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Assessing the potential contribution of cities in improving the planning and delivery of transport NDCs

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Abstract

This paper assessed the potential contribution of cities in improving the planning and delivery of transport-specific Nationally Determined Contributions (NDC), mainly focusing on the case of Pasig City in Metropolitan Manila, Philippines. In doing so, this paper compared the calculated emission reduction from urban transport interventions in Pasig City with the transport NDCs of the Philippines. The results of the modeling exercise suggest that Pasig City can deliver better than the national government – with the transport interventions in Pasig City potentially reducing the city's transport greenhouse gas (GHG) emissions by 22.39% compared with its business-as-usual (BAU) scenario. In contrast, the Philippine transport NDCs can only reduce nationwide transport GHG emissions by 6%. A summary of the crucial gaps in the Philippine transport NDCs based on the results of the assessment is also presented, as follows: 1.) limited to big infrastructure projects; 2.) failed to consider specific interventions for the urban freight sector, for two- and three-wheelers, for active transportation, and for travel demand management; 3.) assumed a low uptake of the Public Utility Vehicle (PUV) Modernization Program; and 4.) the spatial coverage of most interventions included in the transport NDCs is limited to metropolitan areas. Finally, this paper concludes that the Philippine transport sector NDCs may need some rethinking, improvement, updating, or calibration. The crucial role of cities in decarbonizing the urban transport sector must also be recognized and reflected in the Philippines' international GHG emission reduction commitments.

1. Introduction

The Paris Agreement was approved and adopted in 2015 with the central goal of limiting the rise of global temperature to below 2 degrees Celsius (or even further to 1.5 degrees Celsius) compared with pre-industrial levels (UN, 2015). In carrying out the said goal, the parties and signatories of the Agreement are expected to come up, submit, and implement their respective Nationally Determined Contributions (NDCs). This responsibility also includes regularly reporting and updating the parties' respective commitments, including greenhouse gas (GHG) emissions and implementation updates of NDCs.

The Philippines committed through its Intended NDC (conditional) to reduce its emissions by 70% by 2030 compared with its business-as-usual (BAU) scenario between 2000-2030 (Republic of the Philippines, 2015). Under the current projections of Climate Action Tracker (CAT), an independent scientific analysis through the collaboration of Climate Analytics and New Climate Institute, these targets are "2 degrees Celsius compatible" or are in line with the 2009 Copenhagen Accord but still behind the Paris Agreement goal of 1.5 degrees. In its latest

submission of NDC in 2021, the country further committed to reducing its emissions by 75%, although only 2.71% is unconditional, while the remaining 72.29% is dependent on financial and other factors (Republic of the Philippines, 2021). However, this commitment is seen as unrealistic if we look into past trends and current projections (Yap, 2021).

One way to address the climate change problem and meet GHG emission reduction targets is by looking closely at the energy sector, particularly transportation. Direct global GHG emissions from the transport sector rose 250% from 2.8 Gt CO2eq in 1970 to 7.0 Gt CO2eq in 2010 (Sims et al., 2014). This accounts for 23% of global energy-related GHG emissions (Lah et al., 2019; Naimoli and Ladislaw, 2020). Of the 7.0 Gt CO2eq in 2010, 73% or 5.0 Gt CO2eq are from road transport emissions covering passenger and freight transport (ICCT, 2014; IEA, 2012).

In fact, around 75 percent of the 160 NDCs submitted as of 01 August 2016 expressly mention the transportation sector as one of the targeted mitigation sectors, and more than 63 percent of NDCs propose transport sector-specific mitigation actions. However, only around 9% of these NDCs include a specific transport sector emission reduction target (Gota et al., 2019). This suggests that although countries acknowledge the significance and urgency of decarbonizing the transport sector, the integration of the sector in emission reduction targets is still lagging.

In the Philippines, although minimal data are available on emission inventories, the transport sector, in general, is accountable for a significant amount of GHG emissions (Senate Economic Planning Office, 2013; USAID, 2016). According to the latest data from Climate Watch, an online platform for climate-related data, including GHG emissions, the transport sector in the Philippines is responsible for around 34.38 MtCO2e or about 20.69% of the 166.20 MtCO2e total GHG emissions in 2017.

The issues brought about by climate change also hold strong relevance to cities because local governments are directly affected by rising emissions within their areas, thereby requiring more resilient adaptation and social innovation to curb effects. As such, cities have the appropriate motivation to drive these changes by enabling eco-friendly systems (Kern and Alber, 2009) – one strategy is to improve local transport demand management through integrated planning and clean technologies (Bulkeley et al., 2011). Local governments also have varying conditions, hence the importance of involving them when planning for and aligning on climate goals (Bulkeley and Kern, 2006; Kern and Alber, 2009).

However, the Philippine transport NDCs do not consider any subnational or city-level mitigation actions, despite cities being at the forefront of pushing for more sustainable and environment-friendly transport options. This paper, therefore, focuses on assessing the potential contribution of cities in improving the planning and delivery of transport NDCs, mainly focusing on the case of Pasig City in Metropolitan Manila, Philippines.

2. The Philippine urban transport sector

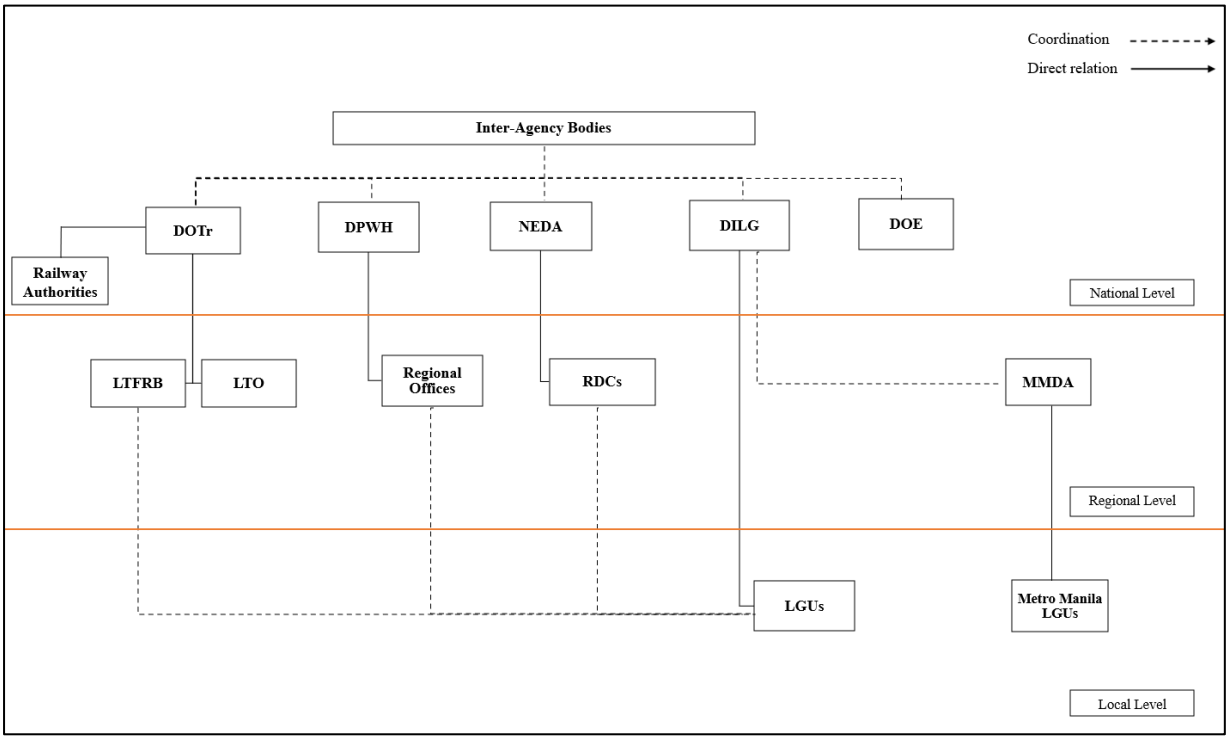
2.1. Current planning and governance regime

This section provides an overview of how urban transportation planning and governance are facilitated in the Philippines. The sector is primarily managed and regulated by the Department of Transportation (DOTr), the chief agency mandated to develop a reliable, efficient, and integrated transportation system and set policies and guidelines for the country. Figure 1 presents this institutional map of the Philippine urban transport sector.

Various attached agencies of the DOTr serve significant roles in regulating urban transportation, primarily the Land Transportation Franchising and Regulatory Board (LTFRB), the Land Transportation Office (LTO), and several railway authorities. The LTFRB is mandated to issue public transport franchises, regulate public transport routes, set areas of operation, and prescribe fares for public transport services. The LTO is responsible for issuing licenses to qualified drivers and facilitating motor vehicle inspection and registration. Three railway authorities manage the railway system in the country, the Metro Rail Transit 3 (MRT 3) and the state-owned railway authorities, namely the Philippine National Railways (PNR) and the Light Rail Transit Authority (LRTA).

Various inter-agency bodies ensure effective collaboration between and among government agencies, especially in delivering complex policies and programs. A usual inter-agency body comprises representatives from different agencies with relevant mandates and interests in a given concern. In the Philippine urban transport sector, relevant inter-agency bodies are the Committee on Infrastructure (INFRACOM), Inter-Agency Committee on Climate Change (IACCC), Task Group on Fossil Fuels (TGFF), Inter-Agency Technical Committee on Transport Planning (IATCTP), Inter-Agency Technical Working Group on Active Transport (IATWG-AT), Inter-Agency Energy Efficiency and Conservation Committee (IAEECC), and the Technical Working Group for the Scrappage Program under the PUV[1] Modernization Program (PUVMP).

Figure 1: Institutional map of the Philippine urban transport sector



Source: Figure by author (2023)

On the other hand, the Department of Public Works and Highways (DPWH) is responsible for developing, maintaining, and improving transport infrastructures and facilities with the DOTr. The department is also mandated to formulate and implement guidelines concerning road

[1] Public Utility Vehicles (PUV) are vehicles that carry passengers and/or cargo for a fee, offering services to the public, which may include, but are not limited to, buses, jeepneys, filcabs, taxis, tricycles, UV express (vans for hire), and app-based services.

developments and ensure that current standards are met. Construction and maintenance of roads include infrastructures for non-motorized transport, such as bikeways and walkways.

Promoting the use of electric vehicles (EVs) and alternative fuel vehicles (AFVs) is under the Department of Energy's (DOE) responsibility. The DOE is also the agency in charge of formulating a roadmap for the EV and AFV industry and ensuring the availability of alternative energy sources. The agency also monitors fuel prices and ensures that clean fuel is available.

The other relevant government agencies are as follows:

- The National Economic and Development Authority (NEDA) monitors and ensures that all transport initiatives follow the national government's social and economic policies, plans, and programs.
- The Department of the Interior and Local Government (DILG) ensures that transport-related ordinances, orders, rules, and regulations issued at the local level are harmonized and consistent with existing national-level policies. Aside from the Local Public Transport Route Plan (LPTRP), the DILG is also mandated to oversee local governments in formulating their respective Tricycle Route Plans (TRP) and Traffic Management Plans (TMP) and in constructing various local transport facilities.
- The Metropolitan Manila Development Authority (MMDA) is a government agency with regulatory and supervisory authority over Metropolitan Manila, also known as the National Capital Region, composed of 16 cities and one municipality. According to Republic Act 7924, part of the mandates and responsibilities of the MMDA is to facilitate regional traffic planning and management. This includes conducting traffic engineering services, spatial planning, and formulating policies and programs. The MMDA is also tasked with urban transport planning and management, which involves pushing forward policies and projects that would improve transport operations and infrastructure, promote the establishment of an efficient mass transport system, and create a system to regulate road users, among others. It is important to note that the MMDA is the only regional-level government agency in the Philippines with these mandates and functions.

Meanwhile, the Local Government Code of 1991, or Republic Act 7160, strengthened the decentralization of powers from the national government to local governments (i.e., the provinces, cities, municipalities, and barangays). Recognizing the critical role of local governments in the transport sector, the DOTr and DILG in 2017 devolved to provinces, cities, and municipalities the responsibility of identifying public transportation routes (formerly a function of the DOTr's Road Transport Planning Division) - through the LPTRP. This initiative paved the way for additional expectations from local governments to help improve the transportation sector, especially from highly urbanized cities with sufficient resources and technical capacities.

Cities and municipalities are tasked with planning intracity and intramunicipal public transport routes, respectively, while provinces are responsible for intercity/municipal and intraprovincial trips. The LPTRP, once approved, serves as the sole basis for issuing public transport franchises and is integrated into the Local Transport Master Plan.

In 2020, the DILG also issued Memorandum Circular 2020-036, directing local governments to create a tricycle task force for formulating a Tricycle Route Plan (TRP). The formulation of TRPs includes reviewing and modifying existing tricycle routes and ensuring that tricycles do not operate along national highways (unless there are no alternative routes). The TRPs are expected to improve how LGUs grant franchises to for-hire tricycles, an authority granted to them under Section 447.3(vi) of the Local Government Code.

In 2020, the DOTr, DPWH, DILG, and the Department of Health (DOH) also issued a Joint Administrative Order to provide guidelines on the proper use and promotion of active transportation. In the legislative document, local governments in metropolitan areas are required to coordinate and rationalize inter-city bike routes and walking paths. In addition, local governments are tasked to provide and maintain active transport infrastructure and ensure that the right of way is available.

2.2. Transport NDCs

This section presents the transport NDCs of the Philippines submitted in 2021, prepared and finalized by the DOTr. According to the agency, the transport NDCs were modeled (i.e., regression modeling) using Gross Domestic Product and population data. The following were data utilized to estimate the sector-wide MtCO2e emission:

- number of flights per flight type
- vehicle population per vehicle type
- passenger kilometer travelled (PKT)
- vehicle kilometer traveled

After that, data on fuel economy, fuel consumption, and emission factors were used to finalize the GHG emission modeling per transport sub-sector. The DOE Energy Balance Table[2] was also used to calibrate the fuel economy and fuel consumption estimates to ensure accuracy and consistency with the energy sector models.

Table 1: BAU emissions from the transport sector, per sub-sector (cumulative), in MtCO2e

Sector	Year		
	2010	2018	2040
Road	21.735	34.147	156.742
Maritime	2.007	4.165	9.864
Rail	0.277	0.27	0.236
Aviation	0.001	0.002	0.012
Total	24.020	38.584	166.855

Source: Department of Transportation

As a result of this modeling exercise, the DOTr reported that the projected BAU for the transport sector from 2021 to 2040 is 166.855 MtCO2e (cumulative). A significant portion of this GHG emission is expected to come from road transportation, with 156.742 MtCO2e or about 93.94% of the total cumulative transport emissions during the said period. Table 1 presents the comprehensive breakdown of the calculated BAU GHG emissions per transport sub-sector.

Interestingly, while road transportation is expected to cause most GHG emissions, it contrasts with how the transport NDCs were developed and finalized (i.e., the NDC focusing on the rail sector). In addition, the promotion and incentivization of electric vehicles are not included in the country's commitments, unlike most transport NDCs in which electrification of vehicles is usually integrated. Hence, under the current commitments, it is safe to assume that the expected GHG emission avoided from the transport sector is from the mode shift from road

[2] The DOE Energy Balance Table provides a set of standardized energy balance sheet expressed in a common unit of tons of oil equivalents. For more information, see https://www.doe.gov.ph/energy-statistics/primer-energy-balance-table

transportation (e.g., private cars, jeepneys, buses, motorcycles, tricycles, and other PUVs) to trains.

It is important to note that the data presented and the discussions in this section are limited to the official list of transport interventions submitted by the DOTr to the Philippine Climate Change Commission (CCC) for consideration in finalizing the Philippines' first NDC. Table 2 below presents this list, including the estimated emission reduction for each intervention.

Table 2: Philippine Transport NDCs submitted in 2021 (cumulative emission reduction target until 2040)

Interventions		Emission Reduction (in MtCO2e)	Emission Reduction (in MtCO2e)
PUV Modernization Program		0.57	0.57
Railways Projects	Metro Manila Subway	0.65	7.02
	MRT Line 7	0.070	
	LRT Line 1 Cavite Extension	0.75	
	LRT Line 2 East Extension	0.85	
	LRT Line 2 West Extension	0.2	
	Subic-Clark Cargo Railway	0.12	
	PNR North 1	0.29	
	PNR North 2	0.69	
	PNR South Commuter	0.15	
	PNR South Long Haul	0.58	
	Cebu Railways	1.16	
	Mindanao Railways Project	1.48	
BRTs	Metro Manila BRT Line 1	0.83	1.01
	Cebu BRT	0.18	
Motor Vehicle Inspection System (MVIS)		1.36	1.36
Total			9.96

Source: Department of Transportation

It is clear from Table 2 that the unconditional Philippine transport NDCs focus on reducing GHG emissions from the land transport sector. The country will heavily rely on the construction and operation of ambitious railways projects (assuming that a modal shift from private vehicles to trains will occur) to potentially reduce its transport emissions. A mix of BRT projects and modernizing the jeepney sector are also considered.

Much of the estimated GHG emission reduction resulting from successfully implementing the presented transport interventions is expected between 2021-2030, in which 7.63 MtCO2e out of the total 9.96 MtCO2e is estimated to be avoided. The remaining 2.33 MtCO2e is expected to be avoided between 2031 – 2040. Table 3 presents this data.

Table 3: Summary of calculated emission reduction in 2030 and 2040 (cumulative)

Year	Unconditional Measures				Total (in MtCO2e
	PUVMP	Railways	BRT	MVIS	
2030	0.36	5.91	0.63	0.73	7.63
2040	0.57	7.02	1.01	1.36	9.96

Source: Department of Transportation

In addition to the (unconditional) transport interventions included in the Philippine NDCs, the following projects were also communicated by the DOTr to the CCC as part of its conditional measures. These projects are expected to be implemented subject to the availability of

funding (usually funded through a combination of grants and loans). However, there are no available GHG emission estimates for these projects yet to date:

- MRT 3 Rehabilitation Project
- MRT Line 4
- Fort Bonifacio – Makati Skytrain (Unsolicited Proposal)
- MRT 11 (Unsolicited Proposal)
- C5 MRT 10 (Unsolicited Proposal)
- LRT Lines 6A, 6B, 6C (Unsolicited Proposal)
- Cebu Monorail (Unsolicited Proposal)
- Davao People Mover (Unsolicited Proposal)
- NITX
- EDSA Greenways
- TITX
- Night Rating of Airports
- Vehicle Scrappage
- Transport Data Center
- Terminal Appointment and Booking System and Vessel Fleet Modernization Program
- National and Local Bikeway Projects

3. Methodology

Interviews and desktop research were carried out to create a compendium of low-carbon urban transport policies, programs, projects, and activities (referred to in this paper collectively as interventions) that are currently being implemented, reviewed/considered, or are in the pipeline for implementation in Pasig City, Philippines.

The requests and invitations for interviews, including the consent forms, participant information sheets, and a list of interview questions, were sent to the heads of the relevant units/divisions/sections within the identified government agencies (using Figure 1 as reference). These heads assisted in inviting potential participants willing to participate in the interviews. Interested participants were requested to contact the researcher if they were willing to participate in the study. Based on the interview results, desktop research was conducted to compile relevant data and information about the transport interventions identified during the interviews. Table 4 summarizes the result of the desktop research. The interviews and desktop research were conducted in accordance with the guidelines set by the University of Auckland Human Participants Ethics Committee (UAHPEC)[3].

The compendium of transport interventions was the primary reference in conducting back-of-the-envelope calculations to model transport emissions. A combination of census data and other available transport studies, including internationally-accepted assumptions, were also utilized. For interventions with existing calculations on their potential/target GHG emission reduction, available data were used and/or updated as necessary.

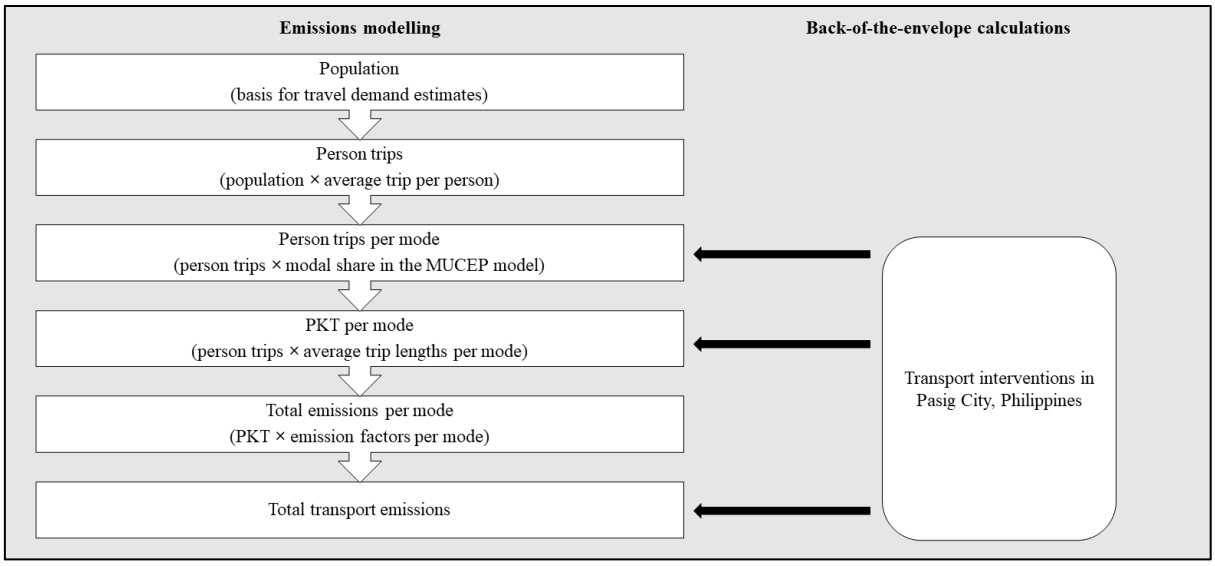
The population in Pasig City based on census data was primarily utilized in estimating travel demand in the city, coupled with the Japan International Cooperation Agency (JICA, 2015) data on travel demand characteristics in the Mega Manila area (commonly known as the MUCEP area). The number of person trips per day was then estimated using population data

[3] Ethics approval has been granted to the study by the University of Auckland Human Participants Ethics Committee on 16 August 2021 for three years. Reference Number UAHPEC22544. For more information, please visit https://www.auckland.ac.nz/en/research/about-our-research/human-ethics.html

and the average trip per person. The estimated person trips per day were then split into different modes of transportation based on the modal share in the same JICA (2015) MUCEP model. Thereafter, PKT was estimated by multiplying person trips per mode and average trip lengths per mode. Finally, the calculated PKT per mode was then utilized to calculate the total GHG emission using emission factors (the same emission factors used by the DOTr in finalizing the Philippine transport NDCs).

The existing and/or calculated emission reduction data from the urban transport sector in Pasig City were then compared with the international commitments and climate targets of the Philippines to assess their significance, both measured in Million tons of carbon dioxide equivalent (MtCO2e). These commitments and targets are indicated in the country's NDC and communicated to the United Nations Framework Convention on Climate Chang (UNFCCC). The transport NDCs were requested from the DOTr as part of the study. Figure 2 presents the methodology for the study.

Figure 2: Methodology for the study



4. The case of Pasig City, Philippines

Pasig City is one of the few local governments in the Philippines which allocated significant resources to improve its transportation sector. In fact, its resource allocation in the sector even expanded to non-infrastructure concerns, such as improving its technical capacity to conduct transportation planning and improving transportation governance. In 2017, Pasig City institutionalized its City Transportation Development and Management Office (CTDMO) through Ordinance No. 25, s. 2017. The CTDMO is a dedicated office for transportation concerns, is mandated to implement sustainable transport initiatives, and is tasked to undertake transport planning and management within the city's jurisdiction.

The establishment of Pasig's CTDMO was considered a novel initiative at the time. The usual practice for local governments in the Philippines, even those with more financial and technical resources, is to subsume all transport-related planning, policy-making, and program implementation to the general functions of the City or Municipal Planning and Development Office (C/MPDO). Due to the workload of the CPDO and MPDO, transportation planning and governance are usually treated as a lesser priority for most local governments. This could be partially attributed to the fact that, to date, no legally-binding mechanisms require and ensure

local governments come up with their respective transport plans and allocate resources for transport interventions. Those previously mentioned circulars and department orders are just executive issuances and do not include penal provisions for non-compliant local governments.

The national government even acknowledged this gap when it mandated all cities to establish their respective transport and traffic management units under the National Transport Policy (NTP) and its Implementing Rules and Regulations (IRR) released in 2019. Only cities were mandated to establish the said office – so municipalities were technically not required to comply with this policy. Meanwhile, no data is currently available regarding the monitoring and compliance of local governments with this policy.

The establishment of Pasig's CTDMO somehow paved the way and allowed multiple transport-related initiatives to be conceptualized and co-implemented by the local government. Initiatives funded by local and international government and non-government organizations usually identify Pasig City as a suitable spatial coverage, case city, or beneficiary due to its stronger institutional capacity than other Philippine cities.

Pasig City is part of the National Capital Region (NCR). This region is unique in terms of transport planning and governance because it is the only region in the Philippines where a separate government agency was created to facilitate traffic and transport planning and management. The Metropolitan Manila Development Authority (MMDA) was created pursuant to Republic Act 7924 with the primary function of performing "planning, monitoring and coordinative functions, and in the process exercise regulatory and supervisory authority over the delivery of metro-wide services within Metro Manila without diminution of the autonomy of the local government units concerning purely local matter" (Section 2 of RA 7924), which includes looking after the transport sector in the region. Ultimately, while Pasig CTDMO takes charge of the city-wide transport planning and governance, they are affected by the day-to-day activities and decisions of MMDA.

In terms of public transportation planning, Pasig City is also part of the Greater Metropolitan Manila Area, legally known as MUCEP Area. This area covers the urban agglomeration of NCR and the adjacent local governments in the Provinces of Bulacan, Cavite, Laguna, and Batangas. It is also the only spatial coverage in the country where a transportation model exists. Due to its complexities, transportation planning within the MUCEP Area is also under the national government's jurisdiction (i.e., DOTr). In other words, local governments within the area, like Pasig City, are only expected to provide inputs and participate during public consultations, but the final public transportation planning decisions rest upon the DOTr.

4.1. Pasig City transport interventions

Desktop research and interviews were conducted to create a compendium of low-carbon urban transport interventions currently being implemented, reviewed/considered, or in the pipeline for implementation in Pasig City, Philippines. The listed interventions were then included in the emissions modeling exercise facilitated in this study. Table 4 below presents these interventions and the corresponding details and information for each intervention:

Table 4: Transport decarbonization interventions in Pasig City

Interventions	Assumptions	References
1. **Pasig City Transit Express (Monorail)**	3% mode shift from cars to trains from 2025 to 2040	• Mishra, 2016 • Systra Philippines, 2019 • MDOT, 2020

2.	**Pasig City Bus Service**	0.32% mode shift from cars to buses in 2020 to 2029; 0.30% mode shift from cars to bus in 2030 to 2039; 0.28% mode shift from cars to buses in 2040	• Lontoc et al., 2018 • CiBiX, 2018
3.	**Pasig City Low Carbon Transport (LCT) Project**	6,901.3 tCO2e emission reduction from 2020 to 2023 (assuming equal reduction per year from 2020 to 2023)	• UNDP, 2021
4.	**Pasig City E-Cargo**	7.7 tCO2e emission reduction per year starting 2021	• SolutionsPlus, Undated
5.	**Bike Sharing Project (E-Mobility Project)**	0.5% GHG emission reduction annually (from total transport emissions)	• James, 2019 • D'Almeida et al., 2021
6.	**Active Transport Infrastructure Development**	10% mode share for biking starting in 2025, with equal mode shift from all other transport modes (except for UV/HOV and trucks, which reached 0% mode share before the mode shift was fully realized)	• DRISI, 2019 • Thorwaldson et al., 2021
7.	**Pasig City PHLPOST**	reduced 46.39 pkt/day for the motorcycle mode share, representing avoided gasoline-fueled motorcycle trips	• Shrestha and Dematera, 2019 • Clean Air Asia, 2022
8.	**Car-free days / Carless weekends**	No emission reduction from the project; diverted traffic in other parts of Pasig City is assumed	• CiBiX, 2018 • Glazener et al., 2022
9.	**E-trike project**	1.54% GHG emission reduction from tricycles as a result of electrification	• Foodpanda, 2020 • PhilHealth, 2020
10.	**Creation and Institutionalization of the CTDMO**	No emission reduction from the project. However, significant improvement in the institutional sector is noted and discussed.	• Perez et al., 2022

4.2. Emissions modeling

Except for the Pasig City LCT project (i.e., the expected emission reduction from the said project is already available), GHG emission reduction for all other interventions was modeled using back-of-the-envelope calculations, with reference to either internationally-accepted assumptions or peer-reviewed literature. Table 4 presents the general assumptions utilized in finalizing the emissions modeling exercise.

Meanwhile, Table 5 below presents the results of the emissions modeling exercise, starting from the BAU scenario in which 3.382 MtCO2e is expected from Pasig's transport sector between 2020-2030 and 4.21 MtCO2e between 2031-2040 (cumulative figures). The successful and/or continuous implementation of the ten (10) presented interventions is expected to bring down emissions to about 2.781 MtCO2e and 3.11 MtCO2e, respectively, during the same periods (cumulative). This equates to a 17.8% emission reduction between 2020-2030 and a 26.13% reduction between 2031-2040. The total emissions reduced between 2020-2040 is 1.7 MtCO2e or about 22.39% emission reduction from the BAU scenario.

Table 5: Modeled emission reduction from the Pasig City transport interventions

Scenarios	Emissions (in MtCO2e)		
	2020-2030	2031-2040	Total
(A) BAU	3.382	4.21	7.592
(B) Successful Implementation of Interventions	2.78	3.11	5.89
(A-B) Modeled Emission Reduction (in MtCO2e)	0.602	1.1	1.7
% Emission Reduction	17.8%	26.13%	22.39%

While car-free days and the creation and institutionalization of the CTDMO do not directly reduce Pasig City's GHG emissions, such interventions have co-benefits that could improve other sectors, such as health and governance. The CTDMO also plays a crucial role in ensuring that the interventions listed, presented, and modeled in this section are funded, implemented, and maintained. The existence of the CTDMO in Pasig City also proves that the city understands that improving the transport sector (which includes its decarbonization) requires more than technical solutions – that transport governance must also be carefully considered and continuously improved.

4.3. Significance of emissions reduced

Returning to the discussion on how significant the potential emission reduction from the Pasig City transport interventions is, Table 6 below compares the national-level data (from the transport NDCs) and our local-level data (from the Pasig City transport interventions). Interestingly, the interventions in Pasig City alone can potentially deliver an additional 7.89% GHG emission reduction in our international commitments between 2021-2030 and as much as a 17.07% increase in GHG emissions reduced between 2021 to 2040.

Table 6: Estimated emission reduction from transport interventions in Pasig City and the Philippines, in MtCO2e

Scope	Cumulative GHG emission reduction (in MtCO2e)	
	2030	2040
PH NDC (Unconditional)	7.63	9.96
Pasig Interventions	0.602	1.7
%	7.89%	17.07%

Comparing BAU emissions and the estimated emission reduction from identified transport interventions, Pasig City is expected to deliver better than the national government. The modeled interventions in Pasig City could potentially reduce the city's transport GHG emissions by 22.39% compared with the BAU scenario. In comparison, the Philippine transport NDCs are only expected to reduce nationwide transport GHG emissions by 6% compared with its BAU scenario.

5. Discussion

Looking closely into how the Philippine transport NDCs were identified and finalized and comparing them with the modeled interventions in Pasig City, some gaps and limitations were identified in the NDCs. These were also among the reasons why the Philippines' international emission reduction commitments in the transport sector may need some rethinking, improvement, updating, or calibration.

First, the committed interventions in the NDCs are limited to big infrastructure projects of the government and are expected to be carried out mainly by national government agencies. Local government initiatives related to low-carbon transport were not included in the NDCs (even though climate budget tagging is already required, which reflects what local governments do concerning climate change). In addition, the transport NDCs overly rely on big-ticket rail projects and fail to consider ongoing and potential initiatives that could help reduce transport emissions (e.g., fuel economy policies, EV promotion, etc.).

Moreover, the transport NDCs also failed to consider specific interventions for the urban freight sector; for two- and three-wheelers (which constitute a majority of the vehicle population in the country); for active transportation (despite the success of active transport programs during the pandemic); and for travel demand management (despite the presence of national legislation promoting alternative work arrangements).

The transport NDCs also assumed a low uptake of the PUVMP. Previous assessments of the PUVMP potential, such as the Philippine Urban Mobility Programme (PUMP) and Nationally Appropriate Mitigation Actions (NAMA), estimate that the modernization program can reduce transport emissions by 6.50 MtCO2e - 9.20 MtCO2e between 2021 to 2040 (the transport NDC only estimated PUVMP could reduce emissions by about 0.57 MtCO2e during the same period).

Lastly, the spatial coverage of most interventions included in the transport NDCs is likewise limited to metropolitan areas, with little or no consideration of other local governments or highly urbanized cities in the country. For example, there have been numerous novel transport initiatives in other urban areas like Tacloban City (e.g., electric jeepneys were launched and are currently operating), the Province of Bataan (i.e., the Provincial government commissioned a project to fast-track the uptake of EVs, including for public transport purposes), and the City of Iloilo (e.g., promotion of active transportation and establishment of extensive walkways and bike lanes) – but none of these were considered nor covered in the country's transport NDCs. In addition, while many government agencies, including inter-agency bodies, are involved in planning for and governing the Philippine transport sector, as presented in Section 2.1, the planning and finalization of transport NDCs were concentrated within the DOTr.

To better highlight and appreciate the potential of local governments in contributing to the Philippines' GHG emission reduction commitments, let us explore the possibility of upscaling the transport interventions in Pasig City. The person trips in the city covered by the emissions modeling exercise earlier presented only account for 5.5% of the total person trips in NCR and 3.3% in the MUCEP Area (JICA, 2015).

Assuming everything else remains the same if all transport interventions in Pasig were implemented in the whole of NCR or the MUCEP area, the emission reduction in these areas alone could deliver the targets set out in the transport NDCs. Although this assumption is an oversimplification of the decarbonization work required in the transport sector, it effectively shows how significant and crucial the potential roles of local governments are in this global undertaking.

6. Conclusions and recommendations

This paper assessed the potential contribution of cities in improving the planning and delivery of transport NDCs, mainly focusing on the case of Pasig City in Metropolitan Manila, Philippines. While the Philippine transport NDCs did not consider any subnational or city-level mitigation actions, there have been cases where cities are at the forefront in pushing for more sustainable and environment-friendly transport options.

To better understand the potential contribution of cities and assess the significance, this paper compared the calculated emission reduction from urban transport interventions in Pasig City with the transport NDCs of the Philippines.

Comparing BAU emissions and the estimated emission reduction from identified transport interventions, Pasig City is expected to deliver better than the national government. The modeled interventions in Pasig City could potentially reduce the city's transport GHG emissions by 22.39% compared with the BAU scenario. In comparison, the Philippine transport NDCs are only expected to reduce nationwide transport GHG emissions by 6% compared with its BAU scenario.

This paper also summarized the following crucial gaps in the Philippine transport NDCs based on the results of the assessment:

- limited to big infrastructure projects of the government and are expected to be carried out mainly by national government agencies
- failed to consider specific interventions for the urban freight sector; for two- and three-wheelers; for active transportation; and for travel demand management
- assumed a low uptake of the PUVMP
- the spatial coverage of most interventions included in the transport NDCs is likewise limited to metropolitan areas, with little or no consideration of other local governments or highly urbanized cities in the country

This paper, therefore, concludes that the Philippine transport sector NDCs may need some rethinking, improvement, updating, or calibration. The crucial role of cities in decarbonizing the urban transport sector must also be recognized and reflected in the Philippines' international GHG emission reduction commitments. To better support cities, the DOTr should also maximize the role of other national and subnational government agencies involved in transportation planning and governance, as presented in Figure 1. A comprehensive and whole-of-government approach must be considered to improve the planning and delivery of transport NDCs.

Finally, the national government has to provide sufficient support and assistance to cities in establishing their respective transport and traffic management units, as mandated under the NTP and its IRR. These dedicated transport units can lead the planning and implementation of transport interventions, including those that are expected to reduce GHG emissions. These transport units may also serve as the point of contact for the DOTr (or other national agencies) whenever their respective inputs are needed (for example, once city-level actions are considered in revisiting the Philippine transport NDCs).

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