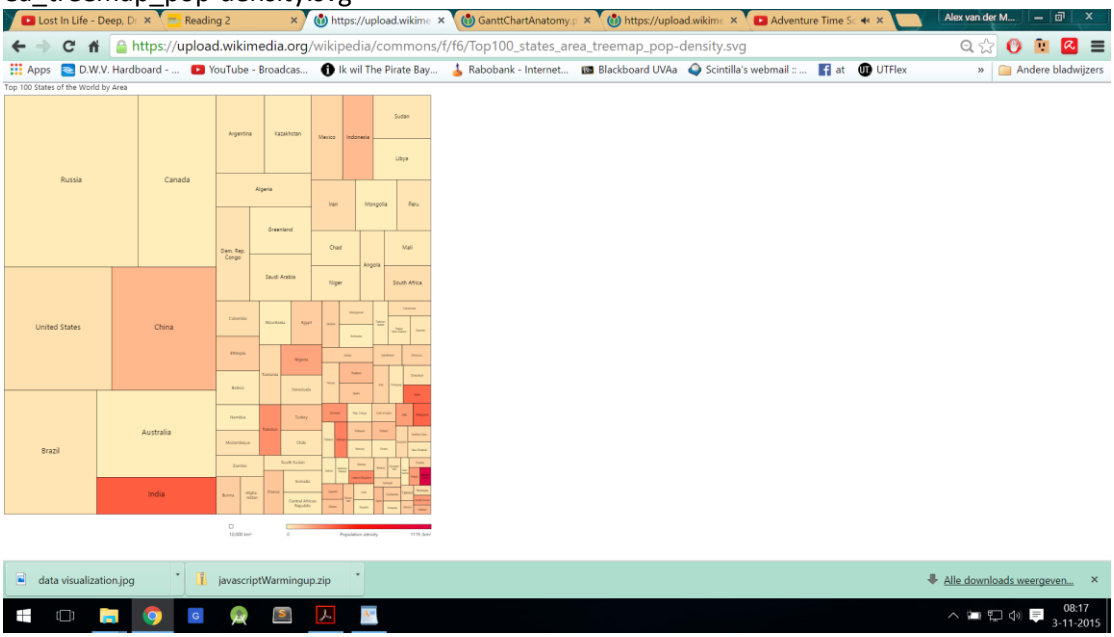
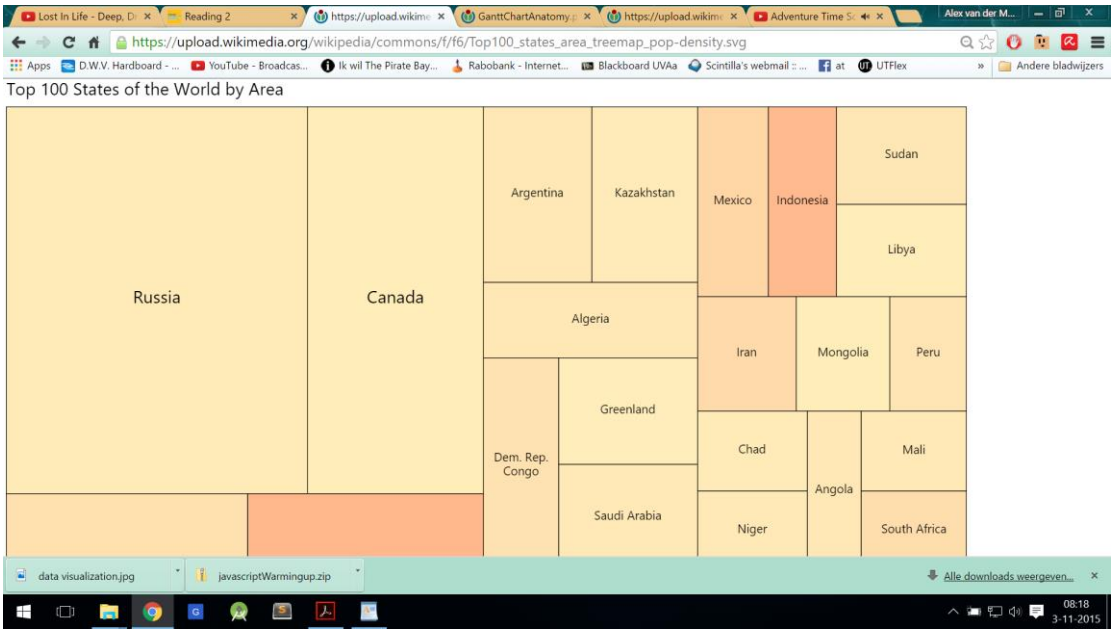
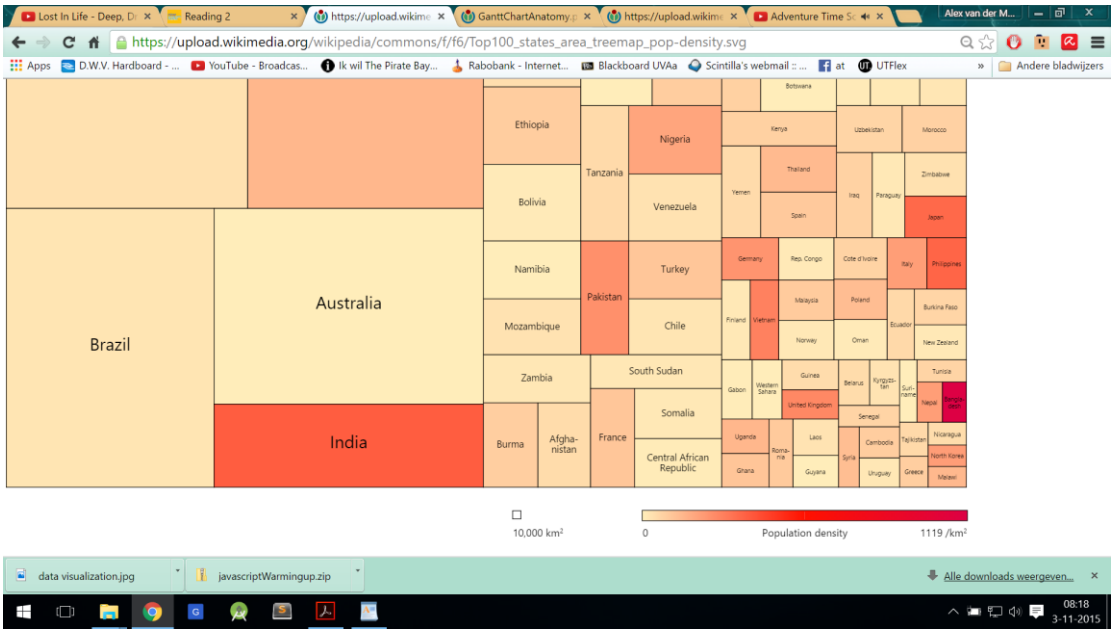
Questions week 2

1. *Find a visualization not discussed in class or used in a homework and answer the following questions pertaining to that visualization. Attach the visualization as a screenshot in your submission.*

The visualization I choose is from: https://en.wikipedia.org/wiki/Data_visualization
The imgage itself is from:
https://upload.wikimedia.org/wikipedia/commons/archive/f/f6/20120914031735%21Top100_states_area_treemap_pop-density.svg







2. *Consider Bertin's characterization of visual variables (position, size, shape, value, color, orientation, and texture). Pick 2 of Bertin's visual variables, and discuss them in relation to your visualization.*

Size

The quantitative aspect of size is important here. The area of a country represents the actual area of the country. There is a small reference area of 10.000 square kilometres shown so the size of a country in the visualization can be matched with a number, however this requires great cognitive effort. The designer chose to use only represent the relative sizes of countries. I think this was a good choice since the real number of the amount of surface is too large to really comprehend.

Since the countries have different shapes, i.e. they vary in more than one dimension, making absolute comparisons in the difference of surface between country's is relatively hard. This reduces selectivity and makes it very hard to establish an absolute order.

To represent the surface of a country the designer could also have used repetition of a number of signs, equal in size. This would have made comparisons easier. However this would have cluttered the visualization.

Colour value

Every country in the visualization has the same colour, but the value is changed (the brightness). The population density is linked to the values by a mapping at the right bottom of the visualization.

The selectivity of value is high, this makes it easy to compare the data for countries that have borders to each other, then the difference is clear. However when countries are further apart it is harder to compare their colour value. The good associativity aspect of using value makes it easy to group in the sense of which countries have about the same population density. The quantitative aspect of value is low, one has to compare a colour to the legend in order to obtain a guess of the population density. However since there are many countries in the visualization a relative approach is wise as to not clutter the visualization.

3. *Munzner proposed a nested model for visualization design and validation. Discuss/validate your visualization with respect to domain problem characterization and data/operation abstraction design.*

Domain problem characterization

The target users are all inhabitants of planet earth who can read.
I am not sure if I understood correctly but I now assume that I should reflect on whether the visualization answers the questions that I think people have when seeing this visualization. Below I list the queations I think people will have and address them with respect to the visualization.

What are the largest countries in the world?
This question is easily answered however a definite ranking is hard since the surfaces vary in both height and width.

What are the most densely populated countries in the world?
The number one is easily recognised because the colour purple is used for the number one, however for the number 2,3,4.. a definite ranking is very hard to make since the changes in colour value are subtle.

How densely is my country populated compared to other countries?
Finding one's country can be hard since the visualization has no relation with the geographic world map. But next to that the visualization only holds about halve of the worlds countries, I presume the rest are too small to make visible using a linear scale in area.
An interactive implementation could fix this by enabling scrolling and a look up function. When your country is visible the shade of colour can be readily compared.

How does my country's surface area relate to other countries in the world?
From the previous question, the part on the country being hard to find or not being in the visualization also holds here. When your country is in the visualization it is hard to compare area when the area does not difference much but when the differences are relatively large this is can be done well in this visualization.

Data/operation abstraction design

There are two types of data in this visualization. Surface area and population density. For the area it was chosen to use cubic kilometres. I believe this is a good choice since kilometres are the largest distance unit where people are familiar with, and a unit of area is always the square of a distance unit. For the population density it was chosen to use number of people per square kilometre. I believe the area unit of one square kilometer was a good choice because the values of density will then reach from 0 to about a 1000. Up to thousand people are well comprehended and easy to visualize for people.

4. *Based on Cleveland and McGill's results, does your visualization embody good practices (i.e. can people accurately perform the tasks based on the encodings?)*

Cleveland and McGill state that one should replace a visualization that uses colour value to represent numbers, by one that uses framed-rectangles with a legend that translates the ratios in the framed-rectangle into numbers. However they say that this should only be used if there is enough space because framed-rectangles should not overlap.
In the chosen visualization there might be just enough space but it is on the small size so the framed-rectangles might become too small to give a good indication of the number of people per square km that is encoded.
From the experiments of Cleveland and McGill it became apparent that people can make a much more accurate reading of a position along an axis than that of an area. The visualization could also be represented by a bar chart where the length is proportional to areas of countries, then the population density could still be made visible with colour value. However as I stated under size at question 2. ;
The designer chose not to make the absolute size of a country apparent, but only to represent the relative sizes of countries. I think this was a good choice since the real number of the amount of surface is too large for people to really comprehend. A bar chart would however make it much easier to compare countries in size, but I think small differences in area are not important to make apparent since the main message is about population density.

5. *Do you agree that visualization is a functional art? Explain.*

Yes I do. Visualization clearly is functional because it makes the reader understand aspects of the data. Now rests the question whether it is art. Like in art colouring is very important, and like in art, when the same object is represented by a “bad” artist people tent to dislike the creation and if it is represented by a “good” artist people tend to like the creation. The same holds for visualizations I think.

6. *Ask yourself what the designer is trying to convey and think of three to four possible tasks this visualization should help you with. Does the visualization achieve any of your tasks? (To view an example, see Albert Cairo, pages 26-28.)*

1. Determine the most densely populated country
The population density is not encoded in one colour and its value (red) but the top of the density scale has purple. Only one country in the visualization has enough population density to reach purple, this makes it stand out even though its size is relatively small.

2. Be able to compare countries densities to each other
As mentioned at question 2 under colour value, when countries are close to each other in the visualization it is easy to see an order in the population density. When countries are further appart they are harder to compare. But larger differences are well visible. The absolute values are hard for the reader to extract from the visualization.

3. Determine the country with the largest surface area.
The designer made it extra clear which country has the largest surface (Russia) by placing in a corner, here the top left corner. But If it was somewhere else it would still have been clear since it has the largest width and also the largest height of all countries.

4. Show in which countries live huge amount of total people.

Countries which are among the largest but also have relatively high population densities of course hold huge amounts of people. China and India stand out.