



Climate Policy Forum Cum Workshops

GHG Reduction Solutions for a Low Carbon Hong Kong

30 September, 2010

Disclaimer: This powerpoint presentation for this forum only reflects the opinion of our guest speakers and do not represent the stance of WWF-Hong Kong.

Climate Policy Forum Cum Workshops

GHG Reduction Solutions for a Low Carbon Hong Kong

30 September 2010

Organizers:

WWF-Hong Kong

Ove Arup & Partners Hong Kong

Hong Kong Green Building Council

Workshop IV: GHG Inventory Calculation

Local Emission Factors in Hong Kong

Ir Dr. Michael K.H. Leung

Associate Professor

School of Energy and Environment

City University of Hong Kong



**Guidelines to Account for and Report on
Greenhouse Gas Emissions and Removals
for Buildings (Commercial, Residential
or Institutional Purposes) in Hong Kong**

2010 Edition



機電工程署
EMSD



環境保護署
Environmental Protection Department



**香港建築物（商業、住宅或公共用途）的
溫室氣體排放及減除的
核算和報告指引
〔中譯本〕**

2008 年版



機電工程署
EMSD

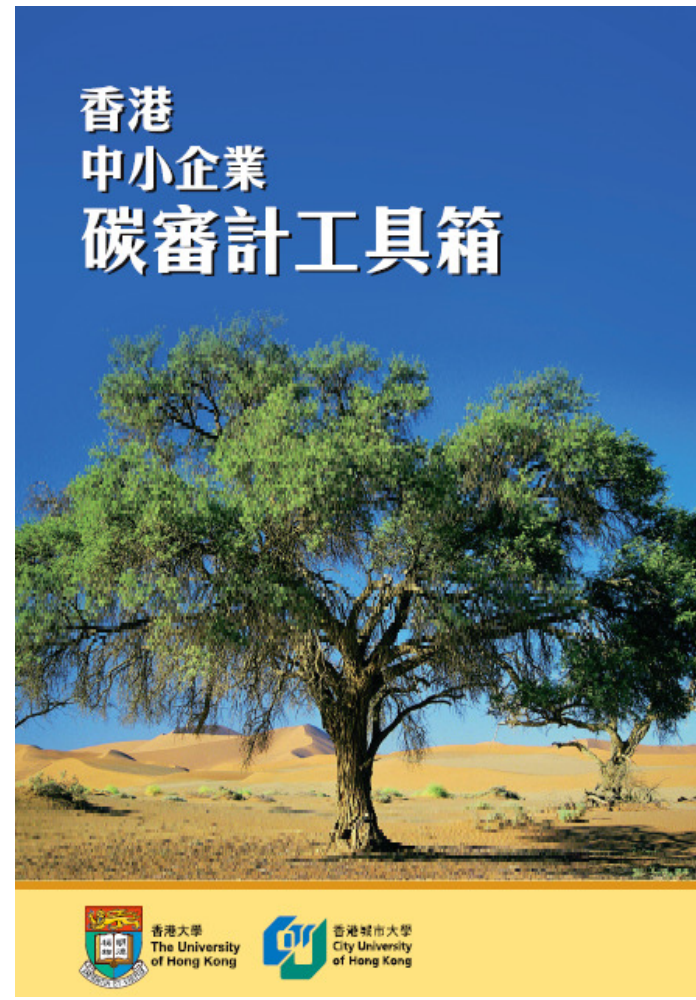
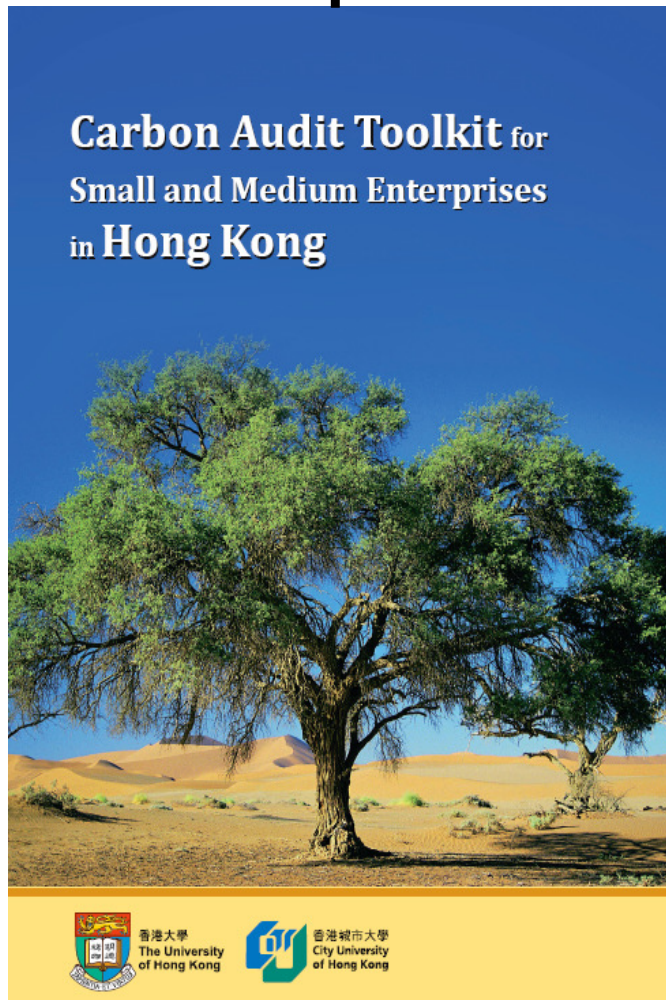


環境保護署
Environmental Protection Department



Carbon Audit Toolkit

<http://www.hku.hk/mech/carbon>



Acknowledgments

Collaborating Organizations

The University of Hong Kong (HKU)
City University of Hong Kong (CityU)
Friends of the Earth (HK)
Hong Kong General Chamber of Commerce (HKGCC)
Hong Kong Environmental Industry Association (HKEIA)
Energy Saving Concern Alliance



香港大學
The University
of Hong Kong



香港城市大學
City University
of Hong Kong



HKGCC
Hong Kong General Chamber of Commerce
香港總商會1861



Hong Kong Environmental
Industry Association
香港環保產業協會



Sponsors

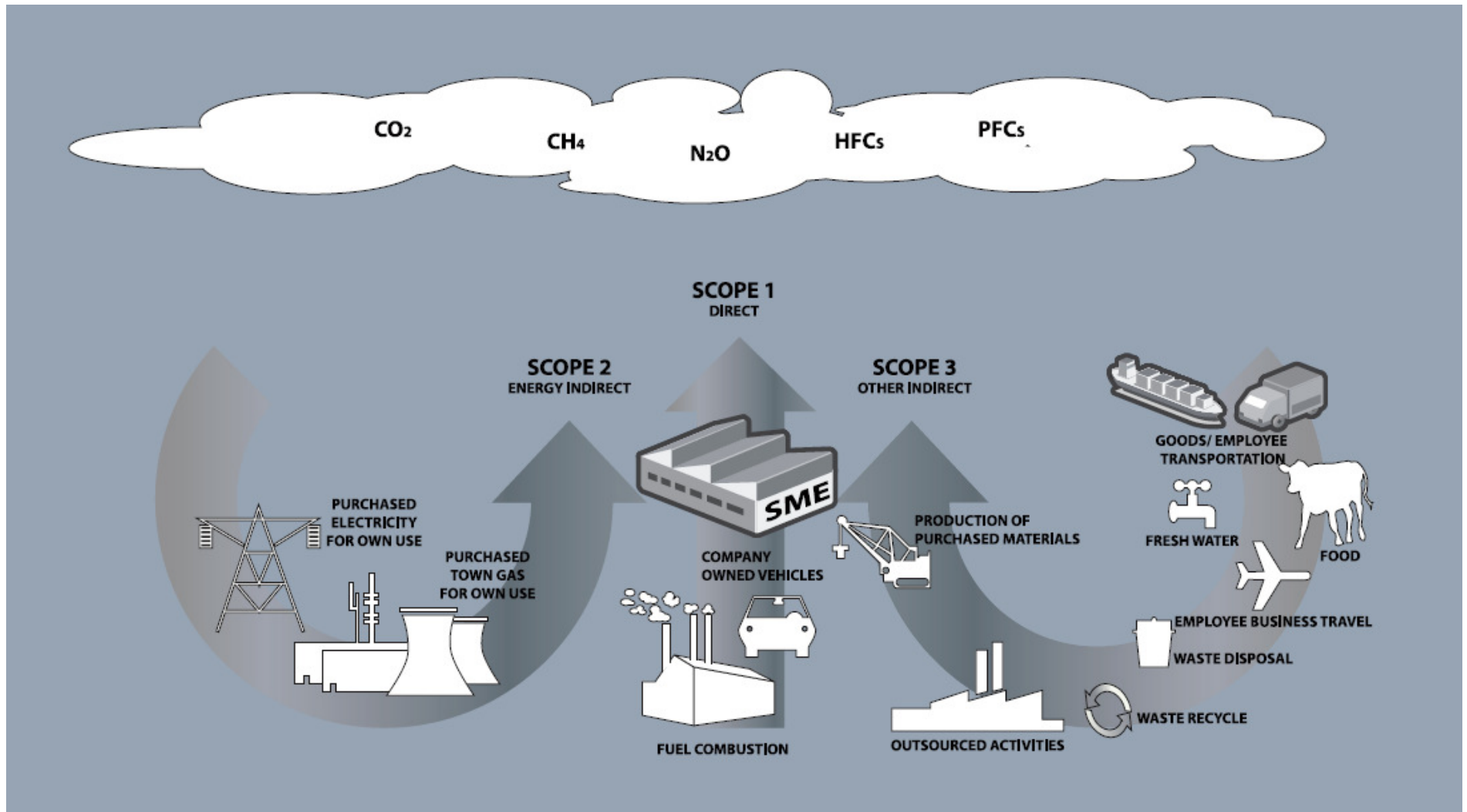
SME Development Fund, HKSAR Trade and Industry Department (SDF)
Aviva Life Insurance Co. Ltd.
Surface Mount Technology (Holdings) Ltd. (SMT)



SMT®

新進科技集團有限公司
SURFACE MOUNT TECHNOLOGY (HOLDINGS) LIMITED

Greenhouse Gases (GHGs)



Useful References for Values of Emission Factors (EF)

e.g. $E_{GHG - i, energy - j} = x_{energy - j} \times EF_{GHG - i, energy - j}$

| Document | Organization | Year |
|--|--|------|
| PAS 2050:2008 Specification for the assessment of the life cycle greenhouse gas emissions of goods and services, British Standards, 2008 | British Standards Institution | 2008 |
| Guidelines to Account for and Report on Greenhouse Gas Emissions and Removals for Buildings (Commercial, Residential or Institutional Purposes) in Hong Kong | Electrical and Mechanical Services Department (EMSD) and Environmental Protection Department (EPD), HKSAR Government | 2010 |
| Emission Factors Database (EFDB) | Intergovernmental Panel on Climate Change - National Greenhouse Gas Inventories Programme (IPCC NGGIP) | 2006 |
| The GHG Protocol for Project Accounting | World Business Council for Sustainable Development (WBCSD) and World Resources Institute (WRI) | 2005 |
| CO ₂ Emission from Business Travel, Version 2.0. http://www.ghgprotocol.org | World Resources Institute (WRI) | 2006 |

SME Carbon Audit Toolkit

• 中文 • English



[Home](#)

[Carbon Audit Guidelines](#)

[Carbon Footprint](#)

[General Information](#)

(optional; for calculating performance indicators)

[Carbon Footprint Calculator](#)

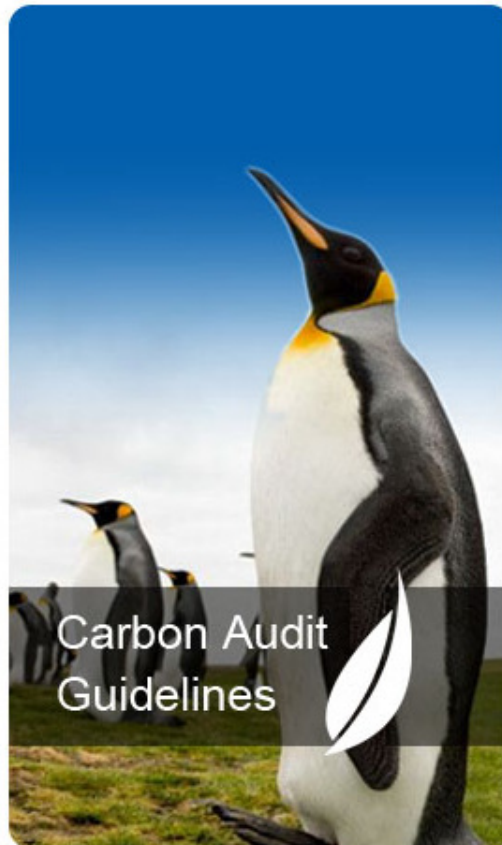
[Scope 1 Energy Direct Emissions](#)

[Scope 2 Energy Indirect Emissions](#)

[Scope 3 Other Indirect Emissions](#)

[Report](#)

[Contact Us](#)



Carbon Audit
Guidelines



Carbon
Footprint

Carbon Audit - Data Collection Form

Audit Period : From _____ to _____

Scope 1 Direct Emissions

1. Mobile Combustion Sources

| Vehicle Type | Fuel Type | Consumption / Mileage | Unit * |
|---------------------------------|-----------|-----------------------|-------------|
| Motorcycle | | | L / km |
| Passenger car, <1,500c.c | | | L / km |
| Passenger car, 1,501 – 2,000c.c | | | L / km |
| Passenger car, 2,001 – 2,500c.c | | | L / km |
| Passenger car, 2,501 – 3,000c.c | | | L / km |
| Passenger car, >3,000c.c | | | L / km |
| LGV, < 2.50T | | | L / km |
| LGV, 2.51 – 4.00T | | | L / km |
| LGV, 4.01 – 5.50T | | | L / km |
| MGV, 5.51 – 10.00T | | | L / km |
| MGV 10.01 – 15.00T | | | L / km |
| MGV 15.01 – 20.00T | | | L / km |
| MGV 20.01 – 24.00T | | | L / km |
| HGV 24.01 – 38.00T | | | L / km |
| Tractor | | | L / km |
| Mini bus | | | L / kg / km |
| Coach | | | L / km |
| Ships | | | L / km |
| Aviation | | | L / km |
| Others Mobile Machinery | | | L / kg / km |

*Note: Delete as appropriate.

2. Stationary Combustion Sources

| Fuel Type | Consumption | Unit |
|-----------|-------------|------|
| Diesel | | L |
| LPG | | kg |
| Kerosene | | L |
| Charcoal | | kg |
| Town Gas | | Unit |
| Acetylene | | m³ |

3. Refrigerant

| Type | Leakage (kg) |
|------|--------------|
| | |
| | |
| | |
| | |

4. Tree Planting

| | |
|--|--|
| No. of new trees that will grow taller than 5m | |
|--|--|

Scope 2 Energy Indirect Emissions

1. Electricity

| Company * | Consumption (kWh) |
|-----------|-------------------|
| CLP / HEC | |
| CLP / HEC | |

*Note: Delete as appropriate.

2. Town Gas

| Company | Consumption (Unit) |
|---------|--------------------|
| Towngas | |

Scope 3 Other Indirect Emissions

1. Paper

| Description | Consumption (kg) | Amount Recycled (kg) |
|-------------|------------------|----------------------|
| | | |
| | | |

2. Raw Materials for Product Manufacturing

[illegible]

3. Food

| Type | Consumption (kg) |
|------------|------------------|
| Beef | |
| Pork | |
| Chicken | |
| Fish | |
| Eggs | |
| Milk | |
| Vegetables | |
| Rice | |

4. Plastic Bags

| Description | Consumption (kg) |
|-------------|------------------|
| | |
| | |
| | |
| | |

5. Fresh Water

| Supplier | Consumption (m³) |
|---------------------------|------------------|
| Water Supplies Department | |

8. Waste & Recycle

Solid Waste

| Type of Solid Waste * | Weight (kg) |
|-------------------------------|-------------|
| General refuse / Office waste | |
| General refuse / Office waste | |

Liquid Waste (Sewage)

| Business Type * | Disposal (m³) |
|---|---------------|
| Restaurant and Catering Services / Other Business | |
| Restaurant and Catering Services / Other Business | |

Chemical Waste (other than mineral oil)

| Description | Disposal (kg) |
|-------------|---------------|
| | |
| | |

*Note: Delete as appropriate.

7. Staff Travel – Air Flight (no need to fill in Origin and Destination if Distance is given)

[illegible]

8. Staff Travel – Public Transportation

| Type | Distance / Expenses | Unit * |
|---------|---------------------|-----------|
| MTR | | km / HK\$ |
| Bus | | km / HK\$ |
| Minibus | | km / HK\$ |
| Tram | | km / HK\$ |
| Taxi | | km / HK\$ |
| Ferry | | km / HK\$ |

*Note: Delete as appropriate.

SME Carbon Audit Toolkit

Carbon Footprint

• 中文 • English



[Home](#)

[Carbon Audit Guidelines](#)

[Carbon Footprint](#)

[General Information](#)

(optional; for calculating performance indicators)

[Carbon Footprint Calculator](#)

[Scope 1 Energy Direct Emissions](#)

[Scope 2 Energy Indirect Emissions](#)

[Scope 3 Other Indirect Emissions](#)

[Report](#)

[Contact Us](#)

Scope 1 Energy Direct Emissions

Mobile Combustion
Sources

Stationary Combustion
Sources

Refrigerant

Tree Planting

| Vehicle Type | Fuel Type | Consumption | Amount |
|----------------------|----------------------|----------------------|----------------------|
| <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

Add and Calculate

[Report](#)

[Next Section](#)

[Next Scope](#)

SME Carbon Audit Toolkit

Carbon Footprint

• 中文 • English

[Home](#)

[Carbon Audit Guidelines](#)

[Carbon Footprint](#)

[General Information](#)

(optional; for calculating performance indicators)

[Carbon Footprint Calculator](#)

[Scope 1 Energy Direct Emissions](#)

[Scope 2 Energy Indirect Emissions](#)

[Scope 3 Other Indirect Emissions](#)

[Report](#)

[Contact Us](#)

Scope 2 Energy Indirect Emissions

Electricity

Town Gas

| Consumption (kWh) | Company |
|--|----------------------|
| <input type="text"/> | <input type="text"/> |
| <input type="button" value="Add and Calculate"/> | |

☐ Report

SME Carbon Audit Toolkit

Carbon Footprint

• 中文 • English



[Home](#)

[Carbon Audit Guidelines](#)

[Carbon Footprint](#)

[General Information](#)

(optional; for calculating performance indicators)

[Carbon Footprint Calculator](#)

[Scope 1 Energy Direct Emissions](#)

[Scope 2 Energy Indirect Emissions](#)

[Scope 3 Other Indirect Emissions](#)

[Report](#)

[Contact Us](#)

Scope 3 Other Indirect Emissions

| Paper | Raw Materials for Products Manufacturing | Food | Plastic Bags | Fresh Water | Waste | Staff Travel |
|--|--|----------------------|--------------|----------------------|-------|--------------|
| Description | | Consumption (kg) | | Recycled (kg) | | |
| <input type="text"/> | | <input type="text"/> | | <input type="text"/> | | |
| <input type="button" value="Add and Calculate"/> | | | | | | |

Carbon Emissions Summary

| | Equivalent CO ₂ Emissions (kg CO ₂ -eq) | Percentage (%) |
|----------------|---|----------------|
| Scope 1 | 7,003 | 20.12% |
| Scope 2 | 19,440 | 55.86% |
| Scope 3 | 8,361 | 24.02% |
| Total | 34,804 | |

Performance Indicator

| Index | Carbon footprint indicator | |
|--------------|----------------------------|-----------------------------------|
| Man-power | 2.11 | kg CO ₂ -eq / man-hour |
| Gross income | | kg CO ₂ -eq / HK\$ |

We derived emission factors for local transportation in HK.

- Distance Approach (kg CO₂-eq / passenger · km)
 - MTR
 - Bus
 - Minibus
 - Tram
 - Taxi
 - Ferry

Why not WRI or BSI emission factors?



San Francisco, U.S.A.



Hong Kong

Sample Analysis – Buses

- Three Major Franchised Bus Co.
 - Kowloon Motor Bus (KMB)
 - CityBus (CTB)
 - New World First Bus (NWFB)
- Two Small Franchised Bus Co.
 - New Lantao Bus (Mainly service in Lantau Island)
 - Long Win Bus (Service between Airport and Towns)



| Descriptions | Kowloon Motor Bus (KMB) | CityBus (CTB) | New World First Bus (NWFB) | Total |
|---------------------------------------|--------------------------------|----------------------|-----------------------------------|--------------|
| Annual Passenger Trip (in million) | 1,007.873 | 207.762 | 183.076 | 1,398.711 |
| Annual Mileage (in million km) | 336.215 | 82.361 | 50.923 | 469.499 |
| Number of Fleets | 4,021 | 913 | 702 | 5,636 |
| Number of Routes | 403 | 111 | 94 | 608 |

Reference: Hong Kong Transport Department (TD), 2007. Annual Transport Digest 2007.

Annual equivalent CO₂ emission by burning diesel for all buses

$$= 2.6394 \text{ kg CO}_2\text{-eq / L} \times 218,223,135.2 \text{ L}$$

$$= 575,978,143 \text{ kg CO}_2\text{-eq}$$

Therefore, the equivalent CO₂ emission factor for taking franchised buses in a single trip

$$= 575,978,143 \text{ kg CO}_2\text{-eq} \div 469.499 \times 106 \text{ km} \div 44 \text{ passengers}$$

$$= 0.0279 \text{ kg CO}_2\text{-eq / passenger} \cdot \text{km}$$

Note: WRI emission factor for diesel urban bus is
0.19 kg CO₂ passenger⁻¹ km⁻¹.

Emission Factors for Public Transportation in Hong Kong

| Transportation type | $EF_{CO_2\text{-eq,trans man-dist}}$ (kg CO ₂ -eq/man-km) | $EF_{CO_2\text{-eq,trans cost}}$ (kg CO ₂ -eq/HK\$) |
|----------------------------|---|---|
| Mass Transit Railway (MTR) | 0.0078 | 0.0115 |
| Bus | 0.0279 | 0.0493 |
| Minibus | 0.0631 (Diesel) / 0.0648 (LPG) | 0.0919 (Diesel) / 0.0944 (LPG) |
| Tram | 0.0274 | 0.0685 |
| Taxi | 0.1210 | 0.0210 |
| Ferry | 2.2276 | 1.478 |

More Local Emission Factors Needed

- Household goods (e.g. clothes, electronic products, etc.)
- Imported foods vs local produces
- Overseas vacations
- More

Thank you