

## Exercise 3: Generating Tiles with TileMill and CartoCSS

### Goal

The goal of this exercise is to learn one possible way to create and serve your own tiled web maps.

### Part 1: Unpack the Required Software and Review the CartoCSS Documentation

Please unpack the contents of the “tilemill.zip” (a portable version of the TileMill software from MapBox), the “SQLiteDBrowser.zip” (a user-friendly interface for browsing the content of SQLite databases) and of the “mbtserver.zip” (a portable version of a Tile Stream) archives into the C:\workspace directory of your computer.

Then briefly study the contents of the following sources of information about CartoCSS (so you can consult them later on if needed):

- <https://www.mapbox.com/tilemill/docs/crashcourse/styling/>
- <https://www.mapbox.com/tilemill/docs/manual/carto/>
- <https://github.com/mapbox/carto/blob/master/docs/latest.md>

Finally, also read briefly the part (A) of the tutorial “Creating a Web Map with Texture and Scale-dependent Symbolization using TileMill and MapBox” available at the following URL: [http://osgl.ethz.ch/osgl/Training/Tutorial\\_TileMill\\_MapBox/Tutorial\\_TileMill\\_MB.pdf](http://osgl.ethz.ch/osgl/Training/Tutorial_TileMill_MapBox/Tutorial_TileMill_MB.pdf).

### Part 2: Create and Export a Tiled Map

Open Tilemill from the unpacked “tilemill” folder and create a new map project by clicking “+ New Project” from the “Projects” tab. Enter “europe” as the name of the project and make sure that the image format is “png”.

Now add to the project the following datasets from the “geodata\_eu” folder: eu\_relief, eu\_countries, eu\_cities, eu\_rivers and eu\_lakes. For this you have to press the icon for the “Layer Stack” and then click the “Add Layer”. Don't forget to click the “Save & Style” when you are loading the shapefiles. For the raster layer (eu\_relief) you need to explicitly introduce the EPSG 4326 projection in the proj4 format (you can get the corresponding string from <http://spatialreference.org/ref/epsg/4326/proj4/>).

After adding the layers to the project, you can click the icon for the project settings in the top right corner. Here you can set the zoom levels (e.g. 4 to 7), the extent and the centre of your map.

Now define simple styles for the vector layer to create your map. For this task, consult the tutorial and the CartoCSS documentation when needed. Use a simple style for the lakes, cities and countries, a style with filter for the river (size based on attribute) and experiment with scale dependent symbolization. Optionally, depending on the available time, you may also label the cities (see <https://www.mapbox.com/tilemill/docs/guides/styling-labels/>) or use custom images as icons (see <https://www.mapbox.com/tilemill/docs/guides/advanced-map-design/#images-as-icons>).

When you have finished the map you can export the map in the mbtiles format. Optionally, if time allows, use the SQLite DB Browser to check how the tiles are saved in the mbtiles format (which is in fact a SQLite database).

### Part 3: Serve the Tiles to Your Web Map

First, copy the exported “europe.mbtiles” files into the “C:\Workspace\mbtserver\tiles\” folder then start the TileStache server by clicking on the “start\_tile\_server” from the “C:\Workspace\mbtserver\” folder.

Then in a web browser window navigate to the “<http://localhost:8081>” address, click on the “Europe” project to see the tiled map that you produced, subsequently click on the “Info” button and finally copy the content of the “TILE URL”.

Then, return to editing the index.html of your web map. There, in your web map, insert a new `L.tileLayer` object with the copied URL (<http://leafletjs.com/reference.html#tilelayer>) and then add the new layer to the map:

```
L.tileLayer("your copied TILE URL here").addTo(map);
```

Furthermore, you can decide to further customize your map, e.g. by commenting out the original base layer from exercise 1.

You should consider adding what is called “attribution” in the leaflet framework and that can be used to mention the copyright/ and/or license information for third-party data you might be using. In this case, the geometries of the countries are from the CIA World DataBank II” and the statistics from Eurostat. To make those visible when the layer is on, have a look at the documentation of the `L.tileLayer` and add it to your tile layer.

Finally check the resulted web map in the web browser.

### Discussion of the Exercise

Congratulations, you have acquired the skills to create, serve and use your own tiled web maps.

### Additional Things to Try at Home:

In order to further improve your skills, you can add in TileMill the “eu\_countries\_them” layer and define a choropleth map with CartoCSS.

## Spoiler:

### Carto CSS

```
#eu_countries {  
  polygon-opacity:0.2;  
  polygon-fill:#F6EFC6;  
  [zoom = 4]{  
    line-color:#777777;  
    line-width:0.5;  
    polygon-smooth:0.9;  
  }  
  [zoom = 5]{  
    line-color:#777777;  
    line-width:0.9;  
    polygon-smooth:0.9;  
  }  
  [zoom = 6]{  
    line-color:#777777;  
    line-width:1.2;  
    polygon-smooth:0.7;  
  }  
  [zoom =7]{  
    line-color:#777777;  
    line-width:1.5;  
    polygon-smooth:0.5;  
  }  
}
```

```
#eu_lakes {  
  line-color:#49aacf;  
  line-width:1;  
  polygon-opacity:1;  
  polygon-fill:#bedee5;  
  [zoom=5]{  
    polygon-smooth:0.5;}  
}
```

```
#eu_rivers {  
  [zoom =5]{  
    ['class'=1]{  
      line-width:1;  
      line-color:#49aacf;  
      line-smooth: 0.5;  
    }  
    ['class'=2]{  
      line-width:0.6;  
      line-color:#49aacf;  
      line-smooth: 0.5;  
    }  
  }
```

```
}
[zoom =6],[zoom=7]{
  line-color:#49aacf;
  line-smooth: 0.5;
[class'=1]{
  line-width:1.2;
}
[class'=2]{
  line-width:0.8;
}
[class'=0]{
  line-width:0.5;
}
}
}

#eurelief {
  raster-opacity:1;
}

#eu_cities {
  marker-width:6;
  marker-fill:#f45;
  marker-line-color:#813;
  marker-allow-overlap:true;
  text-name: [sort_name];
  text-face-name: 'DejaVu Sans Mono Book';
  text-fill: #036;
  text-size:11;
  text-halo-fill: fadeout(white, 30%);
  text-halo-radius: 2;
  text-placements: "NE,N,E,SE,NW,W,S,SW";
  text-placement-type:simple;
  text-dy:-4;
  text-dx:4;
[sort_name]='YEREVAN'{
  text-placements: "NW";
  text-dx:-4;
}
[sort_name]='TBILISI'{
  text-placements: "NW";
  text-dx:-4;
}
}

#eu_countries_them{
[perc_renew' >0][perc_renew' <= 10]{
  polygon-fill:#ffffcc;
```

```
    polygon-opacity:0.5;
  }
  ['perc_renew' >10]['perc_renew' <= 20]{
    polygon-fill:#c2e699;
    polygon-opacity:0.5;
  }
  ['perc_renew' >20]['perc_renew' <= 30]{
    polygon-fill:#78c679;
    polygon-opacity:0.5;
  }
  ['perc_renew' >30]{
    polygon-fill:#238443;
    polygon-opacity:0.5;
  }
}
```