BANGLADESH
People's Republic of Bangladesh

Dhaka

Land area: 130,168 km²
Urban population: 28%, 42 million (2010)
Population with access to electricity: 41%, 60 million (2009)

ROAD TRANSPORT: EMISSIONS PER VEHICLE TYPE

Total CO₂ Emissions

CO₂ Emissions By Type (2010)

CO₂ per GDP & capita

Source: Clean Air Asia estimates, 2012

ROAD TRANSPORT: DRIVERS OF EMISSIONS

Vehicle Population & Motorization Index

Fuel Consumption

VKT by Mode (2000 and 2010)

Emission Standards for New Light-Duty Vehicles

Current Sulfur levels in Diesel (ppm)


The Emissions Profile accompanies Accessing Asia: Air Pollution and Greenhouse Gas Emissions Indicators from Road Transport and Electricity. Accessing Asia presents the first benchmark of air pollutant (as particulate matter, PM) and GHG (as CO₂) emissions for 13 countries across Asia for road transport and electricity.
ELECTRICITY: CO₂ EMISSIONS

CO₂ Emissions (from generation) per Source Type (2009)

- Coal: 49% (27 million tons)
- Oil: 45%
- Natural Gas: 6%

Source: Clean Air Asia estimates, 2012

Total CO₂ emissions from generation and consumption

TWh

Generation by Source Type (2009)

- Natural Gas: 49%
- Oil: 23%

Consumption by End-use Sector (2009)

- Residential: 46%
- Industrial: 28%
- Other: 17%
- Commercial: 9%


NOTES:

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2. Emissions from road transport sector were estimated using the Activity-Structure-Intensity-Fuel (ASIF) approach (adapted from Schipper and Marie 1999; Schipper, Gorham, and Marie, 2000). In this approach, road transport emissions are dependent on the level of transport activity (A); road transport mode structure (S); fuel intensity (I); and carbon content of fuel or emission factor (F).
3. Vehicle population numbers were collected from the Bangladesh Road Transport Authority. VKT information were sourced from the Roads and Highways Department, Ministry of Construction.
4. Fuel consumption data presented in this profile is based on activity data.
5. Data collected is from reported electricity generation and consumption.
6. Electricity generation from oil, natural gas, and hydropower. Geothermal power, combustible renewables, wind power, and solar power are not applicable.
7. Due to the lack of data, electricity consumption by end-use sector is considered to be under reported.
8. Electricity consumption from other sectors includes public administration and defense, education, health and social services, community, social and personal services.

Emissions Profile: Bangladesh

For more information about Clean Air Asia, please visit www.cleanairasia.org
For the data found in this report, please visit www.CitiesACT.org
AIR POLLUTION AND GREENHOUSE GAS EMISSIONS FROM ROAD TRANSPORT AND ELECTRICITY

INDIA

Republic of India

Delhi

Land area: 2973193 km²


Urban population: 30%, 352 million (2010)

Population with access to electricity: 66%, 766 million (2009)


ROAD TRANSPORT: EMISSIONS PER VEHICLE TYPE

Total CO₂ Emissions


CO₂ Emissions By Type (2010)

CO₂ per GDP & capita

Source: Clean Air Asia estimates, 2012

Source: Clean Air Asia estimates, 2012

Source: Clean Air Asia estimates, 2012

ROAD TRANSPORT: DRIVERS OF EMISSIONS

Vehicle Population and Motorization Index

Fuel Consumption

Emission Standards for New Light-Duty Vehicles

Current Sulfur levels in Diesel (ppm)

Source: Clean Air Asia.

Emissions Profile: India

The Emissions Profile accompanies Accessing Asia: Air Pollution and Greenhouse Gas Emissions Indicators from Road Transport and Electricity. “Accessing Asia presents the first benchmark of air pollutant (as particulate matter, PM) and GHG (as CO₂) emissions for 13 countries across Asia for road transport and electricity.”
ACCESSING ASIA
Air Pollution and Greenhouse Gas Emissions from Road Transport and Electricity

ELECTRICITY: CO₂ EMISSIONS

CO₂ Emissions (from generation) per Source Type (2009)

- Coal: 6%
- Oil: 0.00%
- Natural Gas: 91%

Source: Clean Air Asia estimates, 2012

Total CO₂ emissions from generation and consumption

- 2000: 0.81
- 2009: 0.78

TCO₂ per capita

- 2000: 0.81
- 2009: 0.78

Source: Clean Air Asia estimates, 2012

ELECTRICITY: DRIVERS OF EMISSIONS

- Residential: 3%
- Commercial: 11%
- Industrial: 57%
- Transport: 2%
- Other: 27%

Generation by Source Type (2009)

- Coal: 68%
- Oil: 3%
- Natural Gas: 12%
- Renewable: 14%
- Other: 3%

Consumption by End-use Sector (2009)

- Residential: 3%
- Commercial: 11%
- Industrial: 57%
- Transport: 2%
- Other: 27%


NOTES:

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3. Vehicle population numbers were collected from the Ministry of Road Transport and Highways. VKT information were sourced from the SIAM statistics, India Planning Commission, and fleet records.
4. Fuel consumption data presented in this profile is based on activity data.
5. Data collected is from reported electricity generation and consumption.
6. Electricity generation is from fossil fuels and hydropower. Geothermal power is not applicable. Combustible renewables, wind power, and solar power are assumed equal for a rough disaggregated estimate. Other sources include independent power producers and nuclear energy.
7. Due to the lack of data, electricity consumption by end-use sector is considered to be under reported.
8. Electricity consumption from other sectors includes agriculture, public water works, sewage pumping, and non-specified.

Emissions Profile: India
For more information about Clean Air Asia, please visit www.cleanairasia.org
For the data found in this report, please visit www.CitiesACT.org
INDONESIA

Republic of Indonesia

Jakarta

Land area: 9,569,901 km²
Urban population: 50%, 120 million (2010)
Population with access to electricity: 65%, 153 million (2009)
GDP per capita (constant 2000 USD): 1,144 (2010)

ROAD TRANSPORT: EMISSIONS PER VEHICLE TYPE

Total CO₂ Emissions

<table>
<thead>
<tr>
<th>Year</th>
<th>CO₂ Emissions (million tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>44.4</td>
</tr>
<tr>
<td>2002</td>
<td>48.4</td>
</tr>
<tr>
<td>2004</td>
<td>61.5</td>
</tr>
<tr>
<td>2006</td>
<td>79.8</td>
</tr>
<tr>
<td>2008</td>
<td>90.6</td>
</tr>
<tr>
<td>2010</td>
<td>102.3</td>
</tr>
</tbody>
</table>

Source: Clean Air Asia estimates, 2012

CO₂ Emissions By Type (2010)

<table>
<thead>
<tr>
<th>Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2W</td>
<td>32%</td>
</tr>
<tr>
<td>3W</td>
<td>16%</td>
</tr>
<tr>
<td>PC</td>
<td>26%</td>
</tr>
<tr>
<td>MUV</td>
<td>9%</td>
</tr>
<tr>
<td>BUS</td>
<td>17%</td>
</tr>
<tr>
<td>LCV</td>
<td>6%</td>
</tr>
<tr>
<td>HCV</td>
<td>11%</td>
</tr>
</tbody>
</table>

Source: Clean Air Asia estimates, 2012

CO₂ per GDP & capita

<table>
<thead>
<tr>
<th>Year</th>
<th>CO₂ emissions per capita</th>
<th>CO₂ emissions per US dollar at constant 2000 prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>0.50</td>
<td>0.00</td>
</tr>
<tr>
<td>2004</td>
<td>0.40</td>
<td>0.10</td>
</tr>
<tr>
<td>2008</td>
<td>0.30</td>
<td>0.20</td>
</tr>
</tbody>
</table>

Source: Clean Air Asia estimates, 2012

ROAD TRANSPORT: DRIVERS OF EMISSIONS

Vehicle Population and Motorization Index

<table>
<thead>
<tr>
<th>Year</th>
<th>Vehicle Population (millions)</th>
<th>Motorization Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>10</td>
<td>0%</td>
</tr>
<tr>
<td>2002</td>
<td>20</td>
<td>20%</td>
</tr>
<tr>
<td>2004</td>
<td>30</td>
<td>40%</td>
</tr>
<tr>
<td>2006</td>
<td>40</td>
<td>60%</td>
</tr>
<tr>
<td>2008</td>
<td>50</td>
<td>80%</td>
</tr>
<tr>
<td>2010</td>
<td>60</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: Clean Air Asia estimates, 2012

Fuel Consumption

<table>
<thead>
<tr>
<th>Year</th>
<th>Gasoline (ktoe)</th>
<th>Diesel (ktoe)</th>
<th>LPG (ktoe)</th>
<th>CNG (ktoe)</th>
<th>Electric (ktoe)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td>2002</td>
<td>20</td>
<td>40</td>
<td>60</td>
<td>80</td>
<td>100</td>
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<td>2004</td>
<td>30</td>
<td>60</td>
<td>90</td>
<td>120</td>
<td>150</td>
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<tr>
<td>2006</td>
<td>40</td>
<td>80</td>
<td>120</td>
<td>160</td>
<td>200</td>
</tr>
<tr>
<td>2008</td>
<td>50</td>
<td>100</td>
<td>150</td>
<td>200</td>
<td>250</td>
</tr>
<tr>
<td>2010</td>
<td>60</td>
<td>120</td>
<td>180</td>
<td>240</td>
<td>300</td>
</tr>
</tbody>
</table>

Source: Clean Air Asia estimates, 2012

Emission Standards for New Light-Duty Vehicles

- Euro 2: Since 2005

Current Sulfur levels in Diesel (ppm)

- Since 2010: 350

Source: Clean Air Asia

Emissions Profile: Indonesia

Clean Air Asia, 2012. Emissions Profile: P.R. China. Pasig City, Philippines. The Emissions Profile accompanies Accessing Asia: Air Pollution and Greenhouse Gas Emissions Indicators from Road Transport and Electricity.” Accessing Asia presents the first benchmark of air pollutant (as particulate matter, PM) and GHG (as CO₂) emissions for 13 countries across Asia for road transport and electricity.
ACCESSING ASIA
Air Pollution and Greenhouse Gas Emissions from Road Transport and Electricity

ELECTRICITY: CO₂ EMISSIONS

CO₂ Emissions (from generation) per Source Type (2009)

![CO₂ Emissions Chart]

Total CO₂ emissions from generation and consumption

![Total CO₂ Emissions Chart]

ELECTRICITY: DRIVERS OF EMISSIONS

ELECTRICITY GENERATION

ELECTRICITY CONSUMPTION

Generation by Source Type (2009)

Consumption by End-use Sector (2009)

NOTES:

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2. Emissions from road transport sector were estimated using the Activity-Structure-Intensity-Fuel (ASIF) approach (adapted from Schipper and Marie 1999; Schipper, Gorham, and Marie, 2000). In this approach, road transport emissions are dependent on the level of transport activity (A); road transport mode structure (S); fuel intensity (f); and carbon content of fuel or emission factor (F).
3. Vehicle population numbers were estimated from State Traffic Police and GAKINDO. VKT information were sourced from Suhandi, D. (2008) and Indonesia’s TNA on Climate Change.
4. Fuel consumption data presented in this profile is based on activity data.
5. Data collected is from reported electricity generation and consumption.
6. Electricity generation is from fossil fuels, geothermal, and hydropower. Other renewable energy sources are still being explored.
7. Electricity consumption from other sector is from public services.

Emissions Profile: Indonesia
For more information about Clean Air Asia, please visit www.cleanairasia.org
For the data found in this report, please visit www.CitiesACT.org
LAO PDR
Lao People's Democratic Republic

Vientiane
Land area: 230,800 km²
Urban population: 33%, 2 million (2010)
Population with access to electricity: 55%, 3 million (2009)

ROAD TRANSPORT: EMISSIONS PER VEHICLE TYPE

Total CO₂ Emissions

CO₂ Emissions By Type (2010)

CO₂ per GDP & capita

Source: Clean Air Asia estimates, 2012

Vehicle Population and Motorization Index

Fuel Consumption

Emission Standards for New Light-Duty Vehicles

Current Sulfur levels in Diesel (ppm)

Not available

Not available

Emissions Profile: Lao PDR
The Emissions Profile accompanies Accessing Asia: Air Pollution and Greenhouse Gas Emissions Indicators from Road Transport and Electricity.” Accessing Asia presents the first benchmark of air pollutant (as particulate matter, PM) and GHG (as CO₂) emissions for 13 countries across Asia for road transport and electricity.
**ACCESSING ASIA**

Air Pollution and Greenhouse Gas Emissions from Road Transport and Electricity

**ELECTRICITY: DRIVERS OF EMISSIONS**

### Generation by Source Type (2009)

- **Renewable Energy**: 100%

### Consumption by End-use Sector (2009)

- **Residential**: 36%
- **Industrial**: 34%
- **Commercial**: 22%
- **Other**: 8%

**ELECTRICITY GENERATION**

**ELECTRICITY CONSUMPTION**

**Sources:** Ministry of Energy and Mines – Department Of Electricity; World Bank Development Indicators.

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3. Vehicle population numbers were estimated from Ministry of Communication, Transport, Post and Construction. VKT information were estimated from city data (Vientiane).
4. Fuel consumption data presented in this profile is based on activity data.
5. Data collected is from reported electricity generation and consumption.
6. Electricity generation is exclusively from hydropower; Lao PDR was considered to have zero emissions.
**ACCESSING ASIA**

**Air Pollution and Greenhouse Gas Emissions from Road Transport and Electricity**

**MALAYSIA**

**Federation of Malaysia**

Kuala Lumpur

- **Land area:** 328657 km²
- **Population:** 28 million (2010)
- **Urban population:** 73%, 21 million (2010)
- **Population with access to electricity:** 99%, 28 million (2009)
- **GDP (constant 2000 USD):** 147 billion (2010)
- **GDP per capita (constant 2000 USD):** 5212 (2010)

**ROAD TRANSPORT: EMISSIONS PER VEHICLE TYPE**

- **Total CO₂ Emissions**
  - 2000: 29.4 million tons
  - 2002: 30.8 million tons
  - 2004: 36.7 million tons
  - 2006: 41.1 million tons
  - 2008: 45.8 million tons
  - 2010: 50.3 million tons

- **CO₂ Emissions By Type (2010)**
  - 2W: 3% (1.4 million tons)
  - 3W: 1% (513,500 tons)
  - PC: 7% (2.7 million tons)
  - MUV: 1% (246,900 tons)
  - BUS: 1% (246,900 tons)
  - LCV: 24% (1.3 million tons)
  - HCV: 41% (2.1 million tons)

- **CO₂ per GDP & capita**
  - 2000: 0.29 tons CO₂ per US dollar at constant 2000 prices
  - 2002: 0.30 tons CO₂ per US dollar at constant 2000 prices
  - 2004: 0.31 tons CO₂ per US dollar at constant 2000 prices
  - 2006: 0.32 tons CO₂ per US dollar at constant 2000 prices
  - 2008: 0.33 tons CO₂ per US dollar at constant 2000 prices
  - 2010: 0.34 tons CO₂ per US dollar at constant 2000 prices

**ROAD TRANSPORT: DRIVERS OF EMISSIONS**

- **Vehicle Population and Motorization Index**
  - **2000**
    - Vehicle Population: 4.8 million (16% motorization index)
    - Motorization Index: 16%
  - **2010**
    - Vehicle Population: 16.2 million (40% motorization index)
    - Motorization Index: 40%

- **VKT by Mode (2002-2010)**
  - 2000: Total VKT = 142.8 billion km
  - 2010: Total VKT = 732.8 billion km

- **Fuel Consumption**
  - 2000: 2500 ktoe
  - 2010: 10,000 ktoe

- **Emission Standards for New Light-Duty Vehicles**
  - Gasoline: Euro 2 (Since 2009)
  - Diesel: 500 ppm (Since 2009)

**Emissions Profile: Malaysia**

Clean Air Asia. 2012. Emissions Profile: Malaysia. Pasig City, Philippines. The Emissions Profile accompanies Accessing Asia: Air Pollution and Greenhouse Gas Emissions Indicators from Road Transport and Electricity. Accessing Asia presents the first benchmark of air pollutant (as particulate matter, PM) and GHG (as CO₂) emissions for 13 countries across Asia for road transport and electricity.
ELECTRICITY: CO₂ EMISSIONS

CO₂ Emissions (from generation) per Source Type (2009)

- Coal: 16%
- Oil: 24%
- Natural Gas: 60%

112 million tons

Source: Clean Air Asia estimates, 2012

Total CO₂ emissions from generation and consumption

- Total CO₂ from electricity generation
- Total CO₂ from electricity consumption

2000 2001 2002 2003 2004 2005 2006 2007 2008 2009

Source: Clean Air Asia estimates, 2012

ELECTRICITY: DRIVERS OF EMISSIONS

- TCO₂ per capita
- kgCO₂ per GDP

2000 2009

Source: Clean Air Asia estimates, 2012

Emissions Profile: Malaysia

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2. Emissions from road transport sector were estimated using the Activity-Structure-Intensity-Fuel (ASIF) approach (adapted from Schipper and Marie 1999; Schipper, Gorham, and Marie, 2000). In this approach, road transport emissions are dependent on the level of transport activity (A); road transport mode structure (S); fuel intensity (I); and carbon content of fuel or emission factor (f).
3. Vehicle population numbers were estimated from Road Transport Department, Ministry of Transport. VKT information were estimated from various studies.
4. Fuel consumption data presented in this profile is based on activity data.
5. Data collected is from reported electricity generation and consumption.
6. Electricity generation is from fossil fuels and hydropower. Geothermal and wind power are not applicable. Combustible renewables (as biiod) and solar power are considered to be equal for a rough disaggregation.
7. Electricity consumption from other sectors includes public lighting, mining, agriculture, and miscellaneous.
NEPAL
Federal Democratic Democratic Republic of Nepal
Kathmandu
Land area: 143351 km²
Population: 30 million (2010)
Urban population: 17%, 5 million (2010)
Population with access to electricity: 44%, 13 million (2009)

ROAD TRANSPORT: EMISSIONS PER VEHICLE TYPE

CO₂ Emissions By Type (2010)

CO₂ emissions per GDP & capita

CO₂ per GDP & capita

Vehicle Population and Motorization Index

Fuel Consumption

Emission Standards for New Light-Duty Vehicles

Current Sulfur levels in Diesel (ppm)

Not available

Emissions Profile: Nepal

The Emissions Profile accompanies Accessing Asia: Air Pollution and Greenhouse Gas Emissions Indicators from Road Transport and Electricity.” Accessing Asia presents the first benchmark of air pollutant (as particulate matter, PM) and GHG (as CO₂) emissions for 13 countries across Asia for road transport and electricity.
ELECTRICITY: CO₂ EMISSIONS

CO₂ Emissions (from generation) per Source Type (2009)

Total CO₂ emissions from generation and consumption

ELECTRICITY: DRIVERS OF EMISSIONS

Generation by Source Type (2009)

Consumption by End-use Sector (2009)

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3. Vehicle population numbers were collected from the Department of Transport Management. VKT information were sourced from Dhakal, (2003).
4. Fuel consumption data presented in this profile is based on activity data.
5. Data collected is from reported electricity generation and consumption.
6. Electricity generation is exclusively from oil and hydropower.
7. Due to the lack of data, electricity consumption by end-use sector is considered to be under reported.
8. Electricity consumption from other sectors includes water supply & irrigation, non-commercial, street light, temporary supply, temple, community sales and exported supply.

Emissions Profile: Nepal

For more information about Clean Air Asia, please visit www.cleanairasia.org
For the data found in this report, please visit www.CitiesACT.org
**PAKISTAN**

Islamic Republic of Pakistan

Islamabad

- Land area: 770,875 km²
- Urban population: 36%, 62 million (2010)
- Population with access to electricity: 62%, 106 million (2009)

---

**ROAD TRANSPORT: EMISSIONS PER VEHICLE TYPE**

**Total CO₂ Emissions**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total CO₂ Emissions (million tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>20.2</td>
</tr>
<tr>
<td>2002</td>
<td>24.0</td>
</tr>
<tr>
<td>2004</td>
<td>26.0</td>
</tr>
<tr>
<td>2006</td>
<td>29.5</td>
</tr>
<tr>
<td>2008</td>
<td>31.5</td>
</tr>
<tr>
<td>2010</td>
<td>34.7</td>
</tr>
</tbody>
</table>

**CO₂ Emissions By Type (2010)**

- 2W: 23%
- 3W: 13%
- PC: 6%
- MUV: 14%
- BUS: 38%

**CO₂ per GDP & capita**

<table>
<thead>
<tr>
<th>Year</th>
<th>CO₂ per GDP &amp; capita (kgCO₂ per US dollar at constant 2000 prices)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>0.00</td>
</tr>
<tr>
<td>2002</td>
<td>0.05</td>
</tr>
<tr>
<td>2004</td>
<td>0.10</td>
</tr>
<tr>
<td>2006</td>
<td>0.15</td>
</tr>
<tr>
<td>2008</td>
<td>0.20</td>
</tr>
<tr>
<td>2010</td>
<td>0.25</td>
</tr>
</tbody>
</table>

---

**ROAD TRANSPORT: DRIVERS OF EMISSIONS**

**Vehicle Population and Motorization Index**

- Motorization Index: 0%, 20%, 40%, 60%, 80%, 100%

**Fuel Consumption**

- Gasoline
- Diesel
- LPG
- CNG
- Electric

**VKT by Mode (2002-2010)**

- 2W
- 3W
- PC
- MUV
- Bus
- LCV
- HCV

**Emission Standards for New Light-Duty Vehicles**

- Euro 2: Since 2005
- Current Sulfur levels in Diesel (ppm) (marketed): Since 2010, 7000

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**Emissions Profile: Pakistan**


The Emissions Profile accompanies Accessing Asia: Air Pollution and Greenhouse Gas Emissions Indicators from Road Transport and Electricity.” Accessing Asia presents the first benchmark of air pollutant (as particulate matter, PM) and GHG (as CO₂) emissions for 13 countries across Asia for road transport and electricity.
ELECTRICITY: CO₂ EMISSIONS

CO₂ Emissions (from generation) per Source Type (2009)

- Coal: 38%
- Oil: 20%
- Natural Gas: 62%

Source: Clean Air Asia estimates, 2012

Total CO₂ emissions from generation and consumption

- Total CO₂ from electricity generation
- Total CO₂ from electricity consumption

Source: Clean Air Asia estimates, 2012

ELECTRICITY: DRIVERS OF EMISSIONS

ELECTRICITY GENERATION

Generation by Source Type (2009)

- Oil: 36%
- Natural Gas: 29%
- Renewable Energy: 30%

Consumption by End-use Sector (2009)

- Residential: 40%
- Commercial: 25%
- Industrial: 15%
- Other: 15%

Sources: Pakistan Economic Survey 2010-2011; National Electric Power Regulatory Authority State of Industry; Water and Power Development Authority Power Statistics 2010; World Bank Development Indicators

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3. Vehicle population numbers were estimated from Pakistan Economic Surveys. VKT information were estimated from IRG, (2010).
4. Fuel consumption data presented in this profile is based on activity data.
5. Data collected is from reported electricity generation and consumption.
6. Electricity generation is from fossil fuels and hydropower. The other source is nuclear energy.
7. Electricity consumption from other sectors includes agriculture, street lights, and government use.
PHILIPPINES

Republic of the Philippines

Beijing

Land area: 298,170 km²
Population with access to electricity: 90%, 83 million (2009)

ROAD TRANSPORT: EMissions PER VEHICLE TYPE

Total CO₂ Emissions

CO₂ Emissions By Type (2010)

CO₂ per GDP & capita

Vehicle Population and Motorization Index

Fuel Consumption

VKT by Mode (2002-2010)

Emission Standards for New Light-Duty Vehicles

Current Sulfur levels in Diesel (ppm)

Source: Clean Air Asia estimates, 2012
Source: Clean Air Asia estimates, 2012
Source: Clean Air Asia estimates, 2012
Source: Clean Air Asia estimates, 2012
Source: Clean Air Asia estimates, 2012

Emissions Profile: Philippines

The Emissions Profile accompanies Accessing Asia: Air Pollution and Greenhouse Gas Emissions Indicators from Road Transport and Electricity.” Accessing Asia presents the first benchmark of air pollutant (as particulate matter, PM) and GHG (as CO₂) emissions for 13 countries across Asia for road transport and electricity.
**ELECTRICITY: CO₂ EMISSIONS**

**CO₂ Emissions (from generation) per Source Type (2009)**

- Coal: 30%
- Oil: 15%
- Natural Gas: 55%
- Total: 26 million tons

Source: Clean Air Asia estimates, 2012

**Total CO₂ emissions from generation and consumption**

- 2000: 10 TWh
- 2001: 15 TWh
- 2002: 20 TWh
- 2003: 25 TWh
- 2004: 30 TWh
- 2005: 35 TWh
- 2006: 40 TWh
- 2007: 45 TWh
- 2008: 50 TWh
- 2009: 55 TWh

**kgCO₂ per kWh**

- 2000: 0.47
- 2009: 0.42

Asia Average 2009: 0.50

**TCO₂ per capita**

- 2000: 0.22
- 2009: 0.23

Asia Average 2009: 0.83

**kgCO₂ per GDP**

- 2000: 0.30
- 2009: 0.27

Asia Average 2009: 0.90

**ELECTRICITY: DRIVERS OF EMISSIONS**

**Generation by Source Type (2009)**

- Coal: 21%
- Natural Gas: 32%
- Oil: 9%
- Renewable Energy: 32%

**Consumption by End-use Sector (2009)**

- Industrial: 24%
- Residential: 24%
- Commercial: 25%
- Other: 11%

**Emissions Profile: Philippines**


For more information about Clean Air Asia, please visit www.cleanairasia.org

For the data found in this report, please visit www.CitiesACT.org

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2. Emissions from road transport sector were estimated using the Activity-Structure-Intensity-Fuel (ASIF) approach (adapted from Schipper and Marie 1999; Schipper, Gorham, and Marie, 2000). In this approach, road transport emissions are dependent on the level of transport activity (A); road transport mode structure (S); fuel intensity (I); and carbon content of fuel or emission factor (F).
3. Vehicle population numbers were collected from the Land Transportation Office. VKT information were estimated from various studies.
4. Fuel consumption data presented in this profile is based on activity data.
5. Data collected is from reported electricity generation and consumption.
6. Electricity generation is from fossil fuels, geothermal, and hydropower. Combustible renewables, wind power, and solar power are assumed equal for a rough disaggregation.
7. Electricity consumption from other sectors includes public services, agriculture, and non-specified electricity usage. Limited data was found for transport.
PR CHINA

People’s Republic of China

Beijing

- Land area: 956,990 km²
- Population: 133.8 million (2010)
- Urban population: 45%, 601 million (2010)
- Population with access to electricity: 99%, 132.3 million (2009)
- GDP (constant 2000 USD): 324.4 billion (2010)

**ROAD TRANSPORT: EMISSIONS PER VEHICLE TYPE**

\[
\text{Total CO}_2 \text{ Emissions} \\
243.1 + 285.9 + 349.6 + 426.0 = 657.7 \\
\text{CO}_2 \text{ Emissions By Type (2010)} \\
\text{2W: 28%, 3W: 29%, LCV: 9%, HCV: 3%, PC: 1%} \\
\text{CO}_2 \text{ per GDP & capita} \\
0, 0.05, 0.1, 0.15, 0.2, 0.25 \\
\text{CO}_2 \text{ emissions per capita} \\
0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6 \\
\text{CO}_2 \text{ emissions per GDP} \\
0, 0.05, 0.1, 0.15, 0.2, 0.25 \\
\text{KgCO}_2 \text{ per US dollar at constant 2000 prices} \\
0, 0.05, 0.1, 0.15, 0.2, 0.25
\]

**ROAD TRANSPORT: DRIVERS OF EMISSIONS**

- Vehicle Population and Motorization Index
- Fuel Consumption
- Emission Standards for New Light-Duty Vehicles
- Current Sulfur levels in Diesel (ppm)

**Emissions Profile: P.R. China**

The Emissions Profile accompanies Accessing Asia: Air Pollution and Greenhouse Gas Emissions Indicators from Road Transport and Electricity.” Accessing Asia presents the first benchmark of air pollutant (as particulate matter, PM) and GHG (as CO₂) emissions for 13 countries across Asia for road transport and electricity.
**ACCESSING ASIA**

**Air Pollution and Greenhouse Gas Emissions from Road Transport and Electricity**

**ELECTRICITY: CO₂ EMISSIONS**

- **CO₂ Emissions (from generation) per Source Type (2009)**
  - 3137 million tons
  - 99%
  - Source: Clean Air Asia estimates, 2012

- **Total CO₂ emissions from generation and consumption**
  - Million Metric Tons
  - Source: Clean Air Asia estimates, 2012

**ELECTRICITY: DRIVERS OF EMISSIONS**

- **kgCO₂ per kWh**
  - 0.85
  - 0.83
  - Asia Average 2009: 0.83
  - Source: Clean Air Asia estimates, 2012

- **TCO₂ per capita**
  - 0.95
  - 2.32
  - Asia Average 2009: 0.90
  - Source: Clean Air Asia estimates, 2012

- **kgCO₂ per GDP**
  - 0.97
  - 2.33
  - Asia Average 2009: 0.90
  - Source: Clean Air Asia estimates, 2012

**ELECTRICITY GENERATION**

- **ELECTRICITY CONSUMPTION**

  - 3766 TWh
  - 3705 TWh

**Generation by Source Type (2009)**

- Coal 79%
- Oil 79%
- Natural Gas 1%
- Renewable 17%
- Other 2%

**Consumption by End-use Sector (2009)**

- Residential 12%
- Commercial 11%
- Industrial 79%
- Other 2%

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3. Vehicle population numbers were collected from National Bureau of Statistics, Ministry of Environmental Protection. VKT information were estimated from city data (Vientiane).
4. Fuel consumption data presented in this profile is based on activity data.
5. Data collected is from reported electricity generation and consumption.
6. Electricity generation is from fossil fuels and hydropower. Geothermal, combustible renewables, wind power, and solar power are assumed to be equal for a rough disaggregation. The other source is from nuclear energy.
7. Electricity consumption from other sectors includes agriculture, forestry, animal husbandry, fishery, water conservancy, and non-specified areas. Limited electricity consumption data was found for the commercial sector, transport sector, and own-use consumption.

**Emissions Profile: P.R. China**


For more information about Clean Air Asia, please visit www.cleanairasia.org

For the data found in this report, please visit www.CitiesACT.org
SINGAPORE

Republic of Singapore

- Singapore
  - Land area: 627 km²
  - Population: 5 million (2010)
  - Urban population: 100%, 5 million (2010)
  - Population with access to electricity: 100%, 5 million (2009)

### ROAD TRANSPORT: EMISSIONS PER VEHICLE TYPE

**Total CO₂ Emissions**

![Graph of Total CO₂ Emissions](image)

**CO₂ Emissions By Type (2010)**

- 2W: 6.4 million tons
- 3W: 6.6 million tons
- PC: 7.1 million tons
- MUV: 6.6 million tons
- LCV: 7.6 million tons
- HCV: 8.3 million tons

**CO₂ per GDP & capita**

![Graph of CO₂ per GDP & capita](image)

### ROAD TRANSPORT: DRIVERS OF EMISSIONS

**Vehicle Population and Motorization Index**

![Graph of Vehicle Population and Motorization Index](image)

**Fuel Consumption**

![Graph of Fuel Consumption](image)

**Emission Standards for New Light-Duty Vehicles**

- Gasoline
  - Euro 2
  - Since 2001
- Diesel
  - Euro 4
  - Since 2006

**Current Sulfur levels in Diesel (ppm)**

- Since 2006: 50

Source: Clean Air Asia estimates, 2012

---

Emissions Profile: Singapore

Clean Air Asia, 2012. Emissions Profile: S. Pasig City, Philippines. The Emissions Profile accompanies Accessing Asia: Air Pollution and Greenhouse Gas Emissions Indicators from Road Transport and Electricity.” Accessing Asia presents the first benchmark of air pollutant (as particulate matter, PM) and GHG (as CO₂) emissions for 13 countries across Asia for road transport and electricity.
ELECTRICITY: CO₂ EMISSIONS

CO₂ Emissions (from generation) per Source Type (2009)

- Coal: 76% (19 million tons)
- Oil: 24%

Total CO₂ emissions from generation and consumption

- 2000: 0.00 TWh
- 2009: 70 TWh

ELECTRICITY: DRIVERS OF EMISSIONS

- Source: Clean Air Asia estimates, 2012
- Generation by Source Type (2009)
  - Natural Gas: 81%
  - Oil: 19%

- Consumption by End-use Sector (2009)
  - Residential: 19%
  - Industrial: 81%

NOTES:

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2. Emissions from road transport sector were estimated using the Activity-Structure-Intensity-Fuel (ASIF) approach (adapted from Schipper and Marie 1999; Schipper, Gorham, and Marie, 2000). In this approach, road transport emissions are dependent on the level of transport activity (A); road transport mode structure (S); fuel intensity (I); and carbon content of fuel or emission factor (F).
3. Vehicle population numbers and VET were collected from Land Transport Authority.
4. Fuel consumption data presented in this profile is based on activity data.
5. Data collected is from reported electricity generation and consumption.
6. Electricity generation is from oil and natural gas. Coal, geothermal, hydropower, combustible renewables, wind power, and solar power are not applicable.
7. Electricity consumption from commercial and transport sectors have no data.

Emissions Profile: Singapore
For more information about Clean Air Asia, please visit www.cleanairasia.org
For the data found in this report, please visit www.CitiesACT.org
SRI LANKA
Democratic Socialist Republic of Sri Lanka
Colombo
Land area: 64630 km²
Urban population: 15%, 3 million (2010)
Population with access to electricity: 77%, 16 million (2009)

ROAD TRANSPORT: EMISSIONS PER VEHICLE TYPE

Total CO₂ Emissions

<table>
<thead>
<tr>
<th>Year</th>
<th>CO₂ Emissions (million tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>3.8</td>
</tr>
<tr>
<td>2002</td>
<td>4.0</td>
</tr>
<tr>
<td>2004</td>
<td>4.4</td>
</tr>
<tr>
<td>2006</td>
<td>5.1</td>
</tr>
<tr>
<td>2008</td>
<td>5.6</td>
</tr>
<tr>
<td>2010</td>
<td>6.0</td>
</tr>
</tbody>
</table>

CO₂ Emissions By Type (2010)

<table>
<thead>
<tr>
<th>Vehicle Type</th>
<th>CO₂ Emissions (Kt)</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2W</td>
<td>3.7</td>
<td>37%</td>
</tr>
<tr>
<td>3W</td>
<td>0.3</td>
<td>9%</td>
</tr>
<tr>
<td>PC</td>
<td>0.9</td>
<td>10%</td>
</tr>
<tr>
<td>MUV</td>
<td>0.5</td>
<td>12%</td>
</tr>
<tr>
<td>LCV</td>
<td>0.2</td>
<td>6%</td>
</tr>
<tr>
<td>BUS</td>
<td>0.1</td>
<td>17%</td>
</tr>
<tr>
<td>HCV</td>
<td>0.1</td>
<td>9%</td>
</tr>
</tbody>
</table>

CO₂ per GDP & capita

<table>
<thead>
<tr>
<th>Year</th>
<th>CO₂ emissions per GDP (Kt)</th>
<th>CO₂ emissions per capita (Kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>0.00</td>
<td>0.00</td>
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<tr>
<td>2002</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>2004</td>
<td>0.10</td>
<td>0.10</td>
</tr>
<tr>
<td>2006</td>
<td>0.15</td>
<td>0.15</td>
</tr>
<tr>
<td>2008</td>
<td>0.20</td>
<td>0.20</td>
</tr>
<tr>
<td>2010</td>
<td>0.25</td>
<td>0.25</td>
</tr>
</tbody>
</table>

ROAD TRANSPORT: DRIVERS OF EMISSIONS

Vehicle Population and Motorization Index

<table>
<thead>
<tr>
<th>Year</th>
<th>Vehicle Population (millions)</th>
<th>Motorization Index (Vehicles per 1000 people)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>1.0</td>
<td>281%</td>
</tr>
<tr>
<td>2002</td>
<td>1.5</td>
<td>338%</td>
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<tr>
<td>2004</td>
<td>2.0</td>
<td>395%</td>
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<td>2006</td>
<td>2.5</td>
<td>452%</td>
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<tr>
<td>2008</td>
<td>3.0</td>
<td>509%</td>
</tr>
<tr>
<td>2010</td>
<td>3.5</td>
<td>566%</td>
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</table>

Fuel Consumption

<table>
<thead>
<tr>
<th>Year</th>
<th>Gasoline</th>
<th>Diesel</th>
<th>LPG</th>
<th>CNG</th>
<th>Electric</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>50%</td>
<td>40%</td>
<td>5%</td>
<td>5%</td>
<td>0%</td>
</tr>
<tr>
<td>2002</td>
<td>50%</td>
<td>40%</td>
<td>5%</td>
<td>5%</td>
<td>0%</td>
</tr>
<tr>
<td>2004</td>
<td>50%</td>
<td>40%</td>
<td>5%</td>
<td>5%</td>
<td>0%</td>
</tr>
<tr>
<td>2006</td>
<td>50%</td>
<td>40%</td>
<td>5%</td>
<td>5%</td>
<td>0%</td>
</tr>
<tr>
<td>2008</td>
<td>50%</td>
<td>40%</td>
<td>5%</td>
<td>5%</td>
<td>0%</td>
</tr>
<tr>
<td>2010</td>
<td>50%</td>
<td>40%</td>
<td>5%</td>
<td>5%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Emission Standards for New Light-Duty Vehicles

- Euro 1: Since 2003

Current Sulfur levels in Diesel (ppm)

- 2012: 50 ppm (under consideration/discussion)

Emissions Profile: Sri Lanka


The Emissions Profile accompanies Accessing Asia: Air Pollution and Greenhouse Gas Emissions Indicators from Road Transport and Electricity.” Accessing Asia presents the first benchmark of air pollutant (as particulate matter, PM) and GHG (as CO₂) emissions for 13 countries across Asia for road transport and electricity.
CO₂ Emissions (from generation) per Source Type (2009)

- Coal
- Oil
- Natural Gas

Source: Clean Air Asia estimates, 2012

Total CO₂ emissions from generation and consumption

- Million Metric Tons

ELECTRICITY: DRIVERS OF EMISSIONS

- CO₂ Emissions (from generation) per Source Type (2009)

- Total CO₂ emissions from generation and consumption

- kgCO₂ per kWh

- TCO₂ per capita

- kgCO₂ per GDP

Source: Clean Air Asia estimates, 2012

ELECTRICITY: DRIVERS OF EMISSIONS

- ELECTRICITY GENERATION
- ELECTRICITY CONSUMPTION

Sources: Ceylon Electricity Board Statistical Digests 2001-2010; Sri Lanka Energy Balance 2007; World Bank Development Indicators.

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3. Vehicle population numbers were estimated from the Department of Census and Statistics. VKT information were estimated from various studies.

4. Fuel consumption data presented in this profile is based on activity data.

5. Data collected is from reported electricity generation and consumption.

6. Electricity is generated from oil, hydropower, combustible renewables, wind power, and solar power. Solar power is entirely from solar photovoltaic off-grid systems.

7. Due to the lack of data, electricity consumption by end-use sector is considered to be under reported.

8. Electricity consumption from other sectors includes street lighting and religious places.

Emissions Profile: Sri Lanka


For the data found in this report, please visit www.CitiesACT.org
THAILAND

Kingdom of Thailand

Bangkok

Land area: 510890 km²
Urban population: 34%, 24 million (2010)
Population with access to electricity: 99%, 67 million (2009)

GDP per capita (constant 2000 USD): 2751 (2010)

ROAD TRANSPORT: EMISSIONS PER VEHICLE TYPE

Total CO₂ Emissions

CO₂ Emissions By Type (2010)

CO₂ per GDP & capita

ROAD TRANSPORT: DRIVERS OF EMISSIONS

Vehicle Population and Motorization Index

Fuel Consumption

Emission Standards for New Light-Duty Vehicles

Current Sulfur levels in Diesel (ppm)

Emissions Profile: Thailand


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Emissions Profile: Thailand
For more information about Clean Air Asia, please visit www.cleanairasia.org
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4. Vehicle population numbers were collected from Department of Land Transport. VKT information were estimated from Department of Highways and various studies.
5. Fuel consumption data presented in this profile is based on activity data.
6. Electricity generation is from fossil fuels, geothermal, hydropower. Combustible renewables are not applicable. Wind and solar power are assumed equal for a rough disaggregation. Other sources are from small power producers and independent power producers.
7. Electricity consumption from other sources include free of charge, agriculture, and temporary customers.
VIETNAM
Socialist Republic of Vietnam

Hanoi
- Land area: 310070 km²
- Urban population: 30%, 26 million (2010)
- Population with access to electricity: 98%, 84 million (2009)

ROAD TRANSPORT: EMISSIONS PER VEHICLE TYPE

Total CO₂ Emissions

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂ (million tons)</td>
<td>8.5</td>
<td>12.0</td>
<td>13.9</td>
<td>17.9</td>
<td>25.5</td>
<td>30.5</td>
</tr>
</tbody>
</table>

CO₂ Emissions By Type (2010)

- 2W: 3% of CO₂ emissions
- 3W: 19% of CO₂ emissions
- PC: 46% of CO₂ emissions
- MUV: 3% of CO₂ emissions
- BUS: 3% of CO₂ emissions
- LCV: 3% of CO₂ emissions
- HCV: 3% of CO₂ emissions

CO₂ per GDP & capita

- 2000: 0.00 kg CO₂ per US dollar at constant 2000 prices
- 2002: 0.05 kg CO₂ per US dollar at constant 2000 prices
- 2004: 0.10 kg CO₂ per US dollar at constant 2000 prices
- 2006: 0.15 kg CO₂ per US dollar at constant 2000 prices
- 2008: 0.20 kg CO₂ per US dollar at constant 2000 prices
- 2010: 0.25 kg CO₂ per US dollar at constant 2000 prices

ROAD TRANSPORT: DRIVERS OF EMISSIONS

Vehicle Population and Motorization Index

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Motorization Index</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Vehicle Population</td>
<td>0</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>25</td>
</tr>
</tbody>
</table>

Fuel Consumption

- Gasoline
- Diesel
- LPG
- CNG
- Electric

Emission Standards for New Light-Duty Vehicles

- Euro 2
  - Since 2007

Current Sulfur levels in Diesel (ppm)

- Since 2007: 500 ppm

Emissions Profile: Vietnam


The Emissions Profile accompanies Accessing Asia: Air Pollution and Greenhouse Gas Emissions Indicators from Road Transport and Electricity.” Accessing Asia presents the first benchmark of air pollutant (as particulate matter, PM) and GHG (as CO₂) emissions for 13 countries across Asia for road transport and electricity.
ELECTRICITY: CO₂ EMISSIONS

**CO₂ Emissions (from generation) per Source Type (2009)**

- Coal: 49%
- Oil: 6%
- Natural Gas: 45%

35 million tons

**Total CO₂ emissions from generation and consumption**

Million Metric Tons

2000 2001 2002 2003 2004 2005 2006 2007 2008 2009

**ELECTRICITY: DRIVERS OF EMISSIONS**

**Generation by Source Type (2009)**

- Coal: 19%
- Renewable Energy: 36%
- Natural Gas: 41%

62 TWh

**Consumption by End-use Sector (2009)**

- Residential: 41%
- Commercial: 1%
- Industrial: 51%

51 TWh

**kgCO₂ per kWh**

Asia Average 2009: 0.50

2000 2009

**kgCO₂ per GDP**

Asia Average 2009: 0.90

2000 2009

**TCO₂ per capita**

Asia Average 2009: 0.83

2000 2009

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3. Vehicle population numbers were estimated from Vietnam Register and Transport Development an Strategy Institute (TDSI). VKT information were estimated from TDSI.

4. Fuel consumption data presented in this profile is based on activity data.

5. Emissions data from all sources and sectors includes agriculture and management.

6. Electricity generation is from fossil fuels and hydropower. Geothermal, combustible renewables, wind power, and solar power are not applicable.

7. For the data found in this report, please visit www.CitiesACT.org

Emissions Profile: Vietnam