Project to Support the Planning and Implementation of NAMAs in a MRV Manner

GHG Inventory of Ho Chi Minh City

International Context

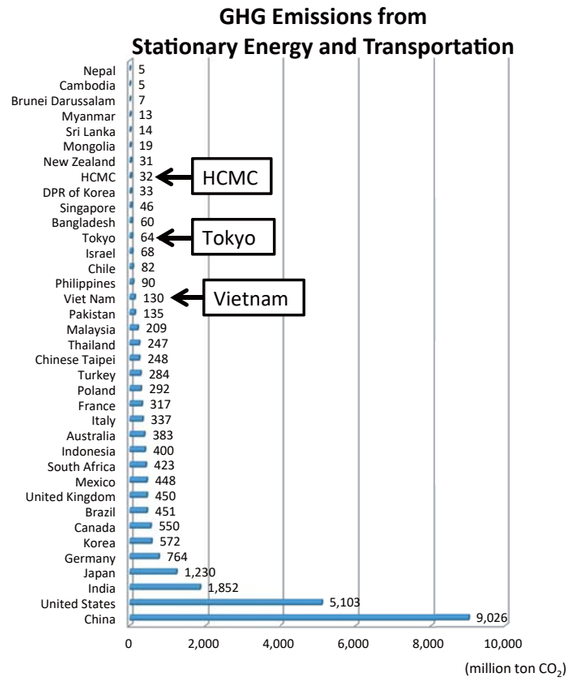
The right-hand chart is an international comparison of the GHG emissions in the Stationary Energy and Transportation Sectors.

The largest emitter is China followed by the United States and India.

The emissions of Vietnam is less than 1.5% of China's and around 2.5% of the United States'.

The emissions of HCMC occupy over 20% of the total emissions in Vietnam. The emissions of HCMC is comparable to the emissions of New Zealand. It is much larger than the emissions of Cambodia, Myanmar and Mongolia.

The emissions of HCMC is around half of the emissions of Tokyo. It is around 70% of Singapore.



Source: IEA and Tokyo Metropolitan Government

Calculating GHG Emissions

GHG emissions are normally calculated using the following basic equitation.

Emisson = Activity Data × Emission Factor

The Activity Data (AD) is the quantity of human activities resulting in GHG emissions, such as gasoline consumption, electricity consumption, waste disposal, releasing of refrigerants, deforestation and so on.

The Emission Factor (EF) is the average rate of GHG emissions per unit of activity data. For example, in HCMC, the EF for electricity consumption is 0.75 tCO_2/MWh (2013).

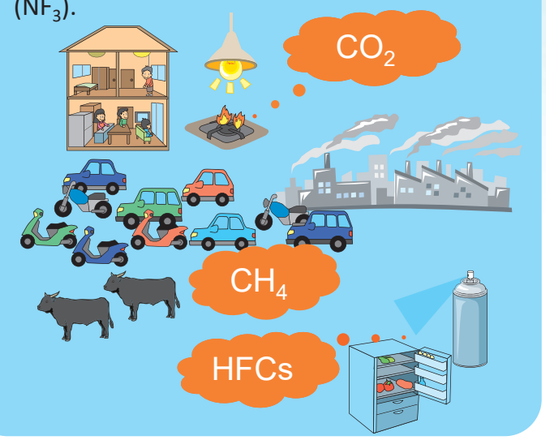
Calculation Example
If a factory consumes 100 MWh of electricity in 2013, its GHG emissions is calculated as:
100 MWh x 0.75 tCO2/MWh = 75 tCO_2
AD EF Emission

Use of GHG Inventory

The GHG inventory is a fundamental information for planning actions to curb global warming. Regular preparation of a city-wide GHG inventory based on GPC enables cities to:

- understand the amount of GHG emitted in the city;
- understand the emission contribution of various activities in the city;
- compare GHG emissions over time;
- compare GHG emissions across cities;
- project future GHG emissions;
- set GHG emission reduction targets;
- identify the sectors and sub-sectors to focus emission reduction efforts;
- track the impact of mitigation measures; and
- provide solid proof of GHG developments for carbon financing.

Greenhouse gases or GHGs trap heat in the atmosphere and cause global warming. The major GHGs are carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_20). Other GHGs are hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6) and nitrogen trifluoride (NF_3).



GHG inventory is a comprehensive list of GHG emissions and removals occurring in a given geological scope (such as a country or a city) and time period (usually a year). It gives the quantity of emissions and removals by gas and source.

A GHG inventory enables policy-makers to understand how much various activities in the society are contributing to global warming and target the areas to reduce GHG emissions (i.e., implement climate change mitigation actions).

The GHG Inventory of HCMC was prepared with the assistance of the Japan International Cooperation Agency (JICA) under the Project to Support the Planning and Implementation of NAMAs in a MRV Manner (SPI-NAMA). It is the first comprehensive GHG inventory of HCMC.

Project to Support the Planning and Implementation of NAMAs in a MRV Manner

Project Website
English: https://www.jica.go.jp/project/english/vietnam/036/index.html
Vietnamese: https://www.jica.go.jp/project/vietnamese/vietnam/036/index.html
Japanese: https://www.jica.go.jp/project/vietnam/036/index.html

GHG Emission in HCMC

2013 GHG Inventory of HCMC (Summary Table)

GPC ref No.	GHG Emissions and Removals GHG Emissions Sources (By Sector and Sub-sector)	Total GHG (metric ton CO2e/year) in 2013			
		Scope 1	Scope 2	Scope 3	Total
I	**STATIONARY ENERGY**				
I.1	Residential buildings	269,780	5,301,680	262,963	5,834,424
I.2	Commercial and institutional building and facilities	440,575	2,505,610	124,278	3,070,463
I.3	Manufacturing industries and construction	2,597,202	5,386,028	267,147	8,250,377
I.4.1/2/3	Energy industries	0	0	0	0
I.4.4	Energy generation supplied to the grid	10,316			
I.5	Agriculture, forestry and fishing activities	621,570	36,366	1,804	659,740
I.6	Non-specified sources	0	0	0	0
I.7	Fugitive emissions from mining, processing, storage, and transportation of coal	0			0
1.8	Fugitive emissions from oil and natural gas systems	23,378			23,378
	SUB-TOTAL	**3,952,505**	**13,229,684**	**656,192**	**17,838,381**
II	**TRANSPORTATION**				
II.1	On-road transportation	14,544,176	NO	NE	14,544,176
II.2	Railways	IE	IE	NE	0
II.3	Waterborne navigation	149,134	NO	NE	149,134
II.4	Aviation	IE	NO	2,701,073	2,701,073
II.5	Off-road transportation	IE	IE	NE	0
	SUB-TOTAL	**14,693,310**		**2,701,073**	**17,394,382**
III	**WASTE**				
III.1.1/2	Solid waste generated in the city	1,293,241			1,293,241
III.2.1/2	Biological waste generated in the city	24,900			24,900
III.3.1/2	Incinerated and burned waste generated in the city	5,606			5,606
III.4.1/2	Wastewater generated in the city	926,142			926,142
III.1.3	Solid waste generated outside the city	NE			0
III.2.3	Biological waste generated outside the city	NE			0
III.3.3	Incinerated and burned waste generated outside the city	NE			0
III.4.3	Wastewater generated outside the city	NE			0
	SUB-TOTAL	**2,249,889**			**2,249,889**
IV	**INDUSTRIAL PROCESSES and PRODUCT USES (IPPU)**				
IV.1	Emissions from industrial processes occurring within the city boundary	565,704			565,704
IV.2	Emissions from product uses occurring within the city boundary	873			873
	SUB-TOTAL	**566,577**			**566,577**
V	**AGRICULTURE, FORESTRY and OTHER LAND USE (AFOLU)**				
V.1	Emissions from livestock	372,891			372,891
V.2	Emissions from land	-161,037			-161,037
V.3	Emissions from aggregate sources and non-CO2 emission sources on land	211,508			211,508
	SUB-TOTAL	**423,362**			**423,362**
Total	**GHG Emissions and Removals**	**21,885,641**	**13,229,684**	**3,357,265**	**38,472,590**

Notes
1. Reporting is based on Global Protocol for Community-Scale Greenhouse Gas Emission Inventories.
2. Scope 1 is emissions from sources located within city boundary; Scope 2 is emissions from use of grid-supplied electricity, heat, steam and/or cooling within city boundary (mainly from electricity consumption); and Scope 3 is all other emissions occurring outside city boundary because of activities within city boundary (mainly from transmission and distribution loss due to electricity consumption).
3. IE is Included Elsewhere; NE is Not Estimated; and NO is Not Occurring.
4. I.4.4 is not included in total emissions and removals because emissions from gird power consumption is accounted for at demand side.

Global Protocol for Community-Scale Greenhouse Gas Emission Inventories or GPC is a standard to measure GHG emissions from cities. GPC enables cities to consistently measure and report GHG emissions. GPC is promoted by the C40 Cities Climate Leadership Group.

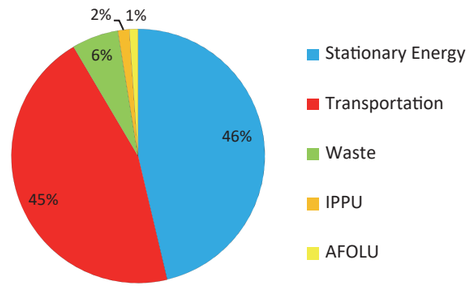
C40 Cities Climate Leadership Group or C40 is a network of the world's megacities committed to addressing climate change. C40 connects more than 90 of the world's greatest cities, HCMC being one of them.

C40 is focused on tackling climate change and driving urban action that reduces greenhouse gas emissions and climate risks, while increasing the health, wellbeing and economic opportunities of urban citizens.

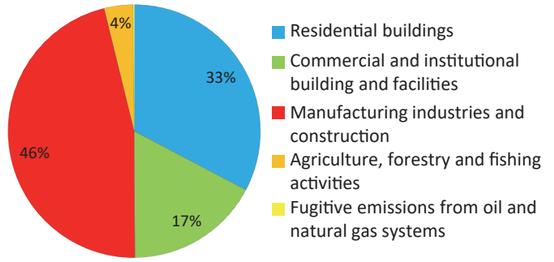
http://www.c40.org/

GHG Emissions and Removals by Sector

- The emissions from Stationary Energy and Transportation Sectors comprise 91% of the total GHG emissions and removals in HCMC.
- The Waste Sector and IPPU Sector emissions comprise 6% and 2% of the total respectively.
- The AFOLU Sector contributes to removals and emissions with a net 1% emission contribution.



GHG Emissions in Stationary Energy Sector



- In the Stationary Energy Sector, Manufacturing Industries and Construction, Residential Building, and Commercial and Institutional Building and Facilities Sub-sectors comprise 96% of the total emissions. The emissions are mainly from electricity consumption.
- The emissions in the Transportation Sector are mainly from gasoline combustion and diesel combustion.

Comparing with Countries and Cites

National Context

The GHG emissions of Vietnam (2010) and HCMC (2013) are 246.8 million tCO_2e and 38.5 million tCO_2e respectively. The emissions of HCMC account for 16% of the national GHG emissions while its population is only around 9% of the national total.

	Emissions (tCO_2e)	Population	Year
HCMC	38.5 million	7.8 million	2013
Vietnam	246.8 million	87.1 million	2010

C40 Cities and GHG Inventory

Of the 91 cities participating in C40, 16 cities have prepared the 2013 GHG inventory based on GPC. Most cities only report the emissions in the three main sectors: Stationary Energy, Transportation and Waste. HCMC is among the only five cities with an inventory covering all five sectors.

C40 Cities	GPC Inventory	
	3 Sectors	5 Sectors
91	15	5

Per Capita Emissions

The right-hand table shows the per capita and per GDP GHG emissions of selected C40 Cities. The per capita emissions of HCMC (4.2 tCO_2e) is at the same level of Seoul (4.6 tCO_2e), London (4.7 tCO_2e) and Buenos Aires (4.4 tCO_2e) despite HCMC being much less economically developed than its counterparts. In fact, its per GDP emissions is the highest among the C40 Cities cited here.

Note: In this comparison, the emissions considered are those in the Stationary Energy, Transportation and Waste Sectors, and excludes Scope 3 emissions.

City	Emissions Per Capita (tCO_2e)	Emissions Per GDP ($kgCO_2e$/USD)	GDP Per Capita (USD)
Seoul	4.638		
London	4.732	82.786	57,157
Los Angeles	7.458	33.422	223,138
Durban	6.588		
Yokohama	5.662	165.596	34,195
Toronto	7.064	123.341	57,273
Buenos Aires	4.395	170.454	25,782
Austin	11.599	121.534	95,437
Madrid	2.869	89.118	32,196
Auckland	5.890	139.831	42,125
Washington DC	12.730	72.891	174,642
Portland	10.064	47.102	213,659
Boston	9.346	54.861	170,355
Salvador de Bahia	1.332	154.384	8,628
Oslo	2.148	24.590	87,361
HCMC	**4.157**	**915.311**	**4,542**