

“Data Report: Analyzing the Dominance of Road Transport in Total Energy Consumption and Its Climate Implications”

1.Introduction:

1.1: Question: How does the energy consumption in road transport compare to the total energy consumption in the transport sector across different countries over the years, and what are the potential climate implications of this dominance?

1.2: Description: This project investigates the significant role of road transport in the overall energy consumption of the transport sector using two key datasets. It aims to compare road transport energy use across different countries over time and discuss the climate implications of its dominance. The analysis will highlight trends and suggest strategies for reducing the environmental footprint of the transport sector, emphasizing the need for sustainable transport policies.

2. Data Sources

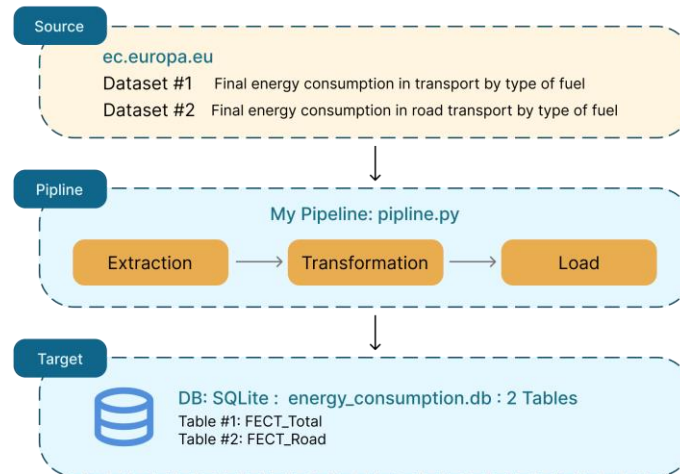
Data Source1: Final energy consumption in transport by type of fuel

- Metadata URL: https://ec.europa.eu/eurostat/databrowser/view/ten00126/default/table?lang=en&category=cli.cli_dri.cli_dri_tran
- Data URL: <https://ec.europa.eu/eurostat/api/dissemination/sdmx/2.1/data/ten00126/?format=SDMX-CSV&compressed=true>
- Data Type: CSV
- Quality: The data is high-quality and reliable, coming from Eurostat, which is known for its rigorous data collection and validation processes.
- License: This data is under the standard open-data license from Eurostat, which allows usage with proper attribution.
- Link (License): <https://ec.europa.eu/eurostat/about-us/policies/copyright>
- Description: This dataset encompasses the total energy consumption across various transport modes including road, rail, domestic aviation, and navigation, while excluding international operations and non-transport energy uses. It provides a comprehensive view of energy use within national transport sectors, omitting energy consumption in airports, train stations, and ports, which is categorized under the service sector.

Datasource2: Final energy consumption in road transport by type of fuel

- Metadata URL: https://ec.europa.eu/eurostat/databrowser/view/ten00127/default/table?lang=en&category=cli.cli_dri.cli_dri_tran
- Data URL: <https://ec.europa.eu/eurostat/api/dissemination/sdmx/2.1/data/ten00127/?format=SDMX-CSV&compressed=true>
- Data Type: CSV
- Quality: As with Datasource1, this data is of high quality and reliability, provided by Eurostat.
- License: The same open-data license from Eurostat applies.
- Link(License): <https://ec.europa.eu/eurostat/about-us/policies/copyright>
- Description: This dataset details energy consumption specifically within road transport, covering vehicles like cars, buses, trucks, and emergency vehicles such as ambulances and fire trucks. It focuses on all forms

of road transport, from urban to international journeys, across publicly accessible road networks, excluding off-road vehicle usage which is accounted for in other sectors like agriculture or construction.



3. Pipeline:

The data pipeline extracts data from two online sources using Python. It downloads gzipped CSV files, decompresses them, and processes the data with pandas before storing it in an SQLite database.

3.1: Technology Used

- Python: Core programming language
- Libraries: requests for data retrieval, pandas for data manipulation, sqlite3 for data storage

3.2: Transformation and Cleaning Process:

- **Data Downloading and Unzipping:**
Used the Requests library to download gzipped CSV files and Pandas to read the decompressed content.
- **Column Dropping:**
Removed unnecessary columns ('DATAFLOW', 'OBS_FLAG') to streamline the datasets.
- **Date Conversion:**
Converted the 'TIME_PERIOD' column to date time format for consistency in time-based analyses.
- **Column Renaming:**
Renamed columns for better readability and understanding of the data.
- **Data Saving:**
Saved the cleaned and transformed data into an SQLite database for efficient querying and analysis.

3.3: Error Handling:

- Implemented error handling for data downloading and reading processes to handle potential network issues or data format changes.
- The pipeline includes error handling mechanisms such as checking the response status of data download requests and handling missing or malformed data gracefully.

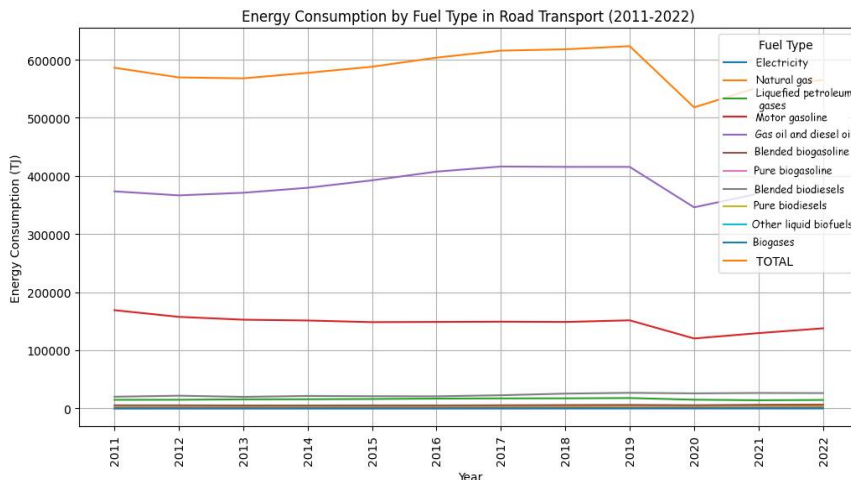
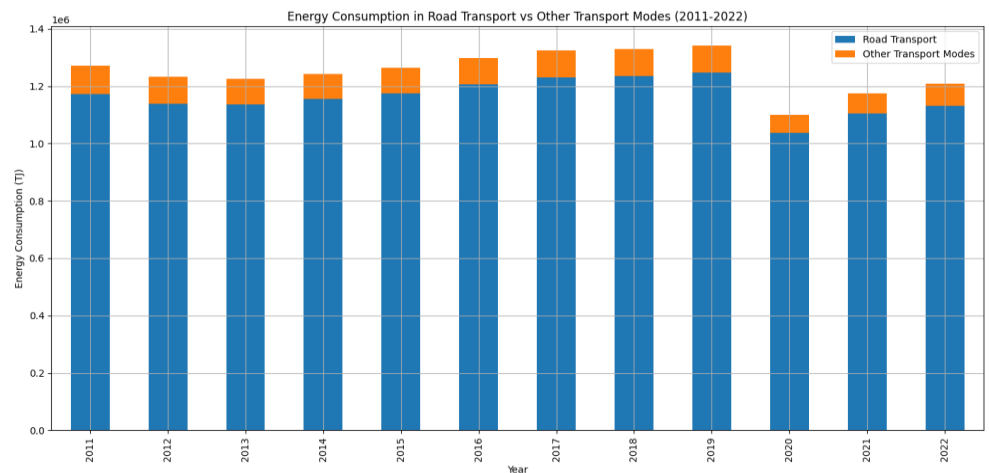
4. Result and Limitations

4.1: Output Data:

- **Structure:** The final output is stored in an SQLite database (energy_consumption.db) with two tables: FECT_Total and FECT_Road. Each table contains columns like 'last_updated_timestamp', 'data_collection_frequency', 'energy_balance_category', 'specific_energy_product', 'unit_of_measurement', 'geographic_area', 'time_period', and 'energy_consumption_value'.
- **Quality:** The quality of the output data is high, maintaining the integrity and reliability of the original datasets from Eurostat.
- **Data Format:** SQLite was chosen as the output format due to its efficiency in handling large datasets, ease of integration with Python for further analysis, and robustness in querying capabilities.

Title: Comparison of Energy Consumption in Road Transport vs. Other Transport Modes (2011-2022)

Description: This comparison will illustrate the energy consumption in road transport compared to other transport modes such as rail, domestic aviation, and navigation over the years 2011 to 2022. This can help in understanding the dominance of road transport in the total energy consumption of the transport sector.



Title: Comparison of Energy Consumption by Fuel Type in Road Transport (2011-2022)

Description: The line chart reveals that while the total energy consumption remains high, specific fuel types such as Liquefied petroleum gases, Motor gasoline, and Gas oil and diesel oil are the primary contributors to road transport energy usage. Trends show a general increase in some fuels up to a peak around 2020, followed by a slight decline, possibly reflecting changes in fuel policies, advancements in fuel efficiency, or shifts towards more sustainable energy sources. Other fuel types, although less significant in total consumption, show varied trends, suggesting a dynamic fuel market in road transport over the decade.

Note: In my Repository /project folder -> DataDiagram.ipynb - There are more diagrams and explanations.

4.2: Critical Reflection:

Potential Issues:

- **Data Completeness:** While the data is comprehensive, there might be missing entries for certain years or countries that could affect longitudinal analyses.
- **Update Frequency:** The data might not be updated in real-time, which could lead to lag in reflecting the latest trends and patterns.