CS-E4450 - Explorative Information Visualization
Time relevant

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1   Topic

I would like to aware people on the negative effects that livestock farming has on the planet, mostly in terms of water scarcity, deforestation and Green House Gas (GHG) emission. The goal is to make everybody understood the importance of dietary change in order to personally contribute to the resolution of climate change.

2   Motivation

My keen interest in climate change comes mostly from my unconditional love for traveling. Since I am a child, I travel the world with my family and have the chance to see amazing landscapes, islands and species that this amazing planet shelters. I am very grateful for that and I want to be able to offer the same experience to my children.

Now, why would I like to tackle livestock farming and not other causes responsible for climate change (electricity generation, transportation, manufacturing...)? Because I feel that, among the biggest causes of climate change, this aspect can be influenced by individuals, whereas the others often depends on some political changes within our governments. If people decide to change their eating habits, then the consumer demand will decrease and so will the supply. This is so simple but can make such a huge impact on the planet. The problem, in my opinion, is that people do not realize to what point eating meat on a regular basis influences climate change.

3   Approach

I first thought about world maps. For example, one could show the areas of deforestation due to livestock farming over time. But the vastness of these lands are difficult to visualize on that kind of map and the astonishment reaction would be lower than I want it to be.

Therefore, I think that a better approach would be to compare the numbers that I want to show with similar measures that people can relate to. For example, one could think of comparing the total number of liters of water needed to produce the quantity of beef consumed by the average citizen in one year with the number of Olympic swimming pools that it represents. Or comparing the total amount of GHG emitted by the cows in one year with the corresponding number of hot-air balloons. Concerning deforestation, we could think about the number of soccer fields equivalent to the total surface of forests used for livestock farming.

Another way to visualize this problem, and that might be even more shocking, is to compare the savings in water consumption/GHG emission/deforestation resulting from a reduction of meat consumption compared to the savings that you achieve when following some well-known recommendations to lower your environmental impact (e.g. take showers instead of baths, take the bike instead of the car, use digital documents instead of printing). Or it might be the other way around, that is converting the consequences of eating meat two times a week for example to the wastes it represents in terms of "home savings". For example, one could say that eating

meat two times a week comes down to take a shower of 4 hours, or that it comes down to print 5.000 sheets of paper, or to drive 200km in car.

4   Tools

I am thinking about https://observablehq.com to implement my visualizations. Some frameworks seem really great and a lot of good visualizations are available with good, providing some inspiration.

If I have enough time, I would like to integrate 3D modeling drawings, designed with SketchUp or another CAD software, in order to impact even more with well-known object (soccer fields, swimming pools) or locations (monuments, buildings, squares) that people are familiar with. Here is an example of what I have in mind: https://www.youtube.com/watch?v=DtqSIplGXOA. The website https://www.remix3d.com/ gives a lot of 3D models realized with Microsoft Paint 3D. Instead of designing my own models from scratch, it might be a time saver to use such already implemented models that can be easily downloaded.

5   Data

Most of the numbers I will use in my visualizations will be retrieved from the following scientific paper: https://science.sciencemag.org/content/360/6392/987/tab-pdf, written two researchers of Oxford. Some key-points of the paper can be found below:

- *"Today's food supply chain creates 13.7 billion metric tons of carbon dioxide equivalents (CO2eq), 26% of anthropogenic GHG emissions. [...] The farm stage dominates, representing 61% of food's GHG emissions (81% including deforestation)."*

- *"We estimate that two-thirds of freshwater withdrawals are for irrigation, then predominating in water-scarce areas and times of the year, driving 90-95% of global scarcity-weighted water use."*

- *"Ninetieth-percentile GHG emissions of beef are 105kg of CO2eq per 100g of protein, and land use (area multiplied by years occupied) is $370m^2.year$."*

- *"In particular, the impacts of animal products can markedly exceed those of vegetable substitutes. To such a degree that meat, aquaculture, eggs, and dairy use 83% of the world's farmland and contribute 56-58% of food's different emissions, despite providing only 37% of our protein and 18% of our calories."*

Other data sources include:

- *"Cowspiracy: The Sustainability Secret"*;

- *"Comment j'ai arrêté de manger les animaux"*, from Hugo Clément.

6   Expected results

I would like to create an interactive tool showing the impacts of livestock farming on our planet (water consumption, deforestation and GHG emission). I expect that the differences between usual savings and those from reducing meat consumption will be so significant it will raise awareness about the negative effects of livestock farming on the planet, and eventually convince people to change their dietary habits.

7   Integrating time

Time could be involved in multiple ways for this topic. First, one could think to visualize the changes over time of aspects such as deforestation, water consumption and GHG emission related to livestock farming. Due to the growth of human population and globalization, livestock farming is also constantly growing. Thus, it is to be expected that its consequences are becoming more and more important. However, such approach is quite risky as it would involve to compare research from different periods of time that may not take the same hypotheses or could make their calculations in very different ways. It is indeed a very complex subject that demands a huge work and discipline of multiple months/years in order to be able to draw conclusions. And even scientific papers that are released the same year might come with different numbers or with opposing theories. The last thing that I want to show is an incorrect visualization, so I prefer not to follow the path of comparison over time for now. The ideal would be to conduct research by myself, by reading a lot on the subject, studying conscientiously each factor that comes into play, analyzing the right data that I would have properly cleaned and asking reviews from experts in the field. Unfortunately, this is the work for a master thesis or a PhD and time is limited during this course, so I let that for future work.

A second way to involve time would be to convert some quantities (numbers) into an equivalent involving time. Here are some example that came into my mind (note that the equivalence given is not correct yet):

- "Eating meat two times a week comes down to take a shower of 4 hours."

- "Eating 1kg of beef comes down to spend 8 hours in the car."

- "Eating 1kg of beef comes down to let the printer work continuously for 2 hours."

I really like these types of comparisons as it impacts a lot more the audience than just giving numbers. Here, a person that is a minimum concerned by the ecology would directly we shocked. Practically, I am thinking of an interactive tool where user would enter the number of times he/she eats beef by week, and my visualization will automatically adapt. Let's take back the example of the shower that is flushing, the visualization could simply be a 3D model of a shower flushing with a clock next to it that will count down from 4 hours to zero. This idea of 3D model plus clock counting down could also apply to the printer and the car.