# Transport Starter Data Kit: Historical socio-transport data for Benin

## Authors

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## Abstract

Data on transport activity is an important element for the development of national transport decarbonisation strategies. By having freight and passenger transport information, the impacts on vehicle and fuel consumption changes from replacing internal combustion engine vehicles with electric vehicles can be calculated. The development of a national decarbonisation strategy requires significant efforts. However, access to data is often a barrier to starting transport system modelling in developing countries, thereby causing delays. This article provides data that can be used to support a model for Benin, which may act as a starting point for further model development and scenario analysis. The data are collected entirely from publicly available and accessible sources, focusing on national reports, statistical yearbooks, and academia.

## Keywords

U4RIA

Transport data

Transport modelling

MAED

Benin

**Specifications Table**

| Subject | Transport |
|---|---|
| Specific subject area | Transport Data |
| Type of data | Tables<br>Graphs |
| How data were acquired | Literature survey (databases and reports from international organisations; journal articles) |
| Data format | Raw and analysed |
| Parameters for data collection | Data collected based on inputs required to create an energy system model for Benin |
| Description of data collection | Data were collected from the websites, annual reports and databases of international organisations, as well as from academic articles and existing modelling databases. |
| Data source location | Not applicable |
| Data accessibility | With the article and in a repository. Repository name: Zenodo. Direct URL to data: https://doi.org/10.5281/zenodo.6539105 |

**Value of the Data**
- The data can be used to develop national transport demand models to inform national investment outlooks and decarbonisation strategies.
- The data are useful for country analysts, policy makers, and the broader scientific community, as a zero-order starting point for model development.
- This data could be used to examine a range of possible transport pathways, in addition to the examples given in this study, to provide further insights into the evolution of Benin's transport system.
- The data can be used both for conducting an analysis of transport activity and emissions, but also for capacity building activities.
- The data can be used as a call to action in addressing transport data gaps and establishing parameters for data collection to improve the consistency of transport-climate research in these countries.

# 1. Data Description

The data provided in this paper can be used to support the development of a transport model for Benin. The data provided were collected from publicly available sources, including statistical yearbooks, transport ministry reports, statistics from national authorities and affiliated research institutions, academia, and journal articles. Global datasets (primarily from the World Bank) were only consulted if severe data gaps existed. The dataset includes parameters on passenger and freight transport activity, disaggregated by transport mode (road, rail, aviation, etc.) and geographic scale (inter-city or inner-city), if available. The dataset also covers the size of the vehicle fleet, disaggregated by vehicle types. The data coverage and subtypes vary among the parameters. The overall ambition is to include the most recent available year(s).

| Item | Description of Content |
|------|------------------------|
| Figure 1 | A graph showing total population (million people), as well as the share of urban and rural population in Benin. |
| Figure 2 | A graph showing total GDP (million USD in 2015), as well as the share of the different sectors contributing to GDP in Benin: agriculture, construction, mining, manufacturing, service, and energy. |
| Table 1 | A table showing passenger transport activity in Benin for the most recent year data was available. The data are curated from national statistics agencies or other government-affiliated agencies. |
| Table 2 | An additional table showing passenger transport activity in Benin based on UN DESA Statistics Division data (see explanation below). The data feature information for 2018. |
| Table 3 | A table showing freight transport activity in Benin based on UN DESA Statistics Division data (see explanation below). The data feature information for 2018. |
| Table 4 | A table showing vehicle fleet data in Benin for the most recent year data were available. |

For the parameters on passenger and freight transport activity, an additional dataset was included in Table 2 and Table 3. The UN DESA Statistics Division modelled passenger activity and freight activity for every country in support of SDG Indicator 9.1.2[1]. Passenger activity data provide information for road, rail, and air transport. Freight data cover road, rail and inland water, and aviation. The passenger-km and tonnes-km data originate from the Open SDG Data Hub. In this dataset, only the data for International Transport Forum (ITF) (representing mostly OECD countries) and UNECE countries (mostly European countries) are based on national reporting. For non-ITF/UNECE countries, the data are estimated using the ITF model, which uses several covariates such as GDP, population, and transport network coverage. A description of the model can be found in the ITF Transport Outlook 2017.

## 1.1   Population

Population data including total population, population growth, and split by rural or urban was gathered from The World Bank Open Data platform[2]. Figure 1 displays the total population disaggregated by urban and rural in Benin.

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[1] Freight: https://www.sdg.org/datasets/undesa::indicator-9-1-2-freight-volume-by-mode-of-transport-tonne-kilometres/about ;
Passenger: https://www.sdg.org/datasets/undesa::indicator-9-1-2-passenger-volume-passenger-kilometres-by-mode-of-transport/about
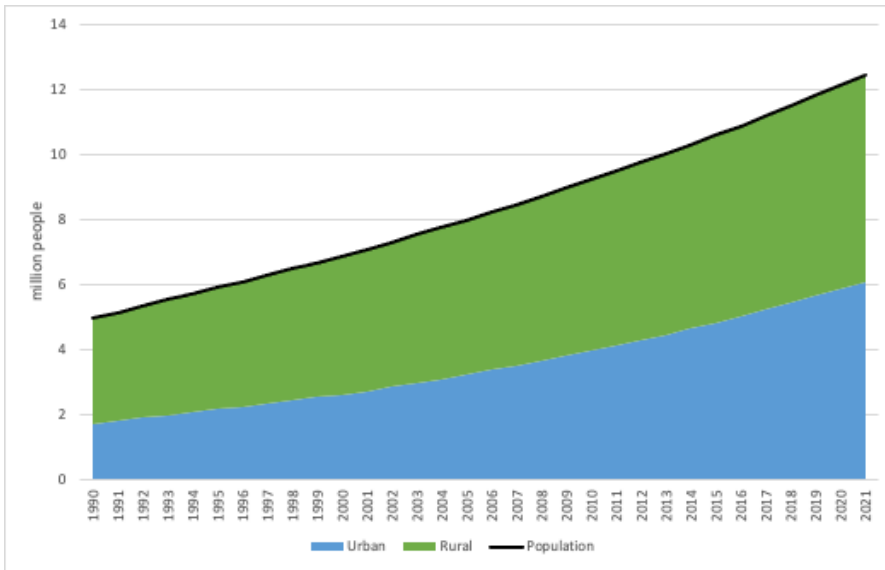[2] https://data.worldbank.org/

**Figure 1: Total population (million people) disaggregated by urban and rural in Benin**

## 1.2 Gross domestic product (GDP)

GDP data including total GDP, GDP growth, and GDP share by sector (agriculture, manufacturing, service) was collected from The World Bank Open Data platform[2]. Where data was not available, data processing was done. Figure 2 shows the total GDP, as well as the share by sector, in Benin.
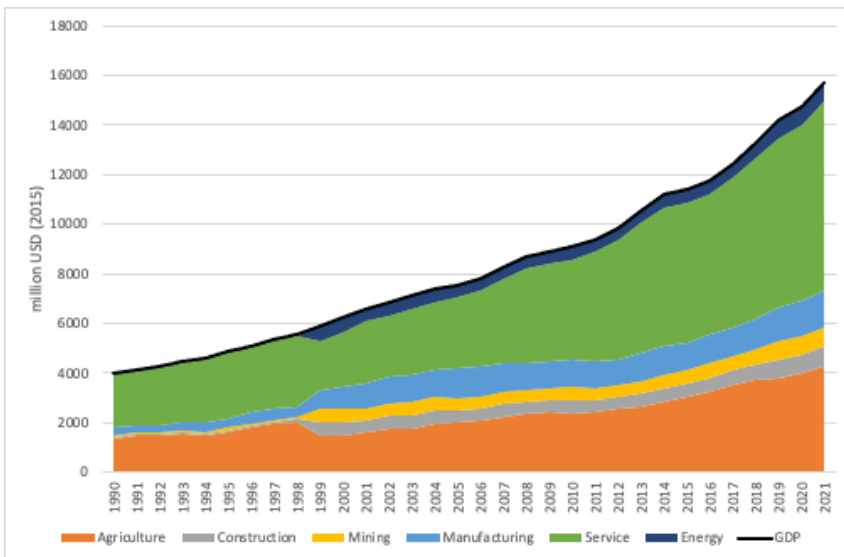


**Figure 2: Total GDP (million USD in 2015) disaggregated by share in Benin**

## 1.3 Passenger transport activity

In the case of Benin, only rail passenger activity data is available. The most recent data year is 2004 and it indicates 66 million passenger-km (Table 1). It shows a rapid decrease compared to the 118 million rail passenger-km in 1997. The data is provided by the World Bank.

**Table 1: Recorded passenger transport activity (million passenger-km) in Benin**

| Mode | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
|------|------|------|------|------|------|------|------|
| Rail | 118 | 120 | 112 | 108 | - | - | - |

According to the UN DESA modelled data, it is estimated that the road passenger activity in Benin is 10722 million passenger-km and rail is estimated to be 1 million passenger-km in 2018 (Table 2).

**Table 2: Modelled passenger transport activity (million passenger-km) in Benin**

| Mode | 2018 |
|------|------|
| Rail | 1.005 |
| Road | 10722 |

## 1.4 Freight transport activity

Neither national authorities, academia nor any global dataset initiatives (except UN DESA) provide any information on freight activity. The UN DESA modelled data estimates rail freight activity for 2018 in Benin to be at 976 million tonnes-km (Table 3). Road freight transport is estimated at 2165 million tonnes-km for the same year.

**Table 3: Freight transport activity (million tonnes-km) in Benin**

| Mode | 2018 |
|------|------|
| Rail | 976.71 |
| Road | 2165.21 |

## 1.5 Vehicle fleets

Benin does not have any records for the total number of vehicles on the road. The data summarised in Table 4 shows the number of new vehicles registered per year. 219118 new road vehicles were registered in 2019. The official records cover information from 2001 to 2019. During this period, the number of registered vehicles grew five-fold. The largest growth was recorded for motorcycles and tricycles. While there were around 30000 new motorcycles and tricycles registered every year until 2013, it grew to 111000 registrations in 2014 and reached 200000 in 2018. Benin clearly saw an increase in motorisation, spearheaded mainly by two- and three-wheelers. The number of new private cars and SUVs registered every year stayed at constant levels since 2001.

**Table 4: Vehicle fleet numbers in Benin**

| Mode | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|---|---|
| Total vehicles registered each year | 25613 | 26881 | 23728 | 34914 | 112389 | 124464 | 74855 | 142117 | 197729 | 219118 |
| Motorcycles and tricycles | 1155 | 1054 | 708 | 828 | 69771 | 77766 | 37559 | 117498 | 173344 | 192933 |
| Private cars | 17181 | 18672 | 16619 | 24507 | 30193 | 29046 | 31229 | 20529 | 19374 | 19119 |
| Vans | 2578 | 2839 | 2420 | 3649 | 4044 | 3823 | 3600 | 2549 | 3118 | 2878 |
| Light -duty commercial vehicles | 1002 | 896 | 816 | 1161 | 1660 | 1999 | 27 | 24 | 19 | 23 |
| Medium-duty commercial vehicles | 0 | 1 | 0 | 3 | 5 | 515 | 92 | 63 | 70 | 37 |
| Heavy-duty commercial vehicles | 69 | 55 | 63 | 45 | 82 | 1954 | 297 | 175 | 222 | 1031 |
| Tractors | 1415 | 38 | 91 | 858 | 1430 | 1715 | 13 | 21 | 44 | 10 |
| Trailer | 1190 | 984 | 852 | 1467 | 2235 | 2031 | 1250 | 895 | 1017 | 1145 |
| Minibus | 927 | 1005 | 941 | 1226 | 1399 | 1183 | 758 | 350 | 478 | 384 |
| Bus | 17 | 14 | 34 | 52 | 24 | 13 | 22 | 13 | 43 | 40 |
| Other vehicles | 79 | 1323 | 1184 | 1118 | 1546 | 4419 | 8 | 0 | 0 | 1518 |

Sources:

- Data for 2001 to 2005: Direction de la Programmation et de la Prospective, 2014, Annuaire Statistique des Transports 2001-2008, https://transports.bj/wp-content/uploads/2018/03/Annuaire_Statistique_TPT_2001_2008_VF.pdf;
- Data for 2006 to 2010: Ministere du Plan et du Developpement, 2019, Tableau de Bord Social 2015, https://instad.bj/images/docs/insae-statistiques/sociales/Tableau%20de%20Bord%20Social/Tableau%20de%20Bord%20Social%202015.pdf;
- Data for 2011 to 2016: Ministere des Infrastructures et des Transports, 2017, Annuire Statistique 2013-2016, https://transports.bj/wp-content/uploads/2018/03/Annuaire_Statistique_TPT_2013_2016_VF.pdf;
- Data for 2017 to 2019: Institut National de la Statistique et de l'Analyse Economique, 2019, Annuaire Statistique 2019, https://instad.bj/images/docs/insae-publications/annuelles/AS-INSAE/Annee_2019/Annuaire_Statistique_National_2019.pdf

The vehicle data is divided into 11 categories, allowing a very detailed overview of the different vehicle types. It shows that the number of freight vehicles (light-, medium- and heavy-duty commercial vehicles) is still very low, limiting the capacity to support economic activities through road freight.

The Sub-Saharan Africa Transport Program released in 2019 a country assessment on policies for sustainable accessibility and mobility. The report confirms the lack of information on the total vehicle fleet.[3]

The vehicle fleet registration data is sourced from multiple sources because there was no single dataset

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[3] Sub-Saharan Africa Transport Program, 2019, Benin - Policies for Sustainable Mobility and Accessibility in Cities, https://www.ssatp.org/sites/ssatp/files/publication/Country-Assesment-report-Benin-En.pdf

containing information for all the years. The Programming and Forecasting Department released data from 2001 to 2005, the Ministry for Planning and Development had data from 2006 to 2010, the Ministry of Infrastructure and Transport covers 2011 to 2016, and the National Institute of Statistics and Economic Analysis covers the data from 2017 to 2019.

## 2. Methodology

The focus is on national data for passenger activity (passenger-km), freight activity (tonnes-km) and modes of transport (number of vehicles). The priority is to collect data released by national governments, government-affiliated organisations, or country-specific studies. The research identifies the most recent available data and any data available from 1990 onwards. The priority was for any data after 2010, because transport is a very dynamic growth sector and anything before 2010 adds limited value to understanding the current real-world situation.

Desk research is the main data collection approach for the Transport Starter Data Kits. The desk research examined annual yearbooks, transport statistics, country reporting, and any national statistical portals. Websites of the national government, transport ministries, statistical institutes and other related authorities were examined. Only when severe data gaps exist, global datasets are consulted. In some cases, World Bank data[4] on rail passenger and rail freight is included.

Each Transport Data for Starter Data Kit set contains an additional dataset, which is sourced from the United Nations Department of Economic and Social Affairs (UN DESA) Statistics Division. It is included as a secondary priority because this dataset is the result of a modelling exercise and covers every country. The UN DESA modelled passenger activity and freight activity has the purpose to support the Sustainable Development Goal Indicator 9.1.2[5]. The passenger activity provides information for road, rail, and air transport. Freight data covers the road, rail and inland water, and aviation. The passenger-km and tonnes-km data originate from the Open Sustainable Development Goals (SDG) Data Hub. In the UN DESA dataset, only the data for countries participating in the International Transport Forum (ITF) (representing mostly member countries of the Organisation for Economic Co-operation and Development (OECD)) and the United Nations Economic Commission for Europe (UNECE) (mostly European countries) are based on national reporting. For non-ITF/UNECE countries, data are estimated using the ITF model, which uses several covariates such as gross domestic product, population, and transport network coverage. A description of the model can be found in the ITF Transport Outlook 2017[6]. The UN DESA dataset is included in the Transport Data for Starter Data Kits as additional tables to fill in the incomplete picture that most countries present. The UN DESA modelled data is less accurate and it shall only be regarded as offering the wider picture of transport activity in the country.

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[4] Rail passenger data: World Bank, 2022, Railways, passengers carried (million passenger-km), https://data.worldbank.org/indicator/IS.RRS.PASG.KM; rail freight data: World Bank, 2022, Railways, goods transported (million ton-km), https://data.worldbank.org/indicator/IS.RRS.GOOD.MT.K6

[5] UN DESA, 2021, Indicator 9.1.2: Freight volume by mode of transport (tonne kilometres): https://www.sdg.org/datasets/undesa::indicator-9-1-2-freight-volume-by-mode-of-transport-tonne-kilometres/about ;
UN DESA, 2021, Indicator 9.1.2: Passenger volume (passenger kilometres) by mode of transport: https://www.sdg.org/datasets/undesa::indicator-9-1-2-passenger-volume-passenger-kilometres-by-mode-of-transport/about

[6] ITF, 2017, ITF Transport Outlook 2017, https://www.itf-oecd.org/transport-outlook-2017

The collected data have been shared with a group of relevant SLOCAT partners to validate and explore any additional sources. The SLOCAT partners were selected based on their actions to lead projects in the region and their involvement in data-focused knowledge products or projects. The consultation involved ten anonymous organisations.

Desk research is an approach that limits the research to material available on the internet, accessible through search engines and linked to government and statistical institutes' websites. However, this does not pose a major limitation to obtaining data. Nearly every country has functional websites for statistics and transport authorities. In a few cases, websites are not well maintained, resulting in missing or broken hyperlinks to reports. By using services that provide access to archived websites, some of these broken pages can be retrieved. The collected information has been shared with partners and no additional information has been received.

While over 1,500 languages are spoken across Sub-Saharan Africa, government datasets are generally published in a smaller subset of languages including English, French, Portuguese and others. Nonetheless, language is not a barrier to navigating through the material and identifying the relevant parameters. The involved team members can navigate through reports in such languages. If needed, automatic translation tools were used.

Due to missing values in the country's historical GDP data, extrapolation between available years was done by the authors to address this. The World Bank's data platform provided GDP share by sector for agriculture, manufacturing, and services. However, GDP share by construction, mining, and energy was also needed to align the data structure with the MAED tool. To address the lack of data available for these sectors, the authors assumed that construction, mining, manufacturing, and energy all fall within the industry sector. Thus, to obtain data for the three remaining sectors, the remaining percentage after considering agriculture, manufacturing, and services from The World Bank's data platform, was divided by three. It is therefore assumed that the GDP share of the construction, mining, and energy sectors are the same.

## 3. Ethics Statement

Not applicable

## 4. CRediT Author Statement

**Naomi Tan:** Investigation, Conceptualisation, Methodology; Data Collection; Visualization, Writing and Editing; **Robert Ambunda:** Data Collection; Investigation; Writing and Editing; **Nikola Medimorec:** Conceptualisation; Methodology; Data Collection; Investigation; Writing, Review & Editing; Supervision; **Angel Cortez:** Data Collection; **Agustina Krapp:** Data Collection; **Erin Maxwell:** Data Collection; **John Harrison:** Supervision; **Mark Howells:** Supervision

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# Declaration of Competing Interests

The authors declare that they have no known competing financial interests or personal relationships which have or could be perceived to have influenced the work reported in this article.