

Transport Starter Data Kit: Historical socio-transport data for Thailand

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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 Thailand, 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

Thailand

Specifications Table

Subject	Transport
Specific subject area	Transport Data
Type of data	Tables 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 Thailand
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.6540050

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 Thailand'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 Thailand. 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).

<i>Item</i>	<i>Description of Content</i>
Figure 1	A graph showing total population (million people), as well as the share of urban and rural population in Thailand.
Figure 2	A graph showing total GDP (million USD in 2015), as well as the share of the different sectors contributing to GDP in Thailand: agriculture, construction, mining, manufacturing, service, and energy.
Table 1	A table showing passenger transport activity in Thailand 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 Thailand 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 Thailand for the most recent year data was available.
Table 4	An additional table showing freight transport activity in Thailand based on UN DESA Statistics Division data (see explanation below). The data feature information for 2018.
Table 5	A table showing vehicle fleet data in Thailand 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 the SDG Indicator 9.1.2¹. 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 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 is 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 platform². Figure 1 displays the total population disaggregated by urban and rural in Thailand.

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/>

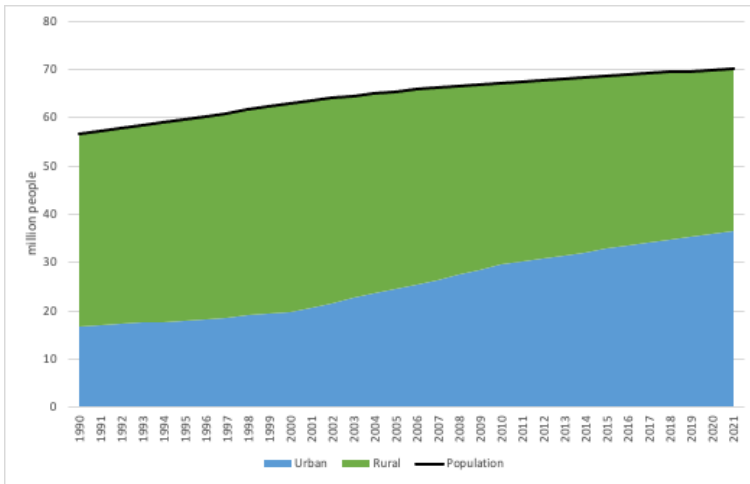


Figure 1: Total population (million people) disaggregated by urban and rural in Thailand

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 platform². Where data was not available, data processing was done. Figure 2 shows the total GDP, as well as the share by sector, in Thailand.

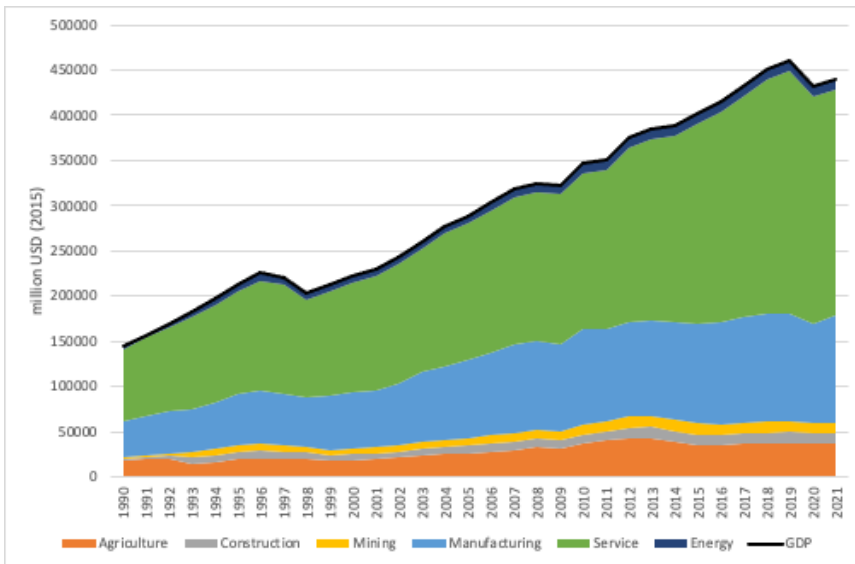


Figure 2: Total GDP (million USD in 2015) disaggregated by share in Thailand

1.3 Passenger transport activity

Information on passenger transport activity in Thailand is only captured through road and rail transport. Road passenger transport activity is 735051 million passenger-km in 2019. For rail transport, the passenger activity was 5906 million passenger-km in 2018. A steady decrease in rail passenger activity by 28%

between 2010 and 2018 was recorded. Road passenger transport activity grew by 58% during the same period. The data comes from the Asian Development Bank’s Asian Transport Outlook Database.

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

Mode	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Rail	8246	8032	7139	7028	6473	6133	6107	6520	5906	
Roads	452040	510514	558196	690882	643164	663561	696062	695426	715798	735051
Total land transport	452886	518546	565335	697911	649637	669694	702169	701946	721705	735051

Source: ADB, 2021, Asian Transport Outlook Database, <https://data.adb.org/dataset/asian-transport-outlook-database>

Rail passenger activity data is provided since 1990, while road transport passenger activity is provided since 2007. Thailand lacks to report on other transport modes, such as domestic aviation and waterways. The source does not further disaggregate the information by fuel type or geography (intercity/innersity etc.).

The UN DESA modelled data shows a very different picture of passenger transport in Thailand: It is estimated that the road passenger activity in Thailand is 125107 million passenger-km in 2018. It is far less than what the national statistics report. Also, rail is estimated to surpass 330000 million passenger-km, which would make it the major transport mode.

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

Mode	2018
Aviation	132748.1261
Rail	330768.7157
Road	125107.6314

1.4 Freight transport activity

Information on freight activity for Thailand exists for all major transport modes (road, rail, waterways, and domestic aviation). The data spans 2014 to 2018. Data for domestic aviation freight starts in 2004 and goes until 2019. Most of the goods transport is being conducted through road transport with 192075 million tonnes-km in 2018. Yet rail freight activity grew by 20% and aviation by 37% between 2014 and 2018. The data is curated by the Asian Development Bank’s Asian Transport Outlook Database.

Table 3: Recorded freight transport activity (million tonnes-km) in Thailand

Mode	2014	2015	2016	2017	2018	2019
Road	187330	193911	189110	191613	192075	
Rail	2294.93	2545.33	2646.55	2846.14	2769.13	

Waterways	7993.44	7160.72	7056.38	7403.77	7808.17	
Domestic aviation	25337	27221	31992	36023	34790	24232

Source: ADB, 2021, Asian Transport Outlook Database, <https://data.adb.org/dataset/asian-transport-outlook-database>

Compared to the passenger transport activity data above, UN DESA delivers more reliable data on freight activity. Road freight activity is assumed to be at 190797 million tonnes-km in 2018, which is very close to the value by the country statistics in Table 3. Rail freight activity for 2018 in Thailand is 24881 million tonnes-km, nearly ten times more than in the country's statistics.

Table 4: Modelled freight transport activity (million tonnes-km) in Thailand

Mode	2018
Aviation	2666.263256
Inland waterways	2371.863
Rail	24881.04
Road	190797.6

1.5 Vehicle fleets

Thailand has a total of 41 million vehicles, as of 2020. Between 2010 and 2020, the total vehicle fleet grew by 45%. The largest growth was recorded for freight vehicles (160%) and light-duty vehicles (80%). Every second vehicle on Thailand's road is a two-wheeler. 43% of vehicles are light-duty vehicles. The vehicle fleet data is sourced from the Asian Development Bank's Asian Transport Outlook Database.

Table 5: Vehicle fleet numbers in Thailand

Mode	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Two-wheelers	17299814	18152469	19147225	19964990	20305708	20497563	22261469	20695832	-	-	21540584
Three-wheelers	22724	22453	22193	22200	22047	21935	22027	21813	-	-	21009
Light-duty vehicles	9887706	10651817	11827710	13023547	13793784	14421267	15003774	15697443	-	-	17799570
Buses	954787	990426	1037334	1104231	1153369	1184503	1213516	1249518	-	-	1325248
Others	97914	101622	105423	988367	110510	115634	117511	121741	-	-	124479
Freight vehicles	221884	276150	337092	401071	449762	490121	506042	522416	-	-	578006
Total road vehicles	28484829	30194937	32476977	35504406	35835180	36731023	39124339	38308763	-	-	41388896

Source: ADB, 2021, Asian Transport Outlook Database, <https://data.adb.org/dataset/asian-transport-outlook-database>

Thailand has information about the historic fleet and the accompanying datasets provide information since 1990. The database does not provide any additional information on fuels used by each vehicle type. The statistics do not feature any data for 2018 and 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 data³ 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 9.1.2⁴. 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 2017⁵. 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.

³ 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>

⁴ 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>

⁵ 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.

Government datasets are generally published in local languages. For this study, the relevant information is accessed through the Asian Transport Outlook Database⁶ which is available in English, thus no language issues were encountered.

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

⁶ ADB, 2021, Asian Transport Outlook Database, <https://data.adb.org/dataset/asian-transport-outlook-database>

Acknowledgements

We would like to acknowledge the SLOCAT Partnership on Sustainable, Low Carbon Transport who helped make this and future iterations possible. We would also like to acknowledge the International Road Federation (IRF) and the International Union of Railways (UIC) for providing us with these data. The data are extracted from IRF World Road Statistics (WRS) and their use is subject to copyright and specific Terms and Conditions available on the WRS website. More WRS data are available for free on its Data Warehouse www.worldroadstatistics.org. Likewise, data was extracted from the UIC Statistics Rail Information System and Analyses (Railisa) and more can be found on its online tool <https://uic-stats.uic.org/>

Funding

As well as support in kind provided by the employers of the authors of this note, we also acknowledge core funding from the Climate Compatible Growth Program (#CCG) of the UK's Foreign Development and Commonwealth Office (FCDO). The views expressed in this paper do not necessarily reflect the UK government's official policies.

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.