Impact of Terrorism on World Development

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EPFL, Data Visualization course process-book

1. Introduction

Definition of terrorism: "The threatened or actual use of illegal force and violence by a non-state actor to attain a political, economic, religious, or social goal through fear, coercion, or intimidation."

Our idea was to give visually insightful information about potential correlation between countries development and terrorist activities.

The challenge was to build a interactive map and an API to power the data needs of our visualization.

2. Preliminary thoughts

Our approach was first to sketch (using a tablet) our initial ideas so we could start with a clear idea before implementing it using JavaScript libraries.

The first things we wanted was world map Figure 1. It would be the starting point of the visualization and the place from where the user can start exploring the data. From this position the user could click on any countries and access to a more detailed view with markers indicating each terrorist attacks in the country. These markers would have a color indicating the density of attacks (because we distinguish superposed markers if many attack occurred in the same place) Figure 2. Lastly it would be possible to access statistics about the country attacks (like number of attacks, type of attacks, who claimed the attacks) in a view with also some plots about the countries indicators in order to correlate between country indicators and terrorist attacks Figure 3. Here is the use workflow we imagine for a user of our visualization.

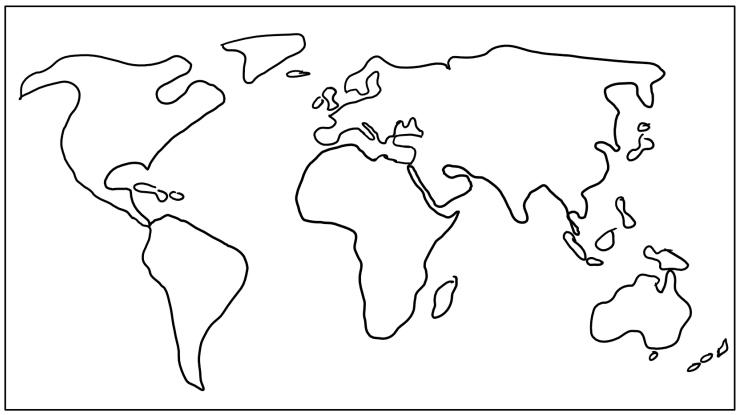


Figure 1: Sketch of the visualization starting point

3. Implementation Process

3.1. Implementing the map

The first step was to implement the world map. In order to do this we used a topoJSON world map representation and the D3.js library to render the map. We also used jQuery to get some element property on the web page and build a responsive map which re-center itself on window resize.

At the beginning the map did not have particular color on country, it was just a representation of the world. Then we wanted to give a quickly a general information to the user that could lead his future exploration. So we added on the map the color of each country representing the total number of attacks that happened from 1970 to 2016 as a gray scale.

3.2. Implementing the clicked detailed view

The next step was to implement the clicked detailed view. We designed the user experience to be a zoom animation on the clicked country. Then we decrease the opacity of all other countries to build some focus effect. On the zoom country we display markers representing terrorist attacks by getting the positions with a call to our API. We had to overcome some difficulties concerning long rendering time of our visualization. Indeed in some countries there are a lot of attacks and a lot of them occur at the sample place resulting in a huge number of markers to position at the same place on the map. Since rendering all these markers isn't necessary we only render markers with unique position and give a color to the markers based on the density of attacks. We used D3 color map to achieve this.

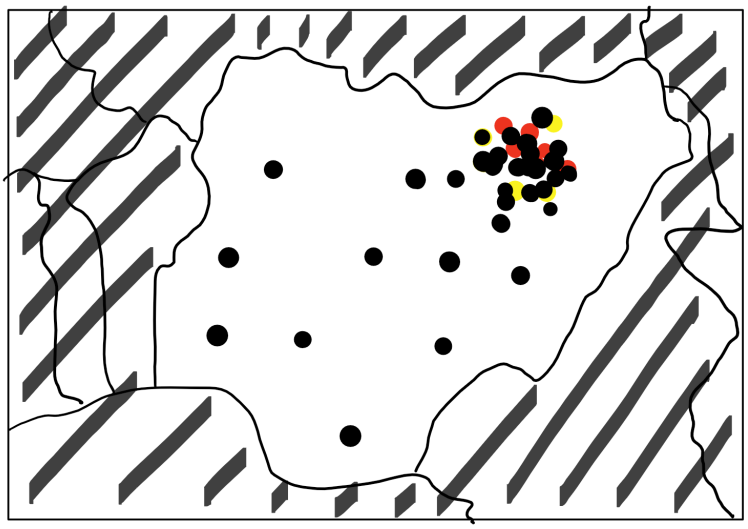


Figure 2: Sketch of the detailed view when a user click on a country. Hatchings mean zone where the user interface opacity is decreased to create a focus effect

3.3. Implementing the statistical panel

The last step was to build the panel displaying the statistics. We added some buttons (Figure 9) at the bottom left of the clicked view (Figure 6). These buttons let the user access two different panels:

- *Time series statistical panel*: this panel contains per year value for different type of information. For each country you click on you have the *number of attacks*, *number of victims* and *global terrorism index* per year from 1970 to 2016. You can also make comparisons and explore correlation with indicators categorized in two different section: *Economic* and *Social/Health*. Some example of indicators are *Tourism number of arrivals* for each year, *Birth rate* for each year, ...

  This part of the visualization is one of the most important since it's the one allowing to find pattern linking terrorism in a country and behavior of import national development indicators. This panel is illustrated in Figure 7

- *General statistics summary panel*: this panel contains general information about a country. These information are split in 4 sections: firstly the *diverse information* including name, region, total number of attacks, total number of victims. Secondly we have the *5 most common*

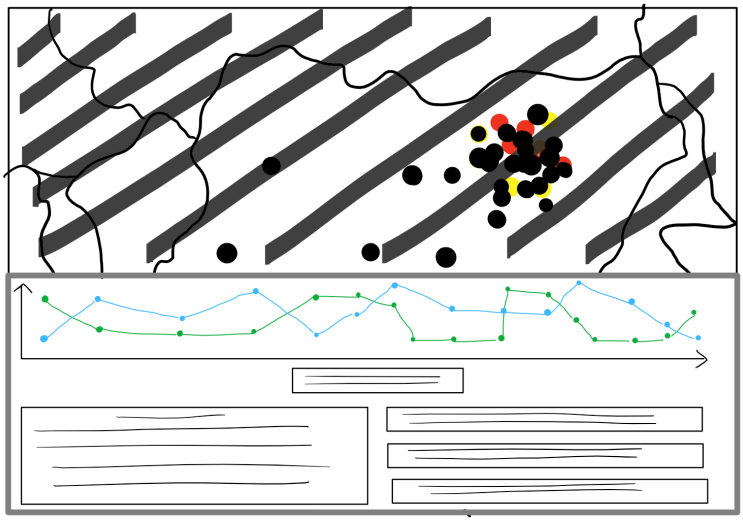


Figure 3: Sketch of the statistical information panel. Hatchings mean zone where the user interface opacity is decreased to create a focus effect

attack types. Thirdly a section is devoted to the *5 most active terrorist groups*. Lastly the user can access to the *5 most common targets*. This view was meant to be a useful summary of interesting data concerning the terrorist activity inside the country. This panel is illustrated in Figure 8.

At the beginning we implemented these 2 panels in a same view, but we changed our mind since the user interface began too "heavy". So we decided to split these two panels into 2 different views accessible through two different buttons at the bottom left of the visualization.

3.4. Miscellaneous features

In this part we will briefly talk about the 2 last features of our visualization:

- *Country search with auto-completion*: we wanted to add even more interactivity to our visualization by allowing the user to search a country by name. In is helpful since users might not identify quickly the location of all countries only by seeing a world map. We also included an auto-completion feature to our search bar in order to help even more the user and maybe make him come up with new exploration ideas as

Figure 4: Map initial view

proposition pop below the search bar. This feature is illustrated in Figure 10

- *Switch between blog and visualization views*: we included the blog concerning the data story in the same website as the visualization. Actually when the user visit the website, it first arrives on the blog view which present the data story. At the end of the blog we put a button to make it easy to switch to the visualization view. Also when in the visualization view, one of the 3 buttons at the bottom left allow the user to switch back to the blog view. The blog view is illustrated in Figure 11.

3.5. Implementing the API

Our visualization is powered by an API that serves our data as the user access them via the visualization. We built it using a python server with the Flask framework. Before serving the data we also had to perform some data cleaning involving merging a dataset of terrorist attacks with a dataset of country indicators.All our data are store in a SQLite database.

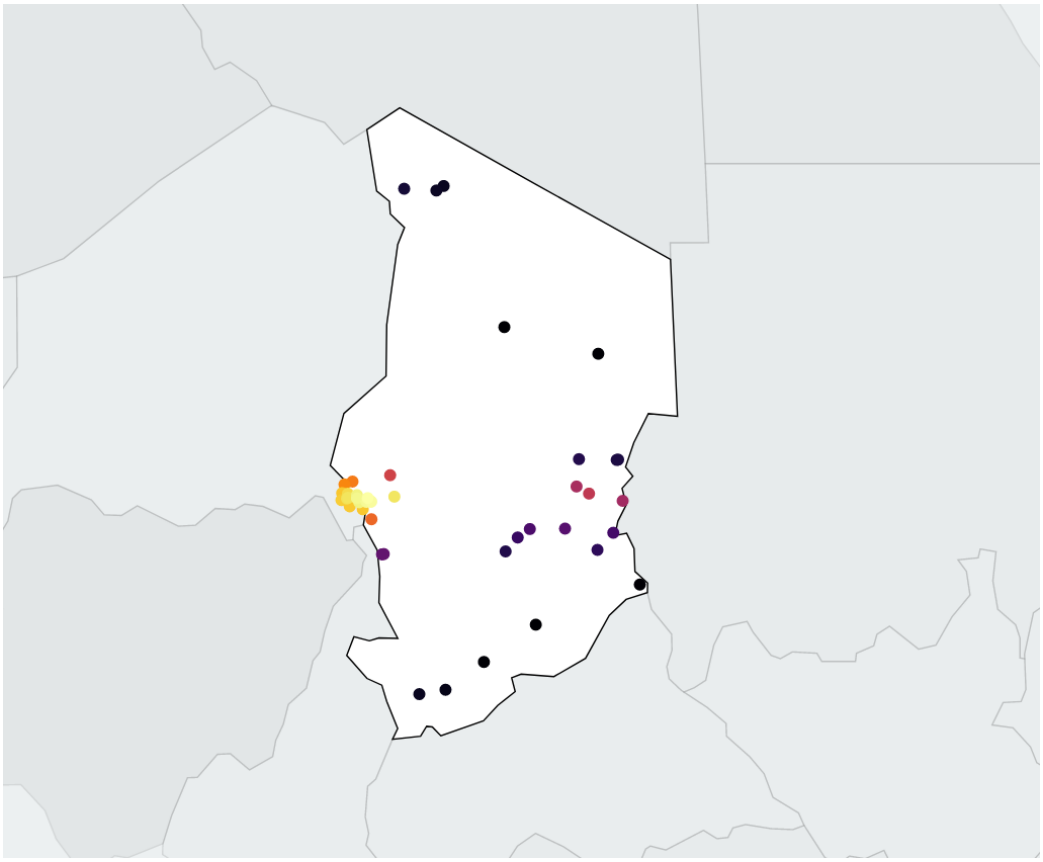


Figure 5: Country clicked view

4. Summary of technologies used

- Website:
  - *bundler*: Webpack
  - *DOM manipulation and data visualization*: D3, JQuery
  - *webpage construction*: HTML, CSS, Materialize
- API:
  - *database*: SQLite
  - *server*: Python, Flask, SciPy

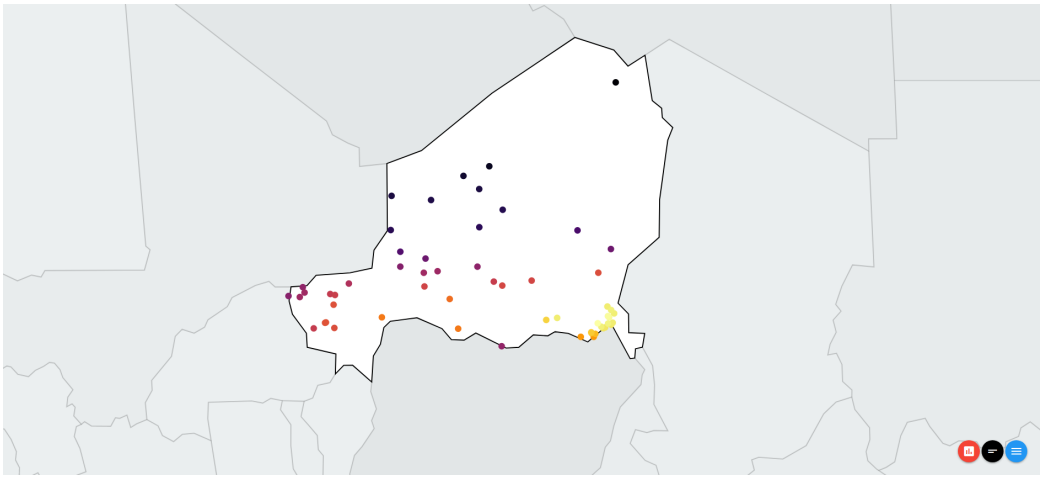


Figure 6: Map with button to access panels

5. Peer assignments

Concerning the work of each member of the group, we don't have any complain. The work were evenly distributed and the collaboration during this project was really beneficial. Here are more details about the repartition of the work:

- **Timon Zimmermann**: worked on the map view, search bar with auto-completion, the blog, the API and the process book.
- **Jimi Vaubien**: worked on the statistical panel view, the blog, the API and the process book.
- **Ismail Bouanani**: worked on the general information panel view, the blog, the screen-cast and the process book.

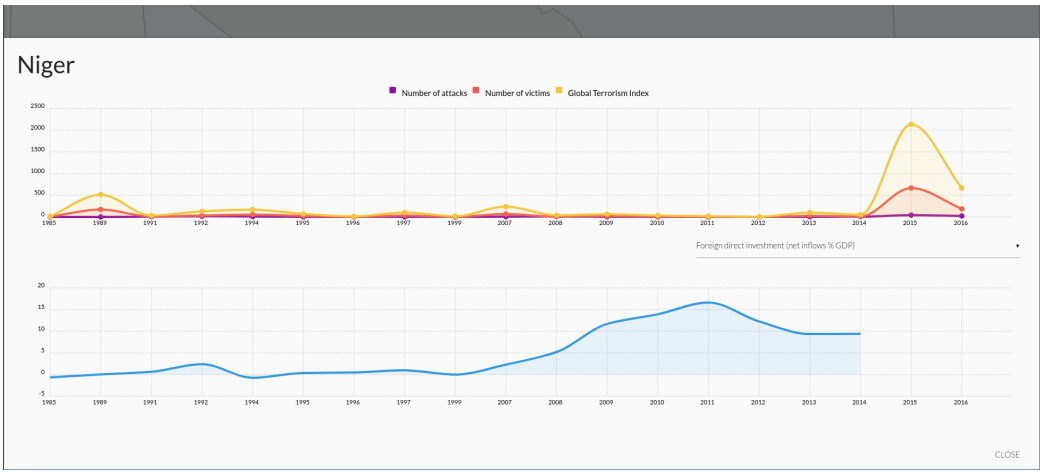


Figure 7: Statistics displaying panel for a clicked country

Figure 8: General statistics summary for a clicked country

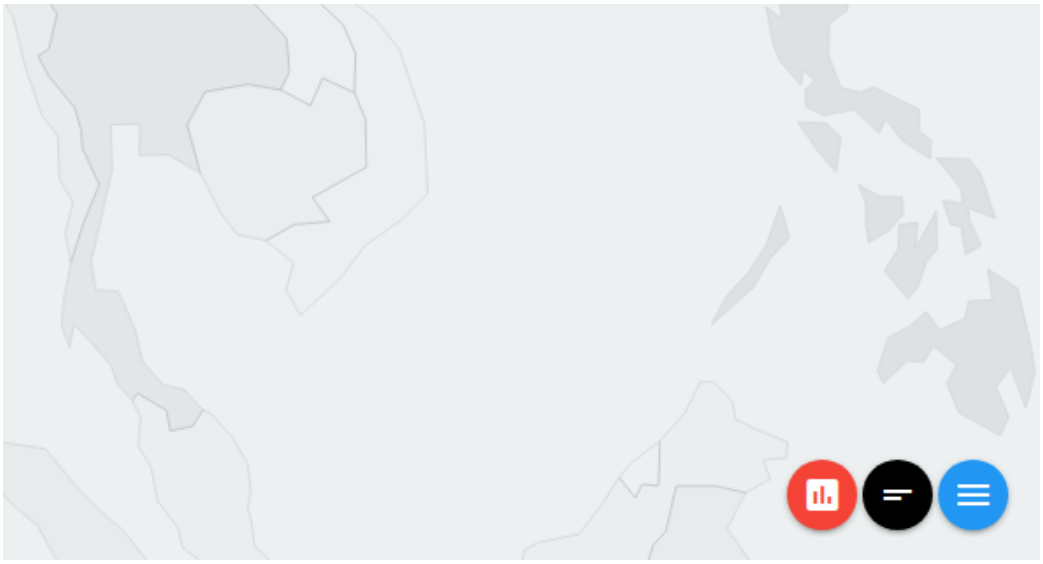
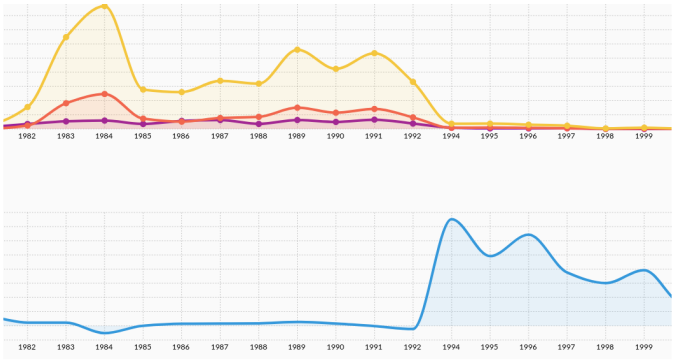


Figure 9: Buttons accessible at the bottom right of the visualization. The red button access to the stats panel if a country is clicked. The black button access to the general information panel also if a country is clicked. The blue button switch to the blog view

Figure 10: Country search with auto-completion feature



Final words...

> Remember that all these analysis are perfunctory and the mechanisms are so complex that it is difficult to model exactly why a trend is shifting or an indicator moving. We decided here to analyze the reactions through the lense of terrorist attacks but many other explanations might be appropriate.
>
> It has to be interpreted with caution, and rather used as an additional insight on the matter.

GO TO THE VISUALIZATION

Figure 11: Blog view with a button at the bottom left to switch to the visualization view