Geographic Information Systems 2018/19
Week 12, Topic 1

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In this session…

Bringing it all together – a worked example

Worked Example

A somewhat silly project (based on last week's example):

"Grape growing in the Gaeltacht"

Scenario

1. You have been awarded a grant (funding) to determine suitable areas for growing grapes in the Gaeltacht (Irish-speaking) regions of Ireland
2. You must ignore the obvious climatic challenges (you're an optimist and your funder is naive)
3. The suitable areas must be
    1. Inside the Gaeltacht areas
    2. On South-facing slopes
    3. Not too flat (to allow for drainage)
    4. Not too steep (to allow for machine access)

Data requirements

- Boundary files
  - Country as a whole
    - Shapefile: *Census2011_Province_Modified* from Census Assignment
  - Gaeltacht areas
    - Shapefile: *Census2011_Gaeltacht_Modified* from Census Assignment
- Height Model (DEM)
  - 4 x SRTM tiles that cover Ireland
    - TIFF files: *srtm_34_01*, *srtm_34_02*, *srtm_35_01*, *srtm_35_02* from Dropbox distribution folder
- OpenStreetMap for background and context
  - We don’t need to extract from this just use as backdrop

Process

Organise data

Make sure that all datasets are in a useful format and in a consistent CRS (Irish Grid)

Boundary files re OK

DEMs need to be

1. Combined
2. Reprojected
3. Relevant area (Ireland) extracted

Result is a more manageable DEM

Process Detail

1. Use GDAL **merge** to combine input DEMs

2. Use GDAL **warpreproject** to reproject combined DEM from WGS84 to Irish Grid

3. Use GDAL **cliprasterbymasklayer** to extract Ireland using *Census2011_Province_Modified* as a template

Process

From the DEM we need

- Slope (must be between 20 and 45 degrees)
- Aspect (Must be facing South – between 160 and 200 degrees)
- Hillshade (used for context and visual appeal)

Next

- Extract cells meeting slope and aspect into new ***binary*** rasters

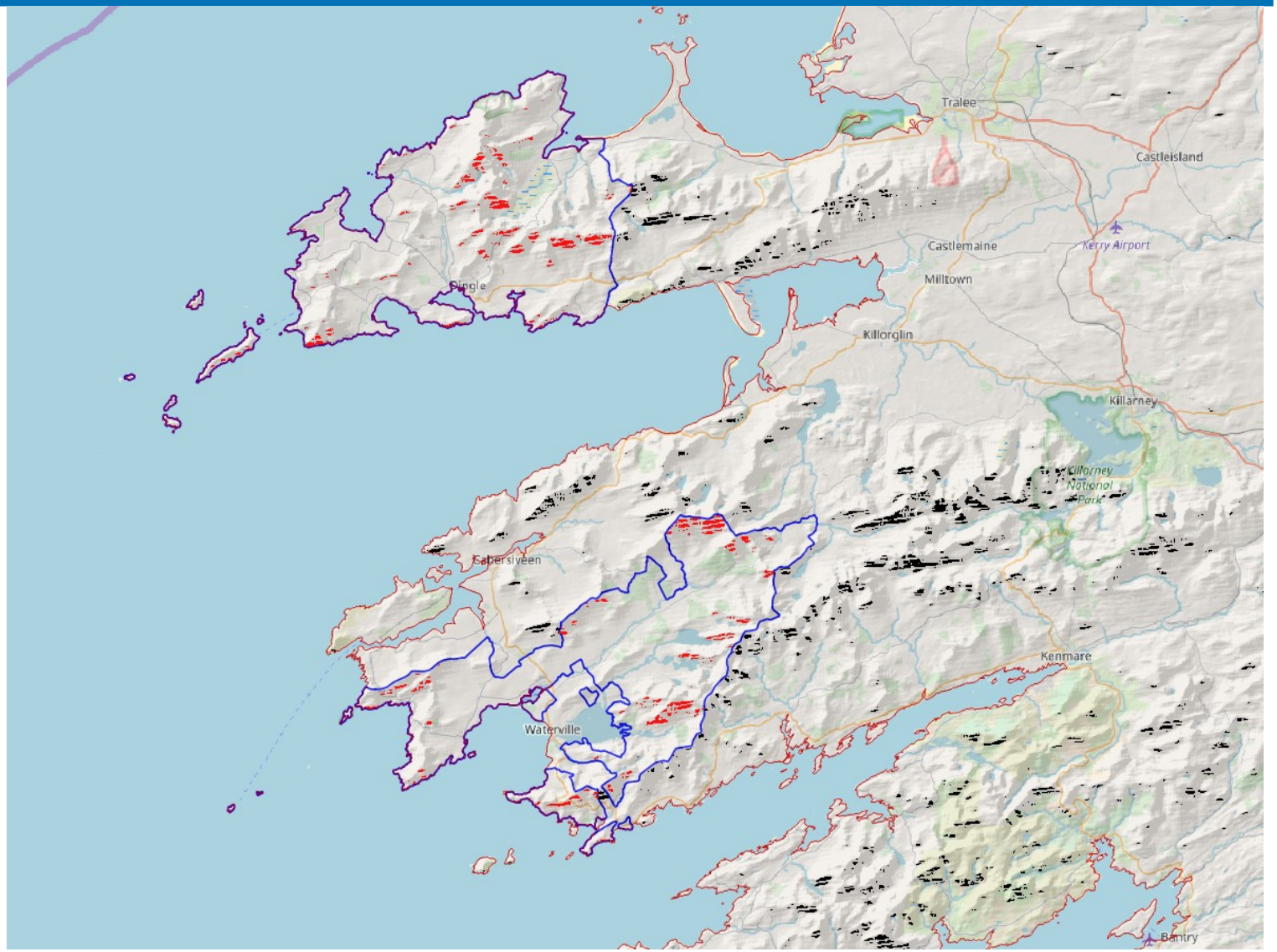
Process Detail

1. Use GDAL **hillshade**, **aspect** and **slope** to calculate new rasters for these
2. Use GRASS **r.reclass** to reclassify aspect and slope into new binary rasters using appropriate rules
3. Use GDAL **rastercalculator** to combine reclassified aspect and slope rasters by multiplying each corresponding cell – 1x1 = 1 therefore the resulting binary raster will have cells that meet *both* criteria
4. Use GDAL **cliprasterbymasklayer** to extract the parts of the suitability raster that lie inside the Gaeltacht regions by using *Census2011_Gaeltacht_Modified* as a template
5. Symbolise and show outputs on QGIS as appropriate

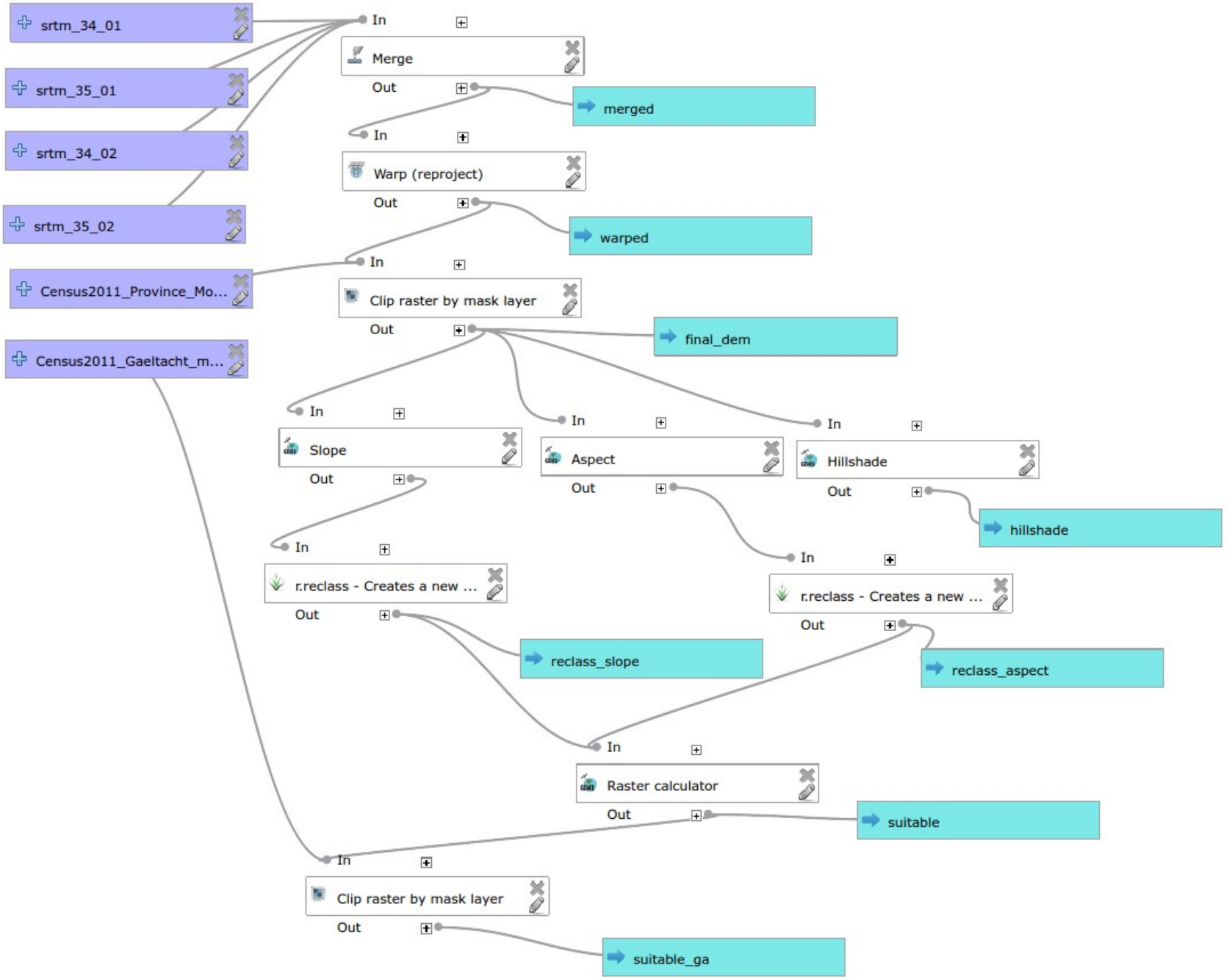
Sample output

Note the Red shaded areas, these meet all the criteria. The black shaded areas meet the criteria but are not in the Gaeltcht region (outlined in blue).

Note that we only use the hillshade model for context and visual appeal



Model


srtm_34_01
srtm_35_01
srtm_34_02
srtm_35_02
Census2011_Province_Mo...
Census2011_Gaeltacht_m...
In
Merge
Out
merged
In
Warp (reproject)
Out
warped
In
Clip raster by mask layer
Out
final_dem
In
Slope
Out
In
Aspect
Out
In
Hillshade
Out
hillshade
In
r.reclass - Creates a new ...
Out
reclass_slope
In
r.reclass - Creates a new ...
Out
reclass_aspect
In
Raster calculator
Out
suitable
In
Clip raster by mask layer
Out
suitable_ga

Model (as ugly Python code)

```
##grapes18=name
##srtm3502=raster
##census2011provincemodified=vector
##srtm3501=raster
##census2011gaeltachtmodified=vector
##srtm3402=raster
##srtm3401=raster
##warped=output raster
##reclassaspect=output raster
##reclassslope=output raster
##merged=output raster
##hillshade=output raster
##suitable=output raster
##finaldem=output raster
##suitablega=output raster
outputs_GDALOGRMERGE_1=processing.runalg('gdalogr:merge', [srtm3502,srtm3501,srtm3402,srtm3401],False,False,-32768.0,4,merged)
outputs_GDALOGRWARPREPROJECT_1=processing.runalg('gdalogr:warpreproject',
outputs_GDALOGRMERGE_1['OUTPUT'],'EPSG:4326','EPSG:29902',None,0.0,0,False,None,'',5,4,75.0,6.0,1.0,False,0,False,None,warped)
outputs_GDALOGRCLIPRASTERBYMASKLAYER_1=processing.runalg('gdalogr:cliprasterbymasklayer',
outputs_GDALOGRWARPREPROJECT_1['OUTPUT'],census2011provincemodified,None,False,False,False,5,4,75.0,6.0,1.0,False,0,False,None,finaldem)
outputs_GDALOGRASPECT_1=processing.runalg('gdalogr:aspect', outputs_GDALOGRCLIPRASTERBYMASKLAYER_1['OUTPUT'],1.0,False,False,False,False,None)
outputs_GDALOGRHILLSHADE_1=processing.runalg('gdalogr:hillshade',
outputs_GDALOGRCLIPRASTERBYMASKLAYER_1['OUTPUT'],1.0,False,False,1.0,1.0,315.0,45.0,hillshade)
outputs_GDALOGRSLOPE_1=processing.runalg('gdalogr:slope', outputs_GDALOGRCLIPRASTERBYMASKLAYER_1['OUTPUT'],1.0,False,False,False,1.0,None)
outputs_GRASS7R.RECLASS_2=processing.runalg('grass7:r.reclass', outputs_GDALOGRASPECT_1['OUTPUT'],'','160 thru 200 = 1\n* =
NULL',None,0.0,reclassaspect)
outputs_GRASS7R.RECLASS_1=processing.runalg('grass7:r.reclass', outputs_GDALOGRSLOPE_1['OUTPUT'],'','20 thru 45 = 1\n* = NULL',None,0.0,reclassslope)
outputs_GDALOGRRASTERCALCULATOR_1=processing.runalg('gdalogr:rastercalculator',
outputs_GRASS7R.RECLASS_2['output'],'1',outputs_GRASS7R.RECLASS_1['output'],'1',None,'1',None,'1',None,'1',None,'1','A*B',None,5,None,suitable)
outputs_GDALOGRCLIPRASTERBYMASKLAYER_2=processing.runalg('gdalogr:cliprasterbymasklayer',
outputs_GDALOGRRASTERCALCULATOR_1['OUTPUT'],census2011gaeltachtmodified,None,False,False,False,5,4,75.0,6.0,1.0,False,0,False,None,suitablega)
```

Coming next...

Review and wrap up