DATA VISUALIZATION PROJECT: ENERGY AROUND THE WORLD

Sanou Faye, Mila Piotrowski
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1. Data presentation

The dataset all_energy_statistics.csv is about the usage of different energies around the world from the year 1990 to 2014. We can observe statistical data thanks to the name of the countries, the year and other more complex data with the commodity transaction that shows the different energies and the different economic activity. The categories specify the type of energy of the commodity transaction. The quantities are expressed in different units.
The dataset is organized in a tabular form with 7 columns and 1 189 482 rows. Its memory usage is up to 63.5+ MB.

Here is an extract of the data frame:

	country_or_area	commodity_transaction	year	unit	quantity	quantity_footnotes	category
0	Austria	Additives and Oxygenates - Exports	1996	Metric tons, thousand	5.0	NaN	additives_and_oxygenates
1	Austria	Additives and Oxygenates - Exports	1995	Metric tons, thousand	17.0	NaN	additives_and_oxygenates
2	Belgium	Additives and Oxygenates - Exports	2014	Metric tons, thousand	0.0	NaN	additives_and_oxygenates
3	Belgium	Additives and Oxygenates - Exports	2013	Metric tons, thousand	0.0	NaN	additives_and_oxygenates
4	Belgium	Additives and Oxygenates - Exports	2012	Metric tons, thousand	35.0	NaN	additives_and_oxygenates
...	...	...	...	...	...	...	...
1189477	Viet Nam	Electricity - total wind production	2012	Kilowatt-hours, million	92.0	1.0	wind_electricity
1189478	Viet Nam	Electricity - total wind production	2011	Kilowatt-hours, million	87.0	NaN	wind_electricity
1189479	Viet Nam	Electricity - total wind production	2010	Kilowatt-hours, million	50.0	NaN	wind_electricity
1189480	Viet Nam	Electricity - total wind production	2009	Kilowatt-hours, million	10.0	NaN	wind_electricity
1189481	Viet Nam	Electricity - total wind production	2008	Kilowatt-hours, million	1.0	NaN	wind_electricity

2. Data exploration

We used python to explore in depth the dataset. We used the python pandas library to get information about the different columns. We found that there exists 71 different types of categories and 2452 different commodity transactions.

```
0                                    additives_and_oxygenates
3018                                        animal_waste
4940                                        anthracite
9834                                    aviation_gasoline
28005                                         bagasse
                                  ...
1037653                                 total_electricity
1171569                             total_refinery_output
1177352                                      uranium
1178036    white_spirit_and_special_boiling_point_industr...
1188115                                 wind_electricity
Name: category, Length: 71, dtype: object
```

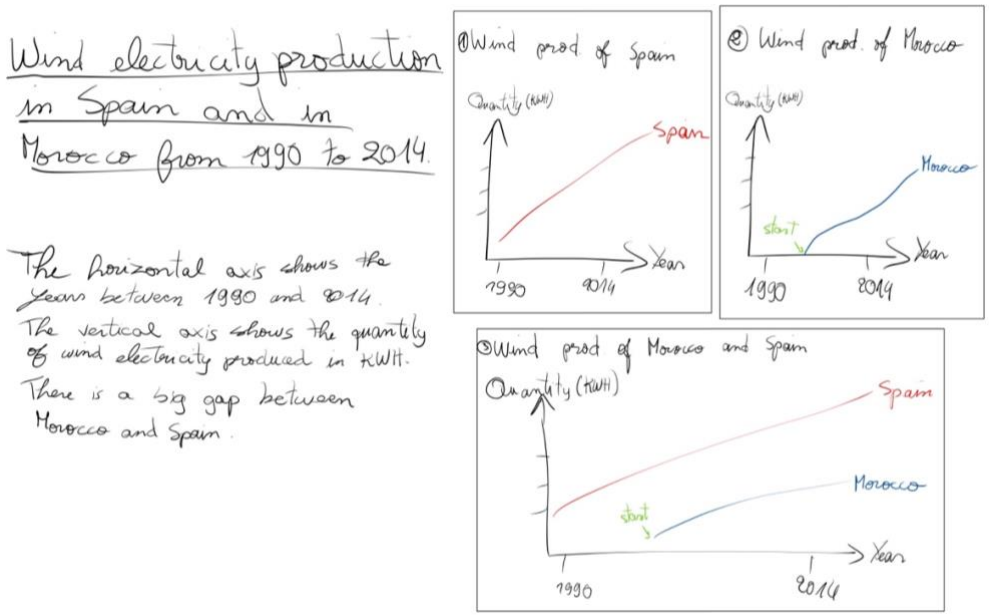
```
0                          Additives and Oxygenates - Exports
149                        Additives and Oxygenates - Imports
617                     Additives and Oxygenates - Production
906        Additives and Oxygenates - Receipts from other...
1000               Additives and Oxygenates - Stock changes
                                  ...
1184452    White spirit and special boiling point industr...
1184462    White spirit and special boiling point industr...
1169888                                  Wind - Autoproducer
1170292                                  Wind - Main activity
4896                        animal waste - Transformation
Name: commodity_transaction, Length: 2452, dtype: object
```

We also found that the units of quantities are not the same for each energy.

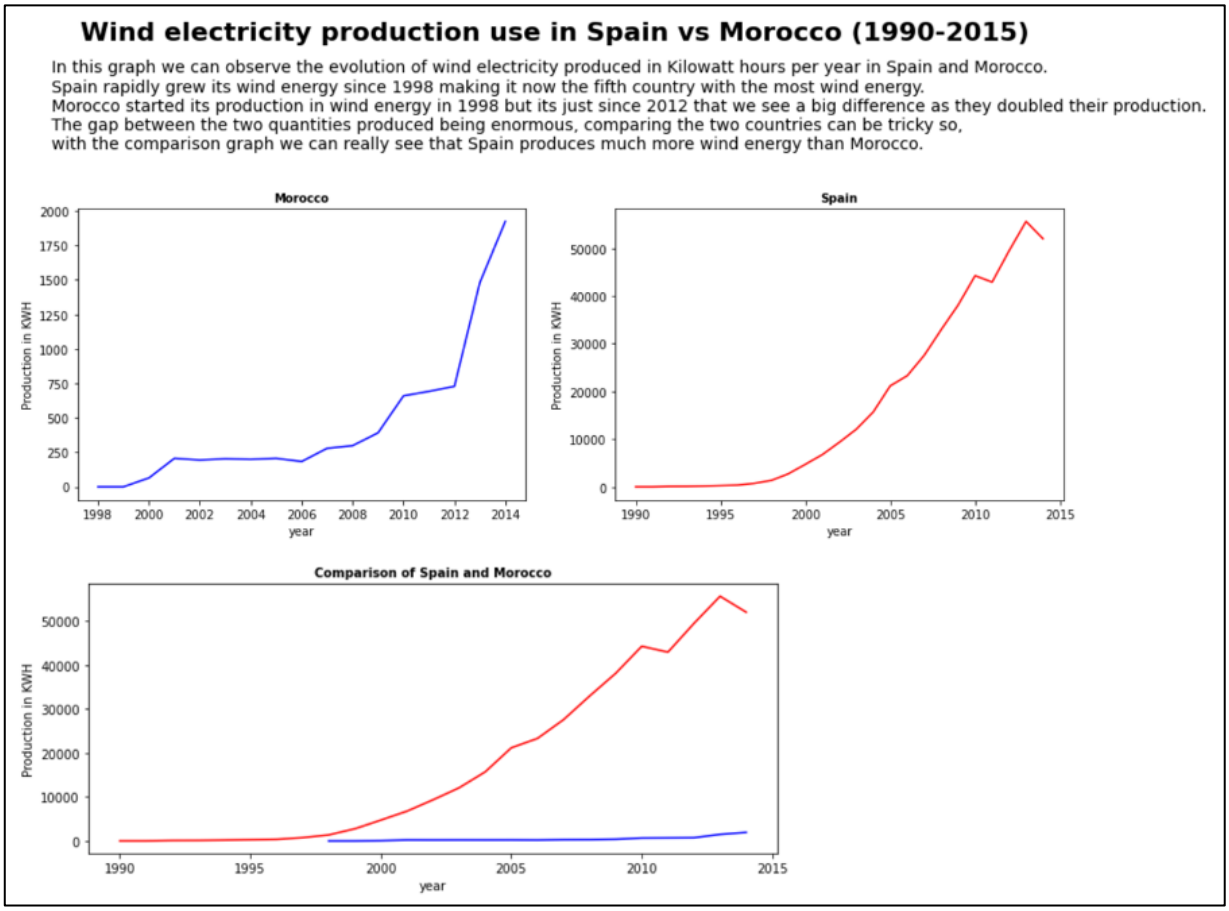
```
332735      Cubic metres, thousand
256641     Kilowatt-hours, million
204398        Kilowatts,  thousand
1177352                 Metric Tons
0            Metric tons,  thousand
3018                     Terajoules
Name: unit, dtype: object
```

3. Technical graphs

a) Wind electricity production use in Morocco vs. Spain over the time



We used python to plot the wind electricity produced in Spain and in Morocco using different function of the library matplotlib.



b) Renewables graph worldwide

In order to extract the data that we needed to make the graphs about renewable energies, we used the pandas library in python to select the commodity transactions called “Electricity – wind production” and “Electricity – solar production” of all the countries. We decided to choose the solar and the wind category because they occupy a very large place among all the renewable energies. We then exported the dataset to import it into Tableau.

```
Entrée [105]: wind = df[df["commodity_transaction"]== "Electricity - total wind production"]
              display(wind)
```

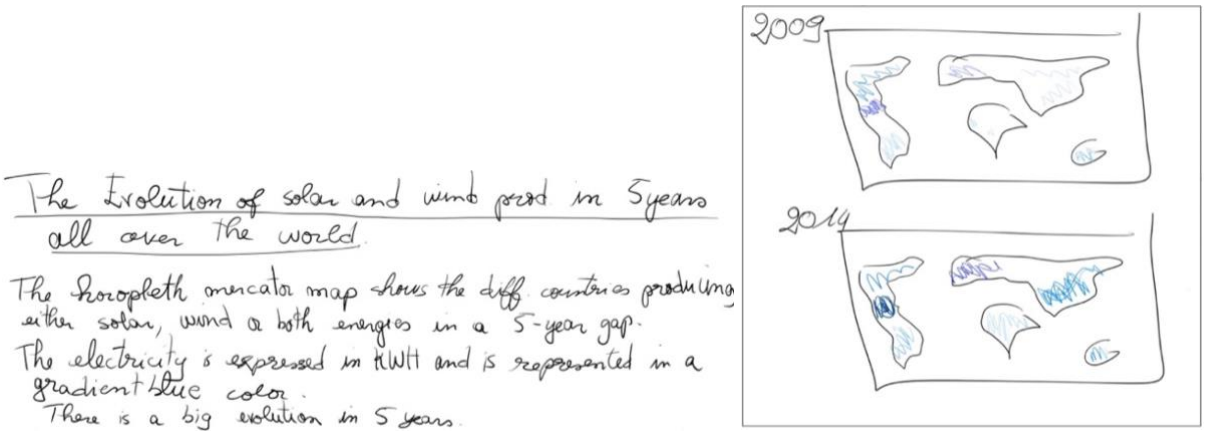
	country_or_area	commodity_transaction	year	unit	quantity	quantity_footnotes	category
1188115	Argentina	Electricity - total wind production	2014	Kilowatt-hours, million	730.0	NaN	wind_electricity
1188116	Argentina	Electricity - total wind production	2013	Kilowatt-hours, million	461.0	NaN	wind_electricity
1188117	Argentina	Electricity - total wind production	2012	Kilowatt-hours, million	369.0	NaN	wind_electricity
1188118	Argentina	Electricity - total wind production	2011	Kilowatt-hours, million	26.0	NaN	wind_electricity
1188119	Argentina	Electricity - total wind production	2010	Kilowatt-hours, million	25.0	NaN	wind_electricity
...	...	...	...	...	...	...	...
1189477	Viet Nam	Electricity - total wind production	2012	Kilowatt-hours, million	92.0	1.0	wind_electricity
1189478	Viet Nam	Electricity - total wind production	2011	Kilowatt-hours, million	87.0	NaN	wind_electricity
1189479	Viet Nam	Electricity - total wind production	2010	Kilowatt-hours, million	50.0	NaN	wind_electricity
1189480	Viet Nam	Electricity - total wind production	2009	Kilowatt-hours, million	10.0	NaN	wind_electricity
1189481	Viet Nam	Electricity - total wind production	2008	Kilowatt-hours, million	1.0	NaN	wind_electricity

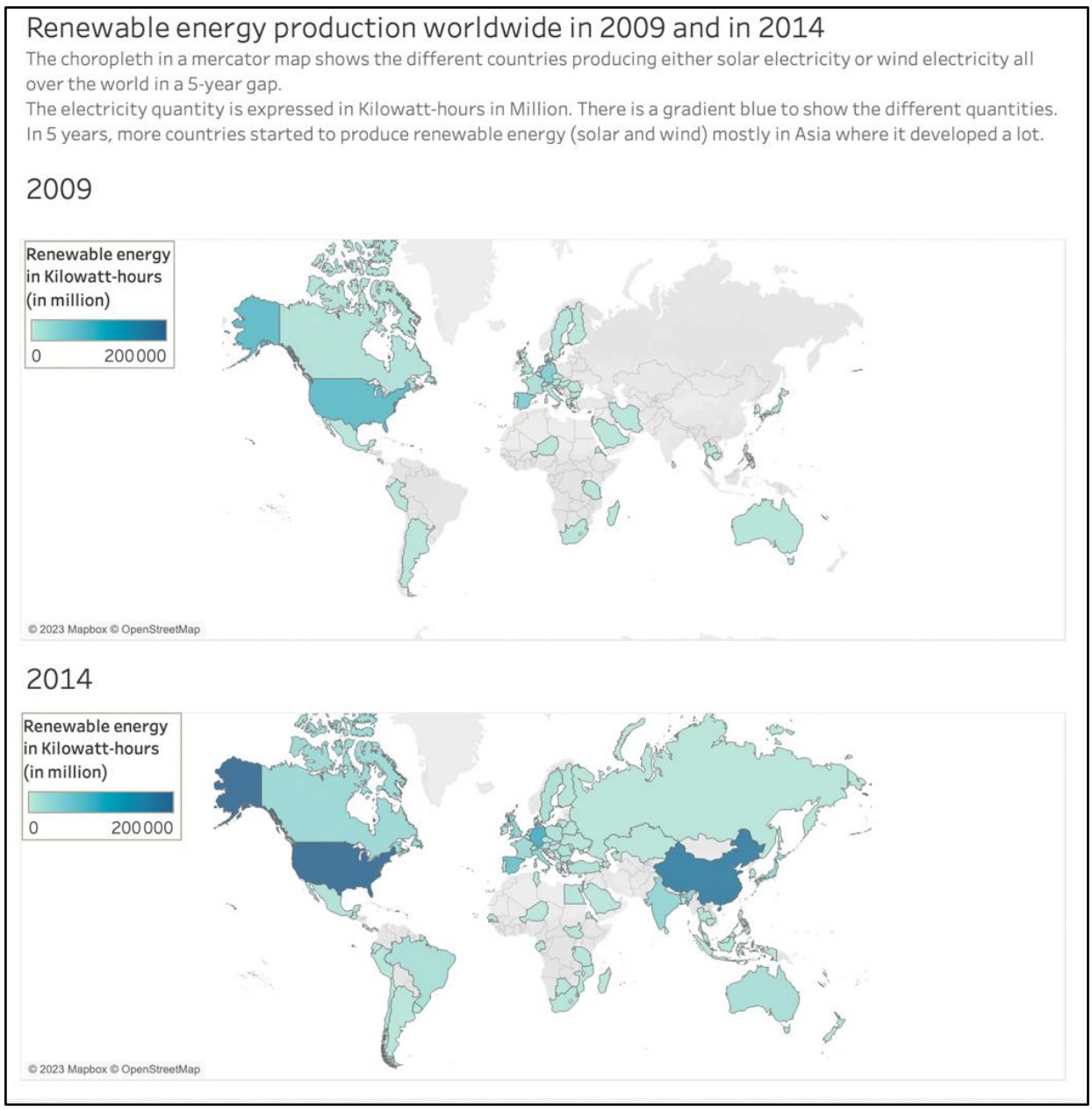
```
Entrée [106]: solar = df[df["commodity_transaction"]== "Electricity - total solar production"]
              display(solar)
```

	country_or_area	commodity_transaction	year	unit	quantity	quantity_footnotes	category
1025748	American Samoa	Electricity - total solar production	2014	Kilowatt-hours, million	1.1	1.0	solar_electricity
1025749	American Samoa	Electricity - total solar production	2013	Kilowatt-hours, million	1.1	1.0	solar_electricity
1025750	American Samoa	Electricity - total solar production	2012	Kilowatt-hours, million	1.1	NaN	solar_electricity
1025751	Argentina	Electricity - total solar production	2014	Kilowatt-hours, million	16.0	NaN	solar_electricity
1025752	Argentina	Electricity - total solar production	2013	Kilowatt-hours, million	15.0	NaN	solar_electricity
...	...	...	...	...	...	...	...
1026696	Uruguay	Electricity - total solar production	2014	Kilowatt-hours, million	3.4	NaN	solar_electricity
1026697	Vanuatu	Electricity - total solar production	2014	Kilowatt-hours, million	0.2	1.0	solar_electricity
1026698	Vanuatu	Electricity - total solar production	2013	Kilowatt-hours, million	0.2	1.0	solar_electricity
1026699	Vanuatu	Electricity - total solar production	2012	Kilowatt-hours, million	0.2	NaN	solar_electricity
1026700	Vanuatu	Electricity - total solar production	2011	Kilowatt-hours, million	0.1	1.0	solar_electricity

```
Entrée [107]: wind.to_excel("wind.xlsx")
              solar.to_excel("solar.xlsx")
```

Worldwide:

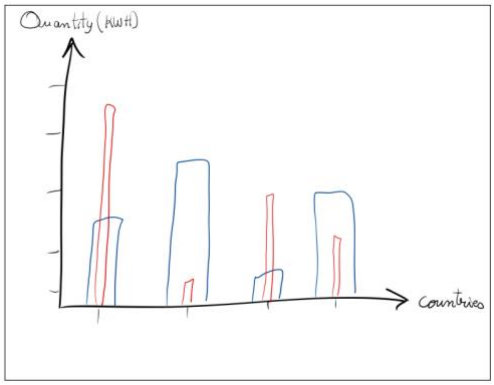

The Evolution of solar and wind prod in 5 years all over the world
The choropleth mercator map shows the diff countries producing either solar, wind or both energies in a 5-year gap.
The electricity is expressed in KWH and is represented in a gradient blue color.
There is a big evolution in 5 years.
2009
2014


Renewable energy production worldwide in 2009 and in 2014
The choropleth in a mercator map shows the different countries producing either solar electricity or wind electricity all over the world in a 5-year gap.
The electricity quantity is expressed in Kilowatt-hours in Million. There is a gradient blue to show the different quantities.
In 5 years, more countries started to produce renewable energy (solar and wind) mostly in Asia where it developed a lot.
2009
Renewable energy in Kilowatt-hours (in million)
0
200000
© 2023 Mapbox © OpenStreetMap
2014
Renewable energy in Kilowatt-hours (in million)
0
200000
© 2023 Mapbox © OpenStreetMap

Big players:

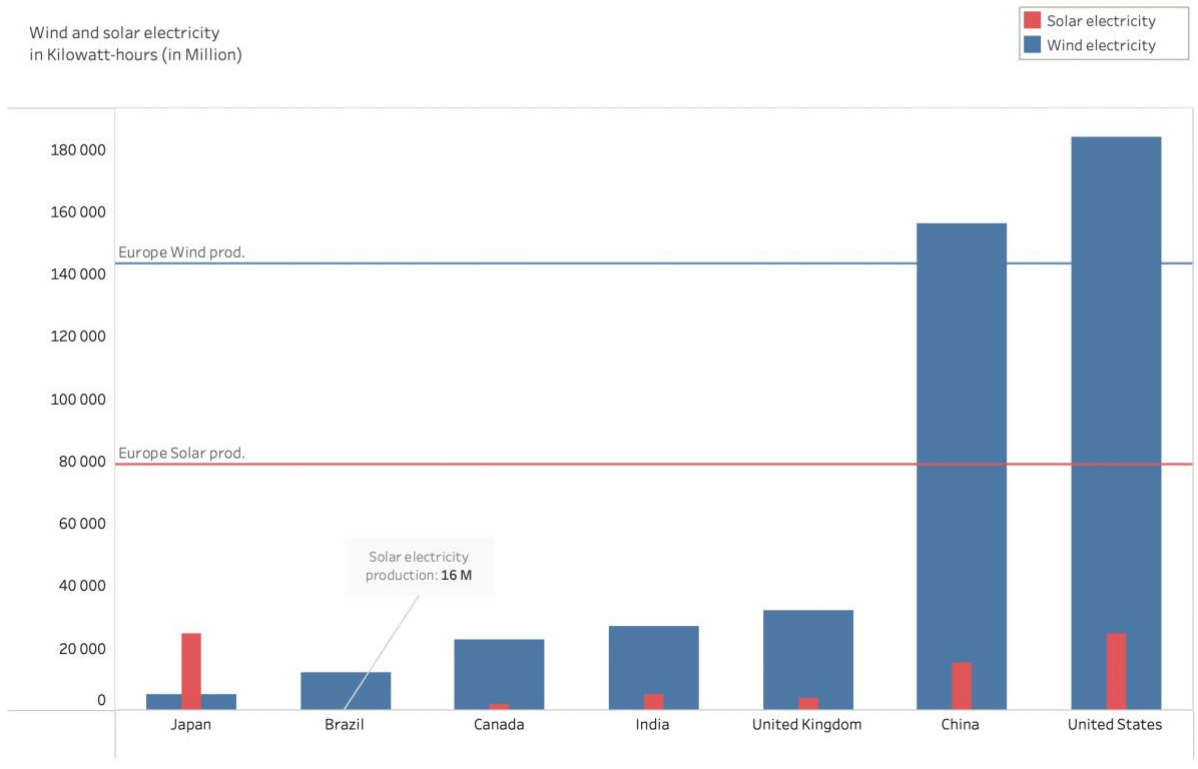
The Big 7 solar and wind electricity production in Year Y

The horizontal axis shows the name of the big players.
The vertical axis is expressed in kWH for solar and wind prod. in 2014.
The wealth of the country and its size can make the quantities to differ.



Wind and Solar electricity production in 2014

The horizontal axis shows the name of the big players. The vertical axis is expressed in Kilowatt-hours in Million for solar electricity production and wind electricity production in the year 2014.
Countries mostly base their electricity production on the wind except for Japan which has a higher solar electricity production compared to its wind electricity production.
The wealth of the country and its size can participate in why the production differs.

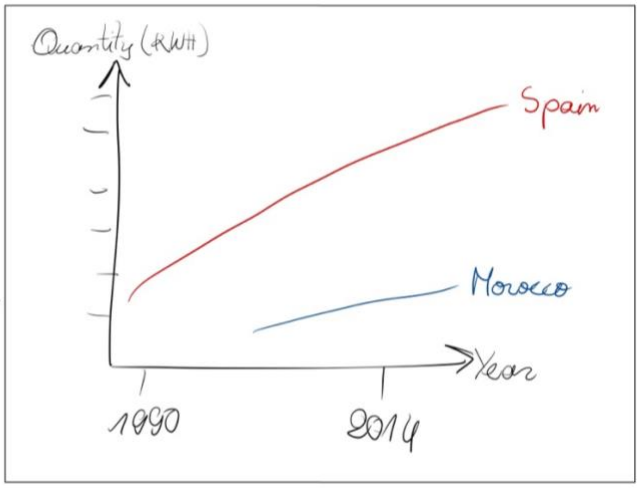


4. General audience graphs

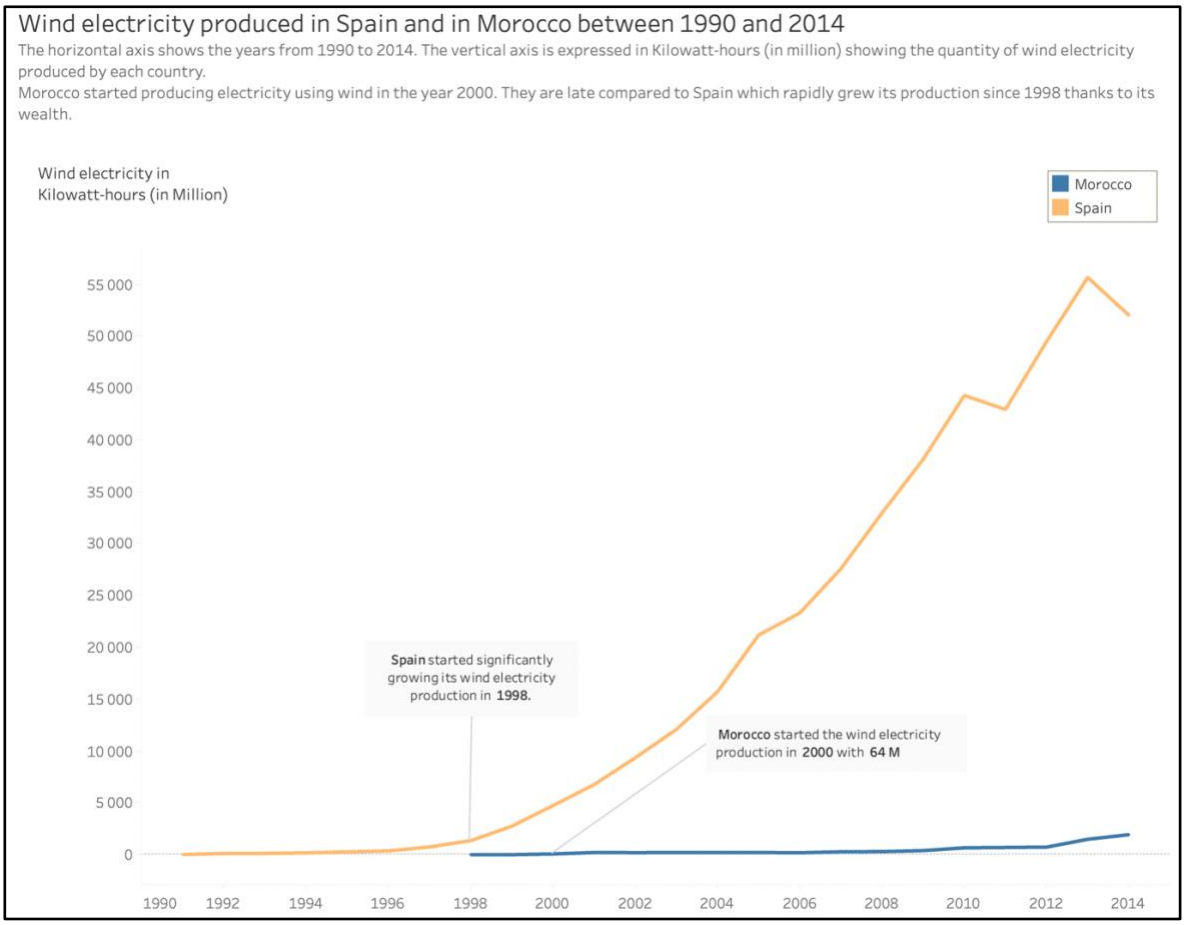
a) Wind electricity production use in Morocco vs. Spain over the time

Wind electricity prod. in Morocco and in Spain between 1990 to 2014.

The horizontal axis shows the years from 1990 to 2014.
The vertical axis is the quantity of wind produced in KWH.
There is a big gap between Spain and Morocco because of the difference of wealth and development.



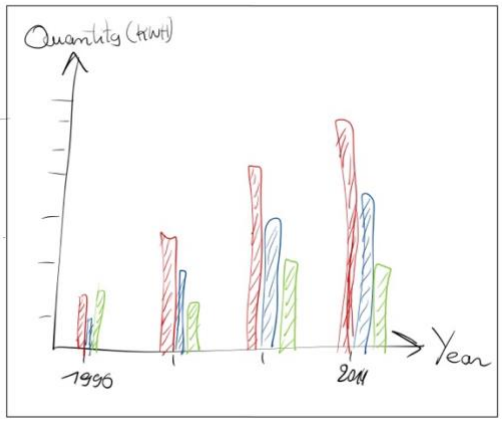
We reused the dataset exported from python about wind electricity. Using Tableau, we chose Morocco and Spain for the filters concerning the countries.



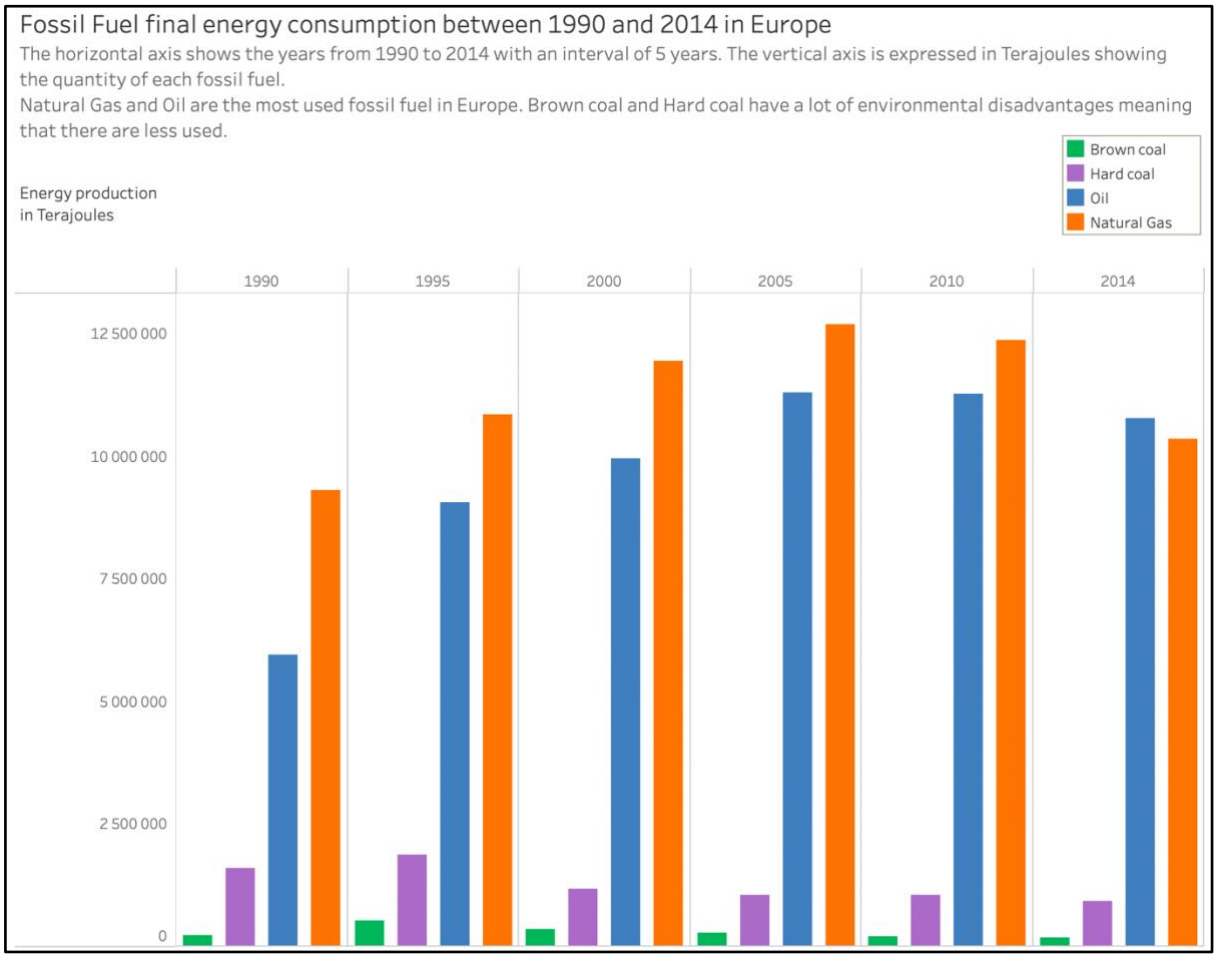
b) Fossil fuels between 1990 and 2014: how is the energy transition going in the EU?

Fossil Fuel prod. between 1990 and 2014 in Europe

The horizontal axis shows the years from 1990 to 2014. The vertical axis is expressed in Terajoules and it shows the quantity of each fossil fuel produced.



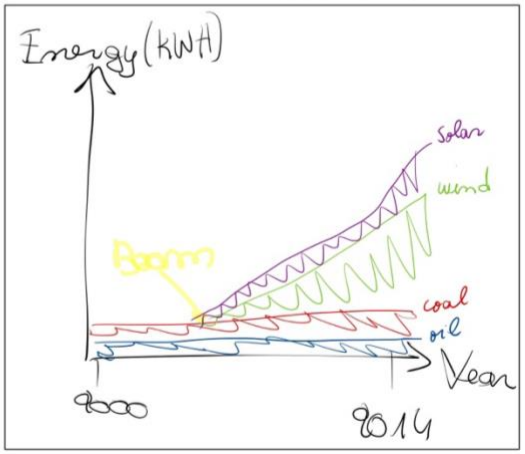
We exported the dataset about fossil fuels from python. With Tableau, we decided to make a bar graph to better see the evolution and the difference about each energy production.



c) Free Subject

Asian energy production between 2000 and 2014

The horizontal axis shows the year from 2000 to 2014. The vertical axis express the energy in KWH. There is a boom of renewable energy in 2009.



We created a new table in Python with the fossil fuels and the renewable energies (wind and solar) in the countries in Asian. We made sure to convert all the units into KWH. We exported the dataset into an excel file that we imported into Tableau. We chose a year range that seemed interesting to us.