Mapping with CartoDB (Tanzania water edition)

In this exercise we are going to use water data to build informative maps of Tanzania.

The idea of this exercise is to create an interactive map of water points in Tanzania showing three key aspects:
1. Source type (Well, spring, rainwater etc…)
2. Water quality (salty, milky etc)
3. Known status (Functional, Non Functional)

The end goal is to create a map where the source type is represented by an icon, quality by the colour of that icon and status is visible via an interactive filter to show or hide the different types.

In order to complete this exercise you need to have a CartoDB account. This can be created at http://cartodb.com

This exercise requires a number of key datasets that are available to download from the course website.
1. The regional boundaries of Tanzania. (Source: Tanzania National Bureau of Statistics)
2. Water points open data. (Source: Opendata.go.tz)

Step 1 - Preparing the data (already done)

You are likely to need to do a lot of preparation of source data, see Annex 1 for a detailed explanation of what preparation has already been carried out for this exercise.

Step 2 - Create water points map of Tanzania

Once you are logged into CartoDB, in the top right hand corner of the screen you should be able to select **maps** or **datasets**. Click **maps** and then click the **new map** button.

On the next screen ensure you select **connect dataset** from the available options and then upload a **data file**. Here you can drag and drop or browse to upload the allwaterpointsjuly2015-ceaned.csv file (this can be done via URL upload from the shared data location). Click **connect dataset** to upload this file. It may take a while to upload and process.

Once the map has loaded, give it a name "Functional water points in Tanzania". This can be done by either double clicking "Untitled Map" or by clicking the *3 dots* next to the map name and clicking rename.

Step 3 - Edit your first layer

In map view, we will be adding two layers to make a map of colour coded icons representing water source type and quality.

The first layer will create a set of colour coded points while the second will add the icons to those points
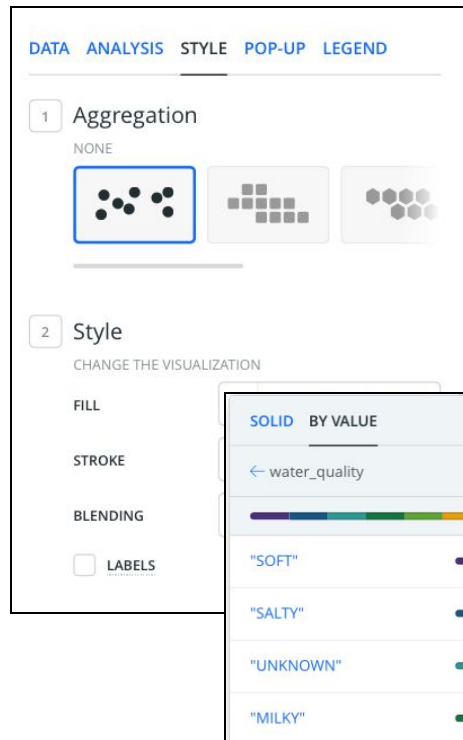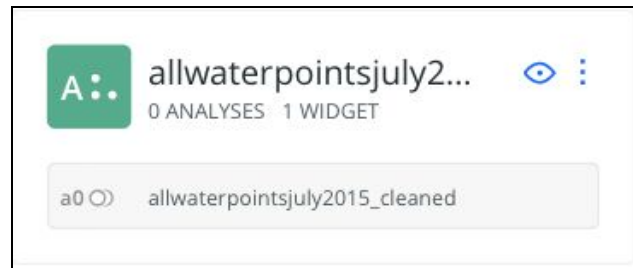
On the left of the map click the title of the layer which is written with an A, as shown above, this will bring up the layer editor.

Before we continue double click the layer title and name it "**Points**". This will help when working out which layer is which when there are multiple layers in use.

To colour code the points, select style and set the aggregation type, as shown on the left. The different aggregation types will group the points differently however some remove exact locations. Choose the first one which keeps the points in their exact geographic locations.

Then click the fill colours and select **by value**. This allows us to select which of the columns from the dataset we want to visualise on this map. For this part of the exercise, we are focusing on the **water_quality** column. Selecting this will automatically select a list of colours and add a key to the map.

Before continuing to the next stage, return to the layers screen by clicking the back arrow.

Step 4 - Add a second layer of icons

In this step we are going to add another dimension (column from our dataset) to our map to represent the type of water source.

In step 3 we used colour to represent the water quality. In this step we are going to use pictorial icons to represent the **source type**.

To add another dimension we need to add another layer to the map.

In step 5 we will combine step 3 and 4 by making the icon colour represent the water quality.

ADD   To add a second layer click the ADD button in the layers view and select the same water points dataset to add it. Name this layer "**Icons**"

Follow the same steps in step 3 to create a set of points on your map, this time based upon the **source type** column (shown right).
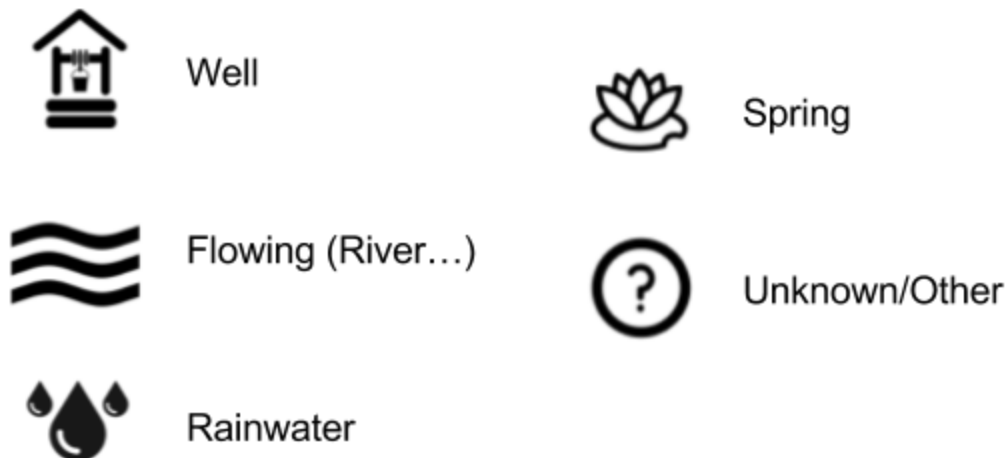
To change the coloured dots in this layer to icons, under the **by value** menu click **img** next to each category and you can select images.

We are going to upload our own images and use ones that are more appropriate for this layer.

From the next screen click the "**show full collections**" option at the bottom and click upload file.

SOLID   BY VALUE
← source_type
"WELL (Hand/Machine/Shal... Img
"SPRING" Img
"FLOWING (Lake/River/Dam)" Img
"RAINWATER" Img

The icons to be uploaded are available from the course website and are used as follows:

Well

Spring

Flowing (River…)

Unknown/Other

Rainwater

Upload all the svg icons (ones with .svg extensions) and assign these to each correct source type (as pictured above) by repeating the selection of image from the **by value** pane (shown top right here). You can upload the images all at once, then simply select the right one for each value.

Once done ,this layer should be shown on the map with icons. However ,the colours reflect the source type and not the water quality .

Proceed to the next step to find out how to combine the colours from the first layer to colour code the icons by water quality.

Step 5 - Colour the icons by water quality

To colour the icons to reflect the water quality we need to grab the colours from the first layer.

To do this navigate back to the **first layer** (called **Points**) and from the **style** pane click **cartocss** at the bottom.

VALUES ⬤ CARTOCSS

This will show the code that colours the points on the map.

Cartocss is a toggle switch available at the bottom of the screen.

```
#layer {
  marker-width: 7;
  marker-fill: ramp([source_type], (#5F4690,
#1D6996, #38A6A5, #0F8554, #73AF48), ("WELL
(Hand/Machine/Shallow)", "SPRING", "FLOWING
(Lake/River/Dam)", "RAINWATER", "UNKNOWN/OTHER"),
"=");
  marker-fill-opacity: 1;
  marker-allow-overlap: true;
  marker-line-width: 1;
  marker-line-color: #FFF;
  marker-line-opacity: 1;
}
```

For the icons to match the key shown on the first layer, we need to copy the *marker-fill* code from one layer to the other.

The points layer contains the marker-fill colours required and should look like the diagram left.

Highlight the **marker-fill** code as shown and copy this code to your clipboard (CTRL-C). Make sure that you copy all punctuation up to the last semi colon (;) or it won't work.

Then switch to your **icons** layer.

Navigate to the **cartocss** view from the **style pane** and replace the marker-fill line with the one that is now copied on your clipboard.

The final code for the icons layer should now look like the one on the right.

Note here how you can see the marker-fill is based upon *water_quality* and *marker-file* is based upon source type.

For the map to change, you need to click apply.

```
#layer {
  marker-width: 20;
  marker-fill: ramp([water_quality], (#5F4690,
#1D6996, #38A6A5, #0F8554, #73AF48, #EDAD08,
#E17C05), ("SOFT", "SALTY", "UNKNOWN", "MILKY",
"COLOURED", "ABANDONED", "GOOD"), "=");
  marker-fill-opacity: 1;
  marker-file: ramp([source_type],
(url('https://s3.amazonaws.com/com.cartodb.users-
assets.production/production/davetaz2/assets/2017
0808114036well.svg'),
url('https://s3.amazonaws.com/com.cartodb.users-
assets.production/production/davetaz2/assets/2017
0808114036spring.svg'),
url('https://s3.amazonaws.com/com.cartodb.users-
assets.production/production/davetaz2/assets/2017
0808114036river.svg'),
url('https://s3.amazonaws.com/com.cartodb.users-
assets.production/production/davetaz2/assets/2017
0808114036rainwater.svg'),
url('https://s3.amazonaws.com/com.cartodb.users-
assets.production/production/davetaz2/assets/2017
0808114036other.svg')), ("WELL
(Hand/Machine/Shallow)", "SPRING", "FLOWING
(Lake/River/Dam)", "RAINWATER", "UNKNOWN/OTHER"),
"=");
  marker-allow-overlap: true;
  marker-line-width: 1;
  marker-line-color: #FFF;
  marker-line-opacity: 1;
}
```

Marker fill on images is only possible if the images are svgs and not png, jpeg or other image types.

The last stage is to hide your first points layer from view such that the dots on the map are not shown, just the icons.

Step 6 - Adding widgets to allow data to be filtered

Even at this stage the map is likely to be too complex to interpret and discover insight. Widgets allow the filtering of data. You can add any number of widgets.
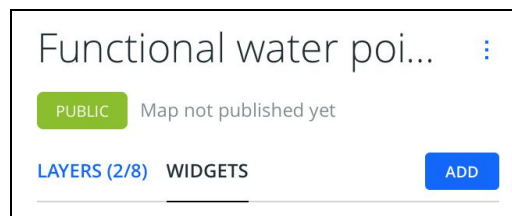
In this section we are going to add a widget to allow the map to filter by if the water source is functional or not. This is defined by the status column in the dataset

To add a widget, switch to the widgets editor (next to layers) and click **add**.

From the next screen select the status column and ensure this is a widget that applies to the **Icons** layer (shown left next to "Select Layer").

Once added from the edit pane for the widget ensure that the widget is dynamic. This will allow the clicking of the categories in the widget to filter the data points shown on the map, thus your map is now dynamic.

Extensions: Why not try adding another widget to your map, or share this map with others!

Annex 1 - Data preparation

In order to prepare each dataset, several translations have **already** been carried out to extract it from the source and translate each dataset into formats appropriate for using with CartoDB.

These steps are briefly described below.

Regional boundary files

Source: Tanzania National Bureau of Statistics (NBS)
Source URL:
http://www.nbs.go.tz/nbstz/index.php/english/statistics-by-subject/population-and-housing-census/258-2012-phc-shapefiles-level-one-and-two

These files come as a rather large zip file containing a lot of shape files. Shape files (SHP) are a zip file format developed by ESRI to a "mostly" open specification. The terms of the specification are vague, particularly around usage rights, many online tools choose not to support the format for legal reasons. This means that in order to make the format usable, we need to translate it into something that is compatible with more tools.

Unwanted data was removed from the source NBS zip file, leaving only the region data inside the zip file. This zip file was then uploaded to the SHP to KML translator available at http://www.mapsdata.co.uk/online-file-converter/.

The resultant KML has been made available on the course website and is the one required for the exercise.

Water points data

Source: Opendata.go.tz
URL:
http://opendata.go.tz/dataset/water-dashboard/resource/58edfa63-b329-45b5-b17f-27603420cd10

For the purposes of this exercises the data has been simplified. This has been done through reduction in the number of types of water sources as well as water qualities.

This process was done using OpenRefine.

The following changes were made to water quality:
- SALTY ABANDONED and FLUORIDE ABANDONED changed to ABANDONED
- FLUORIDE changed to GOOD

The following changes were made to water source:
- HAND DTW, MACHINE DBH, MACHINE-DRILLED BOREHOLE and SHALLOW WELL changed to WELL (Hand/Machine/Shallow)
- LAKE, RIVER and DAM changed to FLOWING (Lake/River/Dam)
- OTHER and UNKNOWN changed to UNKNOWN/OTHER