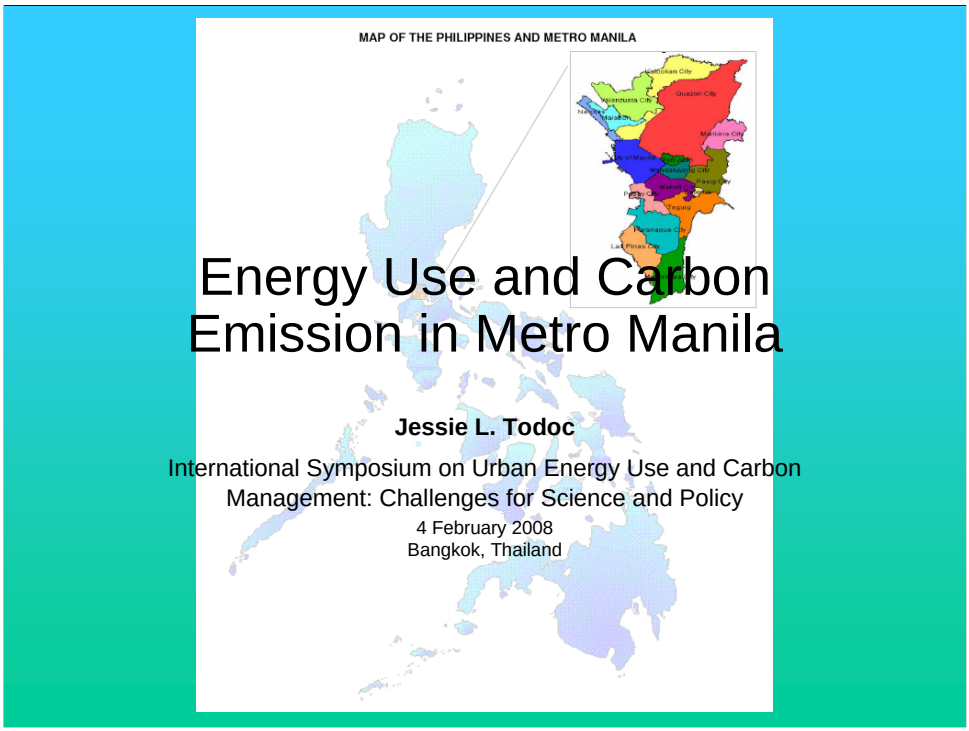


Good afternoon ladies and gentlemen! First of all thank you to Dr Shobakar Dhakal and the Global Carbon Project for this chance to be part of this prestigious meeting. It's indeed my pleasure to be speaking in front of prominent experts in the field of urban energy and climate.

With this presentation I would like of course to contribute to the goals of this meeting, specifically, (1) to highlight the importance of urban energy and carbon in solving climate issues, and (2) to share policy development trends in one mega city in relation to energy and carbon management.

For those of you who are not very familiar with Metro Manila, it is of course at the heart of the Philippine archipelago, like do many national capitals.

Metro Manila at a glance

Land area: 636 sq. km.

Population:

- •10.7 m (2005), 12.8 m (2020), 13.5 m (2030)
- •>16 m daytime
- •17,453 persons/sq km.
- •36% of country's total urban population
- •2.1 m households (2000 census)

Constituencies: 16 cities; 1 municipality; 1,694 barangays

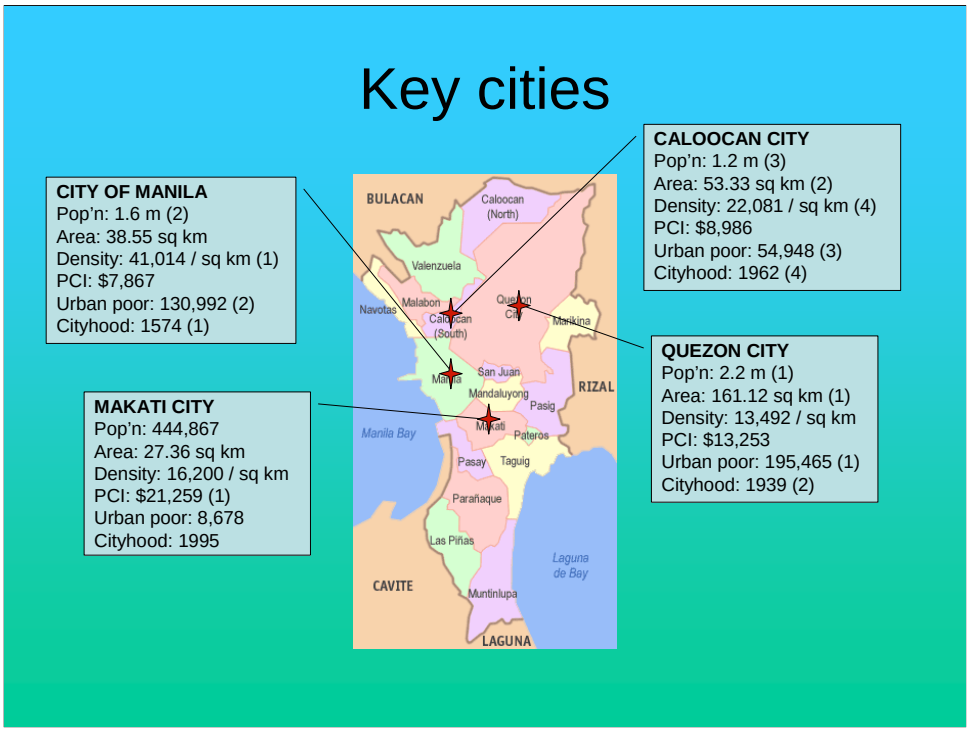
Income: contributes 35.6% of GDP; USD108 b (2005); USD257 b (2020)

Poverty incidence: 5% of households live below (national) poverty line (2003; vs 24.7% national total)

One big difference, however, with many national capitals is that Metro Manila is actually a region. Also called the National Capital Region (NCR), Metro Manila is one of the 17 regions in the Philippines. It is also a special region because instead of being divided into provinces, Metro Manila is divided only into 16 cities and one municipality.

Having lived in Thailand since 1996, I cannot help to compare Metro Manila with Thailand's capital city, Bangkok. It's officially more populous than Bangkok; but the two cities might have more or less the same population size. Metro Manila, despite being a region, is only about 40% the size of Bangkok. Thus, MM is officially about five times more densely populated than Bangkok.

Like Bangkok, MM contributes a big portion of GDP, and in both cities less than 10% live below the national poverty line. (A big difference, however, is that Thailand's national poverty incidence is around if not below 10%, while the Philippines' was close to 25% in 2003.)



MM's key cities are Quezon City, City of Manila, Makati City, and Caloocan City.

Quezon City is the largest in terms of both population and land area. It's probably not surprising if it also has the largest urban population. QC is also the second oldest city in the NCR.

The City of Manila, the official national capital, is the oldest city in MM. It is the 2nd most populous in MM, and also with the 2nd largest urban poor population. But it is the most densely populated in MM, almost 2.5 times the region's average.

Makati City, the region and the country's prime business center, is as expected the richest in terms of per capita income.

The second largest city in terms of land area and also the third largest in population is Caloocan City.

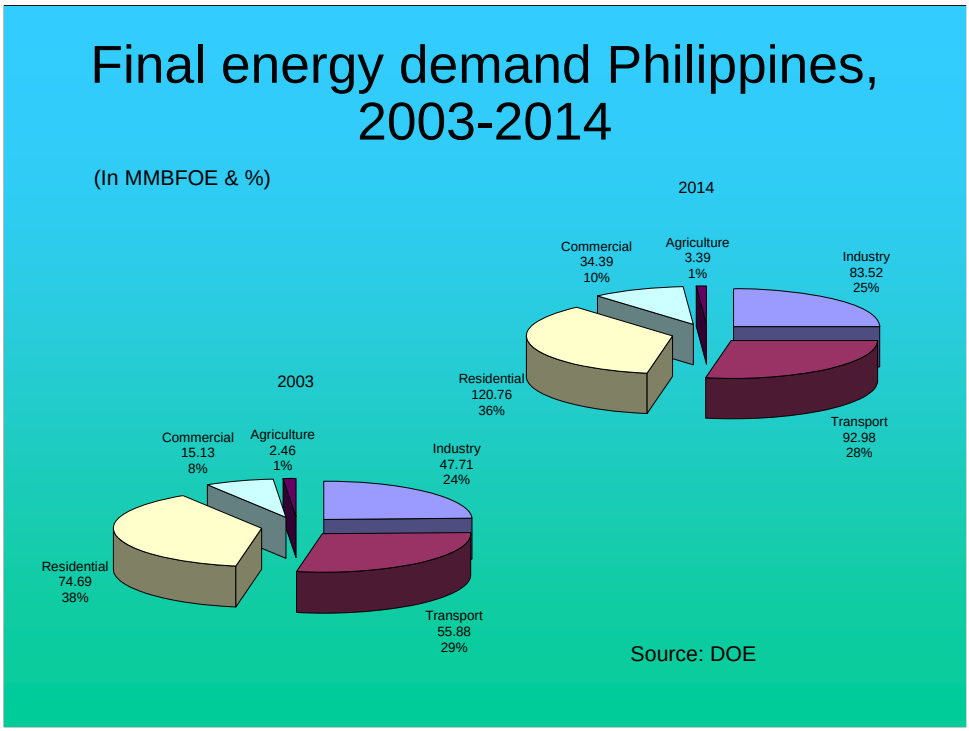
These are of course important determinants of energy demand and carbon emissions.

Contents

- Sectoral energy demand
- Electricity consumption
- Carbon emissions
- Energy demand management policies
- Carbon management policies

As expected official and published data on MM energy use and carbon emission are not readily available. But for the purpose of this presentation, which is to initiate research on the said topic, some information or insights can be gleaned from national data and from determinants of demand and carbon emissions, which are available at MM level.

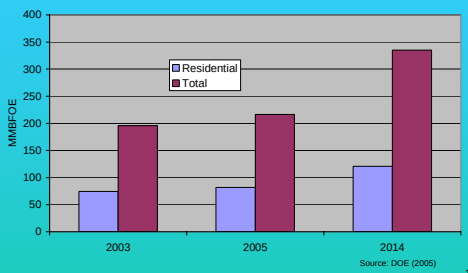
MM nor the cities and lone municipality comprising it do not have separate energy demand and carbon management policies. But national policies apply and in fact should be implemented at city or municipality level. Nevertheless, MM and the cities and municipality comprising it have local policies that contribute to energy demand and carbon management.



More recent data than shown should be available from the DOE, but the sectoral shares of final energy demand should not change much if at all. With MM occupying an important place in Philippine economy in terms of all these sectors, it is expected that these sectoral shares also reflect those in MM. However, I guess there could be a lower share for agriculture, and higher share for transport and commercial sectors. To be sure, residential and industrial shares would remain substantial, but industrial shares could go down with decentalization of industries and development of industrial and commercial growth centers all over the country but away from MM.

Residential energy demand—”quantity”

Final energy demand Philippines, 2003-2014



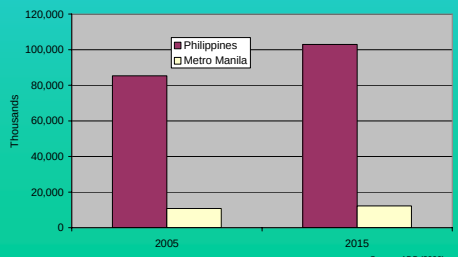
Source: DOE (2005)

•Total residential energy demand would grow 4.4% in 2005-2014

•Total population would grow 1.9% in 2005-2015

•MM population would grow 1.3% in 2005-2015

Growth in population, 2005-2015

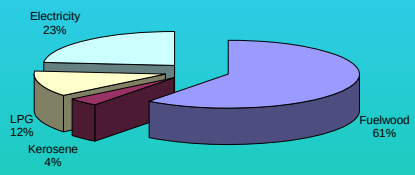


Source: ADB (2006)

Growth in the level of residential energy demand should be dependent on population growth. The decentralization efforts would slow population growth in MM as against total population growth. But because of the large disparity in regional incomes, as indicated earlier, residential energy demand in MM may not be slower than total residential demand in the country.

Residential energy demand—”quality”

Energy consumption in Philippine Households, 2005

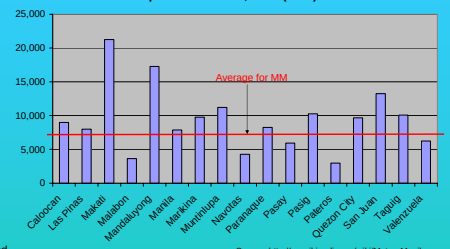


Source: UN Statistics (2005)

Assumptions for projecting national data:

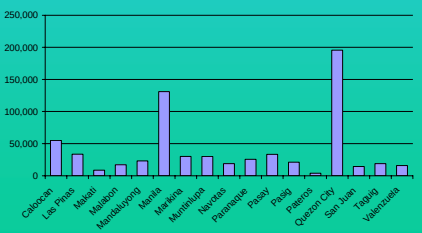
- LPG demand—4.2% p.a.
- Kerosene—0.6% p.a.

Per capita income MM, 2007 (USD)



Source: http://en.wikipedia.org/wiki/Metro_Manila

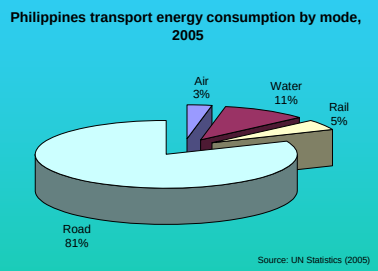
Number of urban poor families

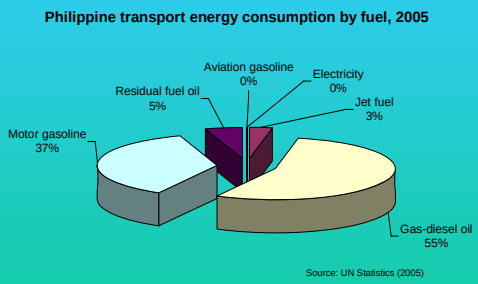


Source: ADB (2006)

Income also determines the “quality” of energy demand that is indicated by the type of fuel used. Overall, Philippine households are to a very large extent remain dependent on fuelwood. We expect of course a lower share of fuelwood and a higher share of the other fuels, especially electricity and LPG, in MM. But fuelwood and kerosene (even if demand for the latter is projected to slow) should be an important fuel for urban poor and low income households in a number of MM cities.

Transport energy demand

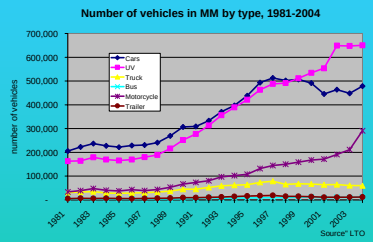


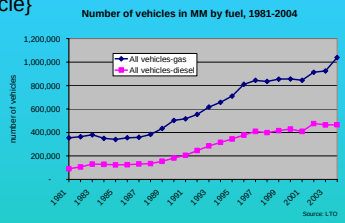


Road transport and, as a consequence, gasoline and diesel demand, account for the largest shares in Philippine transport energy demand. With rail development in MM, it is expected, however, that rail and electricity demand in MM will have higher share than national figures, which would be at the expense of water and perhaps not road transport.

Transport energy demand in MM

Road transport demand = f {no. of vehicles, average mileage per vehicle, average fuel consumption per type of vehicle}





Average trip length in MM:

Buses—13.0 km

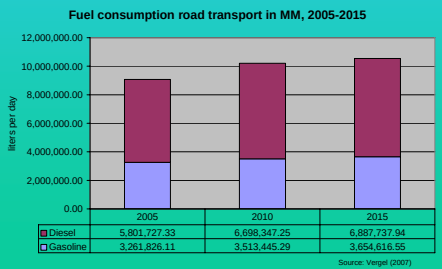
Jeepneys—3.5 km

Other assumptions (2005-2014):

Rail—10% p.a.

CNG—41% p.a.

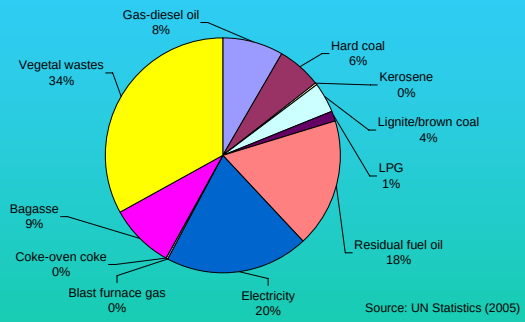
CME & Ethanol—28% p.a.



Road transport demand is of course determined by the vehicle population, distance traveled by these vehicles, and their respective fuel consumption. It seems all these data are available for MM transport. This is also proven by the large number of studies and technical assistance conducted on MM transport. The DOE's projections for the PEP on rail and CNG demand for transport actually apply to MM (as will be seen later). Thus, it seems it will not be difficult to estimated transport energy demand for MM.

Industrial energy demand

Energy consumption in Philippine industries, 2005



Source: UN Statistics (2005)

Projected annual demand growth (2005-2014):

Total—5.5%

Electricity—8.5%

Coal and LPG—5.6%

Diesel—3.7%

Kerosene—3.0%

Fuel oil—1.2%

Natural gas—18.7%

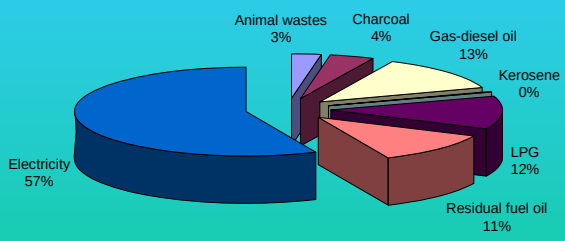
MM industries:

- Food and beverages, textiles, paper and products, industrial and other chemicals, iron and steel
- Large share to national total (e.g. 69% in 1994)
- Fuel consumption by industrial classification

MM hosts the bulk of Philippine industries. So total Philippine industrial energy demand should be a good reflection of MM's. National-level assumptions on projected growth of industrial fuels would be safe to use for projecting MM's industrial demand. Moreover, data can be obtained on the type of industries located in MM as well as fuel consumption of these industries to confirm the validity of these national-level assumptions.

Commercial energy demand

Philippine commercial sector energy consumption by fuel, 2005



Source: UN Statistics (2005)

Projected annual demand growth (2005-2014):

GVA—6.8%

Energy demand—7.5%

LPG—10.5%

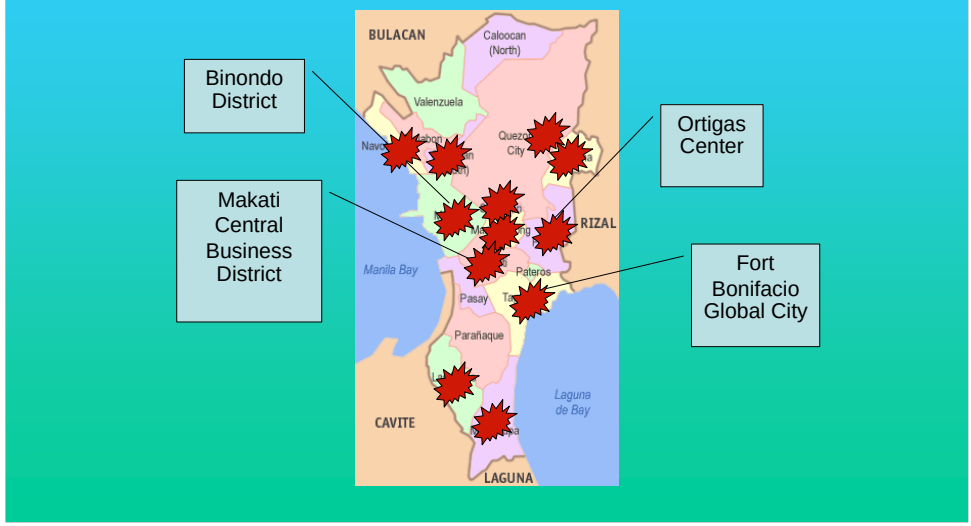
Electricity—8.8%

Renewable energy—4%

Natural gas—8.3%

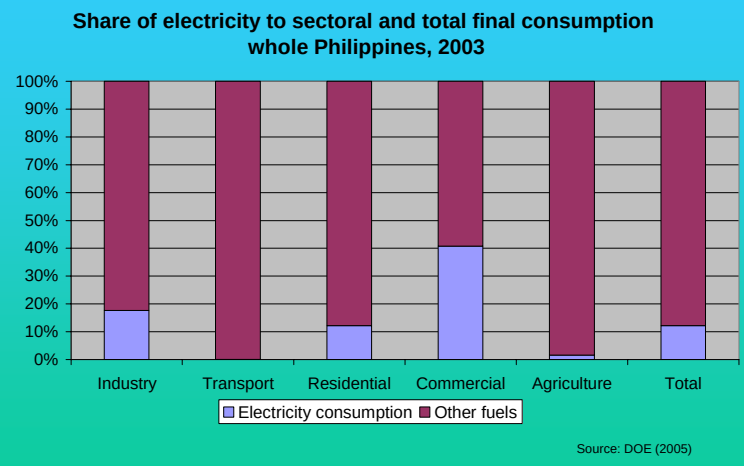
Philippine commercial energy demand is dominated by electricity. But it is expected that electricity share in MM commercial energy demand will be higher. National-level projections of individual fuels will also be safe to use for MM.

Commercial energy demand: business districts and shopping centers in MM



It is also good to know that MM is characterized by few business districts... and several commercial or shopping centers, spread across the region.

Electricity demand



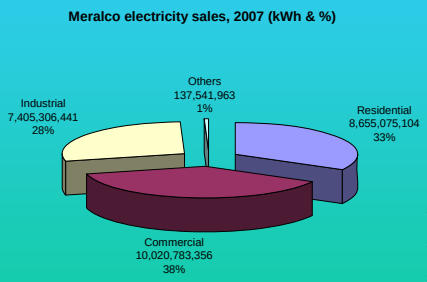
Electricity is of course an important fuel to meet energy demand. Philippines has a high electrification rate, so electricity's share in total Philippine sectoral demand should not diverge too much from corresponding figures for MM. Transport will certainly be an exception, however, because electric rail development is yet confined to MM.

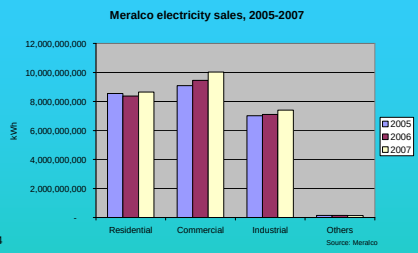
Electricity supply: Manila Electric Company (Meralco)

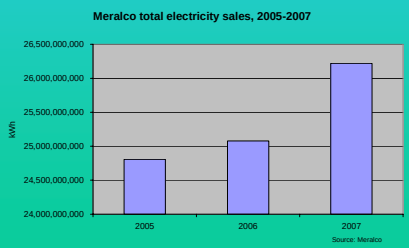
- 9,337 sq km (3% of total Philippines)
- 25 cities, 86 municipalities
- 20 million people
- 4.3 m customers
- 65% of electricity sales in MM

In fact, it is possible to determine electricity consumption in MM from utility data. MM is served by Meralco, whose franchise extends well beyond MM, or 15 times the size of MM. Nevertheless, MM accounts, in total, for 65% of Meralco's electricity sales.

Meralco electricity sales



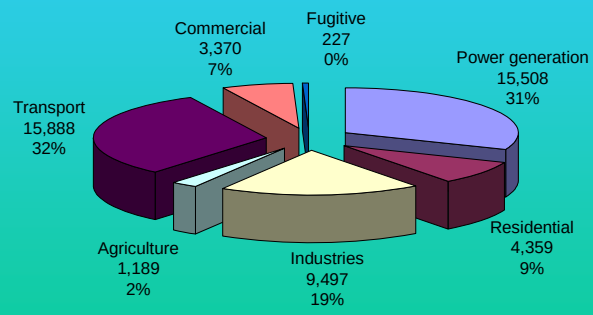




At this time, data can only be made available on total Meralco electricity sales by major customer categories. As shown the commercial and residential sectors consume more electricity than the industrial sector. The biggest increase is also registered by the commercial sector, and the main contributor to the increase in total electricity sales

Total GHG emissions

Philippine GHG emissions inventory from energy sector, 1994 (ktonnes of CO2e)



Source: The Philippines Initial National Communication on Climate Change, 1999

The energy sector is responsible for almost half of Philippine GHG emissions, according to the emissions inventory in 1994. Transport, power generation, and industries are the main contributing sectors to these emissions.

International standard methodologies were used in estimating these national-level emissions.

MM power plants

Power plant	Rated capacity (MW)	Dependable capacity (MW)	Location	Proponent	Scheme	Owner	Date commissioned
Duracom Unit 1 & 2	133.38	113.00	Navotas, Metro Manila	First Private Power Corp.		NON-NPC	9/1/1995
East Asia Diesel (Duracom Unit 3 & 4)	109.00	109.00	Navotas, Metro Manila	East Asia Diesel Power Corp.		NON-NPC	9/1/1995
Hopewell GT	310.00	90.00	Navotas, Metro Manila	Mirant (Navotas) Corp.	BOT	NPC-IPP	8/16/1990 3/18/1993

Source: NPC and DOE

MM hosts three oil-fired power plants, and information required for estimating emissions from these power plants can be obtained from NPC and DOE.

MM transport sector emissions

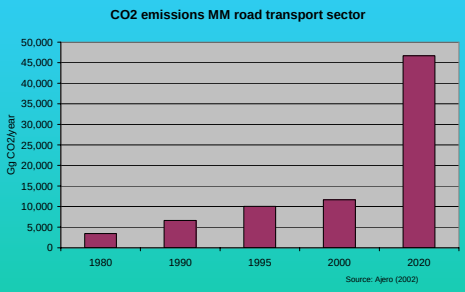
- CO2 emissions = Number of vehicles per type and fuel*mileage*emission factor

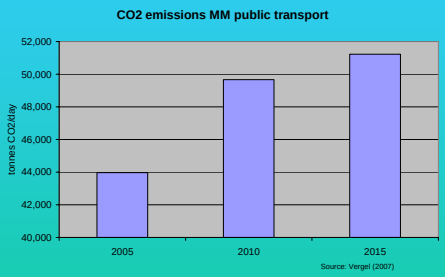
CO2 emission factors, g/vehicle-km

	Ajero (2002) from IPCC	Manila Observatory (2005) from ADB
Gasoline		
Cars	506	399
Utility vehicles/jeepneys	579	456
Trucks	1,320	
Buses	1,320	
Motorcycles/tricycles	266	186
Diesel		
Cars	319	537
Utility vehicle	415	559
Trucks	1,097	
Buses	1,097	1,249

With the activity and technology data available on MM transport, it should also be possible to determine emissions from this important sector. Emission factors per type of vehicle and fuel based on international standards are of course available. But national standards, which reflect the specificity of national situations, should give better estimates of local emissions.

MM transport sector emissions





Indeed, transport sector emissions for MM have been calculated using these two standards. (But care should be taken in comparing these estimates.)

Residential, commercial, industrial emissions?

- Residential sector: HECS for MM
- Commercial sector: electricity is the main fuel; energy audits of DOE
- Industrial sector: some data on fuel consumption by industrial classification; energy audits of DOE

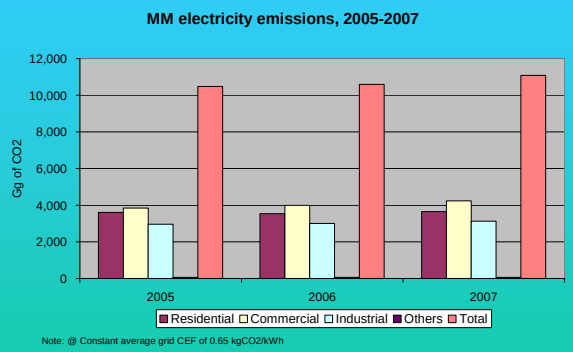
Emissions from residential, commercial, and industrial sectors cannot be obtained at this time. But possible sources of information that can be used for this purpose have been identified.

The NSO conducts every five or 10 years a nationwide HECS. For sure, the results can be made available for MM to determine residential sector emissions.

Knowing that electricity is the main fuel used by the commercial sector is already a good starting point as far as the commercial sector is concerned. Energy audits possibly conducted by DOE on some major commercial establishments can provide information on the other fuels. Activity data can be obtained from other economic agencies.

The same can be said of the industrial sector except that electricity is not the only main fuel.

MM electricity (indirect) emissions*



Assumptions:

- Constant grid emission factor**
- Constant share of MM electricity sales per sector***

*Basic methodology adapted from Ajero (2002).

**Based on 2002 Luzon grid generation mix when fossil fuels accounted for 77.5%; in 2006 fossil fuels accounted for 78.0%.

***Based on 2007 share of MM electricity sales.

Indirect emissions from electricity usage can be determined from Meralco sales data. The sectoral emissions shown here are rough estimates, based on some assumptions that can be corrected or made more accurate using available data from Meralco, as well as NPC and DOE.

National energy demand management policies and targets

- Energy independence
  - Increase use of alternative fuels
  - Strengthen and enhance energy efficiency and conservation
- 60% self-sufficiency by 2010
  - 100% of MM buses running on CNG
  - 5% CME blend with diesel fuel
  - 25% ethanol blend with gasoline
  - 5.7% energy savings

As mentioned in the beginning, local or urban energy and carbon demand management policies and targets are still not a common practice. Nevertheless, ambitious targets exist at the national level. Some of them in fact concern MM directly.

Nationwide energy efficiency and conservation programs

Programs/Project	Timeframe	Target
"EC way of life" (1) nationwide information, education and communication (IEC) campaign; (2) voluntary agreement programs; (3) energy labeling and efficiency standards; (4) energy management programs; and (5) alternative fuels and technology programs	Since 2004	Aggregate energy savings between 2004 and 2014 of 240.8 MMBFOE; equivalent GHG emission avoidance of 61,977 gigagrams of CO2 (GgCO2)
Government Energy Management Program	Since 2004	Reduction in electricity and fuel consumption by 10%; estimated savings from the program in 2004 is around 420,000 barrels of fuel-oil-equivalent (BFOE) or 60.6 thousand tons of oil-equivalent (TOE)
Alternative Fuels and Technology Program (1) Natural Gas Vehicle Program for Public Transport (2) Biodiesel Program (3) Bioethanol Program (4) Autogas Program	Since 2002	Increase use of CNG, CME and bioethanol blend, and LPG
Philippine Efficient Lighting Market Transformation Project	2005-2010	Reduction in GHG emissions from lighting by 11%; increase in energy-efficient lamps used by households to 57%;

The Philippines has instituted many energy demand management policies and programs and corresponding targets. The current ones are shown. For example, the GEMP specifically target the public sector, including local government units (or cities and municipalities).

Metro Manila-wide carbon (GHG) management-related programs

- Air quality improvement
- Solid waste management
- Transport efficiency improvement
  - Metro Padyakan
  - EDSA organized bus routes project
  - Improvement of 7 major roads
  - PUV lane scheme/PUV terminals
  - Objectives:
    - Reduce congestion—costs USD12 b a year, or 4.6% of GDP (ADB 2006)
    - Reduce air pollution and GHG emissions

Metro Manila has region-wide programs and projects that benefits GHG reduction at the same time but are directly aimed at other benefits. For example, the different transport efficiency improvement projects are directly aimed at reducing congestion, but reap GHG reduction benefits.

Energy demand and carbon management at individual cities

- Makati City
- Quezon City
- Marikina City
- Etc…

Programs and projects exist also at the level of the individual city. I could only cite here three cities…

Makati's E-jeepneys

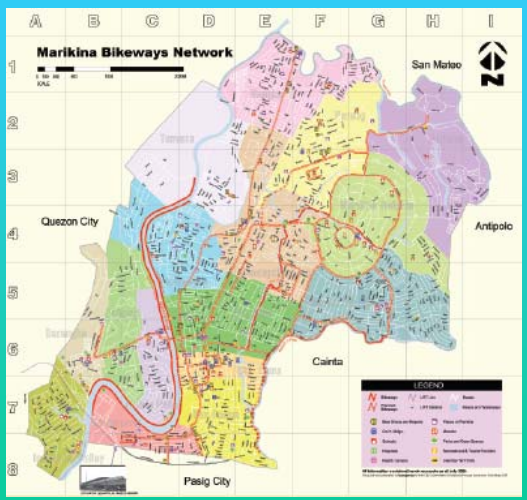
The jeepney is the most popular mode of public transport in the Philippines (available data show that jeepneys account for 39% of person-trips per day in MM). Makati revolutionized the jeepney with the introduction of e-jeepney. Each unit costs PHP500,000 (USD10,000) and the same capacity as an ordinary jeepney. It can run 120 km on a 8-hour overnight charge.

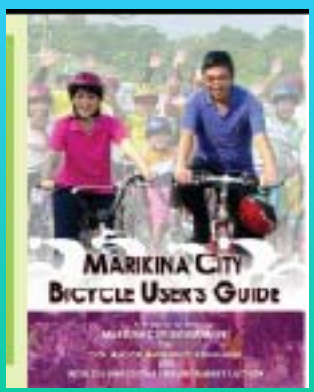
Quezon City's "Palit-ilaw"

PELMATP

Quezon City is one of the local government partners of the PELMATP spearheaded by the DOE with funding from UNDP-GEF. The target is to replace all lightings in the Quezon City Hall with more efficient lighting promoted by the project.

Marikina Bikeways System





Marikina's Bikeways System had aimed to construct 66 km of bikeways and more important to promote this NMT or a culture of cycling. The project started in 1997 with a USD1.3 m grant from WB GEF and PHP15.5 m Countrywide Development Fund. Marikina also created a separate office, the Marikina City Bikeway Office, to run the project.

Conclusion and way forward

- Methodologies exist for estimating energy demand and carbon emissions at city level
- But there's a need to collect field (primary) and most recent data
- This should facilitate translating national energy savings and GHG reduction targets to "urban" targets

Acknowledgments

- CAI-Asia
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- DOE
- ICLEI-SEA

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Thank you!

Jessie L. Todoc

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