PROJECT PROPOSAL

**Estimating & Comparing Public Transport Emissions using gtfs2emis**

**Introduction**

In recent years, the need for sustainable transportation solutions has become increasingly important. One major contributor to global emissions is the transportation sector, specifically public transportation around the world. To mitigate the impact of public transportation on the environment, it is necessary to estimate and compare its emissions on a global scale.

**Problem Statement**

The General Transit Feed Specification (GTFS) is used to estimate the emissions produced by transit services. Using this information, transit agencies can identify opportunities to reduce emissions and improve sustainability. Transit emissions, especially from buses, can negatively impact public health by releasing pollutants into the air which can cause respiratory problems and other health issues. To reduce these impacts, cities and transportation agencies are encouraged to adopt policies promoting clean and low-emission vehicles and fuels. Understanding emissions from transit services can also help agencies comply with regulations such as Euro 6 Emission Standards (*Brazil: Heavy-Duty: Emissions | Transport Policy*, n.d.)and the Clean Air Act, which aim to reduce the environmental and health impacts of transit emissions. To comply with these regulations, agencies and vehicle manufacturers may need to adopt new technologies, fuels, and operating practices that reduce emissions.

**DATASET**

We are using the gtfs2emis R package to estimate the emission levels of public transport vehicles based on General Transit Feed Specification (GTFS) data. The package requires two main inputs: i) public transport data in GTFS standard format; and ii) some basic information on fleet characteristics such as vehicle age, technology, fuel, and Euro stage. Package estimates several pollutants at high spatial. Here are the datasets names: (*Gtfs2emis*, 2019/2023)

1. ef\_brazil\_cetesb\_db
2. ef\_europe\_emep\_db
3. ef\_usa\_emfac\_db
4. ef\_usa\_moves\_db

**Analytics Goals:**

1. Gathering Data: We need to use gtfs2emis package and extract this package which consists of four countries transit emission data. Sao Paulo, Detroit, California, and Ireland transit emission data is present in gtfs2emis package. We need those countries data for our analysis.
2. Emissions Inventory: Creating an inventory of transit emissions, which can be used to identify the largest sources of emissions and prioritize reduction strategies.
3. Fleet Optimization: Analyzing the potential emissions reductions from optimizing transit vehicle routes and schedules, reducing idling, and upgrading to cleaner vehicles and fuels.
4. Technology Assessment: Analyzing the potential emissions reductions from adopting new transit technologies, such as zero-emission vehicles and renewable energy sources.

**Metrics:**

Some common metrics used to evaluate the emissions generated by a transportation system using GTFS data include:

1. Total emissions: This metric measures the total emissions generated by the transportation system, typically expressed in units of carbon dioxide or other emission gases.
2. Emissions per vehicle-kilometer: This metric measures the emissions generated per unit of distance traveled by a vehicle, typically expressed in grams of carbon dioxide per vehicle-kilometer.
3. Emissions per mode: This metric measures the emissions generated by transit vehicles typically expressed in units of carbon dioxide or other emission gases.

**PROJECT EXECUTION**

The following Technologies and tools will be used to execute this project:

**Tools:**

* Understand our Problem Statement
* Data Extraction (R Package)
* Data Understanding
* Exploratory Data Analysis (Python and R)
* Data Cleaning (MS Excel)
* Data Visualization (Excel, Tableau or Power BI)
* Modelling Techniques for Forecasting (If Possible)

**Technologies:**

* Emission Modelling
* Transportation Modelling
* Geographic Information System
* Understanding of GTFS data

**How does this solution compare to existing solutions, or to previous attempts to solve this problem?**

The gtfs2emis tool, developed by IPEA(Vieira et al., 2022) and INPE, is a solution for estimating transit emissions using data from the General Transit Feed Specification. The tool will be used to extract data from Brazil, the USA, and Europe to provide insights on transit emissions.

**REFERENCES**

*Brazil: Heavy-duty: Emissions | Transport Policy*. (n.d.). Retrieved February 2, 2023, from https://www.transportpolicy.net/standard/brazil-heavy-duty-emissions/

*gtfs2emis: Estimating public transport emissions from GTFS data*. (2023). [R]. IpeaDIRUR. https://github.com/ipeaGIT/gtfs2emis (Original work published 2019)

Vieira, J. P. B., Pereira, R. H. M., & Andrade, P. R. (2022). *Estimating public transport emissions from General Transit Feed Specification data*. OSF Preprints. https://doi.org/10.31219/osf.io/8m2cy