

# **European Greenhouse Gas Emission Process Book Final Project CS582**

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## Topic Selection


Our team spend a lot of time to decide the final project topic. We mainly have two meeting for the topic selection.

1. Meeting : share data resource between us and provide initial ideas.
  - a. we all have no too much idea about what we should do for final project. However, everyone has some resource to about data. So at this 1st meeting, we share these resource between us. And individually find the interesting topic which can meet final project requirement.
  - b. Everyone browse the website to select at least two useful data for our analysis. Once we find some useful data visualization work which may be used as the prototype of our work. We also need everyone to provide such case.
2. Meeting : decide our topic and prototype
  - a. Two team members find that the Greenhouse Gas Emission dataset at the same time and share it in this meeting. We think this dataset can make full use of spatial feature and can display the usage of different views like pie chart, bar chart and so on.
  - b. After decide the dataset, we also browse some other data visualization which may be useful for our work.

Finally, we decide to use theEU CO2 emissions data from 1990 to 2012.

<http://ec.europa.eu/eurostat/web/products-datasets/-/tsdgp410>

This is a public website for European statistic information.



eurostat

Your key to European statistics

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ABOUT EUROSTAT

OVERVIEW

What we do

Co-ordination role

Who does what

How to find us

Policies

Dissemination

Quality

Civil Servants Remunerations

Research and methodology

Statistical confidentiality

Copyright notice and free re-use of data

Our partners

European Statistical System (ESS)

International Cooperation

Opportunities

Recruitment

A career at Eurostat

OVERVIEW

Eurostat is the statistical office of the European Union situated in Luxembourg. Its mission is to provide high quality statistics for Europe. While fulfilling its mission, Eurostat promotes the following values: respect and trust, fostering excellence, promoting innovation, service orientation, professional independence.

Providing the European Union with statistics at European level that enable comparisons between countries and regions is a key task. Democratic societies do not function properly without a solid basis of reliable and objective statistics. On one hand, decision-makers at EU level, in Member States, in local government and in business need statistics to make those decisions. On the other hand, the public and media need statistics for an accurate picture of contemporary society and to evaluate the performance of politicians and others. Of course, national statistics are still important for national purposes in Member States whereas EU statistics are essential for decisions and evaluation at European level.


Statistics can answer many questions. Is society heading in the direction promised by politicians? Is unemployment up or down? Are there more CO2 emissions compared to ten years ago? How many women go to work? How is your country's economy performing compared to other EU Member States?

International statistics are a way of getting to know your neighbours in Member States and countries outside the EU. They are an important, objective and down-to-earth way of measuring how we all live.


Changing role of Eurostat

Eurostat was established in 1953 to meet the requirements of the Coal and Steel Community. Over the years its task has broadened and when the European Community was founded in 1958 it became a Directorate-General (DG) of the European Commission. Today, Eurostat is part


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Meet our acting Director-General



Meet our Commissioner



Working arrangements between the Cabinet of Commissioner Marianne Thyssen and Eurostat



Commission Decision on Eurostat

Regulation on European statistics (consolidated)

It also provide some other information about the dataset. We just use few of them for our analysis. Since We have no too much time for this final project.

DATABASE

Your search has matched 1 node.

Here > Data Navigation Tree

- Database by themes
- Tables by themes
- Here > Tables on EU policy
  - ZIP Macroeconomic imbalances procedure indicators
  - ZIP Euro indicators / PEEIs
  - ZIP Europe 2020 indicators
  - Here > ZIP Sustainable Development indicators
    - ZIP Socioeconomic development (sd\_ec)
    - ZIP Sustainable consumption and production (sd\_pc)
    - ZIP Social inclusion (sd\_sc)
    - ZIP Demographic changes (sd\_de)
    - ZIP Public health (sd\_ph)
    - ZIP Climate change and energy (sd\_cc)
    - ZIP Sustainable transport (sd\_tr)
    - ZIP Natural resources (sd\_nr)
    - Here > ZIP Global partnership (sd\_gp)
      - ZIP Official development assistance as share of gross national income (tsdgp100)
      - ZIP Globalisation of trade (sd\_gp\_glo)
      - ZIP Financing for sustainable development (sd\_gp\_fin)
      - Here > ZIP Global resource management (sd\_gp\_res)
        - Here > ZIP > CO2 emissions per inhabitant in the EU and in developing countries (tsdgp410) <
        - ZIP Contextual indicators (sd\_gp\_cxt)
      - ZIP Good governance (sd\_go)
    - ZIP Employment and Social Policy Indicators
  - Cross cutting topics
  - New Items (sorted by code) New
  - Recently Updated Items (sorted by code) Updated

## Project background

A greenhouse gas is any gaseous compound in the atmosphere that is capable of absorbing infrared radiation, thereby trapping and holding heat in the atmosphere. By increasing the heat in the atmosphere, greenhouse gases are responsible for the greenhouse effect, which ultimately leads to global warming.

Human activities since the beginning of the Industrial Revolution (taken as the year 1750) have produced a 40% increase in the atmospheric concentration of carbon dioxide, from 280 ppm in 1750 to 400 ppm in 2015. This increase has occurred despite the uptake of a large portion of the emissions by various natural "sinks" involved in the carbon cycle. Anthropogenic carbon dioxide (CO<sub>2</sub>)

emissions (i.e., emissions produced by human activities) come from combustion of fossil fuels, principally coal, oil, and natural gas, along with deforestation, soil erosion and animal agriculture.

It has been estimated that if greenhouse gas emissions continue at the present rate, Earth's surface temperature could exceed historical values as early as 2047, with potentially harmful effects on ecosystems, biodiversity and the livelihoods of people worldwide.

The EU has set itself objectives for reducing its greenhouse gas emissions progressively up to 2050. For 2020, the EU has committed to cutting its emissions to 20 % below 1990 levels. This commitment is one of the headline targets of the Europe 2020 growth strategy, known as the Climate and Energy package.

## **Data Set**

We get data on CO2 emissions per capita from the EU's official

website(<http://ec.europa.eu/eurostat/web/products-datasets/-/tsdgp410>

). And then according to our needs, using R language data classification and rearrangement.

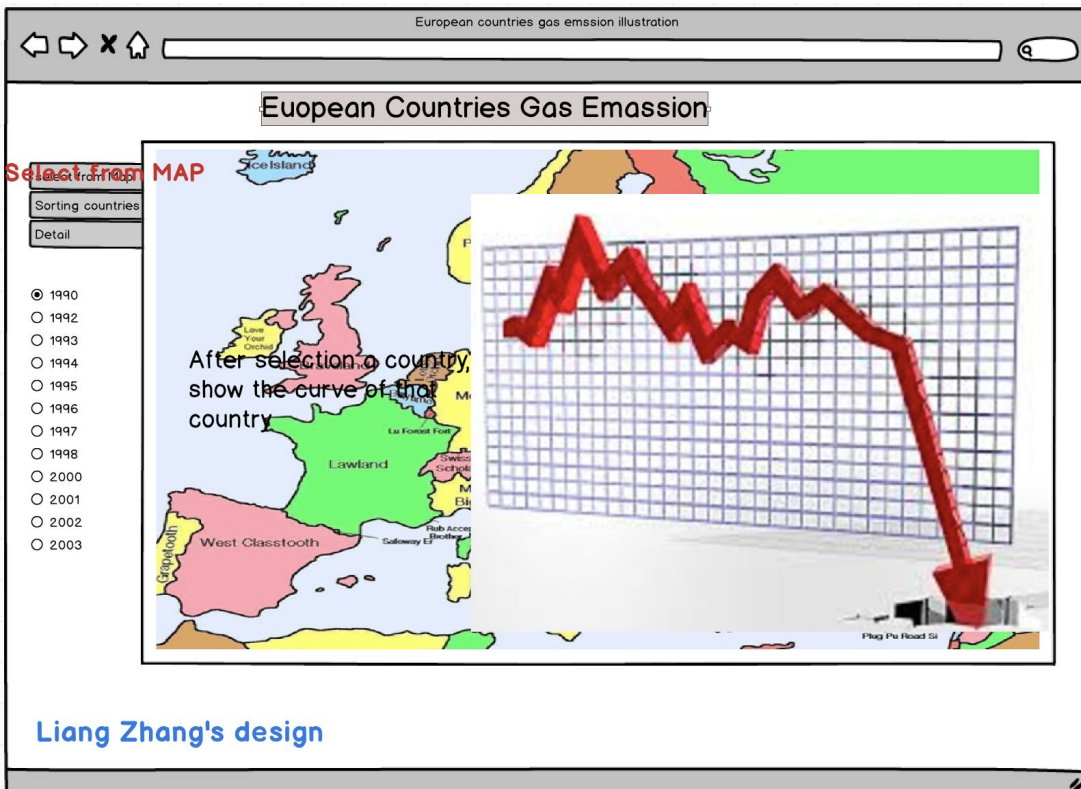
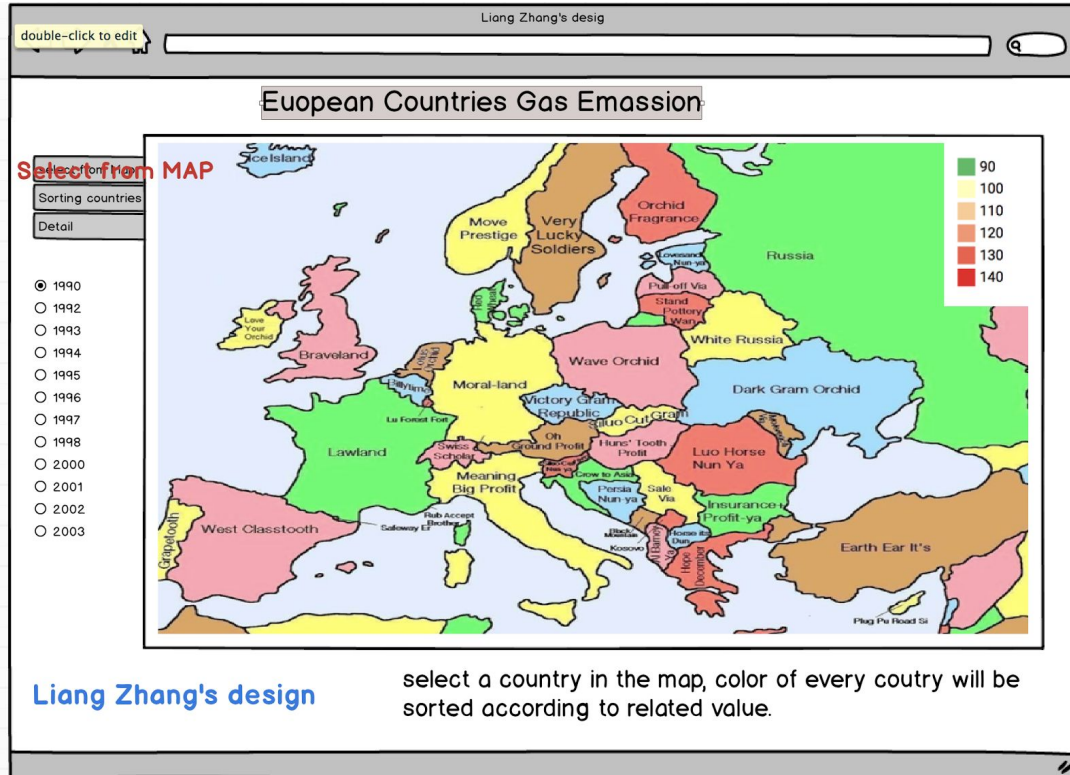
## **Question**

We draw the map relate to the json data without projection so that it is hard to change the size and position of the map. First we created the zoom to change the size and position, but it make the webpage run slowly and it is difficult to put words. Finally we removed the zoom.

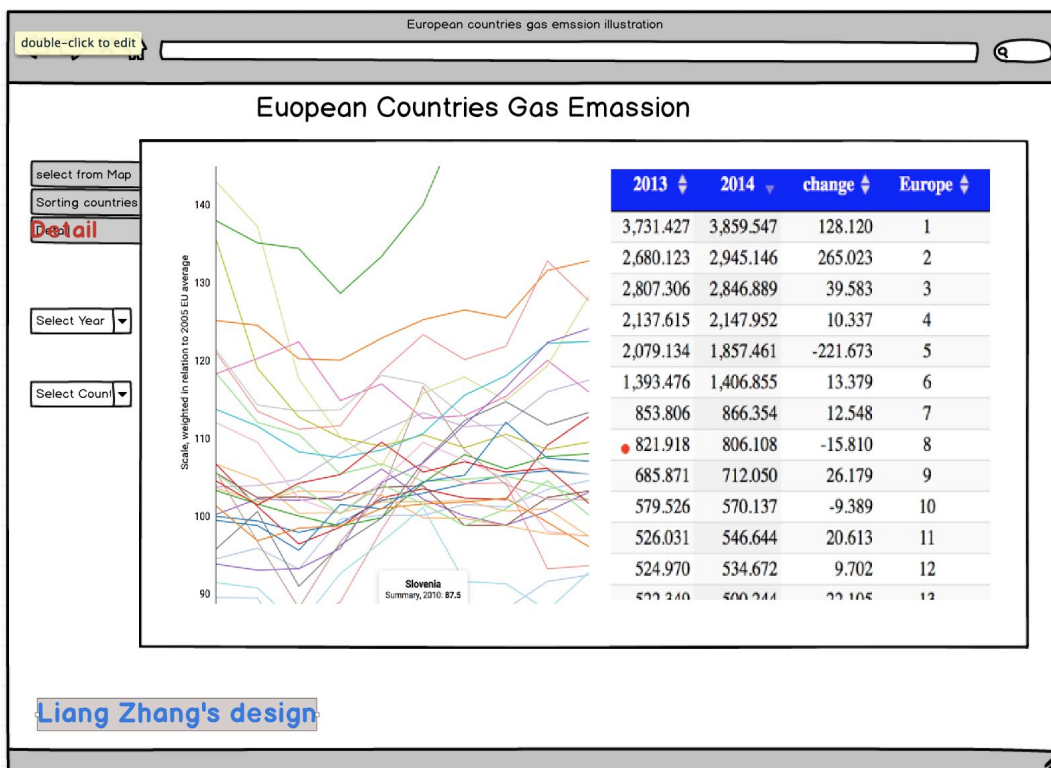
## **Initial visualization design**

### **1. Liangzhang's design:**

The information is convenient for users to find in two methods, one is selected from map while the other is ranked countries according to average gas emission. The value displayed is the summation of all years' value or average by default. In contrast. It can also show the concrete year. Once the country is fixed, the detail of that country display.





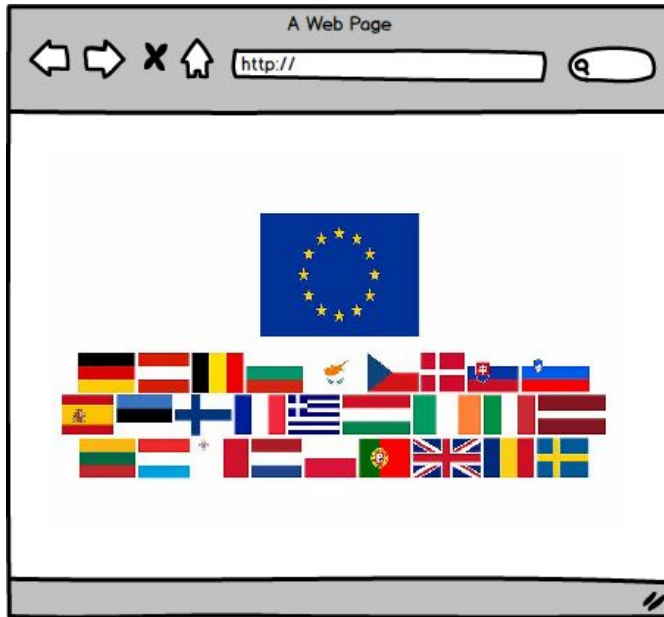


## 2. Zhe Lyu's Design:

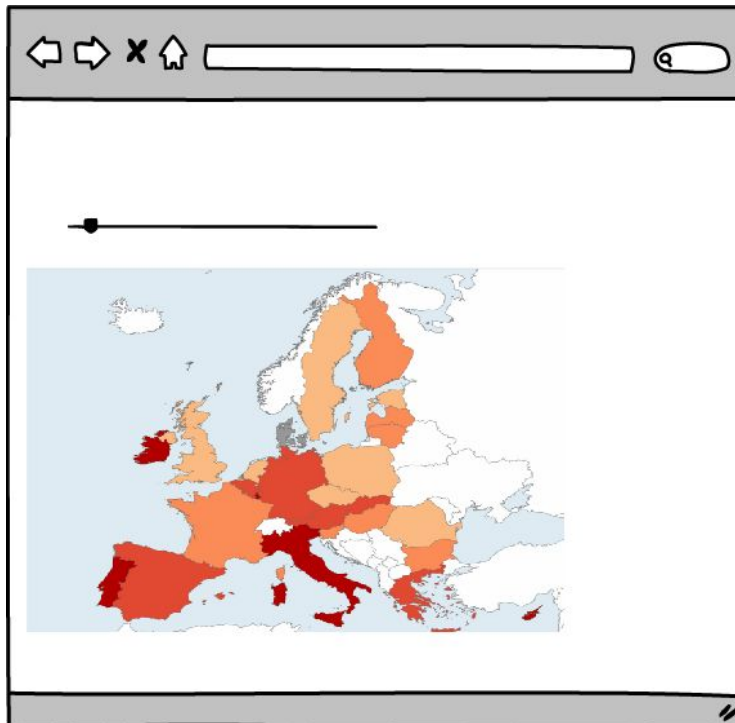
First, the user will see the EU map, he can drag the timeline to get the results of different years. When a user clicks on a country, he can see the country's data changes from a line chart. The line of the selected country will be highlight.

Users can also view the ranking of CO2 emissions. The ranking images are the flags for each country, the user can view the rankings for different years, or click the flag to view country specific data. At the same time, users can also see pie charts and histograms showing the proportions of emissions from different countries.



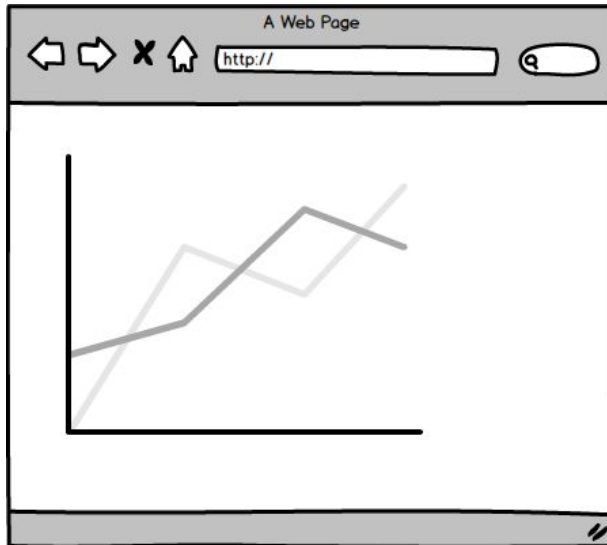


Item Name : Flag  
 Target: User could click flag to get data of different countries



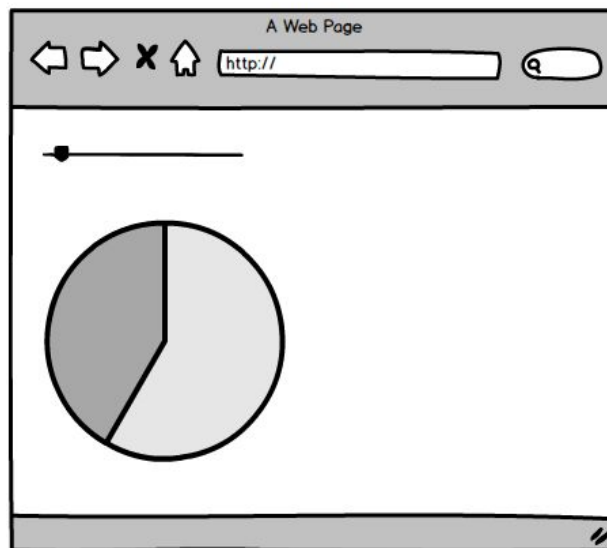
Zhe Lyu Designing

Item Name : Map  
 Target: Map of EU with different rates of CO2 emission, changing with time line



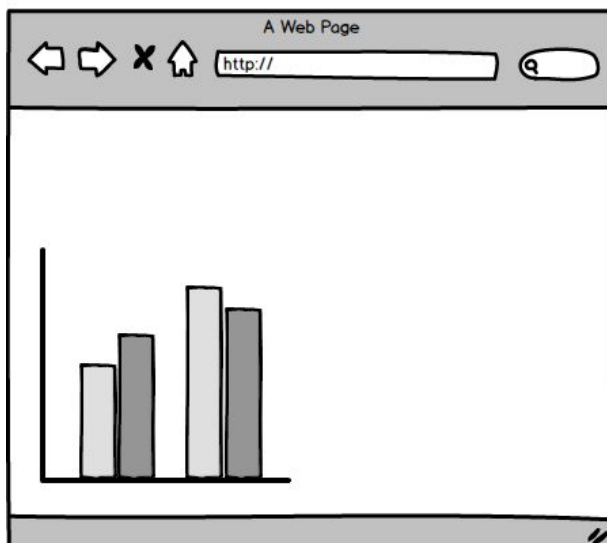
Item Name: Line chart:

Target: Showing changes in CO<sub>2</sub> emissions over time in each EU country. Mouse up to highlight



Item Name: Pie chart:

Target: Displays the proportion of CO<sub>2</sub> emissions of EU  
Changing by the time line.

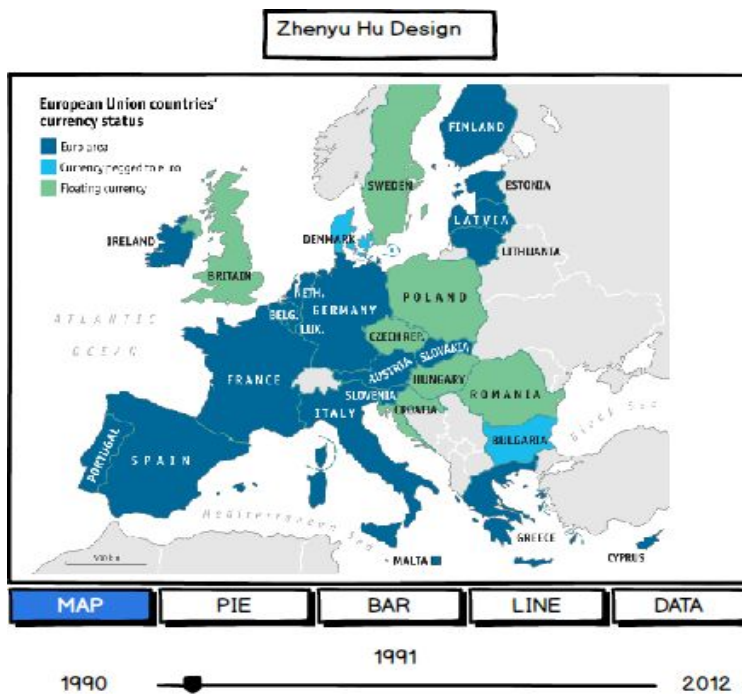


Item Name: Pie chart:

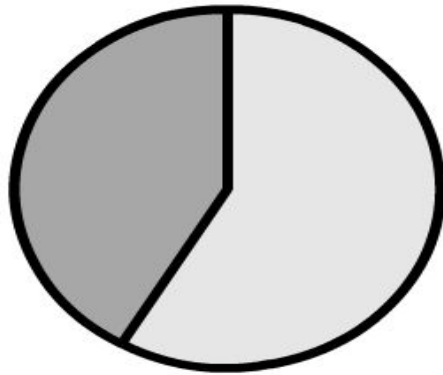
Target: Displays the proportion of CO<sub>2</sub> emissions of one country when click this country from the map.  
Changing by the time line.

### 3. Zhenyu Hu's Design:

The user will see the EU map different year's data by dragging the timeline. When user click the country he will see the line chart data about this country. Users can also view the ranking of CO2 emissions. The ranking images are the flags for each country. As the same time, the user can see pie chart, line chart and bar chart by click the different buttons at the bottom.



Zhenyu Hu Design



MAP

PIE

BAR

LINE

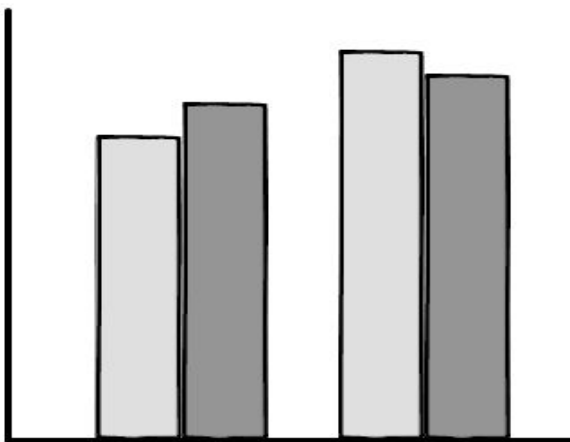
DATA

1990

1991

2012

Zhenyu Hu Design



MAP

PIE

BAR

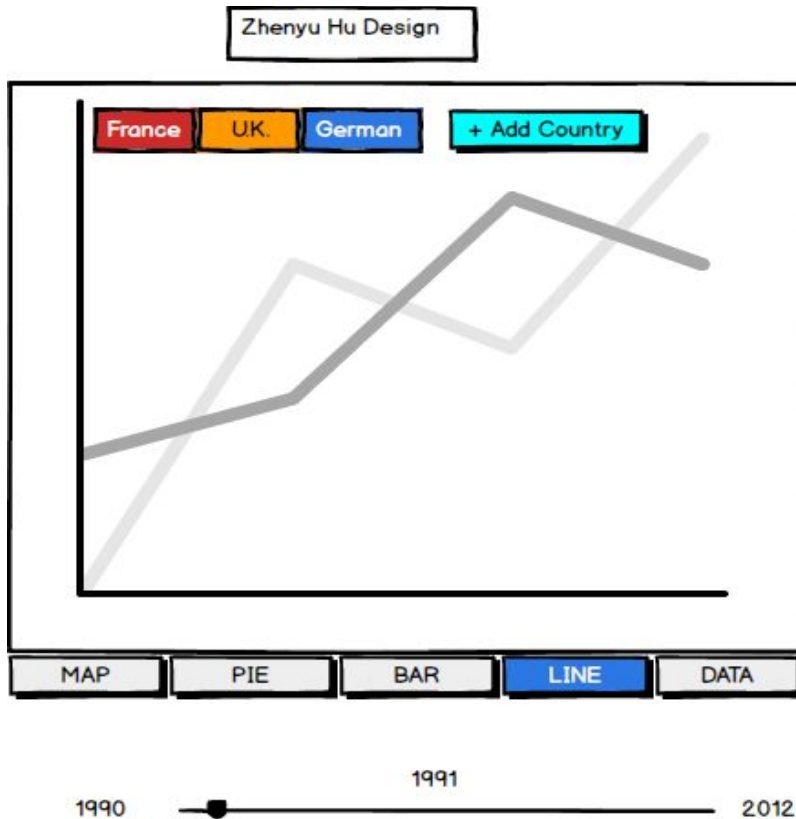
LINE

DATA

1990

1991

2012



## Decide features of work

### Must-Have Features

1. Map view: it is default method to show the country. Move the mouse hover over the country, it will simple information about that country. Different country is displayed in different color which show the ordered category of gas emission level.
2. Ranked countries, show different countries orderly. The logo of every country is represented by the flag of country. It can display in ascending order or descending order. It also can be filtered by year.
3. Year feature, all above two features can display the information in concrete year. The year here is only considered from 1990 to current. Actually, the website only provide data in these years. Definitely, it can show data change in every country or whole European region for every year.

4. Detailed: once the filter condition like country, year is selected, the detail of gas emission will display in the format of curve diagram. The color of curve represent the category of gas emission level.

### Optional Features

1. Pie-chart: Show the proportion of emissions.
2. Hilstrom: Show the data of different countries every year.
3. Click: Aggregate data for visualization with one click
4. Others: Filter data with mouse actions.

### Project Schedule

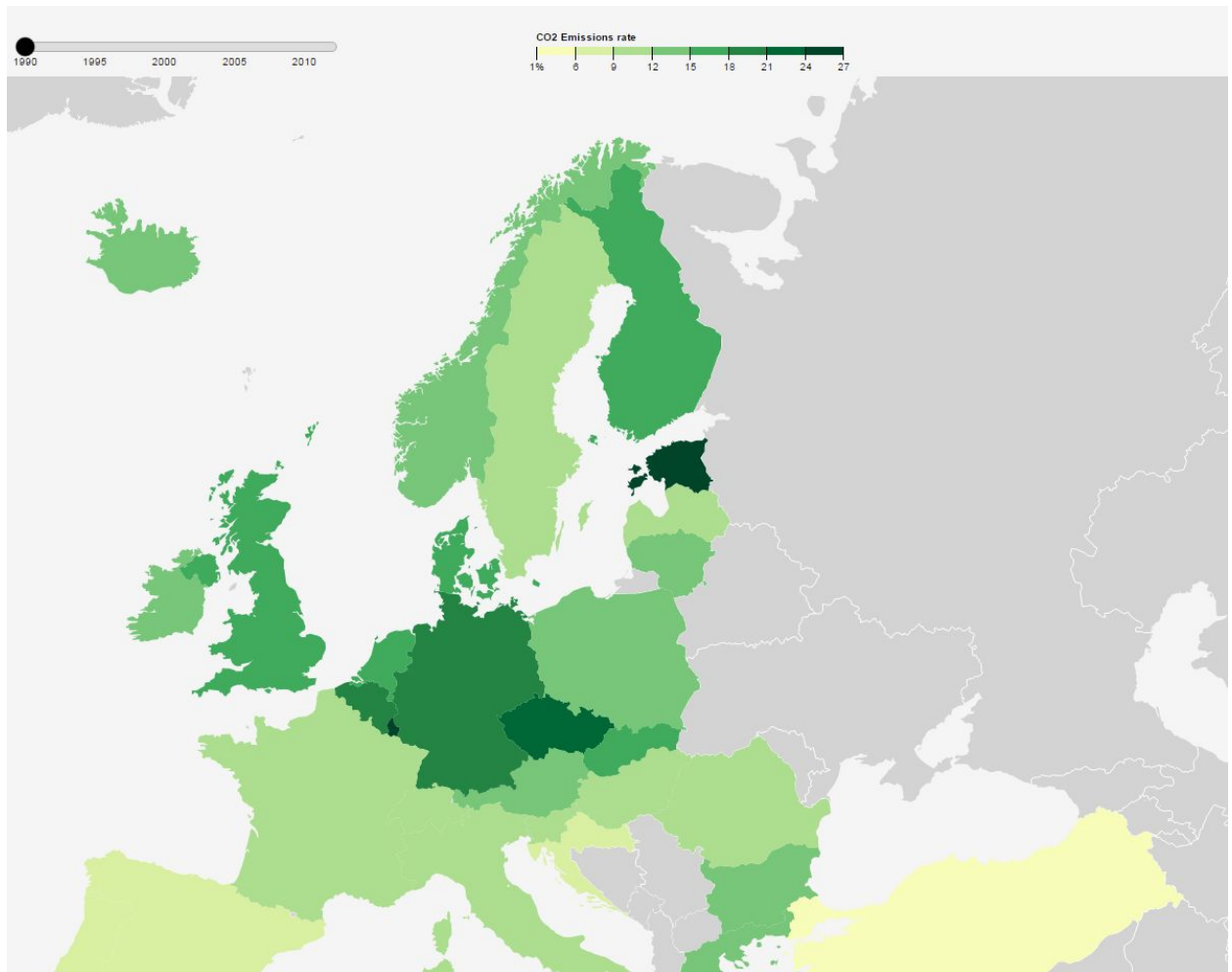
Time	Task	Delivery file
6 Feb	Requirement collection	
11 Feb	analysis	
15 Feb	design	Project proposal
18 Feb	- mockup	
23 Feb	Coding Unit Test	Prototype & Feedback
28 Feb		
2 Mar	System Test	Final submission

### Development problem

We spend a lot of time to search the map resource for European. Actually, We hope to find the Json file which can be used for our coding work directly. Everyone in our team tried to find it. Finally, the current Json file is selected since it has clear European map which can meet our requirement.

Initial we produce a prototype for our discussion.

1. Fast prototype



The above map show the countries which involved in our project. Actually, it is just a prototype for us.

## 2. First version

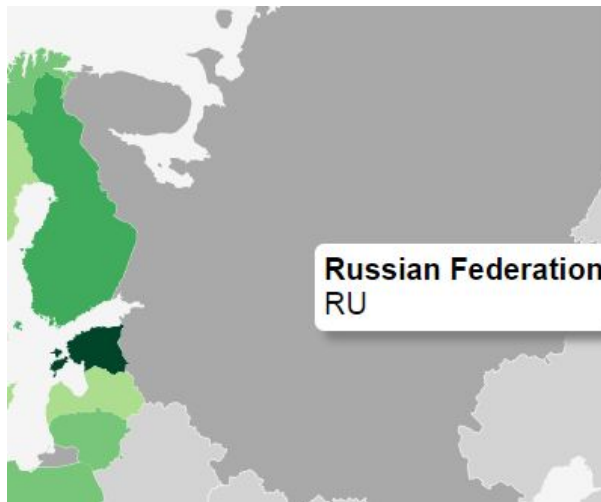
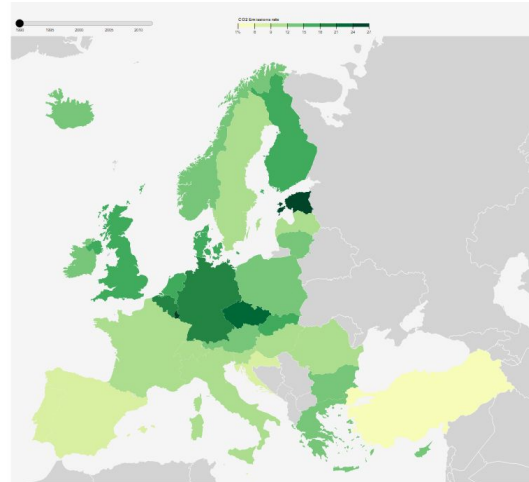
We develop first version of the based on the data with almost full features.

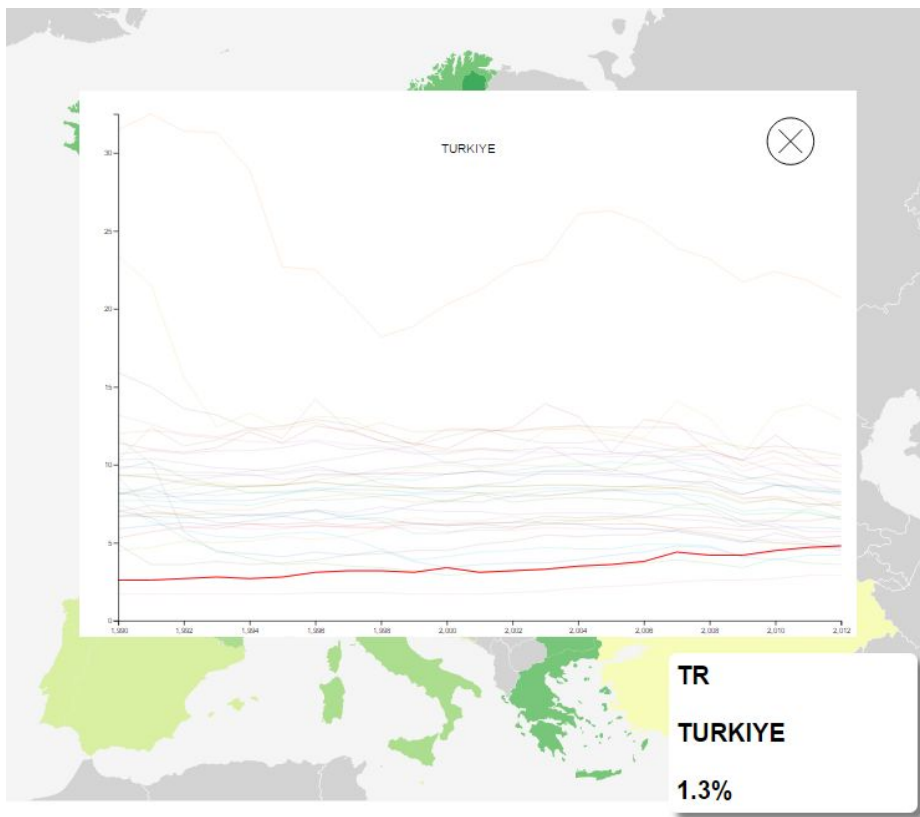
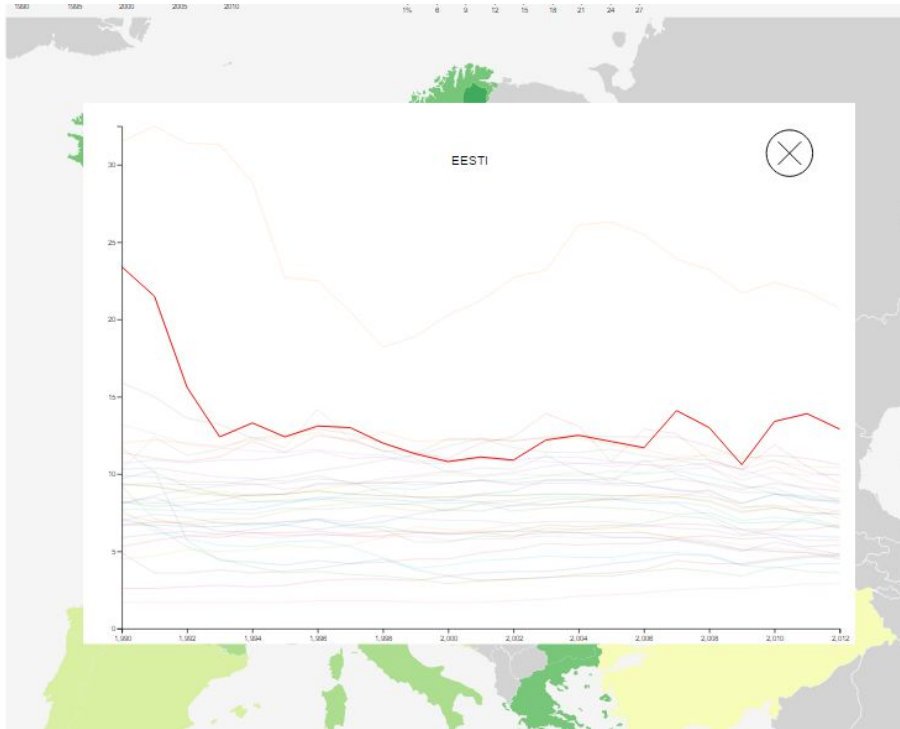


## Overview

The European Union Emissions Trading System (EU ETS), also known as the European Union Emissions Trading Scheme, was the first large greenhouse gas emissions trading scheme in the world, and remains the biggest. It was launched in 2005 to fight Global warming and is a major pillar of EU climate policy. As of 2013, the EU ETS covers more than 11,000 factories, power stations, and other installations with a net heat excess of 20 MW in 31 countries—all 28 EU member states plus Iceland, Norway, and Liechtenstein. The installations regulated by the EU ETS are collectively responsible in 2008 for close to half of the EU's anthropogenic emissions of CO<sub>2</sub> and 40% of its total greenhouse gas emissions.

The EU emissions trading system (EU ETS) is a cornerstone of the EU's policy to combat climate change and its key tool for reducing greenhouse gas emissions cost-effectively. It is the world's first major carbon market and remains the biggest one.

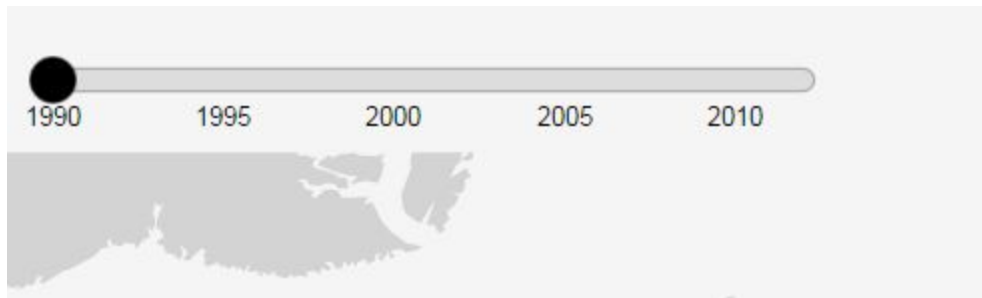




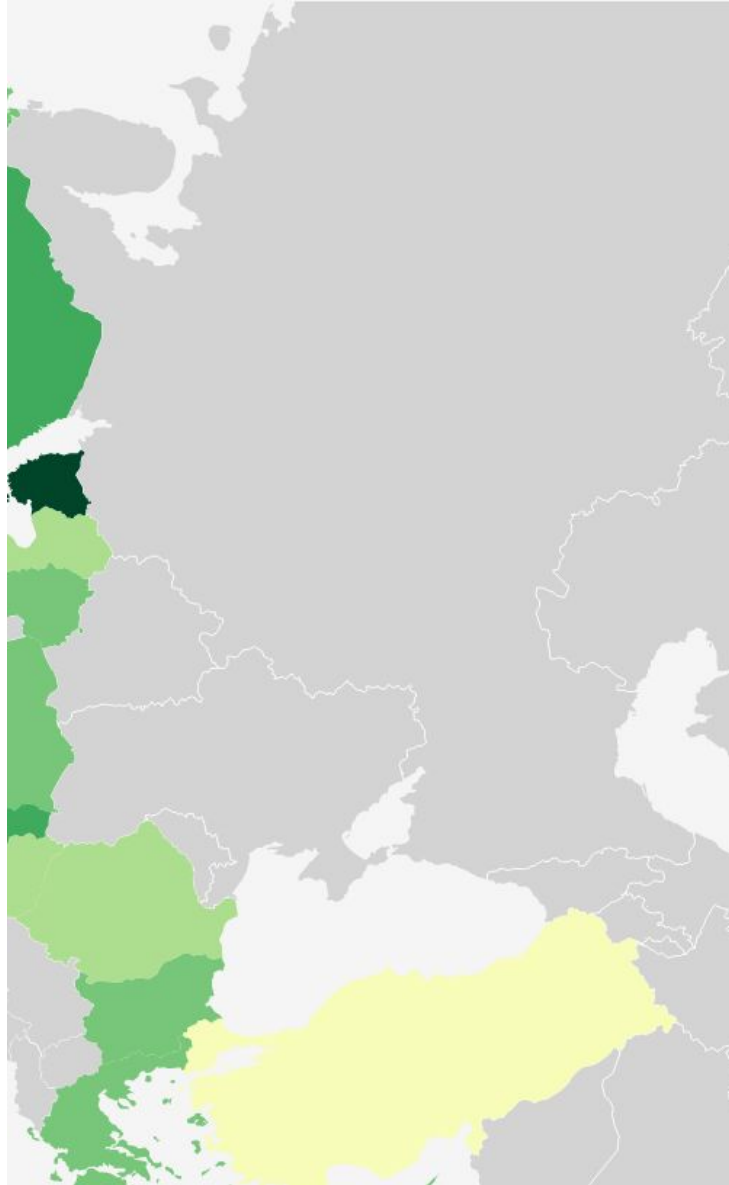
Since one of our members who is in charge of the ranking national flag is sick, we decided to focus on the map selection. After discussion, we plan to add this features to our future roadmap.

The work above is still a prototype, so we hope a meeting to perfect it. Finally, we got some space for improvement.

1. The introduction of the background, it is too simple to add it in this way. We need to find a good place to optimize it. Actually, we trust no people like so many words.
2. The year selection. It should show all the years from 1990 to 2012. So that customer can select it more easily.



3. Map is too small to select. There are two ways to solve this problem.
  - a. Use a larger SVG container to contain this map.
  - b. Add zoom features to this map
  - c. Remove the unrelated part in the right side.



4. The line chart is too naive. Although it can show all information wanted. We should add more interactive features to it.

### 3. Final version

We use a mature template for our work. The color design and background selection is not easy for us since no one in our team is good at designing. So we decide to use a template to finish these work for us. Actually, it is far more better our design.

This page is about the topic of whole project.

# EUROPEAN GREENHOUSE GAS EMISSION

BY LIANG ZHANG, ZHENYU HU, ZHE LYU

Welcome



This is the background information about our work. European union provides these data for our analysis. The whole european union set the target to reduce it to 40% at 2020.

It also provide the history dataset for analysis.

## OVERVIEW

The European Union Emissions Trading System (EU ETS), also known as the European Union Emissions Trading Scheme, was the first large greenhouse gas emissions trading scheme in the world, and remains the biggest. It was launched in 2005 to fight Global warming and is a major pillar of EU climate policy. As of 2013, the EU ETS covers more than 11,000 factories, power stations, and other installations with a net heat excess of 20 MW in 31 countries—all 28 EU member states plus Iceland, Norway, and Liechtenstein. The installations regulated by the EU ETS are collectively responsible in 2008 for close to half of the EU's anthropogenic emissions of CO<sub>2</sub> and 40% of its total greenhouse gas emissions. The EU emissions trading system (EU ETS) is a cornerstone of the EU's policy to combat climate change and its key tool for reducing greenhouse gas emissions cost-effectively. It is the world's first major carbon market and remains the biggest one.

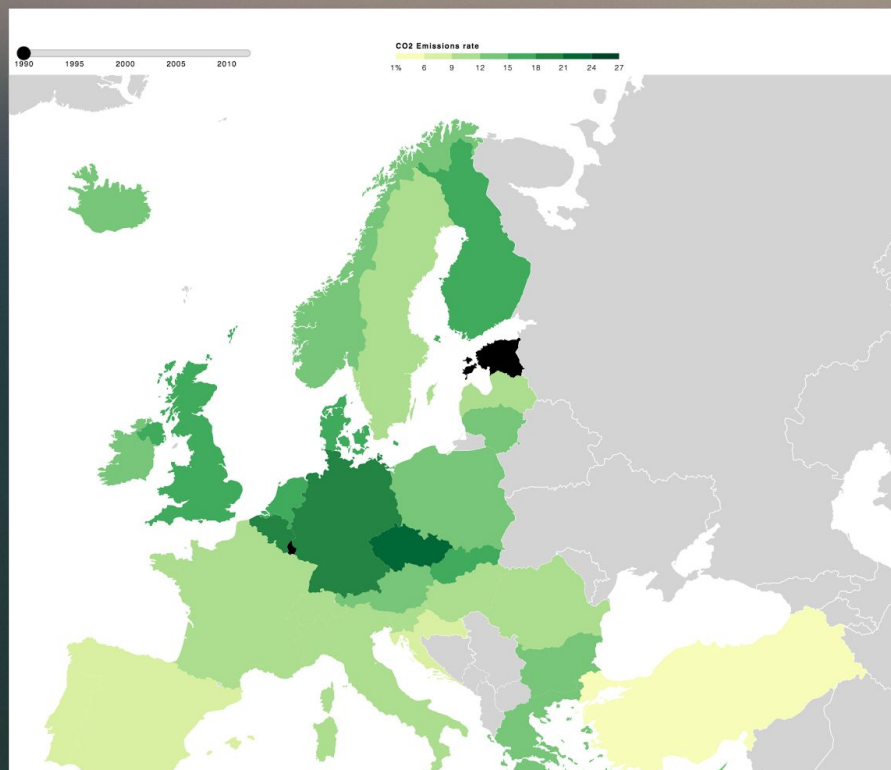
Start

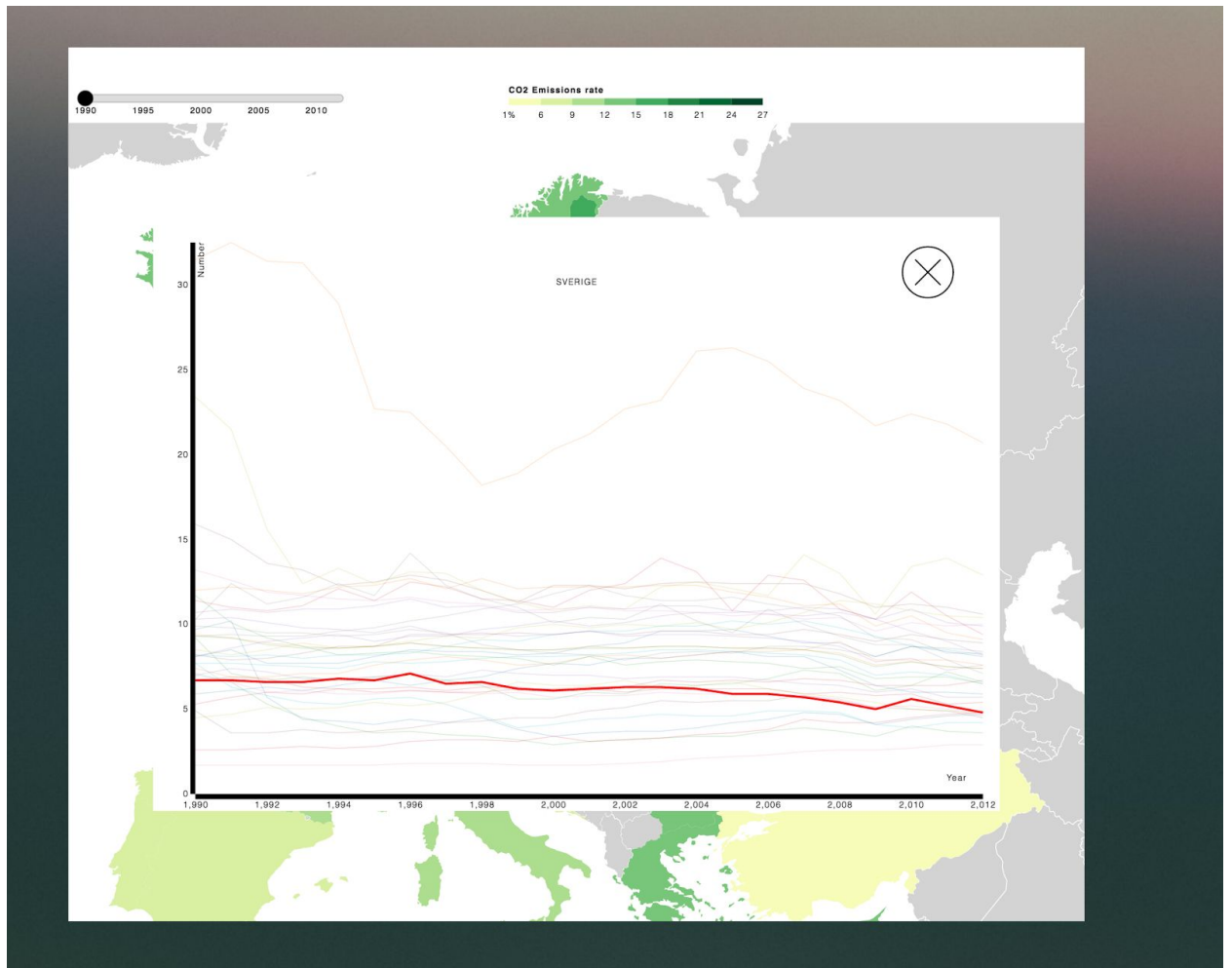


## CO2 EMISSION CHANGES IN EU

According to from 1990 to 2012, we can see changes in carbon dioxide emissions in Europe overall downward trend, especially in the downward trend in developed countries, France, Britain and Germany on behalf of the very obvious, which may have a great relationship with their industrial transformation At the same time, we found that some industries are not developed countries such as Spain, carbon dioxide emissions without significant changes too. There are also countries in which carbon dioxide emissions are on the rise, especially in less developed regions such as Eastern Europe. This may be related to the industrial development of these countries

Countries





There are two types of ranking method, one the is quantity and the other is the name of that country.



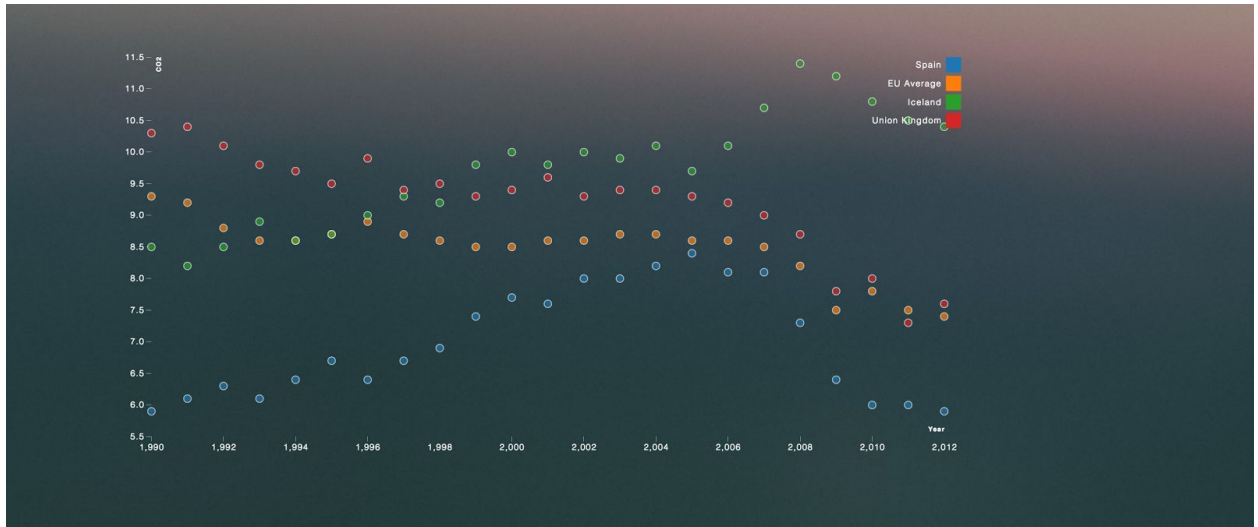


## ANALYZE AND PREDICT

Our works shows that there was a general downward trend to CO2 emissions from 1990–2012 period . From 1999 to 2006 the evolution of greenhouse gas emissions within the EU-28 remained relatively unchanged, although it started falling at a modest pace through to 2008. The year 2009 saw a sharp drop in emissions as a consequence of the global financial and economic crisis and the resulting reduced industrial activity. Emissions increased in 2010 and decreased again from 2011. Incidentally, 2012 marked the year with the lowest emissions on record since the beginning of the time series.

For 2020, the EU has committed to cutting its emissions to 20 % below 1990 levels. According to the changing trend, we believe that the EU countries can achieve the overall goal, but there are still individual countries difficult to complete it.

Based on the dataset that we have, we did a simple analysis for the dataset. It show that the the average greenhouse gas emission of whole European decreased from 2005 to 2012. But Iceland increase singly.



## REFERENCE

Dataset: <http://ec.europa.eu/eurostat/web/products-datasets/-/tsdgp410>

Drag Slider: <https://bl.ocks.org/mbostock/645297>

Map: <https://gist.github.com/milafrerichs/69035da4707ea51886eb>

Small Multiple: <http://flowingdata.com/2014/10/15/linked-small-multiples>

Data Analysis: [http://ec.europa.eu/eurostat/statistics-explained/index.php/Greenhouse\\_gas\\_emission\\_statistics](http://ec.europa.eu/eurostat/statistics-explained/index.php/Greenhouse_gas_emission_statistics)

Web Design: <https://html5up.net/overflow>

Github: <http://ZheLyu.github.io/DataVisFinal/> | Data Visualization Final Project

## Evaluation

Use preserveAspectRatio attribute to make the Map size to suit the webpage and set the position. And we do the rank chart of every country data by name and count.

### Reference :

- [http://ec.europa.eu/eurostat/statistics-explained/index.php/Greenhouse\\_gas\\_emission\\_statistics](http://ec.europa.eu/eurostat/statistics-explained/index.php/Greenhouse_gas_emission_statistics)
- [https://en.wikipedia.org/wiki/Greenhouse\\_gas](https://en.wikipedia.org/wiki/Greenhouse_gas)
- <https://html5up.net/overflow>
- [http://ec.europa.eu/eurostat/statistics-explained/index.php/Greenhouse\\_gas\\_emission\\_statistics](http://ec.europa.eu/eurostat/statistics-explained/index.php/Greenhouse_gas_emission_statistics)

- <http://flowingdata.com/2014/10/15/linked-small-multiples>
- <https://gist.github.com/milafrerichs/69035da4707ea51886eb>
- <https://bl.ocks.org/mbostock/645297>