# Create SHETRAN DEM and Mask Data

This uses ArcView (Version 9) to create a catchment/watershed for a river catchment. From there both a SHETRAN DEM and a SHETRAN mask data file can be easily created. The procedure can either the ASTER 30m DEM dataset or the SRTM 90M DEM dataset

The ASTER dataset (http://asterweb.jpl.nasa.gov/gdem.asp) has free to download 30m DEM of nearly the whole of the Earth's land surface. The SRTM dataset is also free to download (http://srtm.csi.cgiar.org/). You seem to be able to download both from the Digital Elevation section in the Earth Explorer website (http://earthexplorer.usgs.gov/). The data is downloaded in GoeTIFF format. It has geographic lat/long coordinates and the Aster dataset has a 1 arcsecond (approximately 30 m) grid. It is referenced to the WGS84/EGM96 geoid.

GeoTiff data can be read directly in ArcMap (within the ArcView software package)

A similar procedure can be used for other DEM datasets. For example, if you download data from Digimap (ordnance survey map collection -> data download services -> data download -> OS land-form profile DTM, 10000 or 1,50000) you can download DEM in either 10m or 50m grids in British National Grid. This needs an additional stage to convert the NTF data to ASCII data (e.g. Map Manager Software).You need to add the data using the ArcMap ARCToolbox and using (**Conversion Tools -> To Raster -> ASCII to Raster**)

## 1. DEM in ArcMap

In ArcMap use is made of the ArcToolbox. This can be displayed by clicking on **Window -> ArcToolbox**

In **File -> Add data** select the appropriate file e.g. ASTGTM_N54W003_dem.tif

The DEM data range is over a strange scale. Double click on the dataset (e.g. ASTGTM_N54W003_dem.tif ) in **Layers**, click on **classified** then **OK**

If the catchment is over several datasets then add all the required datasets to ArcMap. Then in **ArcToolbox** go to
**Data Management tools -> Raster -> Mosiac to New raster**

Add all the input rasters, e.g.
ASTGTM_N54W003_dem.tif
ASTGTM_N54W002_dem.tif
In **Output Location** choose a folder
In **Raster dataset name with extension** choose a name and leave the extension blank for a grid

## 2. Convert to projected coordinate system

The GeoTiff data is in lat/long coordinates. To convert to a projected coordinate system (i.e national grid system such as the British National Grid) in the **Arctoolbox** go to:
**Data Management tools -> Projections and Transformations -> raster -> Project raster** select the DEM created in 1. In **Output coordinate system** select the appropriate national grid (**Coordinate system -> Select…**) (e.g. **projected coordinate system -> National grids -> British National grid.prj**) In **resampling technique** choose **bilinear** or **cubic**. The **output cell size** is automatically set (in this case at 30.822m). This can be set at the desired size for the catchment boundary and SHETRAN files (e.g. 100m) in which case stage 3 (see below) is not needed.

The display in the bottom right of the screen will still be in lat/long coordinates. This can be modified by selecting

**View -> Data fame properties** and selecting a coordinate system (e.g. **predefined** -> **projected coordinate system -> National grids -> British National grid.prj**)

The display in the bottom right of the screen will now be in the projected coordinate system.

## 3. Change grid size

In **Spatial Analyst Tools -> Generalisation -> Aggregate**
Select the DEM with the new coordinate system. The **cell factor** is the factor by which to multiply the cell size (i.e 3 to convert from 30m to 90m). The **aggregation technique** should be **median**

## 4. Clip the DEM

If the DEM covers too big an area it may need clipping.
In **Data Management tools -> raster -> clip** select the DEM dataset and the new rectangle

## 5. Create a catchment

**a. Fill Sinks**

- **Spatial analyst tools -> hydrology -> Fill.** The **z-limit** is generally left blank, however, it may need to be altered.

**b. Determine Flow Direction and Accumulation**

- **Spatial analyst tools -> hydrology -> Flow Direction**
- **Spatial analyst tools -> hydrology -> Flow Accumulation.** The flow accumulation shows the location of the river channels.

**c. Create Pourpoint shapefile**

- In Arc Catalog create a new shapefile **File -> New -> Shapefile.** Call the file pour-point
- Add the new file to **ArcMap File -> Add Data - > pour-point.shp**
- Make sure the editor toolbox is open (right click on grey screen at the top and select **editor**). Edit pour-point.shp dataset (**editor -> start editing**) and click on the picture on the pencil (**Sketch tool**) and click where the exit of the channel should be (i.e. the pour point which can seen from the **flow accumulation** data layer) which delineates where you want the basin to. Stop editing (**editor -> stop editing**).

**d. Create actual watersheds**

- **Spatial analyst tools -> hydrology -> Watershed.** Use flow direction from b. and pour point from c. This procedure is very sensitive to the exact location of the pour point. If this does not work try a very slightly different location for the pour point. Go to **editor -> start editing.** Click on the arrow **(Edit tool)** move the location of the pour point and stop editing (**editor -> stop editing**). (Note: I also seem to have more problems if the catchment is north-east of the pour point. i.e. for rivers flowing in a south-west direction. So to make it work I will try to choose a section flowing in a different direction i.e. a north-west flowing section)

# 6. Output SHETRAN DEM and Mask

Zoom so that the entire catchment is just visible in the display (you may also need to change the size of the window). Then in
**Conversion Tools -> From Raster -> Raster to ASCII.** select the catchment (or watershed) dataset created in 5d. Click on
**Environments -> General Settings -> Output Extent** (you need to scroll down) **- > Same as Display**

Do the same for the DEM data

There may be better ways of doing some of the above, but this is what works for me.. Thanks to Isabella Bovolo for the original document on which this is based.

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