

APEC Symposium on Promoting Energy Efficiency and Energy Management System, 23-24 January 2024, Tokyo, Japan
Hosted by the Asia Pacific Energy Research Centre (APEREC)

Improving Energy Efficiency in Transport in The Philippines

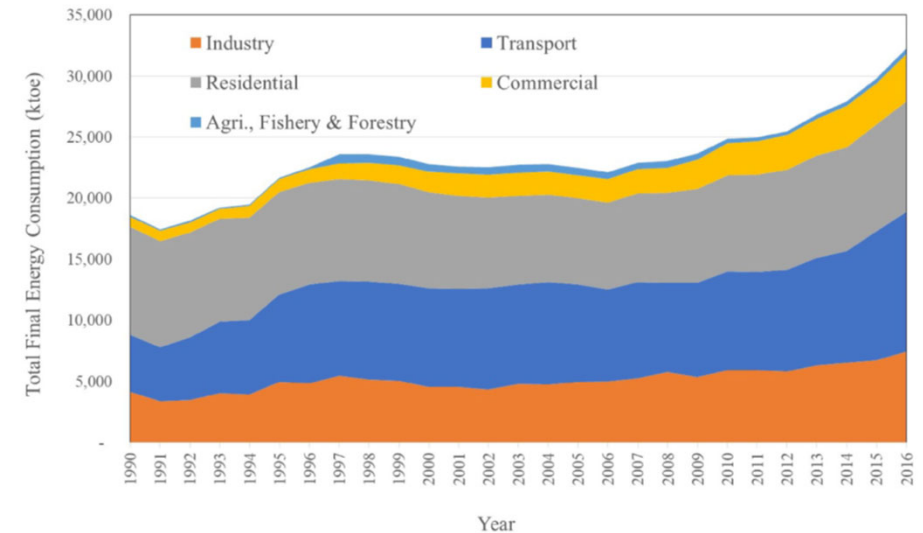
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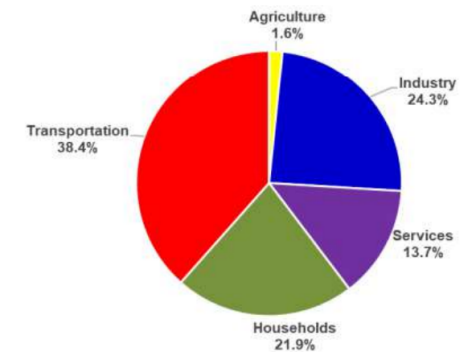
Session 3 “Improving Energy Efficiency in Transport - The use, challenges and future of urban transportation

Total Energy Consumption

- According to the Philippines Department of Energy's Compendium of Philippine Energy Statistics and Information
 - The total final energy consumption (TFEC) increased from 18.619 Mtoe in 1990 to 32.224 Mtoe in 2016 increasing annually by 2.8%
 - The TFEC of the transportation sector had increased by an average of 5.5% per year
 - In the 1990s, the residential sector had the largest share of TFEC where the transportation sector ranked second. From 2000 to 2016, the transportation sector occupied the largest share of total final energy consumption, with an average share of 34.2%
 - The TFEC of the transportation sector increased from 4.685 Mtoe in 1990 to 11.425 Mtoe in 2016



Energy Consumption by Sector

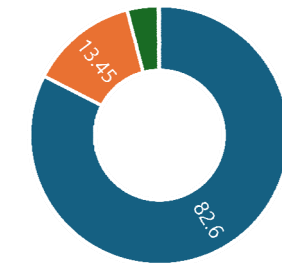


Total Final Energy Consumption by Sectoral Share (2018-2040)

Transport Sector Energy Consumption

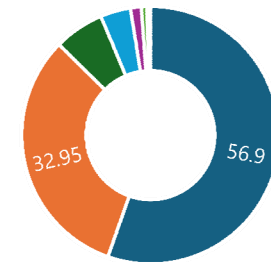
- The road transportation mode consistently had the largest share ranging from 77.0% to 88.2%, followed by the water transportation mode (~7.2% to 19.7%), followed by the domestic air transportation mode (~1.9% to 5.9%), and the lastly followed by the rail transportation mode (~0.03% to 0.23%)
- Diesel consistently had the largest share ranging from 53.0% to 60.8% followed by gasoline (~29.6% to 36.3%), followed by fuel oil (~1.7% to 11.2%), followed by aviation fuel (~1.9% to 5.9%), followed by bioethanol with an average share of 1.4%, and the bottom three with less than 1% share, biodiesel (0.7%), Auto-LPG (0.4%) and electricity (0.08%)
- The transportation sector is highly dependent on fossil fuels and it will remain as the highest energy consuming sector with a 35.6% average share across the entire planning horizon, and accounting for the bulk of the increase (38.1%) in total final energy consumption levels between 2015 and 2030

Transportation Sector Energy Demand by Model



■ Road ■ Water ■ Air ■ Rail

Transportation Sector Energy Demand by Fuel Type



■ Diesel ■ Gasoline ■ Fuel Oil ■ Aviation Fuel
 ■ Bioethanol ■ Biodiesel ■ Auto-LPG ■ Electricity

Air Quality and Climate Impacts

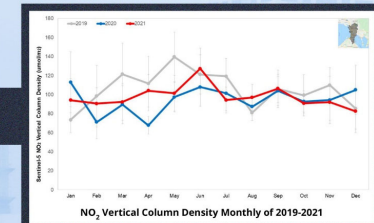
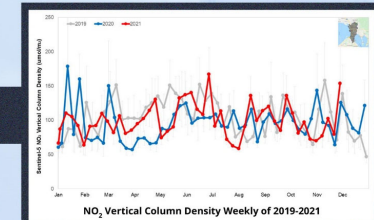
- In the Philippines, the transportation sector is the largest source of air pollution and energy-related greenhouse gas (GHG) emissions.
- In 2015, transport GHG emissions contributed to 34% of the total Philippines GHG emissions, with road transport accounting for 80% of those emissions
- The DENR reports that 74% of air pollutants come from transport sources (e.g., cars, motorcycles, trucks, and buses). Transport sources account for 83.09% of NOx (0.40 Mt) and 37.73% of PM (0.29 Mt) of pollutants in Metro Manila
- The transport sector in the Philippines is energy-intensive and contributed about 35.6 metric tons of carbon dioxide equivalent (MtCO₂e) and 27.4 MtCO₂e of emissions in 2019 and 2020, respectively. Moreover, the price volatility of oil products and fears of fuel shortages, in addition to continued fuel dependence, pose a burden on our energy security, the economy, and the public



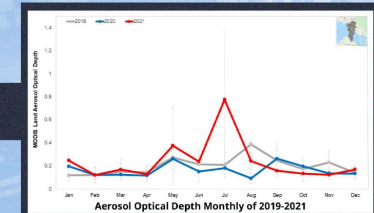
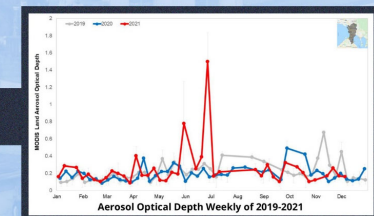
Sept 2023 smog in Metro Manila due to vehicular traffic

NCR AIR QUALITY

NCR AIR QUALITY ASSESSMENT
(Sentinel-5 Satellite) TROPOMI NO₂ Retrieval



NCR AIR QUALITY ASSESSMENT
(AQUA & TERRA Satellite) MODIS Aerosol Optical Depth Retrieval



Low Carbon Transport Development

- In April 2021, the Philippines submitted its Nationally Determined Contribution (NDC) in accordance to the Paris Agreement
 - The Philippines “commits to a projected GHG emissions reduction and avoidance of 75%, of which 2.71% is unconditional and 72.29% is conditional, representing the country’s ambition for GHG mitigation for the period 2020 to 2030 for the sectors of agriculture, wastes, industry, transport, and energy”
 - This commitment is referenced against a projected business as usual (BAU) cumulative economy-wide emission of 3,340.3 MtCO₂e for the same period
- Data from the Department of Transportation indicates that from a baseline of 24.02 MtCO₂e in 2010, the GHG contribution from the transport sector (combined road, rail, air, water) is projected to grow to 87.10 MtCO₂e (in 2030) and 166.07 MtCO₂e (in 2040) under the BAU scenario
 - Based on initial calculations, transport projects can contribute to a GHG reduction of 10.03 MtCO₂e in 2030 and 14.34 MtCO₂e in 2040, which are equivalent, respectively, to 11.51% and 8.63% GHG reduction from the BAU.
 - Disaggregating the total by projects, rail has the largest contribution to GHG reduction at 6.79% (2030) and 4.23% (2040), followed by Public Utility Vehicle (PUV) Modernization Program at 2.91% (2030) and 2.75% (2040)

Assessing Sustainable Transport Measures

- Vergel & Tiglao (2013) estimated fuel consumption and air pollutant emissions for baseline and transportation policy scenarios in 2010 and 2015 using fuel consumption factors from local studies
 - The **expansion of the mass transit network** is the single policy scenario that contributed to higher overall reduction in petroleum and alternative fuel consumption levels. This is followed by the **vehicle restraint (TDM) policy**. The implementation of all-CNG bus policy contributed to the significant reduction of diesel fuel consumption. The public utility buses consumed the largest share (28%) of diesel fuel consumed in Metro Manila in 2010. The **MVIS policy did not contribute** to significant reduction in fuel consumption.

Change in Fossil Fuel and Alternative Fuel Consumption of Each Scenario Compared to Baseline

Scenario	Reduction in Daily Fuel Consumption				
	Diesel	Gasoline	LPG	CNG	CME
4-Stroke TC	0%	-1%	0%	0%	0%
MVIS	-3%	-3%	-5%	-5%	-3%
TDM	-6%	-10%	-11%	0%	-6%
Bikeways	0%	0%	0%	0%	0%
Mass Transit	-13%	-13%	-14%	-11%	-13%
CNG	-28%	0%	0%	high	-28%

Fuel Economy

Vehicle Type	Fuel Type	FCF (li/km)	Fuel Economy (km/li)	Source
passenger car	gasoline	0.133	7.50	DOE
passenger car	diesel	0.102	9.79	MMUTIS
utility vehicle	gasoline	0.133	7.50	DOE
utility vehicle	diesel	0.176	5.69	
motorcycle	gasoline	0.034	29.29	
truck	diesel	0.224	4.47	MMUTIS)
taxi	gasoline	0.133	7.50	
taxi	LPG	0.144	6.94	DOE
tricycle (2-stroke)	gasoline	0.041	24.41	Biona et al. (2007)
tricycle (4-stroke)	gasoline	0.034	29.29	
jeepney	diesel (B1)	0.176	5.69	UPD-COE (2009)
bus	diesel (B2)	0.375	2.67	DOTC-MMPTPSS (2010)
AUV	diesel (B2)	0.173	5.77	DOTC-MMPTS (2007)
jeepney	LPG	0.298	3.36	
bus	LPG	0.635	1.58	
bus	CNG*	0.326	3.07	

Comprehensive Roadmap for the Electric Vehicle Industry (CREVI)

- The [Electric Vehicle Industry Development Act \(EVIDA\)](#) became law on April 15, 2022, as Republic Act 11697, which mandates the creation of CREVI
 - A Law that “ensures the country’s energy security and independence by reducing reliance on imported fuel for the transport sector” and provides an enabling environment for the development and adoption of EVs and EV charging stations
 - Includes fiscal and non-fiscal incentives
- “The [CREVI refers to a national development plan for the EV industry with an annual work plan](#) to accelerate the development, commercialization, and utilization of EVs in the country comprised of the following four (4) components”:
 - [EVs and charging stations](#) component;
 - [Manufacturing](#) component that gives emphasis on EV for public transport in addition to EV for individual use;
 - [Research and development \(R&D\)](#) component that generates Science and Technology (S&T) based policies and local technologies for commercialization; and
 - [Human resource development](#) component which includes skills and capacity building of needed personnel to support the development of the EV industry

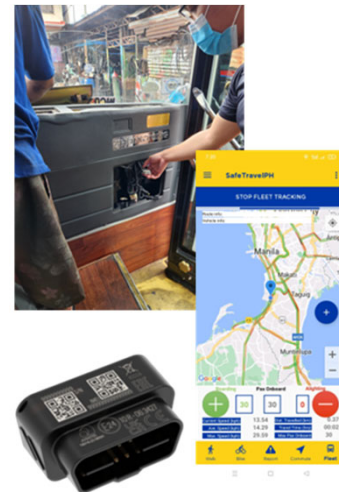
National Energy Efficiency and Conservation Plan (NEECP)

- “A comprehensive framework and plan that institutionalizes energy efficiency and conservation in the country across key sectors of the economy in accordance with the EEC Act”
 - “Section 4(z) of the EEC Act stipulates that the NEECP shall set out the governance structure, and programs for energy efficiency and conservation with defined national targets, feasible strategies, and regular monitoring and evaluation. The plan is also required to be regularly reviewed and revised by DOE”
 - “The DOE has forecasted that the country’s energy mix in 2040 will appear like the energy mix to date, with a strong emphasis on oil products (50%). This is due, in part, to the predicted continued demand for diesel and petrol from the transportation sector. While there have been programs to test electric vehicles and the use of natural gas in public transport, these have been limited. The limited infrastructure and regulatory barriers in place mean that it may be several years before the use of electric vehicles can be effectively scaled up”
 - Under the Clean Energy Scenario (CES) of the Philippine Energy Plan 2018-2040 , there will be a 10% penetration rate for EVs for road transport by 2040

Sector	Programs	Short Term Emissions Savings (2023 – 2024)	Medium Term Emissions Savings (2025 – 2028)	Long Term Emissions Savings (2029 – 2050)
Transport	Fuel Efficiency Standards	-	-	-
	10% EV penetration by 2040	-	-	116.54 Mt CO ₂ e 8.22%

Improving Fuel Efficiency in Transport

- The **Philippine Energy Labelling Programs (PELP)** is a large program that has been undergoing phase-by-phase implementation since 2020
 - The **development and rollout of energy performance requirements** beyond the appliances sector remains a high priority for the DOE. These include technologies and industrial devices such as motors, and possibly transformers, which is widespread in use and energy consuming
 - **Minimum fuel efficiency ratings and labelling for vehicles** also fall under the PELP
 - The updated Roadmap **highlights the necessary actions to expand the PELP product/technology coverage**, through the conduct of market assessment studies, establishing and harmonizing standards in collaboration with experts and ASEAN countries respectively.
 - Supporting measures to the PELP include a robust online registration system, a Monitoring, Verification and Evaluation (MV&E) framework
- **Incentivizing Eco-Driving on Busway operations**
 - Literature points out that through the practice of eco-driving, **fuel consumption can be reduced by 25%**. Eco-driving can be measured by determining that the vehicle would operate at optimal fuel efficiency, or within the green area, through the estimation of parameters including speed, speed variation, acceleration/deceleration, and the continuous improvement through the use of real time data.
 - Based on on-road observation of bus operations on the EDSA Busway, the observed **Engine Fuel Rate for Aggressive Driving is 22.03 Liter/Hr while Eco-Driving is 13.03 Liter/Hr, a 41% reduction**
 - Eco-drivers when in motion and maintaining a cruising speed for an hour with at least 1,000 RPM **can save up to 8.217 liters of fuel, compared to driving more aggressively.**



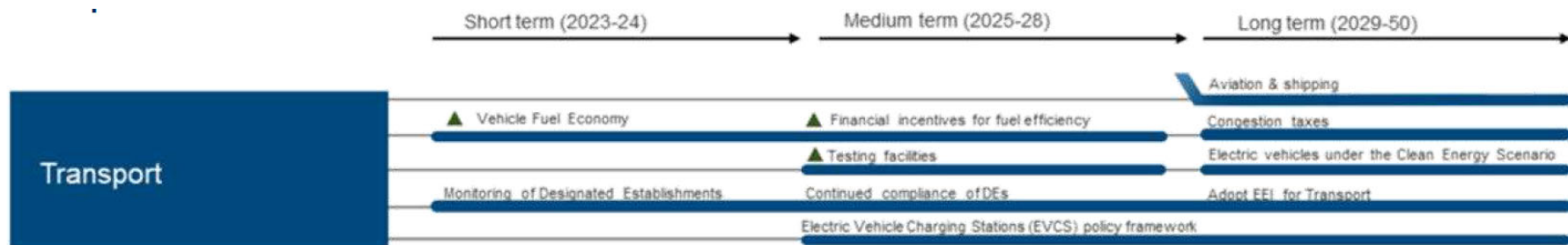
Telematics IoT device and *SafeTravelPH* crowdsourcing app



EDSA Busway

Philippine Transport Vehicles Fuel Economy Labeling Program (VFELP)

- With the expansion and amendment of the PELP coverage as indicated in DC2022-11-0035 and the requirement for fuel economy performance labelling under Section 17 of the EEC Act, the government’s initiative on energy efficiency and conservation policies for the Transport Sector entails the development of the **Philippine Transport Vehicles Fuel Economy Labeling Program**
 - The program covers the **fuel economy performance rating for the transport sector** which will initially cover road transport vehicles
 - Requires that transport vehicle manufacturers, importers, distributors, dealers, and rebuilders shall comply with the vehicle fuel economy labeling requirements set by the DOE with the assistance of the DOTr, DENR, and other concerned agencies (EEC under Section 17, Section 2 of DC2020-10-0023, Sections 58 and 60 of DC2019-11-0014)
 - DOE will **develop the necessary technical requirements**, including but not limited to, implementing guidelines, vehicle fuel economy performance testing guidelines, and minimum energy performance for transport vehicles



Key Strategies

- Transport Vehicles Fuel Economy Labeling Program (VFELP)
 - The **Short-Term (2023-2024)** strategic action includes the development of a **Monitoring, Verification and Enforcement (MVE)** framework
 - The **Medium-Term (2025-2028)** actions will establish **financial incentives for fuel efficiency** and the establishment of **Electric Vehicles Charging Stations (EVCS) policy framework**
 - The emerging EV technology presents opportunities for improving energy efficiency in the transportation sector in support of the government's energy independence agenda. There is a need to consolidate and harmonize all existing issuances to ensure the safe, efficient operations and system reliability and to accelerate investments in EVCs in the country
 - In terms of vehicle testing, dedicated testing facilities will be established that are aligned with ASEAN standards
 - The **Long-Term (2029-2050)** actions will include energy efficiency programs beyond road transport (passenger and cargo ships, aviation fuels), congestion taxes, and continued institutionalization of the Energy Efficiency Index (EEI) across the sector
- Research and Development
 - **Co-create programs** for incentivizing fuel efficiency and emission reduction
 - **Public transport monitoring and evaluation tools** for government uses
 - Professionalizing **fleet management** through training programs and development of tools for asset management
 - Upgrade **Competency Standards** to include **eco-driving as a core competency**, and improve knowledge of drivers and operators on transport sector's environmental footprint

Maraming Salamat Po!