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

1. Introduction

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?

Description:

The transportation sector is a major contributor to global energy consumption and greenhouse gas emissions. Within this sector, road transport stands out due to its extensive use of fossil fuels and its impact on climate change. This report investigates the dominance of road transport in the overall energy consumption of the transport sector across different countries over the years, using two key datasets. The aim is to quantify road transport's energy consumption relative to total transport energy consumption and discuss the potential climate implications of this dominance.

2. Used Data:

Data Source #1: Final Energy Consumption in Transport by Type of Fuel

- Source: Eurostat
- URL: Eurostat Dataset 1
- Period: Data available from 2011 to 2022
- Description: This dataset provides a comprehensive view of energy consumption across various transport modes, including road, rail, domestic aviation, and navigation, while excluding international operations and non-transport energy uses.
- License: Eurostat Open Data License
- Structure: Includes columns such as “time_period”, “energy_balance_category”, “specific_energy_product”, “unit_of_measurement”, “geographic_area”, and “energy_consumption_value”.

Data Source #2: Final Energy Consumption in Road Transport by Type of Fuel

- Source: Eurostat
- URL: Eurostat Dataset 2
- Period: 2011 to 2022
- Description: This dataset focuses on energy consumption within road transport, covering vehicles like cars, buses, trucks, and emergency vehicles on public roads.
- License: Eurostat Open Data License
- Structure: Similar to the first dataset, with detailed energy consumption data specific to road transport.

3. Analysis:

3.1. Comparative Analysis of Energy Consumption Between Total Transport and Road Transport

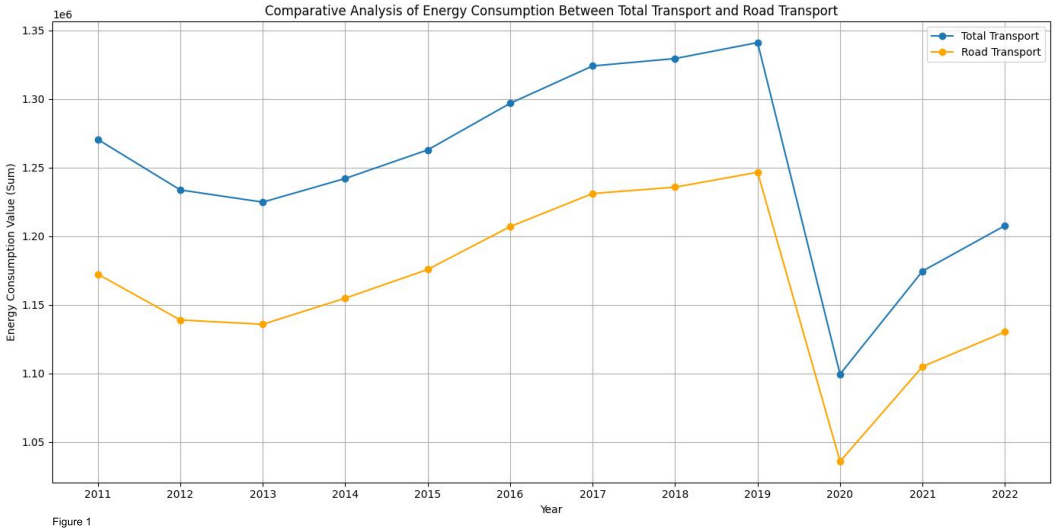

Figure 1

Overall Trends:

- Both the total transport and road transport energy consumption show a generally increasing trend from 2011 to around 2019.
- A significant drop is observed in 2019 for both total and road transport energy consumption, followed by a further sharp decline in 2020.

Road Transport Dominance:

- Road transport consistently constitutes a significant portion of the total transport energy consumption throughout the years. Despite the fluctuations, the energy consumption trends for road transport closely follow the trends for total transport, indicating that road transport is a major contributor to the overall transport energy consumption.

Impact of External Factors:

- The sharp decline in energy consumption in 2020 can likely be attributed to external factors, such as the global COVID-19 pandemic, which led to reduced transport activities due to lockdowns and travel restrictions. The recovery observed in 2021 and 2022 indicates a rebound in transport activities as restrictions were lifted and normal activities resumed.

3.2. The heatmaps provide a visual representation of energy consumption for various fuel types across different countries from 2011 to 2022, both for total transport and road transport.

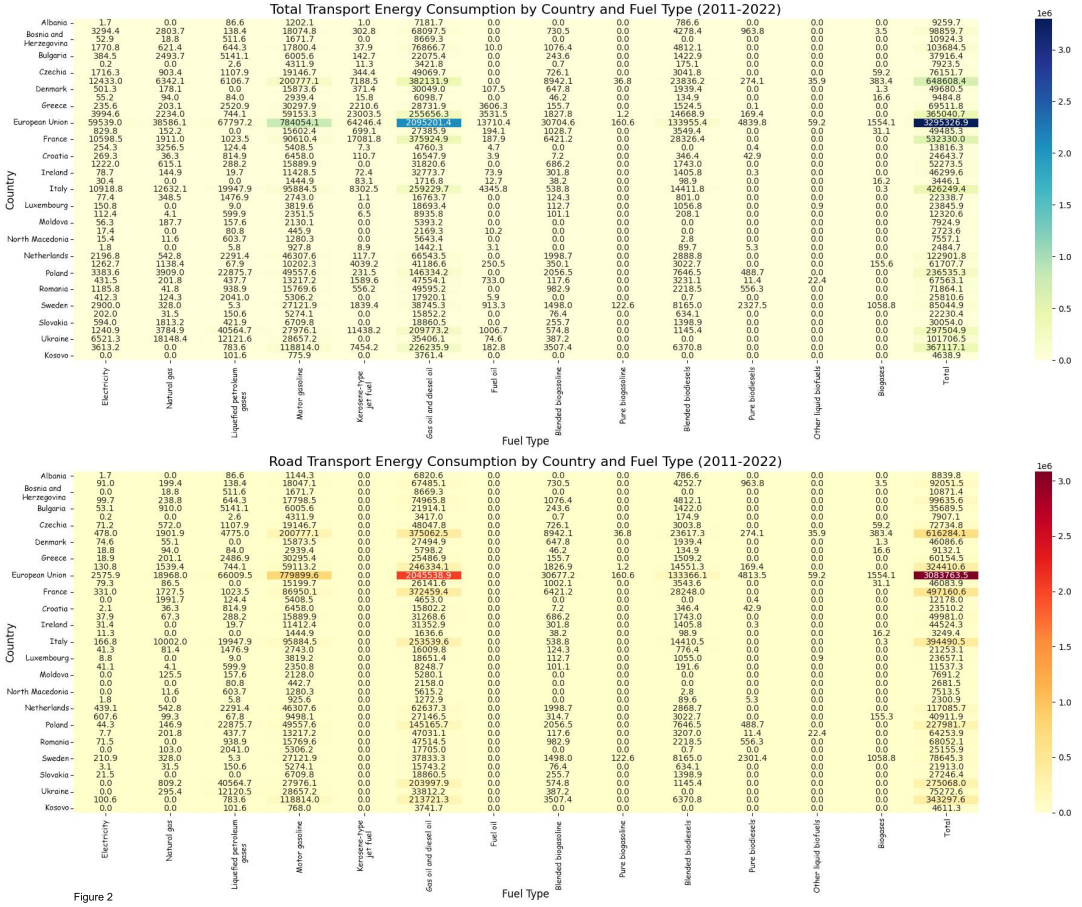

Figure 2

Dominant Fuel Types:

- Both in total transport and road transport, the fuel types Motor gasoline and Gas oil and diesel oil are the most prominent across multiple countries.
- Other fuel types like Blended biodiesels and Blended biogasoline also show significant consumption but to a lesser extent.

Country-Specific Insights:

- Germany (DE), France (FR), and Italy (IT) consistently show high energy consumption values for both total and road transport. This suggests that these countries have substantial transport activities contributing to overall energy use.
- European Union - 27 countries also shows high consumption, indicating a collective high use of transport energy within the EU.

Overall Trends:

- The trends show a strong correlation between the fuel types used in both total and road transport, with certain countries and fuel types standing out consistently.

3.3. Analysis of Energy Consumption Trends in Germany (Total vs. Road Transport)

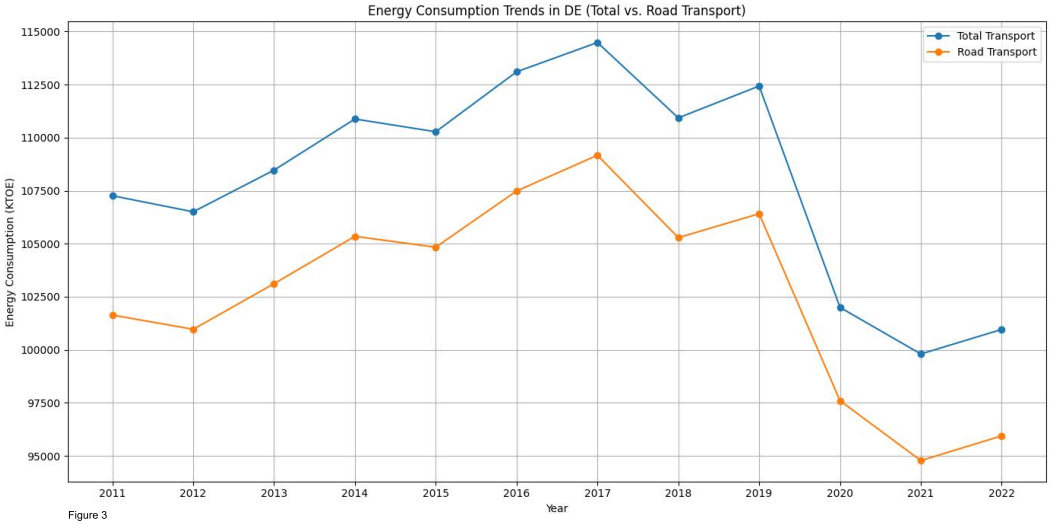

Figure 3

Overall Trends:

- Both total and road transport energy consumption show a decline from 2018 onwards.
- Peaks occur around 2017-2018, with a significant drop in 2020. (Due to COVID-19 pandemic)

Comparison:

- Total transport energy consumption is consistently higher than road transport.
- The gap between total and road transport remains relatively stable, indicating road transport as a major component of total transport energy consumption.

3.4. Analysis of Top 5 Fuel Type Consumption in Germany (2011-2022)

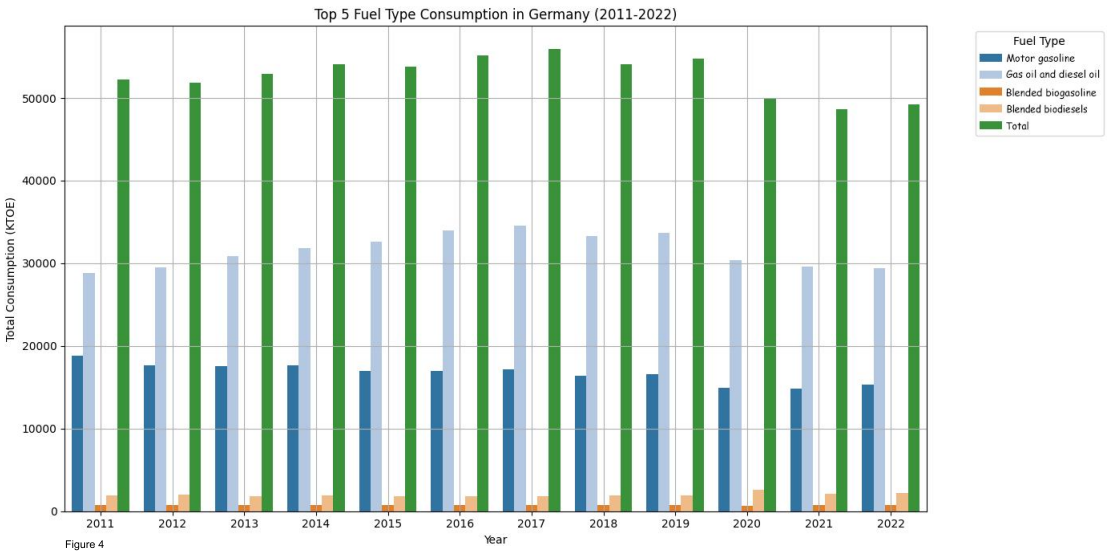

Figure 4

Dominant Fuel:

- Motor gasoline and Gas oil and diesel oil are the next most significant fuels.

Stable Trends:

- Motor gasoline and Gas oil and diesel oil show stable usage over the years.
- Blended biogasoline and Blended biodiesels have consistently low usage.

4. Conclusions:

The analysis reveals that road transport consistently accounts for a significant portion of total transport energy consumption across various countries, particularly in Germany, France, and Italy. This dominance has profound climate implications due to the heavy reliance on fossil fuels like motor gasoline and diesel oil, which are major sources of greenhouse gas emissions. The trends from 2011 to 2022 show a strong correlation between total and road transport energy use, with notable peaks around 2017-2018 and a sharp decline in 2020, likely due to the COVID-19 pandemic. This underscores the urgent need for targeted policies to reduce emissions by transitioning to cleaner energy sources, improving fuel efficiency, and promoting alternative transport modes. However, the analysis is limited by the scope of available data and does not account for all factors influencing energy consumption, suggesting the need for further research to fully understand and address the transport sector's impact on climate change.