)
- paramsSelect (Optional) (Param list on page 2)
- dirOutputs (Optional) (Default is your working dir)

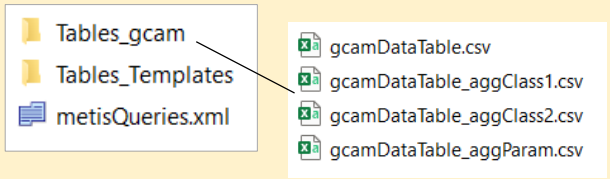
```
library(metis)

dataGCAM <- metis.readgcam (
    #gcamdatabase = "Path_to_GCAMdatabase",
     dataProjFile = metis::exampleGCAMProj)

df <- dataGCAM$data
dfParam <- dataGCAM$dataAggParam
dfClass1 <- dataGCAM$dataAggClass1
```

Key Outputs:

- Function returns a list with data (df above) AND
- Data also saved in dirOutputs/readGCAM folder



- gcamDataTable.csv has all data
- gcamDataTable_aggClass1.csv has data aggregated to class1 (same for class 2 and param)

metis.chartsProcess

In progress…

metis.mapsProcess

metis.mapsProcess() plots R or .csv data onto pre-loaded metis maps by Basins, States and Countries

Key Inputs:

- polygonDataTables OR gridDataTables (R data or .csv with at least "subregion" and "value" columns. Additional columns accepted: param, x, class,lat,lon)
- subRegShape (Optional) (Custom map or page 2 maps)
- xRange (Optional) (Choose years range)
- scenRef (Optional) (Choose Ref scen for diff plots)
- nameAppend (Optional) (Append name to files)
- dirOutputs (Optional) (Default is your working dir)

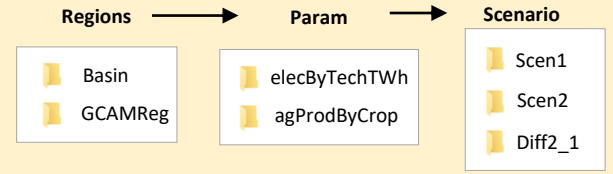
```
ibrary(metis); library(dplyr)

data = metis::exampleMapDataParam %>%
filter(param %in% c("elecByTechTWh", "agProdByCrop"))
metis.mapsProcess(polygonDataTables=data,
            xRange=c(2010,2020,2030))

data = metis::exampleMapDataClass %>%
 filter(param %in% c("watWithdrawBySec"))
metis.mapsProcess(polygonDataTables=data,
            xRange=c(2010,2020,2030),
            scenRef="SSP3", # For Diff maps
            nameAppend="class")
```

Key Outputs:

- Series of maps saved in dirOutputs/Maps in the folders:



metis.readGCAM paramsSelect list

Pick individual parameters or the param-set name (energy, water, livestock, landuse, ag, water, socioecon)

energy

- energyPrimaryByFuelEJ
- energyPrimaryRefLiqProdEJ
- energyFinalConsumBySecEJ
- energyFinalByFuelBySectorEJ
- energyFinalSubsecByFuelTranspEJ
- energyFinalSubsecByFuelBuildEJ
- energyFinalSubsecByFuelIndusEJ
- energyFinalSubsecBySectorBuildEJ
- energyFinalConsumByIntlShpAvEJ
- energyPrimaryByFuelMTOE
- energyPrimaryRefLiqProdMTOE
- energyFinalConsumBySecMTOE
- energyFinalbyFuelMTOE
- energyFinalSubsecByFuelTranspMTOE
- energyFinalSubsecByFuelBuildMTOE
- energyFinalSubsecByFuelIndusMTOE
- energyFinalSubsecBySectorBuildMTOE
- energyFinalConsumByIntlShpAvMTOE
- energyPrimaryByFuelTWh
- energyPrimaryRefLiqProdTWh
- energyFinalConsumBySecTWh
- energyFinalbyFuelTWh
- energyFinalSubsecByFuelTranspTWh
- energyFinalSubsecByFuelBuildTWh
- energyFinalSubsecByFuelIndusTWh
- energyFinalSubsecBySectorBuildTWh
- energyFinalConsumByIntlShpAvTWh

electricity

- elecByTechTWh
- elecCapByFuel
- elecFinalBySecTWh
- elecFinalByFuelTWh
- elecNewCapCost
- elecNewCapGW
- elecAnnualRetPrematureCost
- elecAnnualRetPrematureGW
- elecCumCapCost
- elecCumCapGW
- elecCumRetPrematureCost
- elecCumRetPrematureGW

transport

- transportPassengerVMTByMode
- transportFreightVMTByMode
- transportPassengerVMTByFuel
- transportFreightVMTByFuel

water

- watConsumBySec
- watWithdrawBySec
- watWithdrawByCrop
- watBioPhysCons
- watIrrWithdrawBasin
- watIrrConsBasin
- watSupRunoffBasin

socioecon

- gdpPerCapita
- gdp
- gdpGrowthRate
- pop

ag

- agProdbyIrrRfd
- agProdBiomass
- agProdForest
- agProdByCrop

livestock

- livestock_MeatDairybyTechMixed
- livestock_MeatDairybyTechPastoral
- livestock_MeatDairybyTechImports
- livestock_MeatDairybySubsector

land

- landIrrRfd
- landIrrCrop
- landRfdCrop
- landAlloc
- landAllocByCrop

emissions

- emissNonCO2BySectorGWPAR5
- emissNonCO2BySectorGTPAR5
- emissNonCO2BySectorOrigUnits
- emissLUC
- emissCO2BySectorNoBio
- emissNonCO2ByResProdGWPAR5
- emissMethaneBySourceGWPAR5
- emissByGasGWPAR5FFI
- emissByGasGWPAR5LUC
- emissBySectorGWPAR5FFI
- emissBySectorGWPAR5LUC
- emissNonCO2ByResProdGTPAR5
- emissMethaneBySourceGTPAR5
- emissByGasGTPAR5FFI
- emissByGasGTPAR5LUC
- emissBySectorGTPAR5FFI
- emissBySectorGTPAR5LUC

Example Usage of params

```
library(metis)
df1 <- metis.readgcam(dataProjFile=metis::exampleGCAMproj, paramsSelect="energy", saveData = F)
df2 <- metis.readgcam(dataProjFile=metis::exampleGCAMproj, paramsSelect="elecByTechTWh",
                      saveData = F)
head(df1$data); head(df2$data)
```

Metis Maps list

Select Color Palettes

- pal_hot
- pal_wet
- pal_green
- pal_spectral
- pal_metis
- pal_Div_RdBl
- pal_Div_RdBlu
- pal_Div_BrGn
- pal_16
- pal_Div_BrGn

Select Map List

- mapGCAMReg32
- mapGCAMBasins
- mapGCAMLand
- mapGCAMBasinsUS49
- mapIntersectGCAMBasin32Reg
- mapIntersectGCAMBasinCountry
- mapHydroShed1
- mapHydroShed2
- mapHydroShed3
- mapCountries
- mapStates
- mapUS49
- mapUS49County
- mapUS49HUC2
- mapUS49HUC4

Quick View of Maps:

```
library(sp); library(metis);
head(mapGCAMReg32@data)
sp::plot(mapGCAMReg32)
metis::metis.map(mapUS49,printFig=F,
fillColumn="subRegion", labels=T)
```