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


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**Abstract**

Morocco is a mountainous country located on the western side of North Africa. The country lies across the Strait of Gibraltar from Spain. The Country spans a land area of 446 550 square kilometres and has a coastline of 1835 kms. Morocco is bordered by Algeria to the east and southeast, the Western Sahara to the south, the Atlantic Ocean to the west and the Mediterranean Sea to the north. Morocco has a population of 37 million people, of which about three-fifths live in urban areas. Morocco has the fifth largest economy in Africa by GDP, which is largely driven by the services sector. The services sector accounts for more than half the country's GDP.

Transport in Morocco is of relatively high quality, as the government is spending high amounts of investment in high-speed rail, ports, highways and urban transport. Morocco realised the first high-speed rail passenger service in Africa. There are over 1,800 km of highways connecting all major cities and industrial complexes.[1] Morocco has submitted Nationally Determined Contributions and a long-term strategy to the UNFCCC. The climate strategies cover a comprehensive set of transport activities, ranging from sustainable urban mobility plans over vehicle efficiency improvements to freight system improvements.[2]

Transport demand modelling can be used to assess the implications of different scenarios and support improved policymaking. 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


[1] https://en.wikipedia.org/wiki/Transport_in_Morocco

[2] https://changing-transport.org/ndc_country/morocco/

provides data that can be used to support a model for Morocco, 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

Morocco

**Specifications Table**

| | |
|---|---|
| **Subject** | Transport |
| **Specific subject area** | Transport Data |
| **Type of data** | Tables<br>Graphs<br>Charts<br>Description of main modelling assumptions |
| **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 Morocco |
| **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.7997567 |

**Value of the Data**

- These data can be used to develop national transport demand models to inform national transport investment outlooks and policy plans, as well as provide insights on the evolution of total final energy demand.
- The data are useful for country analysts, policy makers, and the broader scientific community, as a zero-order starting point for model development.
- These 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 the country's power system.
- The data can be used for conducting an analysis of transport activity and capacity-building activities. Additionally, the methodology of translating the input data into modelling assumptions for a demand projection tool is presented in this article, which is useful for

developing a zero-order national transport demand model. This is consistent with the U4RIA goals.

- The data can also 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 as input data to develop transport demand models for Morocco. The data provided in this paper can be used to support the development of a transport model for Morocco. 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 sub-types 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 Morocco. |
| Figure 2 | A graph showing total GDP (million USD in 2015), as well as the share of the different sectors contributing to GDP in Morocco: agriculture, construction, mining, manufacturing, service, and energy. |
| Table 1 | A table showing passenger transport activity in Morocco 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 Morocco based on UN DESA Statistics Division data (see explanation below). The data feature information for 2019. |
| Table 3 | A table showing freight transport activity in Morocco for the most recent year data was available. The data are curated from national statistics agencies or other government-affiliated agencies. |
| Table 4 | A table showing freight transport activity in Morocco based on UN DESA Statistics Division data (see explanation below). The data feature information for 2019. |
| Table 5 | A table showing the energy intensity levels (MJ per passenger-km) for urban transport in 2013. It is based on a study for Cape Town (South Africa) and it is intended to support estimations for this parameter in the country. |
| Table 6 | A table showing load factors (average number of people per vehicle) for urban transport in 2013, based on the same study for Cape Town (South Africa). |

| | |
|---|---|
| Table 7 | A table showing vehicle fleet data in Morocco for the most recent year data was available. |

For the parameters on passenger and freight transport activity, an additional dataset was included in Table 2 and Table 4. The UN DESA Statistics Division modelled passenger activity and freight activity for every country in support of SDG Indicator 9.1.2[3]. Passenger activity data provide information for road, rail and air transport. Freight data cover road, rail and inland water, 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[4]. Figure 1 displays the total population disaggregated by urban and rural in Morocco.

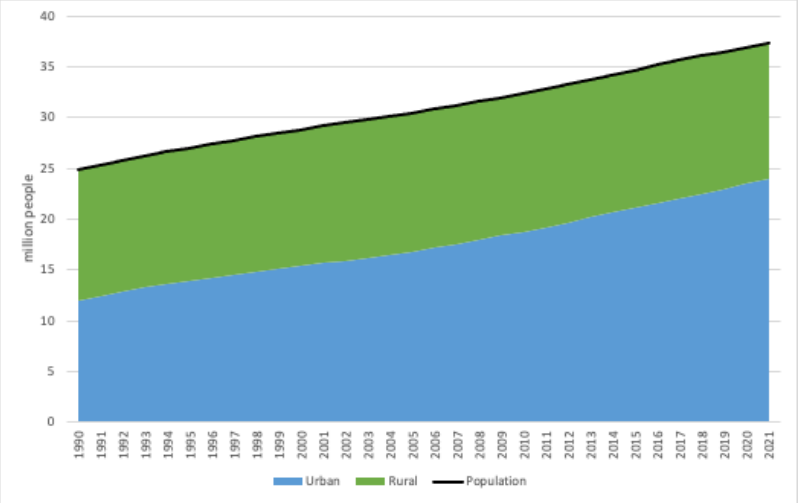


**Figure 1: Total population (million people) disaggregated by urban and rural in Morocco**

## 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[4]. Where data was not available, data processing was done. Figure 2 shows the total GDP, as well as the share by sector, in Morocco.

[3] UN DESA (2020), Indicator 9.1.2: Freight volume by mode of transport (tonne kilometres), https://unstats-undesa.opendata.arcgis.com/datasets/4a5d7189e27148c48f045729ef9e40c8_0/about;
UN DESA (2020), Indicator 9.1.2: Passenger volume (passenger kilometres) by mode of transport, https://hub.arcgis.com/datasets/undesa::indicator-9-1-2-passenger-volume-passenger-kilometres-by-mode-of-transport-5/about

[4] https://data.worldbank.org/

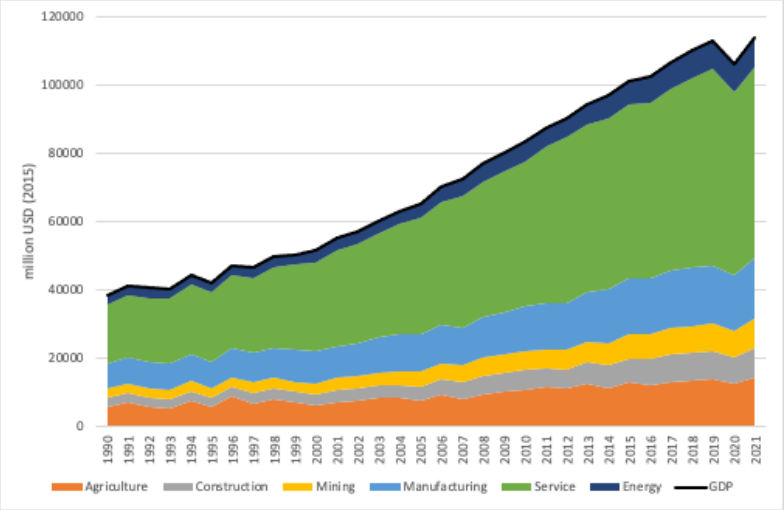


**Figure 2: Total GDP (million USD in 2015) disaggregated by share in Morocco**

## 1.3 Passenger transport activity

Information on passenger transport activity in Morocco is not released by country statistics. The World Bank Data Portal only provides information on rail passenger activity. IRF World Road Statistics have information on vehicle activity for road transport. UIC provides the most recent information on rail passenger activity: 4464 million passenger-km in 2021 (Table 1).

**Table 1: Passenger transport activity (million passenger-km) in Morocco**

| Mode | Year | Value |
|---|---|---|
| Railway Transport | 2015 | 5507 |
| Railway Transport | 2016 | 5208 |
| Railway Transport | 2017 | 4923 |
| Railway Transport | 2018 | 4475 |
| Railway Transport | 2019 | 4803 |
| Railway Transport | 2020 | 2409 |
| Railway Transport | 2021 | 4464 |

Source: UIC (2023), International Railway Statistics, Traffic on the national Territory - PKm, VAR 5113, ISBN 978-2-7461-3144-6, https://uic-stats.uic.org/

According to the UN DESA modelled data, it is estimated that the passenger activity in Morocco recorded over 137161 million passenger-km for road, 10220 million passenger-km for rail and 20431 million passenger-kms for aviation in 2019. The large majority of passenger activity is conducted through road transport.

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

| Mode | 2019 |
|---|---|

| | |
|---|---|
| Aviation | 20431.79361 |
| Rail | 10220.37143 |
| Road | 137161.1143 |

Source: UN DESA (2020), Indicator 9.1.2: Passenger volume (passenger kilometres) by mode of transport, https://hub.arcgis.com/datasets/undesa::indicator-9-1-2-passenger-volume-passenger-kilometres-by-mode-of-transport-5/about, last accessed April 2022.

## 1.4 Freight transport activity

Information on freight activity for Morocco has been retrieved for rail, road and domestic aviation. However, aviation covers only data until 2014 and road transport only until 2009. Road was recorded to have transported 800 million tonnes-km in 2009 by the African Development Bank. Statistical, Economic and Social Research and Training Centre for Islamic Countries (SESRIC) recorded that aviation transported 46 million tonnes-km in 2020.

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

| Year | Rail Transport | Aviation |
|---|---|---|
| 2017 | 3896 | 78 |
| 2018 | 3485 | 98 |
| 2019 | 3125 | 102 |
| 2020 | 3111 | 46 |
| 2021 | 3148 | - |

Source: Rail: UIC (2023), International Railway Statistics, Global Traffic -Domestic traffic in millions of tonne kilometres, VAR 6757, ISBN 978-2-7461-3144-6, https://uic-stats.uic.org/

Aviation: SESRIC (2022), Statistical Yearbook on OIC Member Countries 2021, Statistical, Economic and Social Research and Training Centre for Islamic Countries, https://www.sesric.org/files/article/808.pdf

The UN DESA modelled data for 2019 estimates that freight activity through roads surpasses 24832 million tonnes-km, rail is assumed to transport 2677 million tonnes-km and aviation is estimated to transport 1022 million tonnes-km.

**Table 3: Modelled freight transport activity (million tonnes-km) in Morocco**

| Mode | 2019 |
|---|---|
| Aviation | 102.19214 |
| Rail | 2677.6 |
| Road | 24832.8 |

Source: UN DESA (2020), Indicator 9.1.2: Freight volume by mode of transport (tonne kilometres), https://unstats-undesa.opendata.arcgis.com/datasets/4a5d7189e27148c48f045729ef9e40c8_0/about, last accessed April 2022.

## 1.5 Energy intensities for transport

To further understand the efficiency of the transport system, information on the transport energy intensity is relevant. It is together with load factors (see *1.4 Load Factors*) inputs to MAED. However, such information is difficult to retrieve and there were no values available for this country. A study on urban transport in Cape Town (South Africa) provides estimates for some road transport modes.[5]

**Table 5: Energy intensity levels (MJ per passenger-km) for urban transport**

| Mode | MJ per passenger-km for 2013 |
|---|---|
| Electric Car | 0.55 |
| Hybrid Car | 1.56 |
| Petrol Car | 2.22 |
| Minibus taxi (petrol) | 0.66 |

Source: Kane, L. (2016), What do we mean by low carbon transport: Understanding how people move in Cape Town, https://www.researchgate.net/publication/308899067_What_do_we_mean_by_low_carbon_transport_Understanding_how_people_move_in_Cape_Town

## 1.6 Load factors

The load factors in the Starter Data Kits for Transport focuses on the average number of people transported by one unit in each transport mode. For example, for a bus, it is the average number of people per trip. In some cases, it might be also referred to as 'occupancy levels' for passenger transport. There were no values available for the country, but a study for urban transport in Cape Town (South Africa) provides some insights that can support estimating values in other cities or countries.

**Table 6: Load factors**

| Mode | Load factors for 2013 |
|---|---|
| Electric Car | 1.4 |
| Hybrid Car | 1.4 |
| Petrol Car | 1.4 |
| Minibus taxi (petrol) | 7.8 |

Source: Kane, L. (2016), What do we mean by low carbon transport: Understanding how people move in Cape Town,

[5] Kane, L. (2016), What do we mean by low carbon transport: Understanding how people move in Cape Town, https://www.researchgate.net/publication/308899067_What_do_we_mean_by_low_carbon_transport_Understanding_how_people_move_in_Cape_Town

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### 1.7 Vehicle fleet

Morocco has a total of 4.3 million road vehicles, as of 2020. Records cover information from 2015 to 2020. The vehicle fleet data is sourced from the IRF World Road Statistics 2022.

**Table 7: Vehicle fleet in Morocco**

| Mode | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|
| Buses and Motor Coaches In Use | 12124 | 13329 | 10616 | 11594 | 14940 | 15323 |
| Lorries and Road Tractors In Use | 215743 | 230832 | 196768 | 211122 | 260300 | 270279 |
| Motorcycles and Mopeds In Use | 43220 | 55517 | 130257 | 191611 | 236415 | 266035 |
| Passenger Cars In Use | 2531753 | 2670614 | 2808782 | 2950056 | 3090063 | 3194307 |
| Total Vans, Pickups, Lorries and Road Tractors In Use | 892394 | 939432 | 801463 | 873388 | 1082730 | 1125128 |
| Total Vehicles In Use | 3436271 | 3623375 | 3620861 | 3835038 | 4187733 | 4334758 |
| Vans and Pickups In Use | 676651 | 708600 | 604695 | 662266 | 822430 | 854849 |

Source: IRF (2023), World Road Statistics 2022, International Road Federation, https://worldroadstatistics.org/

## 2. Experimental Design, Materials, and Methods

The above data were gathered through extensive desk research. This included material from international organisations, journal articles, and media reports. 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. The transport data was also compiled, presented, and discussed with local stakeholders to reach a consensus on the main data and assumptions.

## 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.