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CURRENT STATE OF TRANSPORTATION DATA AND STATISTICS IN THE PHILIPPINES AND OPPORTUNITIES FOR IMPROVEMENT TOWARDS USABILITY

by

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ABSTRACT

Data and statistics on transportation come in various formats. Data collected by various sources are processed and presented in many ways. In certain cases, there are forms or templates that agencies have developed or adopted that they eventually used to generate reports. For example, the Land Transportation Office (LTO) publishes statistics on vehicle registration every year, and the same are submitted to the Philippine Statistics Authority (PSA) for the compilation the agency publishes every year. Meanwhile, agencies like the Philippine Ports Authority (PPA) also publishes reports containing the summaries of inbound and outbound passengers and freights at ports across the country. A basic question that needs to be answered is if the data and statistics being published are readily usable for other purposes such as in-depth analysis, modelling, forecasting or back-casting. This paper presents on the current ways transportation data and statistics are produced and published. More importantly, the paper discusses the requirements for in-depth transportation data analysis and relates this to the form and quality of data that can be acquired from various sources. Recommendations are made for more effective data collection, processing and presentation that will enable users to maximize the use of data.

1. Introduction

Data and statistics on transportation come in various formats. Data collected by various sources are processed and presented in many ways. In certain cases, there are forms or templates that agencies have developed or adopted that they eventually used to generate reports. For example, the Land Transportation Office (LTO) publishes statistics on vehicle registration every year, and the same is submitted to the Philippine Statistics Authority (PSA) for the compilation the agency publishes every year. Meanwhile, the Philippine Ports Authority (PPA) also publishes reports containing the summaries of inbound and outbound passengers and freights at ports across the country.

This paper has the following objectives:

a. Present an inventory of transportation data sources
b. Assess the usability of the data according to the purpose
c. Formulate recommendations for more effective data collection, processing and presentation

2. Data Sources

The following agencies are the typical sources of data, which they currently publish or share in various forms and content. These are categorized under four transport sectors:

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- Air transport
    - Department of Transportation (DOTr) – Air transport division
        - Summary of Air Transport Statistics
    - Civil Aviation Authority of the Philippines (CAAP)
        - Air transport statistics
        - GHG inventory for aviation
    - Clark International Airport Corporation (CIAC)
        - GHG emissions calculation
        - Clark Flight Traffic Statistical Reports
        - Domestic and International Traffic Movements
    - Mactan Cebu International Airport Authority (MCIAA)
        - MCIAA Flight Traffic Statistical Reports
        - Domestic and International Traffic Movements
    - Manila International Airport Authority
        - MIAA Flight Schedule
        - MIAA Flight Traffic Statistical Reports
        - Domestic and International Traffic Movements

- Maritime transport
    - Cebu Ports Authority (CPA)
        - Bulk cargo statistics
        - Cargo throughput
        - Container traffic
        - Passenger traffic
        - Rolling Cargo
        - Shipping traffic
    - Maritime Industry Authority (MARINA)
        - Registered vessels
    - Philippine Coast Guard
        - Floating assets
        - Fuel oil requirements
        - Vessels
    - Philippine Ports Authority (PPA)
        - Summary port statistics
        - Summary shipping, cargo and passenger statistics
        - Cargo handling tariffs
        - RoRo Traffic summary
        - Container statistics summary

- Rail transport
    - Light Rail Transport Authority (LRTA)
        - Lines 1 and 2 audit reports
        - Lines 1 and 2 ridership statistics
        - Lines 1 and 2 train schedules
    - Metro Rail Transit Corporation (MRTC)
        - MRT3 train schedule
        - MRT3 Average trips/train/day
        - MRT3 Average round trips
        - MRT3 ridership statistics
    - Philippine National Railways (PNR)
        - Passenger-Kilometers

        - Ridership statistics
        - Summary passenger-kilometers for commuter and Bicol Express

- Road transport
    - Department of Transportation (DOTr) – Road Transport Division
        - Project study reports
        - Summary reports submitted to the DOTr by agencies under them
    - Land Transportation Office (LTO)
        - Motor vehicle registration – new and renewals
        - Motor vehicle fuel used
    - Land Transportation Franchising and Regulatory Board (LTFRB)
        - Inventory of routes, regional
        - Public utility bus (PUB) routes with distance
        - Public utility jeepney (PUJ) routes with distance
        - UV Express routes with distance
    - Department of Public Works and Highways (DPWH)
        - Traffic counts along national roads
        - Inventory of national roads and bridges
    - Metropolitan Manila Development Authority (MMDA)
        - Road crash statistics via MMARAS
    - Philippine National Police (PNP)
        - Road crash reports via e-blotter

Aside from these data sets, various reports and other references are available with the various agencies. The DPWH annually publishes an Atlas that contains a wealth of information that are used by Traffic and Highway Engineers and Planners. Annual reports are published by the same agencies and corporations above and others that also deal with transportation. The latter include tollways operators like the Metro Pacific/Manila North Tollways Corporation, Skyway Corporation and TPLEX. Among the national agencies, perhaps the National Economic and Development Agency (NEDA) would also have a significant collection of transport-related data and reports from various studies undertaken through or commissioned by the agency.

Others transportation data sources would be local government units (i.e., cities and municipalities), the academe and private companies. LGUs regularly collect data though types and formats may vary from one LGU to another with the more progressive ones usually having more data. What is untapped are the data from various transport or traffic studies submitted to them that are the outputs of projects in their localities.

Academic institutions such as the University of the Philippines, De La Salle University, Ateneo De Manila University, Polytechnic University of the Philippines, Xavier University and Mindanao State University, among others, conduct transportation researches. They generate data and reports containing the outcomes of analysis performed by students, faculty and staff of these institutions.

3. Purposes of data collection and use

Data is collected for certain purposes. More specifically, these include the most basic, which is reporting traffic or transport statistics (e.g., traffic counts along roads, number road crashes, number of passengers, volume of freight, etc.). Following are more in-depth objectives for data collection and analysis.

3.1 Determination of mode share

The percentage shares according to vehicle classification can be referenced from the LTO, which publishes the data on the annual vehicle registration. However, these do not reflect the actual traffic and usage of vehicles. DPWH has the traffic counts data in the form of Annual Average Daily Traffic (AADT) for national roads, which vary from one road to another depending on factors like urbanization and vehicle ownership. The share of vehicles for various road classifications are not generally available. The DPWH publishes traffic counts data for national roads so perhaps these can substitute for the data. However, this requires additional data in the form of vehicle occupancies for the determination of mode shares in terms of person trips.

The best (i.e., ideal) source or reference would be mode shares derived from surveys such as Household Information Surveys (HIS). For example, JICA has derived the shares by mode including an estimate for walking based on the responses to surveys conducted in Metro Manila and adjacent areas. These are among the inputs for developing transport models employed for travel demand forecasting and evaluation of identified scenarios for infrastructure development as well as transport policies or traffic schemes. Table 1 shows an example of % share of person trips as estimated by JICA in MUCEP, 2014.

Table 1: Trip composition by mode (JICA, 2014)

Mode	No. of Trips (000)	% of Public or Private	% to Total
Public Mode	17,337	100.0	48.8
Train	1,485	8.6	4.2
Bus	2,352	13.6	6.6
Jeepney	6,763	39.0	19.1
Tricycle	5,687	32.8	16.0
UV/HOV	261	1.5	0.7
Pedicab	631	3.6	1.8
Others	156	0.9	0.4
Private Mode	7,263	100.0	20.4
Motorcycle	2,948	40.6	8.3
Car	2,894	39.9	8.2
Taxi	315	4.3	0.9
Truck	270	3.7	0.8
Others	826	11.4	2.3
Walking	10,913	-	30.7
Total	35,503	-	100.0

Source: JICA Project Team
Note: Trips are by residents inside study area only.

Another source of data for the determination of mode shares, non-motorized modes are not considered in the modelling work. Modes or vehicle types are adopted from the LTO, which already has a good summary as stated in their Motor Vehicle Registration (MVR) data:

- Passenger Cars (PC)

- Utility Vehicles (UV)
- SUV
- Buses
- Trucks
- Motorcycles (MC)
- Tricycles (TC)
- Non-Conventional (NC)

3.2 Determination of occupancy

Vehicle occupancy is used to determine the number of passengers traveling. Occupancy is multiplied to the estimated number of vehicles traveling (i.e., in the form of either vehicles/hour or vehicle-kilometers traveled) to obtain the number of passengers traveling (i.e., in the form of either passengers/hour or passenger-kilometers traveled). Table 2 shows the average passenger occupancy values employed for the modeling in this study.

Table 2: Average passenger occupancy per vehicle

Vehicle Type	Vehicle Occupancy	
	MUCEP (2012/2014)	**MMUTIS (1997/1999)**
Car	1.7	2.5
Jeepney	10	15.1
Bus	35.3	46.5
Truck[a]	2	2
MC[b]	1.2	n/a

[a]Assumed based on typical driver and helper crew of trucks.
[b]Determined based on research at the National Center for Transportation Studies (NCTS).

Again, these values are required to estimate total passengers from travel demand models. Passenger-kilometers can be estimated if average travel distances are also known.

In the cases of rail, air and maritime transport, it may be possible to obtain data to directly estimate the number of passengers, passenger-kilometers and vehicle-kilometers since vehicle movements are recorded. It is just a matter of processing and reporting such data in forms that are readily usable for analytical or modelling purposes.

3.3 Determination of fuel economy

Fuel economy is another input to the transport models derived for this study. Fuel economy values for jeepneys can be determined based on the distance traveled and the amount of fuel consumed over those distances. Table 3 shows jeepney route classifications derived in a 2009 study at the NCTS. Also shown are the average total distance traveled per day by jeepneys from the same study.

Table 3: Jeepney route classifications based on travel distance and average total distance traveled per day

Route Class	Coverage Distance	Distance traveled, km
Short	5 kilometers or less	68.75
Medium	6 – 9 kilometers	98.24
Long	10 – 19 kilometers	111.22
Extra Long	20 kilometers & above	164.00

Source: Regidor, Vergel&Napalang, 2009, Environment Friendly Paratransit: Re-Engineering the Jeepney, Proceedings of the Eastern Asia Society for Transportation Studies, Vol. 7.

Table 4 shows the average daily consumption and computed fuel efficiency for jeepneys.

Table 4: Average daily consumption and computed fuel efficiency

Route Class	Kilometers/Liter	Liters/Day
Short	6.00	11.00
Medium	5.53	19.97
Long	5.68	20.64
Extra Long	5.61	31.64

Source: Regidor, Vergel&Napalang, 2009, Environment Friendly Paratransit: Re-Engineering the Jeepney, Proceedings of the Eastern Asia Society for Transportation Studies, Vol. 7.

3.4 Estimation of Emissions

The reference values used by JICA in the MUCEP study in 2015 are shown in Table 5 and 6. These are related to the speeds of vehicles along the road network considered in the transport models they developed to estimate the total emissions per type of vehicle.

Table 5: Fuel consumption for vehicles and NOx emission factors in Metro Manila

Vehicle Type	Speed Classes / Speed of Representative (km/h)						
	3 to 5 4	5 to 10 7.5	10 to 15 12.5	15 to 25 20	25 to 40 32.5	40 to 60 50	60 to 80 70
Fuel consumption for Bus	0.809	0.681	0.602	0.532	0.455	0.383	0.337
Fuel consumption for Passenger car	0.167	0.123	0.099	0.079	0.061	0.048	0.045
NO_x Emission factor for Bus	22.7	16.2	12.9	10.7	8.8	7.3	6.5

Source: MUCEP, 2015

Table 6: Reference emission factors in Metro Manila

	Speed Classes / Speed of Representative (km/h)							
	Vehicle Type	3 to 5 4	5 to 10 7.5	10 to 15 12.5	15 to 25 20	25 to 40 32.5	40 to 60 50	60 to 80 70
CO_2	Gas car	447.6	363.7	327.5	306.3	292.0	282.5	277.3
	Diesel utility vehicle/ jeepney	643.7	544.6	501.8	476.7	459.9	448.7	442.5
	Diesel truck/ bus	1182.9	1083.9	1041.1	1016.0	999.1	987.9	981.7
NO_x	Gas car	5.512	3.656	2.998	2.700	2.546	2.462	2.424
	Diesel utility vehicle/ jeepney	4.212	2.356	1.698	1.400	1.246	1.162	1.124
	Diesel truck/ bus	15.312	13.456	12.798	12.500	12.346	12.262	12.224
PM	Gas car	2.912	1.056	0.398	0.100	0.100	0.100	0.100
	Diesel utility vehicle/ jeepney	3.712	1.856	1.198	0.900	0.746	0.662	0.624
	Diesel truck/ bus	3.712	1.856	1.198	0.900	0.746	0.662	0.624
CO	Gas car	52.312	50.456	49.798	49.500	49.346	49.262	49.224
	Diesel utility vehicle/ jeepney	5.312	3.456	2.798	2.500	2.346	2.262	2.224
	Diesel truck/ bus	15.212	13.356	12.698	12.400	12.246	12.162	12.124
SO_x	Gas car	2.823	0.967	0.309	0.011	0.011	0.011	0.011
	Diesel utility vehicle/ jeepney	2.933	1.077	0.419	0.121	0.121	0.121	0.121
	Diesel truck/ bus	3.186	1.330	0.672	0.374	0.220	0.136	0.098
HC	Gas car	8.812	6.956	6.298	6.000	5.846	5.762	5.724
	Diesel utility vehicle/ jeepney	3.512	1.656	0.998	0.700	0.546	0.462	0.424
	Diesel truck/ bus	6.512	4.656	3.998	3.700	3.546	3.462	3.424

Source: MUCEP, 2015

3.5 Estimation of Vehicle Speeds

Vehicle speeds are estimated using a variety of techniques including conventional approaches (e.g., trap length method) and instruments (e.g., speed guns or radars). These, however, only allow for spot speeds to be obtained. The more useful data would be travel speeds, which can be estimated by recording travel times along specific routes. Again, these can be through conventional means (e.g., travel time surveys) or by using more sophisticated approaches such as test cars. Such data can now also be outsourced via smartphones on-board vehicles (e,g,, via apps like Waze).

For driving speeds, there are scarce data for this as agencies and local government units do not usually collect such data. The following Table 7 shows the maximum speeds used for modelling travel from past studies including MMUTIS (1999) and MUCEP (2015).

Table 7: Road capacity and maximum speed by road category

Area	Road Category	Carriageway Type	Capacity 1-way pcu/day/lane	Maximum Speed (km/h)
Inside EDSA	Local road	Single	2,200	30
	Secondary	Single	4,400	40
	Primary	Single	6,600	45
Outside EDSA Inside MM (including EDSA)	Secondary	Single	7,700	50
	Primary	Single	8,250	60
	Secondary	Divided	14,000	70
	Primary	Divided	16,500	80
Outside MM	Local road	Single	8,000	30
	Secondary	Single	11,000	55
	Primary	Single	15,400	60
Urban / Intercity	Access / egress	Single	15,000	80
	Expressway	Single	17,000	80
	Expressway	Divided	20,000	100

Source: JICA, 2015, "The Project for Capacity Development on Transportation Planning and Database Management in the Republic of the Philippines: MMUTIS Update and Enhancement Project (MUCEP); Manual Vol. 2, Travel Demand Forecasting." JICA and DOTC. http://open_jicareport.jica.go.jp/pdf/12247649.pdf.

Since these are maximum speeds, lower average speeds may be assumed (perhaps 10% less than the maximum). For more accurate and "real-time" estimates, possible sources of speed data could be Waze and Grab. Google Traffic's data is supposed to come from Waze and is presented for varying conditions throughout the week (day of the week) and day (time of day).

3.6 PKT and VKT Estimation

a. Land transportation

Passenger-kilometers traveled (PKT) and vehicle-kilometers traveled (VKT) may be derived in a number of ways. The best but not necessarily the easiest approach is through travel demand modelling and forecasting using established models and software. Among the more popular commercial software, for example, are CUBE, VISSUM and EMME. These allow for the estimation of the characteristics of a system, network or perhaps a corridor. In the Philippines, detailed models have been developed for only a few cities including Cebu City and Davao City.

These models, however, require much information including origin-destination tables and travel patterns and preferences (i.e., modes and routes) to establish the number of vehicles and their loads (i.e., passengers and freight) traveling from one point to another. In the absence of such computer models, the PKT and VKT values can still be estimated but using an approach employing proportioning and regression of available data.

Due to the lack of reliable data such as those ideally produced by detailed transport studies across the country, we can only use those published in reports showing estimates of PKT or VKT for specific modes of transport such as reports from studies the Japan International Cooperation Agency (JICA) for Metro Manila and its adjoining areas. These include PKT estimates from the Metro Manila Urban Transportation Integration Study (MMUTIS) in 1999 and the MMUTIS Update and Capacity Enhancement Project (MUCEP) in 2014. These reports only state the cases of Mega Manila.

Tables 8 to 10 show the estimated passenger-kilometers traveled for three scenarios simulated by JICA in the Roadmap 2 study: do-nothing, with BBB, and with Roadmap. 'Do-nothing' corresponds to the Business-As-Usual (BAU) case. 'BBB' refers to the current administration's "Build, Build, Build" projects while 'Roadmap' refers to the long list of projects identified by the JICA study that are proposed to address the transport problems (e.g., congestion, inefficient services, etc.) and the backlog of transportation infrastructure in the Mega Manila area.

Table 8: Estimated person-kilometers for the Mega Manila area from the JICA Roadmap 2 transport model

Mega Manila		2017	2022 Do-Nothing	2022 with BBB	2035 Do-Nothing	2035 with BBB	2035 with Roadmap
Person-km ('000)	Car	63,736	66,133	64,126	73,769	74,641	73,499
	Public	84,042	93,582	78,451	121,701	93,611	95,733
	Rail	8,550	9,726	21,630	11,015	39,702	35,251
	Total	156,328	169,442	164,207	206,485	207,953	204,483

Source: JICA Roadmap 2 (2019)

Table 9: Estimated person-kilometers for the Metro Manila area from the JICA Roadmap 2 transport model

Metro Manila		2017	2022 Do-Nothing	2022 with BBB	2035 Do-Nothing	2035 with BBB	2035 with Roadmap
Person-km ('000)	Car	40,860	41,098	39,820	42,524	42,529	44,050
	Public	49,115	54,789	41,189	71,974	45,674	49,302
	Rail	8,550	9,726	21,630	11,015	39,702	35,251
	Total	98,526	105,614	102,639	125,512	127,906	128,602

Source: JICA Roadmap 2 (2019)

Table 10: Estimated person-kilometers for the adjoining areas of Metro Manila area from the JICA Roadmap 2 transport model

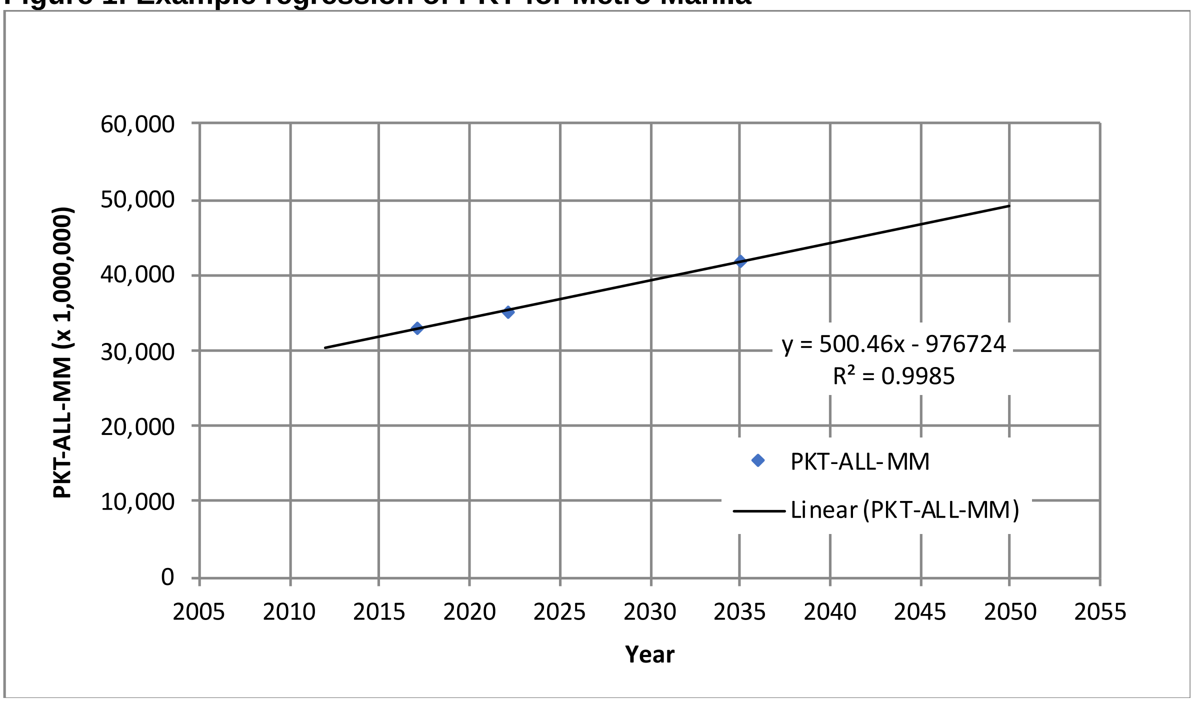
Adjoining Area		2017	2022 Do-Nothing	2022 with BBB	2035 Do-Nothing	2035 with BBB	2035 with Roadmap
Person-km ('000)	Car	22,876	25,035	24,305	31,245	32,111	29,449
	Public	34,927	38,793	37,263	49,728	47,936	46,431
	Rail	-	-	-	-	-	-
	Total	57,803	63,828	61,568	80,972	80,048	75,880

Source: JICA Roadmap 2 (2019)

Note from the tables that the vehicle classifications are quite general with ‘car’ representing all types of private vehicles (e.g., cars, vans, SUV, motorcycles, etc.), ‘public’ representing all types of public utility vehicles (e.g., jeepneys, vans, buses, etc.), and ‘rail’ representing what appears as only commuter rail services (e.g., Lines 1, 2 and 3 & PNR commuter rail). That means there is still a need to disaggregate these into more detailed vehicle types depending on the purpose of analysis. For our case, such a disaggregation is required since energy modelling requires specific types of vehicles for correspondence with fuel efficiency and consumption data. These were disaggregated according to the vehicle types and VKT values can be determined using the occupancy values in Table 2.

Since the available data are for specific years 2017, 2022 and 2035, regression models were employed to determine future PKTs for Metro Manila. For the rest of the country, the options were to use either population and GDP to estimate/proportion the total. Metro Manila is the NCR and has the largest share for economic activity for the country. GDP was determined to be a more reliable parameter to estimate PKT across the regions compared to population. Figure 1 shows the regression model for estimating future PKT for Metro Manila.

Figure 1: Example regression of PKT for Metro Manila



For specific projects such as BRT, the PKT attributed to the project can be derived from the GHG estimates for both the proposed Cebu and Metro Manila BRT projects. These are sourced from the reports for each project but are presented in different ways as shown in Tables 11 and 12. For the case of the proposed Cebu BRT corridor, emissions were presented per vehicle type and emissions specifically attributed to BRT buses can be isolated. These are divided by the corresponding emission values per passenger-kilometer to determine PKT values.

Table 11: PKT estimates for the Cebu BRT corridor

Vehicle type	Tons CO2 emitted along BRT corridor			
	2015	**2020**	**2025**	**2035**
Cars	30,469	47,855	71,141	121,890
Taxis	12,562	16,880	22,525	28,059
Jeepneys	13,179	14,417	22,629	33,072
Inter-urban buses	8,142	7,796	7,252	1,187
BRT buses	**6,620**	**9,046**	**11,862**	**27,605**
MC/TC	6,723	7,203	4,769	11,429
Trucks	7,435	9,430	13,988	20,094
TOTAL	**85,130**	**112,627**	**154,166**	**243,336**
BRT corridor emissions per person-km, grams CO2e	75.2	81.3	91.6	82.6
Person-kilometers, BRT Corridor	1,132,047,872	1,385,325,953	1,683,034,934	2,945,956,416
Person-kilometers, BRT buses	**88,031,915**	**111,266,913**	**129,497,817**	**334,200,969**

Reference: World Bank (2012) Cebu City Urban Transport Greenhouse Gas Emissions Study, Final Report.

For the Manila-Quezon City BRT corridor, the emissions attributed specifically to the BRT are presented in the report instead of a breakdown similar to the Cebu case. As such, a simpler table is presented below.

Table 12: PKT estimates for the Manila-Quezon City BRT corridor

Year	Annual GHG Emissions (tons CO2e)	GHG emissions per person-km (g/pkm CO2e)	Passenger-kilometers from model
2016	6,200	140	**44,285,714**
2020	12,735	174	**73,189,655**
2025	94,833	201	**471,805,970**
2035	357,246	213	**1,677,211,268**

Reference: World Bank (2013) Manila-Quezon Corridor Improvement Project, Detailed Technical Study, Final Report.

The PKT estimates in Tables 11 and 12 are estimated from transport model outcomes for the two studies conducted in support of the projects. These were modeled using similar approach and software by the JICA Roadmap 2 study.

b. Rail transportation

One approach for estimating PKT for rail transport is by using the train capacity, operating hours, and number of trains operating per hour to estimate the number of passengers per day. If the average distance traveled per passenger is known, then the PKT can be directly calculated from these values. This is shown in Table 13 where the PKTs for the four railway lines in Metro Manila are estimated.

Table 13: Example data and calculations for railways in Metro Manila

	Line 1	Line 2	Line 3	PNR
Capacity, passengers per train[a]	1,358	1,628	1,182	1,348[d]
Operating hours[a]	17	17	18	14
Average trains per hour[a]	9.5	3.4	9.0	1.2
Directions	2	2	2	2
Pax per day[b]	438,634	188,197	382,968	45,293
Average distance traveled per passenger, kilometers[c]	7.5	7.5	7.5	7.5
PKT/day[b]	3,289,755	1,411,476	2,872,260	339,696
Passengers per year[b]	160,101,410	68,691,832	139,783,320	16,531,872
PKT per year[b]	1,200,760,575	515,188,740	1,048,374,900	123,989,040

[a]*Reference: LRTA and MRTC*
[b]*Calculated*
[c]*Reference: JICA: Metro Manila Strategic Mass Rail Transit Development (2009)*
[d]*The PNR operates two configurations of trains: 3-car and 6-car configuration. The capacity assumed is that for a 6-car train, which is the more frequent set.*

The ideal case is if the railway companies process their data and report on the PKT. Lines 1, 2 and 3 only report the number of passengers arriving or departing at each station but does not report the PKT. Meanwhile, the Philippine National Railways (PNR), reports statistics on passenger-kilometers traveled. Table 14 shows the monthly and total passenger-kilometers statistics from 2010 to 2017 as reported by the PNR.

Table 14: Passenger-kilometers for the PNR Metro Manila Commuter Line

	2010	2011	2012	2013	2014	2015	2016
JAN	4,432,274	16,085,762	19,529,412	18,141,578	34,006,853	36,301,867	37,942,765
FEB	4,687,256	15,878,870	19,447,582	17,628,548	33,509,270	32,350,308	35,883,449
MAR	7,758,170	18,559,632	20,327,188	18,344,396	39,621,590	39,295,745	32,777,765
APR	7,635,978	15,099,350	16,579,150	19,629,988	33,827,346	32,218,542	32,109,825
MAY	8,792,140	17,341,422	17,803,310	21,153,328	37,493,404	3,505,818	31,125,155
JUN	10,634,722	17,575,250	17,931,746	21,620,536	34,022,051	-	30,895,223
JUL	12,841,332	18,123,574	17,761,520	25,246,872	34,630,021	7,380,948	29,752,548
AUG	12,751,774	18,381,650	13,579,020	22,322,216	34,294,939	29,942,926	29,282,517
SEP	12,919,970	18,725,644	15,386,714	25,043,620	34,163,112	34,371,817	29,559,730
OCT	13,821,248	19,433,624	17,485,132	26,831,168	35,764,053	32,631,060	32,051,587
NOV	14,738,038	19,029,738	17,498,796	22,964,346	36,620,564	37,781,009	28,834,979
DEC	16,278,416	20,354,278	18,008,494	26,527,875	36,816,325	39,199,580	24,472,125
TOTAL	**127,291,318**	**214,588,794**	**211,338,064**	**265,454,471**	**424,769,528**	**324,979,620**	**374,687,668**

Source: Philippine National Railways

A similar approach is applied for the case of BBB projects including the Clark Railway Line, the Metro Manila Subway, MRT Line 7 and the extensions of Lines 1 (to Cavite) and 2 (to Antipolo). For projecting future PKTs, however, the estimated growth rates of rail passenger traffic is adopted from the JICA Roadmap 2 study to obtain values until 2051. This is possible given that the JICA study estimated and reported rail PKTs.

c. Air transportation

In the case of air transportation, PKTs may be estimated directly from data comprising of flights (including aircraft type) and number of passengers. The complete data can be approximated based on the information that can be gathered from four airports. These are Ninoy Aquino International Airport (NAIA), Mactan Cebu International Airport (MCIA), Clark International Airport and Francisco Bangoy International Airport. Inbound and outbound flights from these airports account for most of the aircraft movements in the country including both domestic and international flights. Other significant airports would be Iloilo, Bacolod-Silay, Caticlan, Puerto Princesa, Cagayan-De Oro/Laguindingan, and Zamboanga. These also have unique flights including limited international services.

For this study and at this point, only Cebu and Clark had the details required to estimate PKTs. These include aircraft origin, destination, departure and arrival times, aircraft type and number of passengers. These allowed for more precise calculations of PKTs that in turn allowed for regression models to be used to project future PKTs. Table 15 shows the VKT and PKT estimates for MCIA based on statistics provided by the airport authority.

Table 15: Statistics, and VKT and PKT Estimates for MCIA

Aircraft Type	Number of Departure Flights		Passenger Capacity	Passenger Number	Distance Travelled of Domestic Flights (in KM)			Average VKT	Average PKT
	Total	%Share			Arrival	Departure	Total		
A321-100	1,521	4.13%	200	108.84	761,933	754,644	1,516,577	496.15	54,000.93
A320	15,328	41.64%	180	97.96	7,712,652	7,784,857	15,497,509	507.88	49,750.35
A321	1	0.00%	200	108.84	567	567	1,134	566.92	61,703.57
A321-211	498	1.35%	200	108.84	282,326	282,326	564,652	566.92	61,703.57
A321-231	703	1.91%	200	108.84	397,004	395,941	792,946	563.22	61,300.52
A330	54	0.15%	335	182.31	30,614	30,614	61,227	566.92	103,353.48
A330-300	394	1.07%	335	182.31	222,233	223,366	445,599	566.92	103,353.48
A330-343	399	1.08%	335	182.31	225,646	226,201	451,847	566.92	103,353.48
A340-300	275	0.75%	375	204.08	155,903	155,903	311,806	566.92	115,694.20
B737-200	241	0.65%	215	117.00	159,646	158,332	317,978	656.98	76,868.63
B777-300	7	0.02%	396	215.50	2,132	3,625	5,757	517.80	111,587.56
Q300	594	1.61%	56	30.48	115,895	117,016	232,911	197.00	6,003.49
Q400	6,520	17.71%	90	48.98	1,521,544	1,528,289	3,049,832	234.40	11,480.45
ATR 72	10,242	27.82%	90	48.98	2,333,558	2,436,636	4,770,194	237.91	11,652.17

Reference: Statistics from Mactan Cebu International Airport Authority

d. Maritimetransportation

The Philippine Ports Authority (PPA) data generally reports on inbound and outbound passengers and freight at ports under their jurisdiction. Meanwhile, the MARINA has data on the vessels registered and operating in the country. Similar to the case of aviation, the PKTs and VKTs may be derived if the port origin-destination data are known together with the data on passengers and freight for each vessel. Unfortunately, such data are not readily available with the maritime agencies that only publish summaries of inbound and outbound passengers and freight.

3.7 Crash data analysis

Road crash analysis are often performed by government agencies and LGUs in order to assess road safety and formulate interventions to reduce, for example, the number of fatal crashes occurring at particular locations (i.e., black spots). Road crash data, for example, are compiled by several agencies such as the DPWH, DOTr, DOH, PNP, and the MMDA. LGUs may also have their own database for road crashes particularly those that occurred at local roads. Currently, there are several databases managed by government agencies. These include Metro Manila Accident Recording and Analysis System (MMARAS) of the MMDA and Online National Electronic Injury Surveillance System (ONEISS) of the DOH.

4. Conclusions and Recommendations

In the ideal scenario, there should be regular and strategic data collection both at the national and local levels geared towards the estimation of inter-regional, inter-provincial and even inter-town (cities and municipalities) trips. It is recommended that agencies at least perform some analysis of the data concerning trips made through their facilities such as terminals, airports and ports. Most of the current data being collected and published are good enough for descriptive statistics but are difficult to use in order to obtain more substantial or in-depth analysis using them.

It was also mentioned in the previous sections that transport models are quite useful in the evaluation of scenarios in addition to their typical use for travel demand forecasting. Currently, there are only the transport models for Metro Manila and Cebu City, which are the outcomes of foreign-funded initiatives (i.e., JICA and WB). These models were developed using the CUBE software though there are other software suites like VISSUM and EMME that can also be developed. These usually have their own microsimulation software (e.g., Dynasim for CUBE and VISSIM for VISSUM) that allows for what are often macroscopic transport models to be transformed or exported for microsimulation. Other cities also need to have transport models for similar purposes as the studies for Metro Manila and Cebu City. However, there is also a need for a macroscopic transport model that covers the entire country to account at least for inter-regional or inter-island flow for all transport modes for both passengers and freight. Transport models cannot be developed without the data required for inputs. In many cases such data are not collected on a regular basis but only when there is a big study being implemented (e.g., MMUTIS, MUCEP, etc.).

Port statistics, for example, only state total inbound and outbound passengers and freight (i.e., of various categories); often distinguishing only between domestic and international passengers or freight. It is basically unknown where passengers and freight originated or destined. And passenger and freight would need to be related to the vessels to determine traffic at the vehicular (i.e., vessels or boats in the case of maritime transport). Similar cases may also be found for the aviation sector where few airports report details to establish the equivalents of passenger-kilometers or vehicle-kilometers. Again, the most common manner of data reporting is in the form of summarized inbound and outbound passengers and freight. Details such as origin-destination pairs and their corresponding distances and aircraft types are not immediately available and would need to be analyzed together to obtain substantial outputs usable for tasks such as analyzing demand and supply or perhaps estimating emissions or energy demand.

For railways, the examples of the PNR and MRT 3 reporting on PKTs is recommended for adoption by Lines 1 and 2 as well as future railway lines like Line 7 and the MM subway that are either under construction or approved for implementation. These can be derived based on actual passenger ticket sales or fares. Perhaps the LRTA (Line 2) and the LRMC (Line 1) compile and process their data but useful information such as PKT need to be included in their reports following the PNR summary format. Thus, the need for standardization of data collection, analysis and reporting becomes obvious among these entities. The example for railways can be replicated in other agencies as well in terms of what data needs to be reported and in what form. In some cases, the larger agencies like the DOTr and DPWH may be the ones responsible for processing the data into forms that are more accessible and ready for analysis. Agencies or offices under them would be required to submit data in formats that would facilitate their use regardless of the user.

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