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Energy Use in the European Union

Anna Sophia Stonek	11809899
Stefan Helm	11938265
Thomas Laner	11807845
Marko Gugleta	12016483

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Introduction & Setup

”How close is the EU to successfully transitioning away from fossil fuels, and what might be key obstacles still needing to be addressed?”

Specific Questions

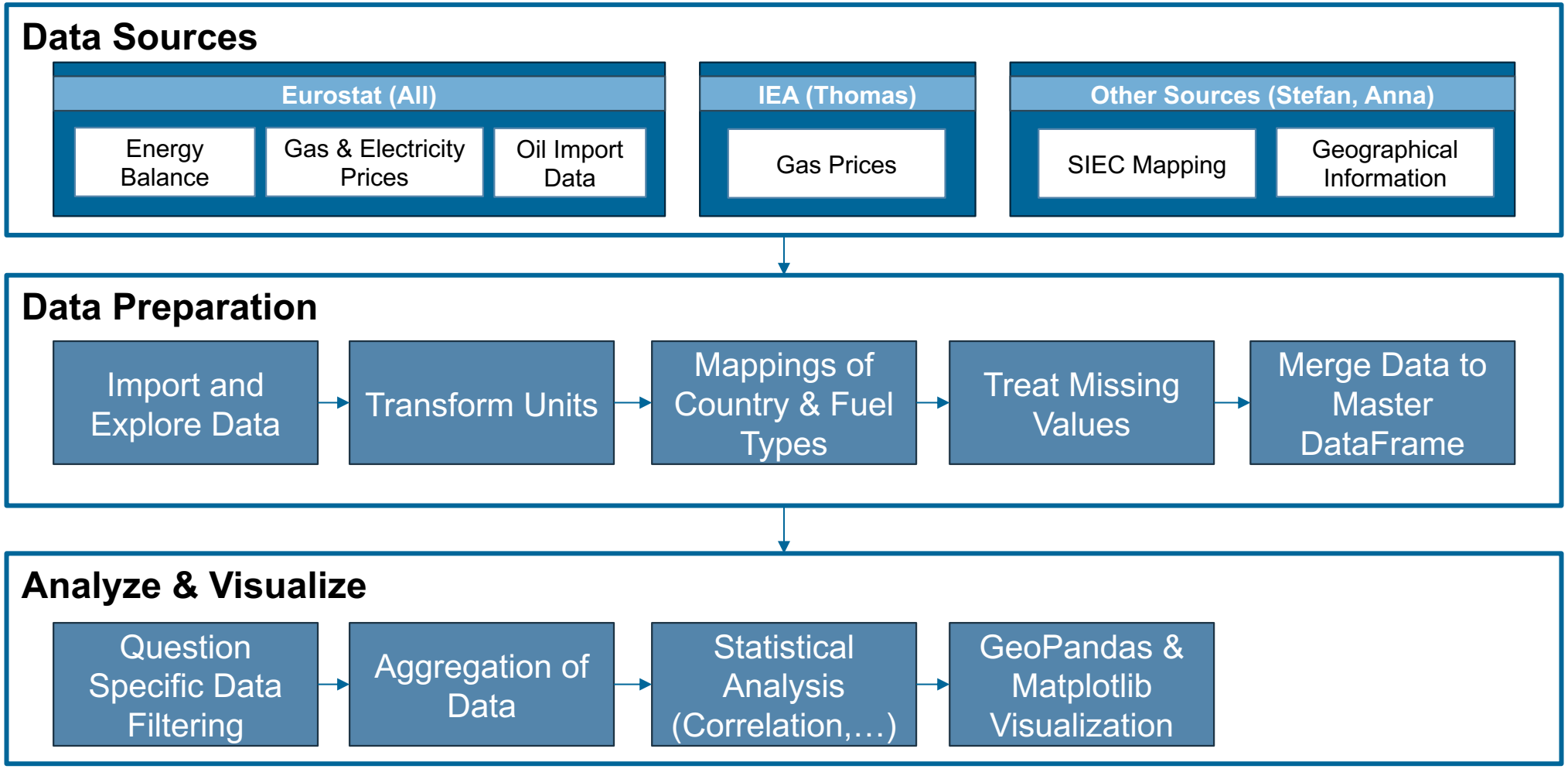
1. How has the European Union’s dependence on different types of fossil fuels, particularly Oil, Natural gas and Solid fossil fuels changed since 2010? (Question Owner: Anna Stonek)

2. What are the primary industrial and domestic uses of fossil and renewable fuels in European Union, and how have these usages changed since 2010? (Question Owner: Stefan Helm)

3. How do fluctuations in electricity, natural gas, oil end-user prices, affect the consumption of these goods (correlation, other influences)? How do they affect the share of renewable energy in gross final energy consumption? (Question Owner: Thomas Laner)

4. Identify the main external and internal sources of fossil fuels for European Union. How has the reliance on these sources shifted over time? (Question Owner: Marko Gugleta)

Steps of the Data Science Process



Specific Data Science Techniques

Data Cleaning and Preprocessing

Handling missing values, data type conversions, data filtering

e.g. Filtering of EU27 country data to focus on the EU as a whole.

Statistical Analysis and Correlation Studies

Statistical Analysis: Between different variables
Correlation Analysis: Statistical methods for trend and correlation identification

e.g. Performed time-series analysis on electricity and natural gas prices

Exploratory Data Analysis & Visualization

Various Charts: Line plots, bar charts, and geographical heatmaps for data distribution and trend analysis

e.g. Generation of heatmaps to visualize energy consumption by region

Interpretation and Bias Discussion

Interpretation: Key insights from the analysis
Bias Discussion: Potential biases and their implications

e.g. Discussed the impact of geopolitical events on energy data reliability

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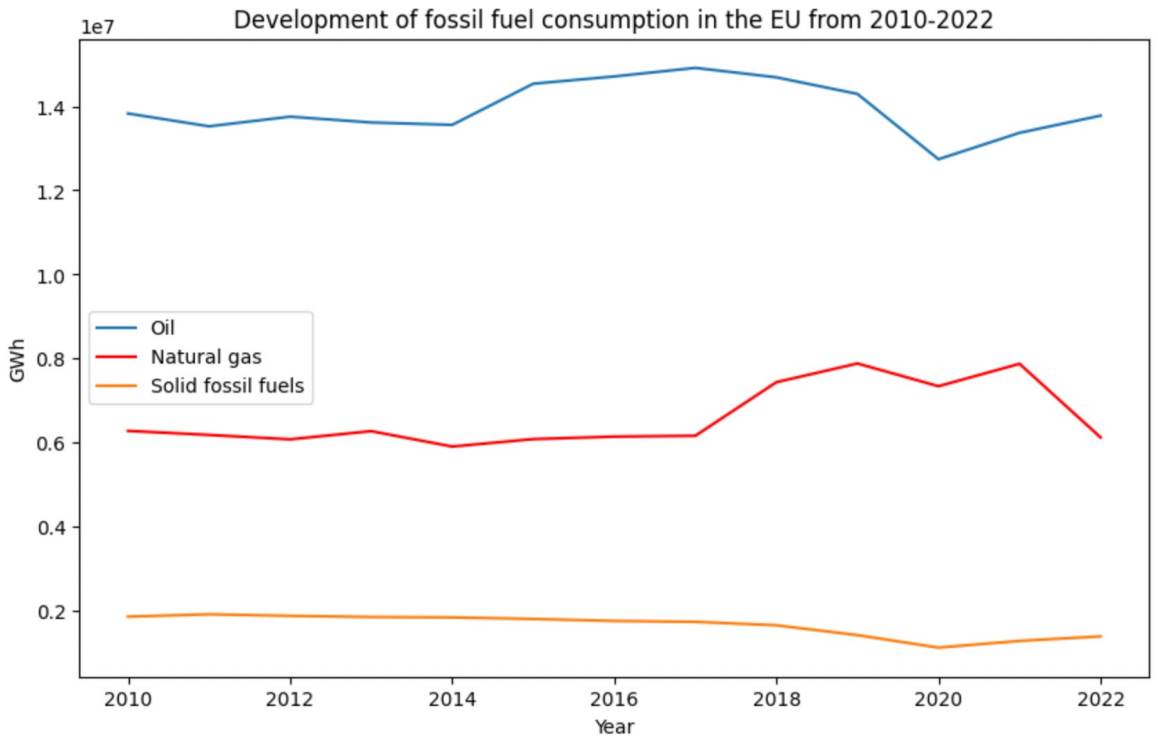
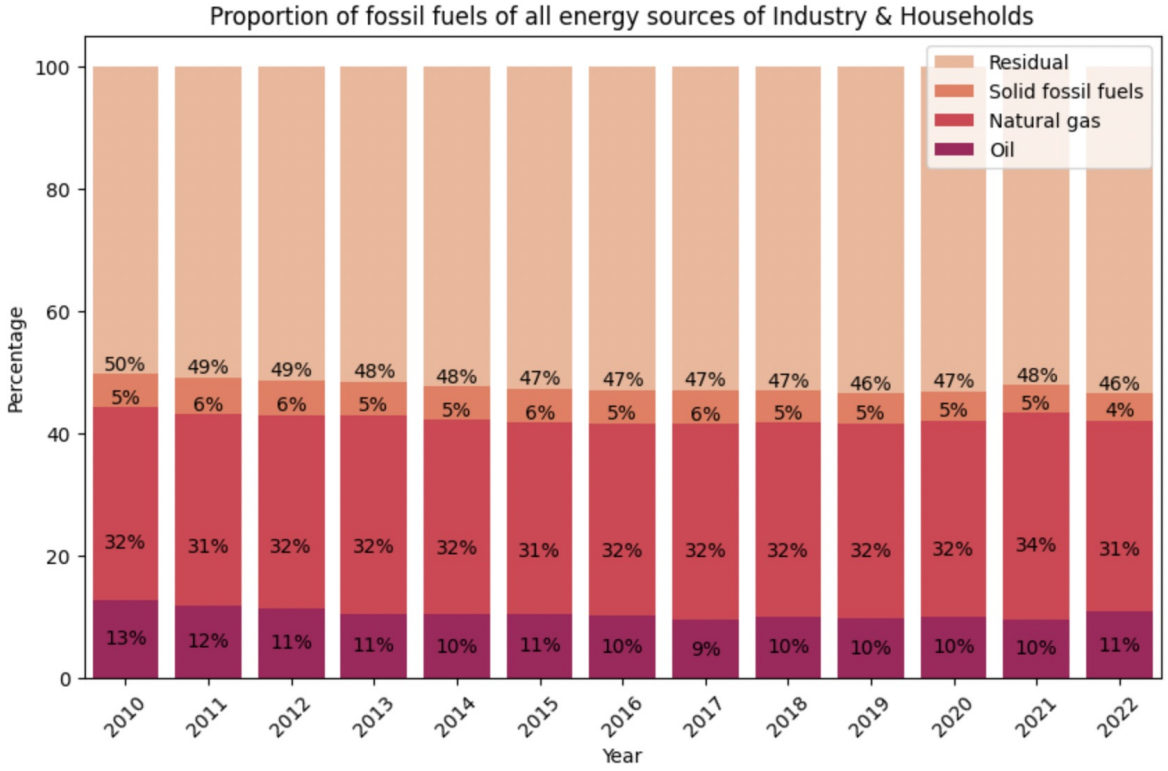
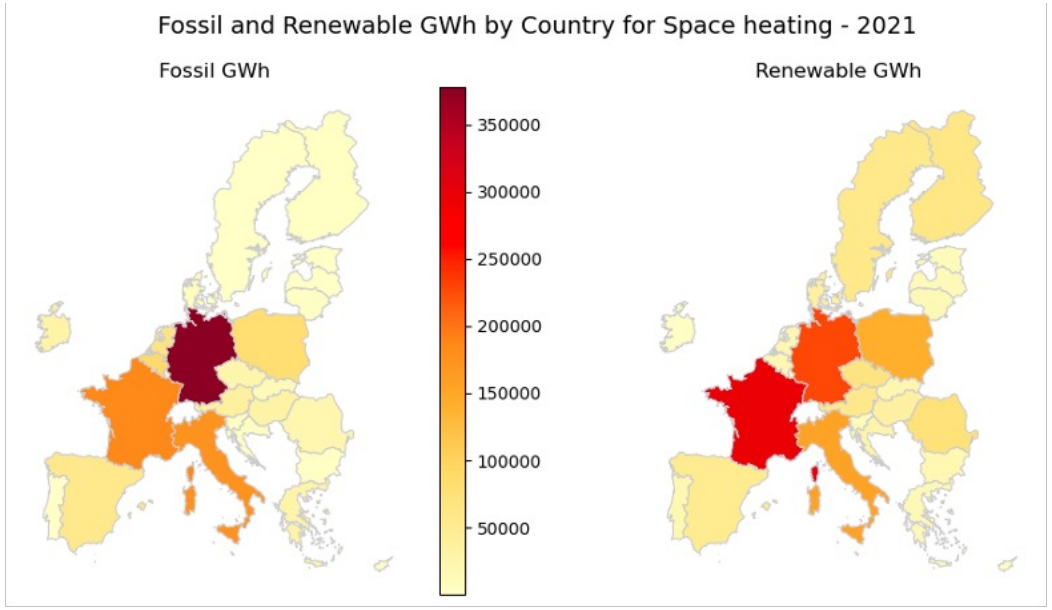
Insights and Findings

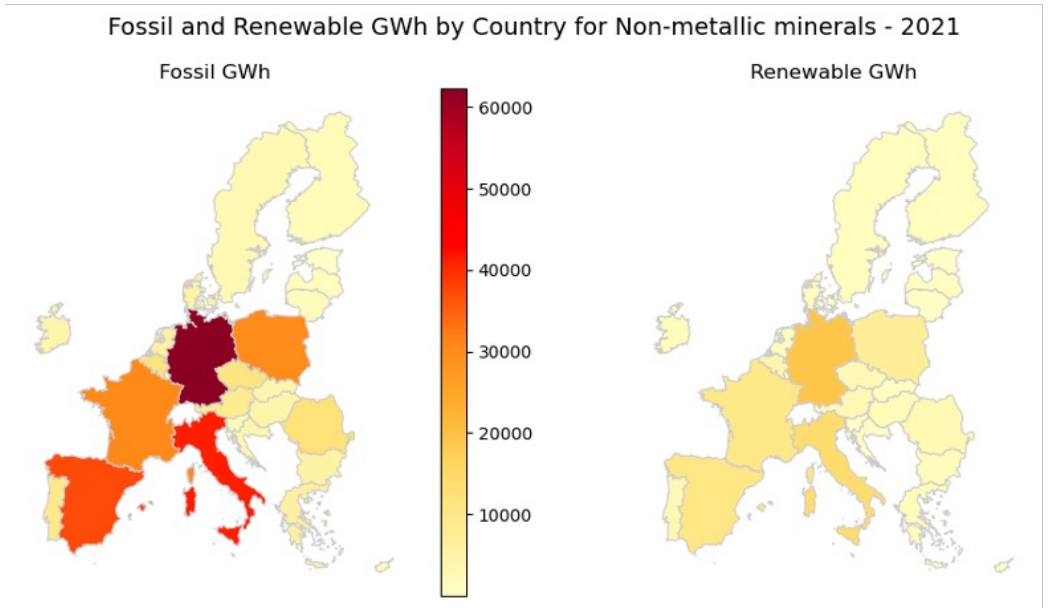
Dependency on oil, natural gas and solid fossil fuels in the European Union

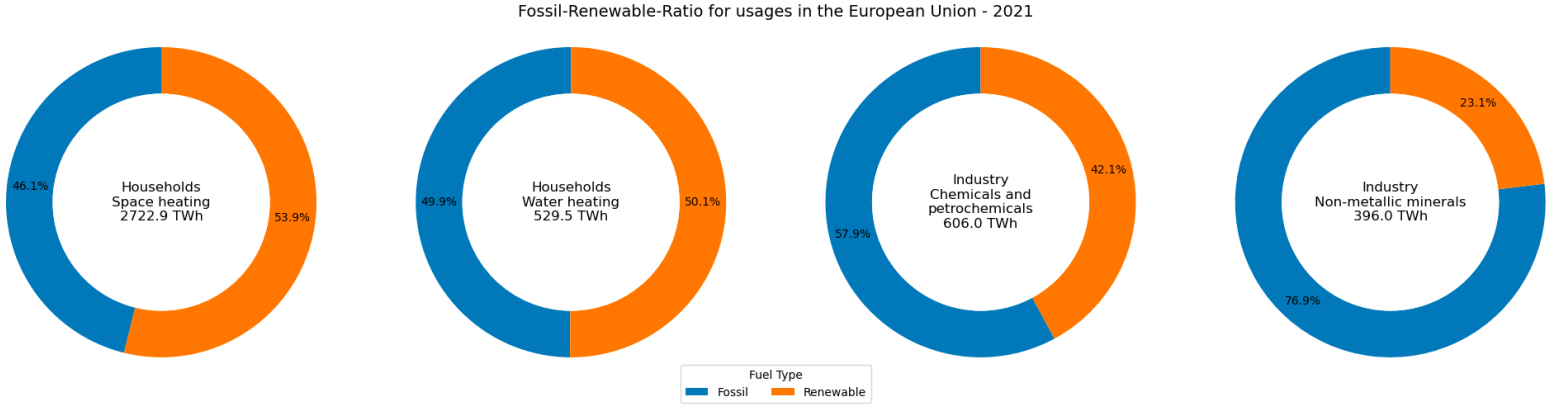




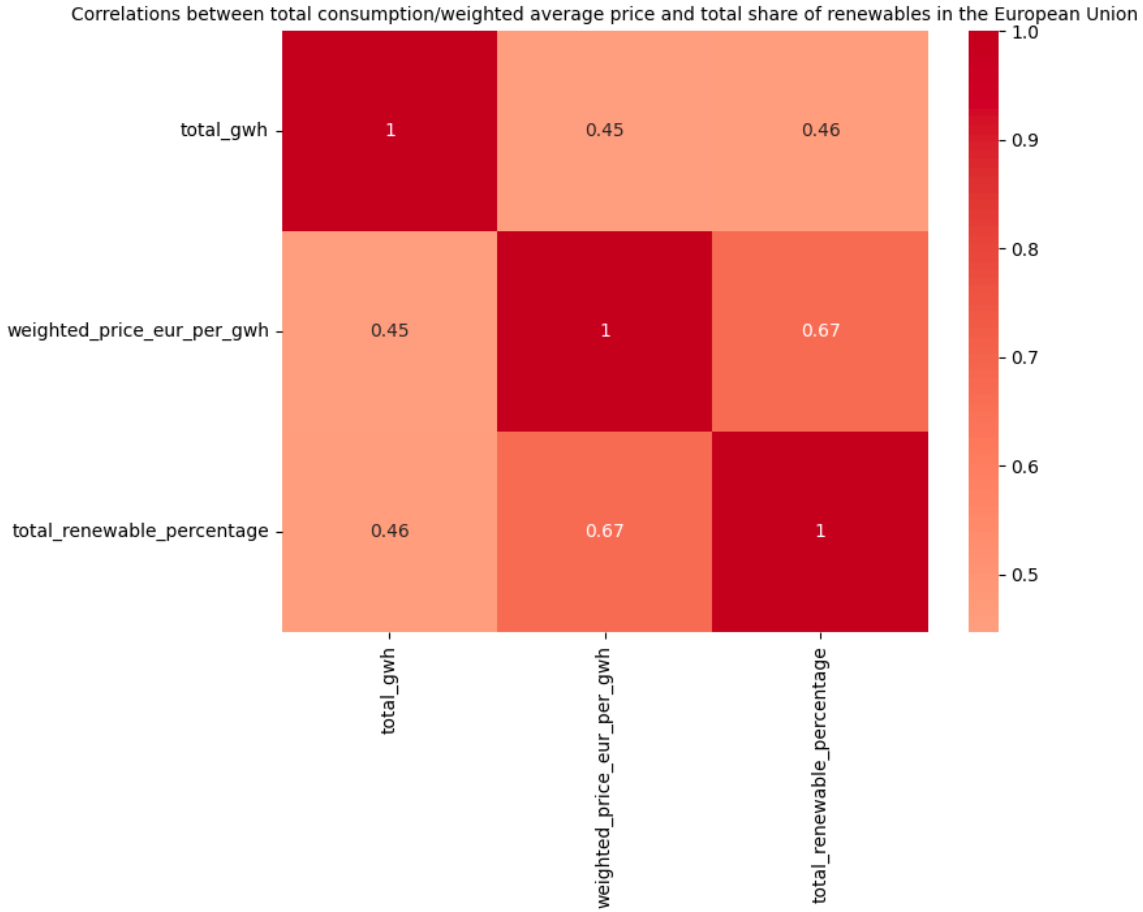
Overall, there is a trend towards renewable energy
Challenges persist in reducing fossil fuel reliance

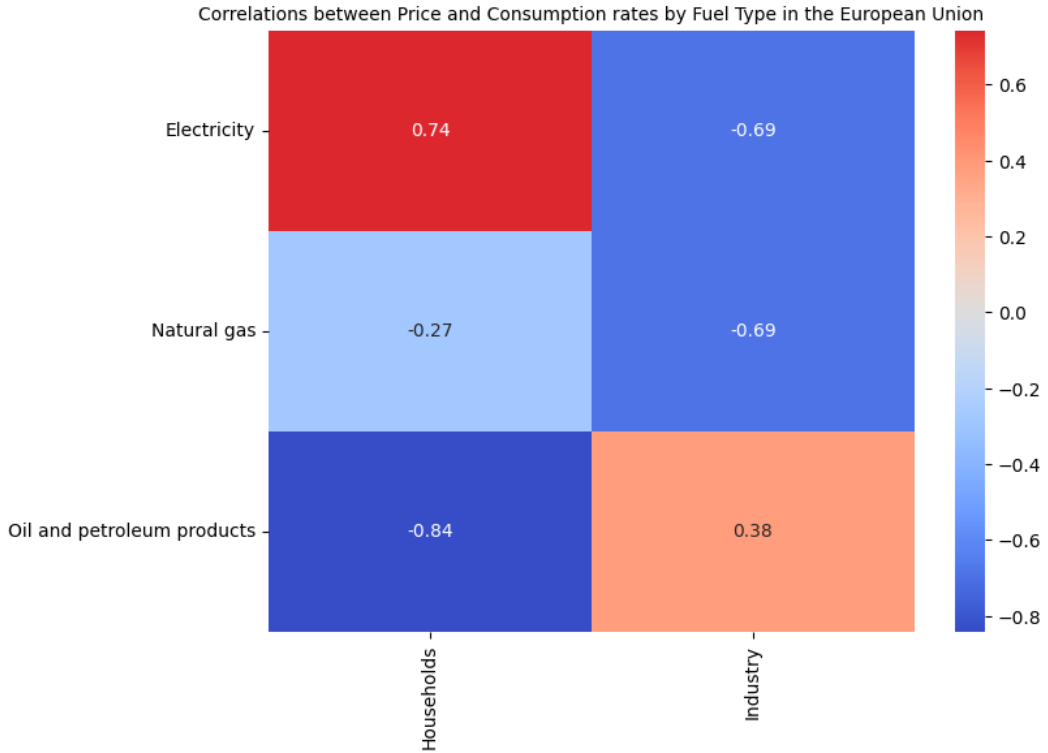






Price elasticity varies by sector, influencing consumption
Renewable energy adoption rises with increasing prices

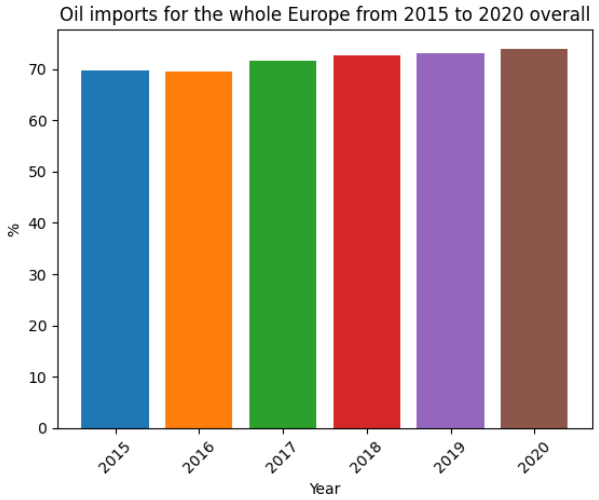




Main external and internal sources of fossil fuels for Europe

- Europe dependent on oil imports
- Importers:
  - European:
    - Russia
    - Norway
    - United Kingdom
  - Non-European:
    - Azerbaijan
    - Algeria
    - Iraq
    - Kazakhstan etc.

- Biggest importer by far:
  - Russia
- Significantly more than anyone else
- Reasons: location, part of Europe, reserves, etc.
- Situation changes after the sanctions, data for 2021 and further on not available



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Conclusion

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There is room for improvement!

- Reduction of fossil fuel consumption by ~4% in Industry & Households from 2010 – 2022
- Trend towards renewable energy, but very slow development
- Trend is driven by rising prices for fossil fuels (among other factors)
- Most important importer: Russia