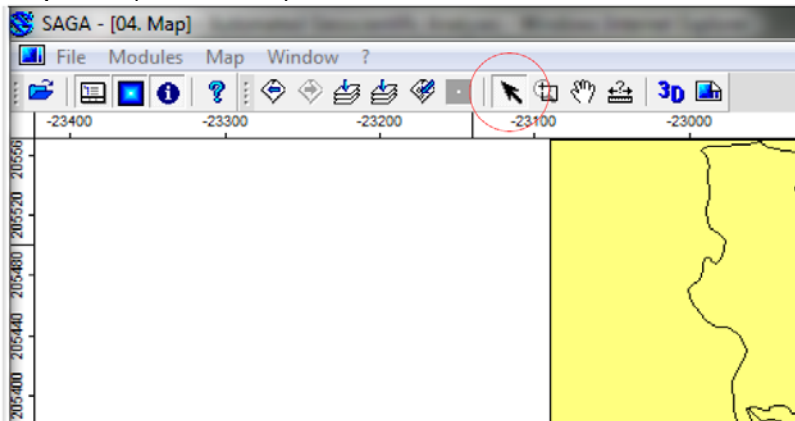


Using GIS for preparing Rockyfor3D input data in 10 steps

Before starting, install QGIS (download from www.qgis.org) and SAGA GIS (download from www.saga-gis.org).

Step	Description
1	<p>Make a hillshade map using a digital elevation model (DEM). This can be done either in SAGA GIS or in QGIS:</p> <ol style="list-style-type: none"> In SAGA GIS, import your DEM or digital terrain model (DTM) via “<i>Modules>File>Grid>Import>...</i>”. After importing, the data will appear in the Data tab of the Workspace window under the heading Grid. Then, use “<i>Modules>Terrain Analysis>Lighting>Analytical Hillshading</i>”. In the opened window select the input grid (the DTM) and subsequently set the Exaggeration value to 2, for creating a map with bright colours. Press Okay. After successful module execution, double-click the raster map "Analytical hillshading" in the Data tab of the Workspace window to visualise the hillshade raster in a map. Then save the hillshade as ESRI Arc/Info Grid using “<i>Modules>File>Grid>Export>Export ESRI Arc/Info Grid</i>”. In the opened window select the input grid. For choosing the output file name, click in the empty cell to the right from “File”. SAGA automatically adds the extension .asc to the given file name. Other important settings: Format = ASCII, ASCII precision for integer type grids = 0, for double type grids precision = 2, ASCII Decimal Separator needs to be a point (.). Then click okay for exporting the grid. In QGIS, download the plugin hillshading and follow the instructions.
2	<p>In QGIS, display the background you would like to use (created hillshade, orthophotos or slope map (a slope map can be created on the basis of the DTM in SAGA GIS, analogue to step 1.1, using “<i>Modules>Terrain Analysis>Morphometry>Slope, Aspect, Curvature</i>”) to prepare the digitizing of the terrain polygons. Save the slope map as defined in step 1 (Careful !!! the slope angles are given in radians and not in degrees, multiply the grid by $180/\pi()$ to calculate degrees using the grid calculator in SAGA GIS).</p>
3	<p>In QGIS, add the template terrain.shp (downloadable from http://www.ecorisq.org/openFTP/RF3D_script.zip) in QGIS using the menu “Layer>Add Vector Layer” or using the button “Add Vector Layer”. The template terrain.shp already contains the attribute structure that is needed for the different required rasters that will be created from it.</p>
4	<p>In QGIS, save the opened template terrain.shp in a new, specific project directory using the menu “Layer>Save as...”. Only fill in the name, keep the other settings as they were.</p>
5	<p>In QGIS, close the shapefile terrain.shp and open the newly created terrain.shp.</p>
6	<p>In QGIS, before one starts with set the project properties using the menu “Settings>Project Properties”. In the “General” tab select your proper “Layer units” (e.g, Meters) and in the section “Digitizing” activate “Enable topological editing”. In addition click “Avoid intersections of new polygons” and tick your shapefile terrain.shp. Then click “Snapping options” and under Layer tick your shapefile terrain.shp; under Mode select to “to vertex and segment”, under Tolerance put the value 1 (or 5 if you want to be less precise or 0.5 if you</p>

	<p>want to be more precise) and under <i>Units</i> select “map units”. Finally, additional useful settings concerning digitizing, such as line colour, can be found in the menu “Settings>Options” in the “Digitizing” tab.</p>
7	<p>To start digitizing in QGIS, use the menu “Layer>Toggle editing”. To successfully digitize your terrain polygons it is advisable to read Section 5.5 of the Quantum GIS User Guide (<i>tip: one can digitise one large polygon around the complete study area and cut this large polygon repeatedly into smaller ones; this avoids snapping and overlap problems of adjacent polygons</i>). After finishing digitizing a field polygon using a right mouse click all the attribute values of that polygon have to be completed. Do not forget to save your shapefile repeatedly and surely at the end before you finish editing using the same “Toggle editing” button. Now all the polygons are digitized and all attributes values are recorded, QGIS can be closed.</p>
8	<p>Now, using SAGA GIS, the shapefile terrain_projectarea.shp has to be converted into the grids required for Rockyfor3D. This can be done by hand or automatically using SAGA scripts, which can be downloaded from http://www.ecorisq.org/openFTP/Terrainshp.zip (see readme.txt, the next steps 8 & 9 of this manual are not needed anymore). By hand, one has to load the shapefile using the menu upper left “File/Shapes/Load shapes” and browse for your shapefile. In the data tab (bottom left part of the window), it can be checked if the shapefile loaded well. Double-click on the shapefile opens it in a map.</p>
9	<p>Next, there are two possibilities:</p> <ol style="list-style-type: none"> 1. If your shapefile terrain_projectarea.shp covers the same or a bigger area as the DEM, the newly created rasters have to be adapted to the cellsize and the extent (area) of the DEM. First, make sure that none or all polygons are selected. If a single polygon is selected, only this one will be taken into account in the gridding procedure ! This can be done by opening the shapefile in a map, i.e. by double-clicking the filename of the shapefile in the data tab of the Workspace window. Then select the black pointer tool and click somewhere outside the shapefile (see below).  <p>The screenshot shows the SAGA GIS interface. At the top, there is a menu bar with 'File', 'Modules', 'Map', and 'Window'. Below the menu bar is a toolbar with various icons. A red circle highlights the black pointer tool icon. The main window displays a map with a yellow polygon. The map has a coordinate system with X-axis values from -23400 to -23000 and Y-axis values from 205400 to 205600.</p> <p>Then, select menu “Modules/Grid/Gridding/Shapes to Grid” to start converting the shapefile. In the opened window “Shapes to Grid”, select the attribute that will be used for the defining the cell values of the grid to be created. The target Grid Type should be set to Integer (2 byte is mostly sufficient) or floating Point (4 byte). Target dimensions:</p> <ul style="list-style-type: none"> – User defined: the user defines the cellsize and the number of rows and columns of the grid to be created

	<ul style="list-style-type: none"> – Grid project: the dimensions and cellsize of the grid to be created will be similar as the ones of an existing grid, which has to be selected in a second step – Grid: an existing grid will be overwritten, but its dimensions and cellsize will remain unchanged <p>Press Okay and then, depending on your choice in the first window, the target dimensions of the new grid, or the existing grid project, or respectively the grid to be overwritten should be defined in the second window. Then press okay again and the grid will be created.</p> <p>2. If the shapefile terrain_projectarea.shp covers a smaller area as the DEM, firstly the shapefile has to be rasterised and secondly the existing DEM has to be adapted to the rasterised shapefile. First import the DEM by selecting “<i>Modules/File/Grid/Import</i>”. There you can select your Grid type (e.g., Import ESRI Arc/Info Grid if you have an ASCII file with ESRI format header). Then select “<i>Modules/Grid/Construction/Resampling</i>” to start resizing the grid. Select the grid you want to resample in the Input field and then the characteristics of the new grid to be created using "Create new grid in existing project" The resulting grid will have the same characteristics as the grids of the specified project. That means that not only the cell size can be modified, but also the boundaries of the DEM will be adapted to the grids in the defined grid project.</p>
10	<p>If all required grids are finished and have the same cellsize and map extent (number of rows and columns), they can be exported as .asc raster files. As mentioned in the Rockyfor3D paper, the minimum input data required by Rockyfor3D consists of a set of 10 raster maps, which can be created using the menu “<i>Modules/File/Grid/Export/Export ESRI Arc/Info Grid</i>”. In the opened window select the input grid. For choosing the output file name, click in the empty cell to the right from the cell with the label “File”. SAGA automatically adds the extension .asc to the given file name. Other important settings: Format = ASCII, ASCII precision for integer type (2 or 4 byte) grids = 0, for double (floating point 4 or 8 byte) type grids precision = 2, ASCII Decimal Separator needs to be a point (.). Then click okay for exporting the grid. Repeat this for all required grids and pay attention when choosing the grid to be exported and when giving the final filename.</p>

Good luck!

Luuk Dorren, 30.05.2012

(many more details on QGIS and SAGA GIS can be found in the software manuals, freely available on the respective websites).