

## Greenhouse Gas Emissions Inventory for Shimla City



## Title

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## 1. Shimla City: Draft Energy Consumption and Greenhouse Gas Inventory for the year 2013-14

### 1.1. About the Project

**Promoting Low Emission Urban Development Strategies in Emerging Economy Countries (Urban-LEDS)** is a project funded by the European Commission, and implemented by UN-Habitat and ICLEI, with an objective of enhancing the transition to low emission urban development by offering selected local governments a comprehensive methodological framework (the GreenClimateCities methodology) to integrate low-carbon strategies into all sectors of urban planning and development.

This project is being implemented in 4 emerging economy countries including Brazil, South Africa, India and Indonesia, covering over 25+ cities. Selected cities from Europe support the project cities in identifying and implementing Low Emission Development initiatives in cities.

### 1.2. The GreenClimateCities Process

The GreenClimateCities (GCC) program is a comprehensive planning framework for addressing climate change mitigation (reducing greenhouse gas emissions) in Local Governments. The program includes:

- A clear and flexible methodology covering 3 phases: Analyze, Act and Accelerate- each unfolding into three steps - outlining how low emissions options can be identified and integrated into urban development policies, plans and processes
- A wide range of tools and guidance to support Local Governments to deliver effective Local Climate Action step-by-step
- A network focusing on urban infrastructure, policy, people and investments
- Multi-disciplinary expertise, capacity building and peer exchange opportunities
- An improved approach to integrated local climate action, exploring the connection to climate change adaptation

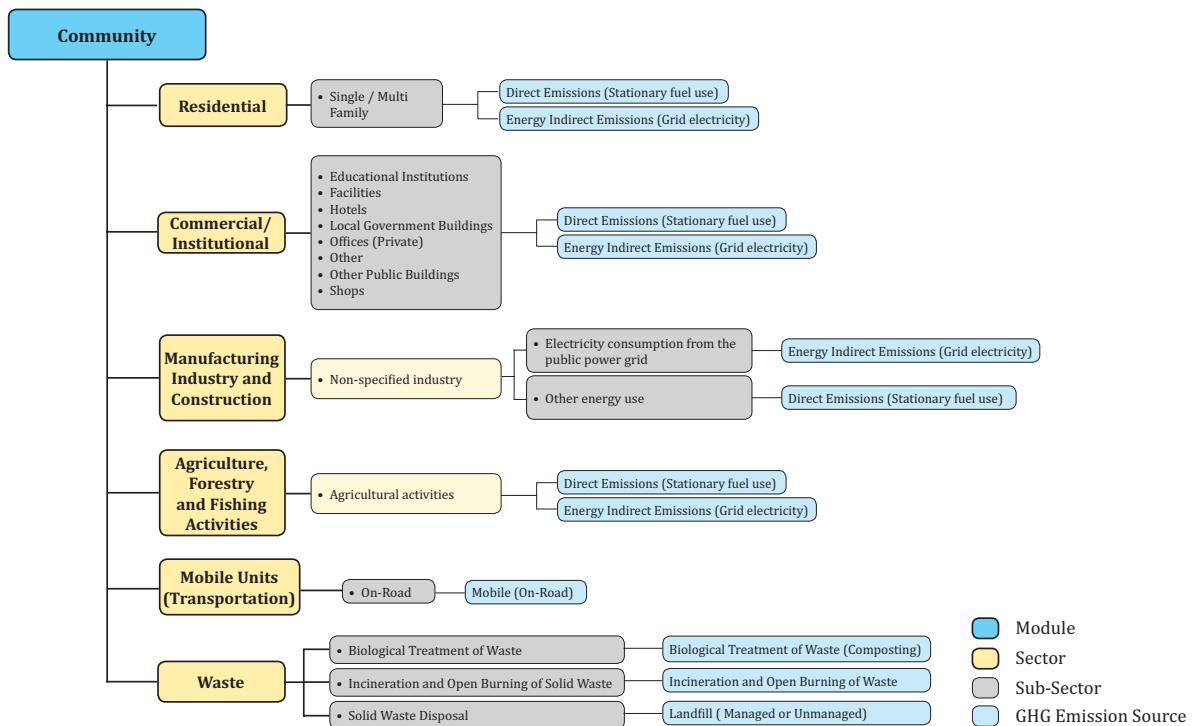
### 1.3. carbonn Climate Registry

The **carbonn Climate Registry (cCR)** is the leading global reporting platform of local climate action. It is an online platform that enables cities and Local Governments to report their GHG emissions, energy and climate commitments, including mitigation and adaptation actions to demonstrate their potential to reduce climate risks and move towards a global low-emissions scenario.

More than 420 cities around the globe representing one-seventh of the world's urban population have reported their greenhouse gas emissions data into carbonn. The platform has already been adopted by several international climate programs and initiatives, including the WWF Earth Hour City Challenge, Durban Adaptation Charter, and R20-Regions of Climate Action. The platform is poised to become a central part of how cities engage with international climate policy being negotiated through the UN Framework Convention on Climate Change.

## 1.4. Green House Gas (GHG) Inventory Methodology

The GHG Inventory was prepared in accordance with the approved principles and standards of the **Global Protocol for Community-Scale Greenhouse Gas Emissions (GPC)**. This protocol provides internationally agreed methodologies and guidelines to assist local governments in quantifying GHG emissions from activities within the administrative boundaries of cities.



## 1.5. Shimla City Profile

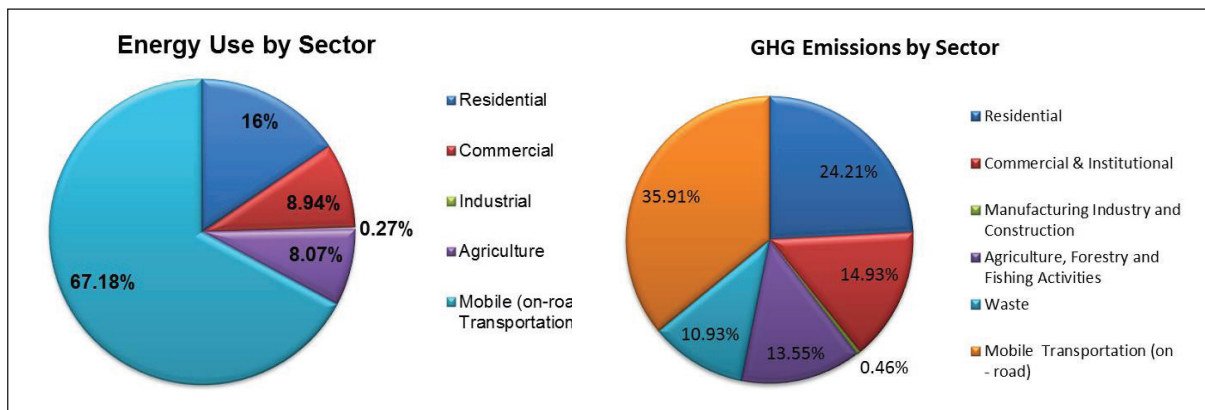
State	Himachal Pradesh
Local Government	Municipal Corporation Shimla
Country	India
Estimated Resident Population	1,76,022 (2013)
Daily Floating Population	81,256 (2013)
Area	22.07 sq. km
Population Density	7,976 persons per sq. km (2013)
Estimated Households	46,322
Registered Vehicles	71,781
Daily Solid Waste Generation	92 metric tonnes per day (2013)
Annual Electricity Consumption	139,150,000 kilowatt hours (2013-14)

## 1.6. City Level Energy Consumption and GHG Emission for Shimla City (2013-14)

Total Energy Use <sup>1</sup>	1,607,996 Giga Joules
Total GHG Emission	218,898 tonnes of CO <sub>2</sub> e
Energy Use per capita: Shimla City	8.18 Giga Joules <sup>2</sup>
Energy Use per capita: India's National Average (2012-13)	23.1 Giga Joules

## 2. Community Level Energy Consumption & GHG Emissions

### 2.1. Snapshot of Energy Consumption and Resultant GHG Emissions by Energy Source



### Energy Consumption by Sector

Sector	Energy Use (GJ)
Residential	2,49,888
Commercial/Institutional	1,43,698
Industrial	4,419
Agriculture	1,29,789
Mobile Units (On-Road Transportation)	1080203

<sup>1</sup> Includes direct energy use (from combustion of fuels such as kerosene, LPG, petrol, diesel) and indirect energy use (due to consumption of grid electricity)

<sup>2</sup> Statistic as of 2012-13 as per National Power Statistics Report 2013, Ministry of Statistics, Government of India

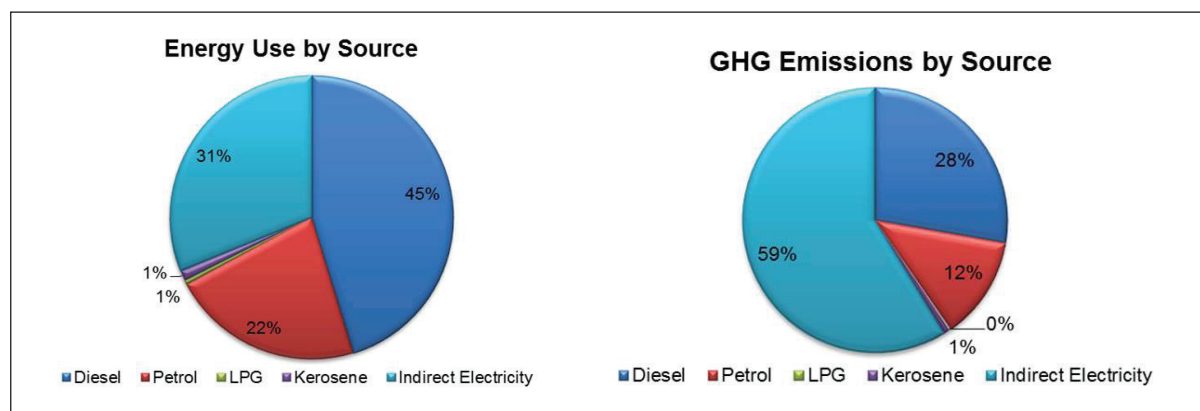


## GHG Emissions by Sector

Sector	GHG emission (tonnes of CO <sub>2</sub> e)
Residential	53003.86
Commercial/Institutional	32,688.75
Industrial	1010.07
Agriculture	29,663.33
Waste	23934.68
Mobile Units (On-Road Transportation)	78597.75

- Total Community scale Energy use in 2013-14: **1607996.38 Giga Joules**
- Largest Energy consumers: **Transport (67.18%); Residential Buildings (15.54%); Commercial/Institutional Buildings (8.94%), Agriculture (8.07%), Industrial (0.27%)**
- Trend of Energy use: **Rise of 27.59% since 2009-10 (at CAGR of 6.0%)**
- Total community scale GHG emission in 2013 -14: **218989 tonnes of CO<sub>2</sub>e**
- Largest GHG emitters: **Transport Sector (35.91%); Commercial/Institutional buildings (14.93%); Residential Buildings (24.21%)**

## 2.2. Snapshot of Energy Consumption and Resultant GHG Emissions by Energy Source



## Energy Consumption by Energy Source

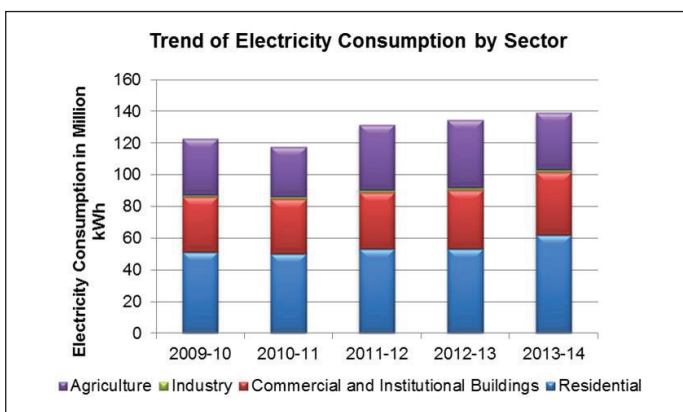
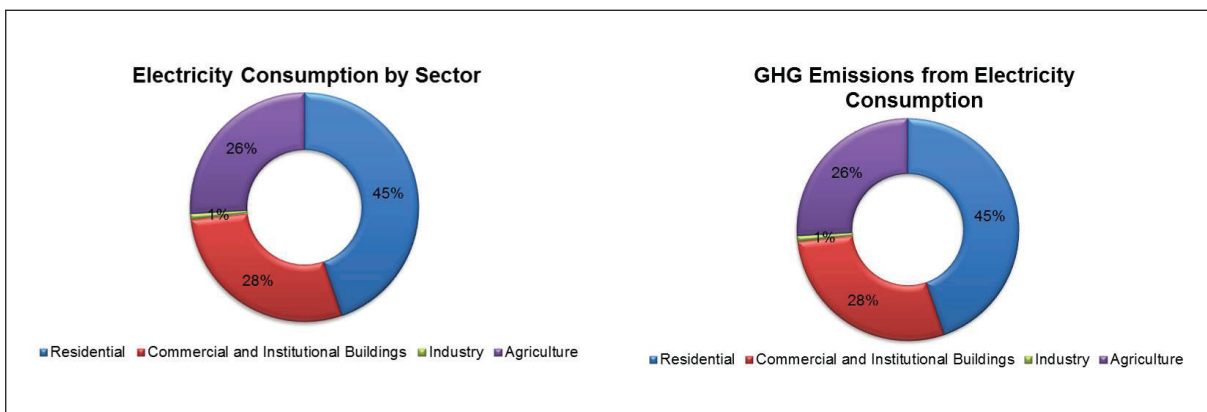
Fuel/Energy Source	Energy Use (GJ)
Diesel	727612
Petrol	352590
LPG	7503
Kerosene	19342
Electricity	500949

## GHG Emissions by Energy Source

Fuel/Energy Source	GHG emission (tonnes of CO <sub>2</sub> e)
Diesel	54083
Petrol	24515
LPG	475
Kerosene	1399
Electricity	114493

- Total Community scale Energy use in 2013-14: **1607996.38 Giga Joules**
- Prominently used Energy sources: **Diesel (45%); Electricity (31%); Petrol (22%)**
- Total community scale GHG emission in 2013 -14: **2,18,898 tonnes of CO<sub>2</sub>e**
- Largest GHG emitting Energy sources: **Electricity (59%); Petrol (12%); Diesel (28%)**

### 2.3. Sectoral Electricity Consumption and Resultant Indirect GHG Emissions



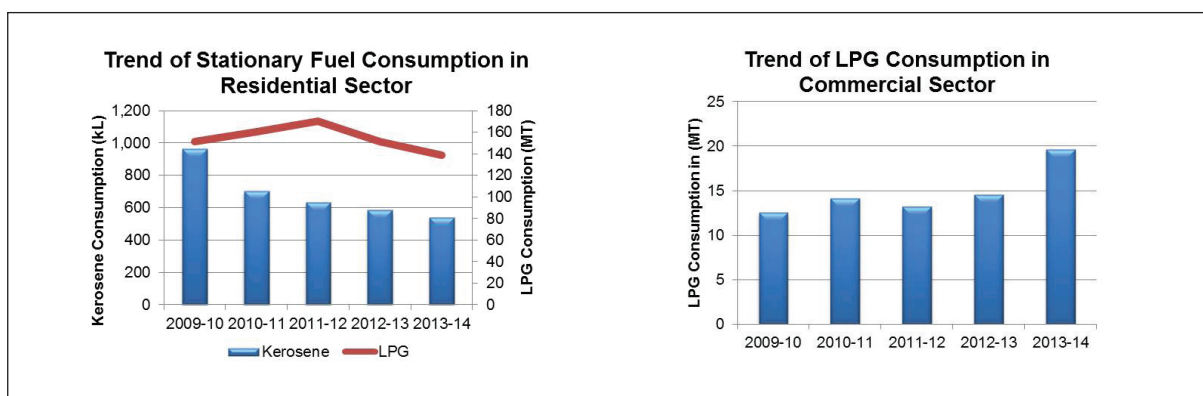
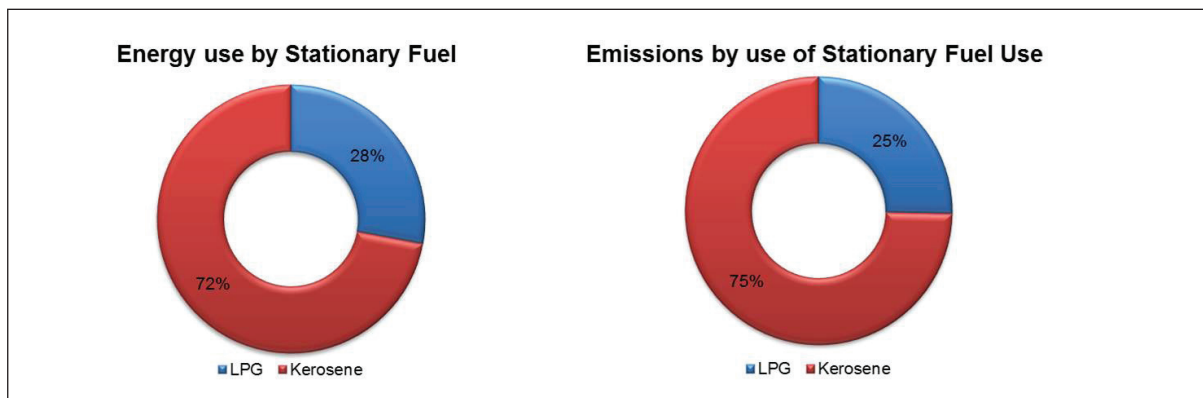


## Annual Sector-wise Electricity Consumption

Sector	Annual Electricity Consumption (Million kWh)				
	2009-10	2010-11	2011-12	2012-13	2013-14
Residential	51.36	50.35	53.38	53.42	62.21
Commercial/Institutional	34.56	34.25	35.58	36.99	39.66
Industrial	1.47	1.36	1.28	1.32	1.23
Agricultural	35.39	31.63	41.42	43.07	36.05
<b>Total</b>	<b>122.78</b>	<b>117.59</b>	<b>131.66</b>	<b>134.8</b>	<b>139.15</b>

- Total Electricity consumption in 2013-14: **139.15 million kWh**
- Electricity consumption per capita: **Shimla City: 765.84 kWh; India's National average (2012-13): 917 kWh<sup>3</sup>**
- Largest Electricity consumers: **Residential Sector (45%); Commercial/Institutional Sector (28%)**
- Trend of Electricity consumption: **Rise of 13.34% since 2009-10 (in last four years)**
- Total GHG emission from electricity consumption in 2013 -14: **114492.52 tonnes of CO<sub>2</sub>e**

## 2.4. Non-Mobile (Stationary) Fuel Use & Resultant Direct GHG Emissions



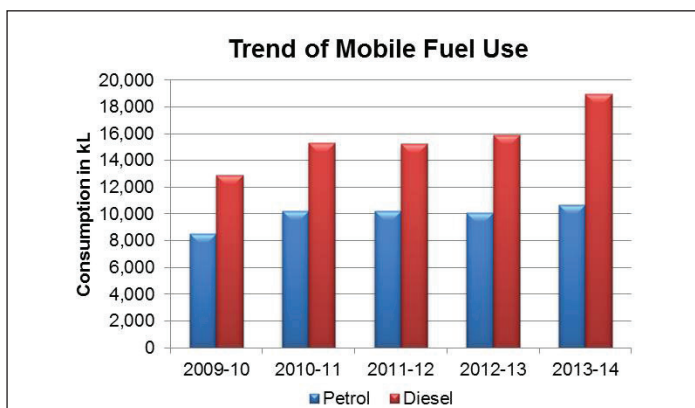
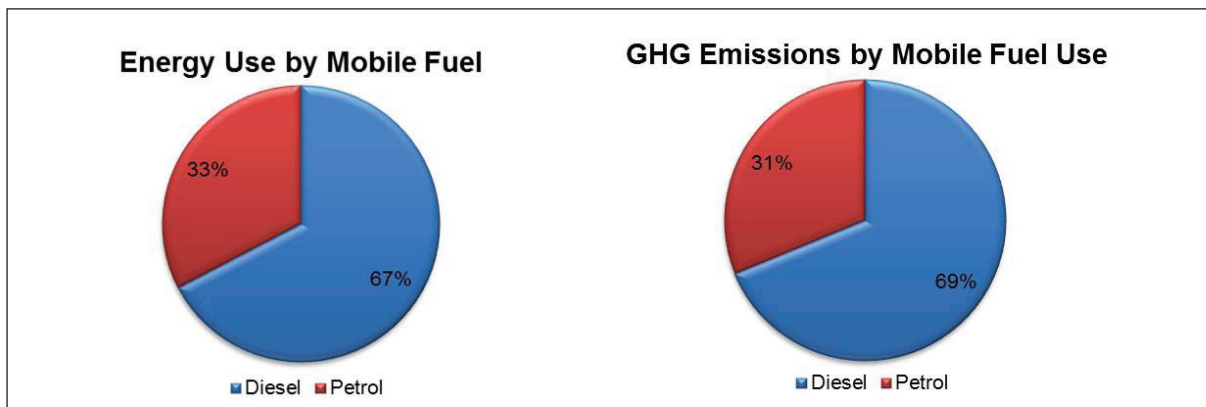
<sup>3</sup> Central Electricity Authority (2014): Executive Summary of Indian Power Sector- Feb 2014. Available online at [http://www.cea.nic.in/reports/monthly/executive\\_rep/feb14.pdf](http://www.cea.nic.in/reports/monthly/executive_rep/feb14.pdf)

## Annual LPG and Kerosene Consumption in Shimla City

Fuel	Unit	2010-11	2011-12	2012-13	2013-14
LPG (residential)	Metric tonnes	160	170	151	139
LPG (commercial)	Metric tonnes	14	13	15	20
Kerosene (residential)	kiloliters	703	633	584	541

- Share of Stationary Energy use: **Residential Sector - LPG (28%); Kerosene (72%);**
- Trend of fuel consumption: **Decline in residential Kerosene consumption at CAGR of (-)13.4%; rise in commercial LPG consumption at CAGR of 11.88%**
- Total GHG emission from Stationary fuel combustion in the Residential Sector in 2013 -14: **1814.73 tonnes of CO<sub>2</sub>e**
- Total GHG emission from Stationary fuel combustion in the Commercial Sector in 2013 -14: **58.76 tonnes of CO<sub>2</sub>e**

## 2.5. Fuel Consumption in Transport Sector and Resultant Direct GHG Emissions

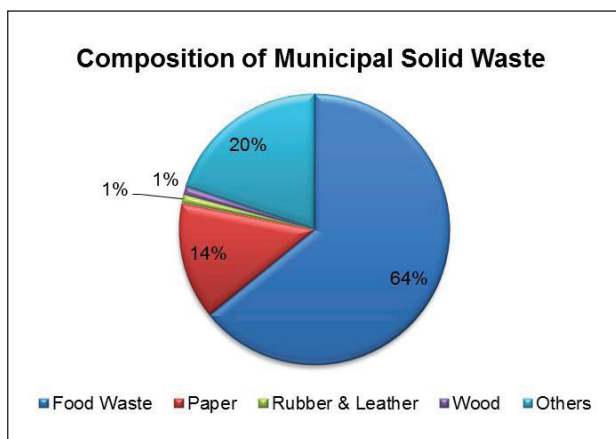


## Annual Fuel Consumption by On-Road Transportation at the Community Level

Fuel	Unit	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
Petrol	kilolitres	8518	10219	10200	10088	10675
Diesel	kilolitres	12902	15310	15251	15928	18973

- Share of Energy Use in On-Road Transportation: **Petrol (33%); Diesel (67%)**
- Trend of Fuel Consumption: **Rise in Petrol consumption at CAGR rate of 5.8%; rise in Diesel consumption at CAGR of 10.12%**
- Total GHG emission from Mobile Combustion in Transportation in 2013 -14: **78,598 tonnes of CO<sub>2</sub>e**

## 2.6. GHG Emissions from Solid Waste Treatment and Disposal



### Composition of Municipal Solid Waste

Waste Type	Tonnes per day (TPD)
Food Waste	59.00
Paper	13.00
Rubber and Leather	1.00
Wood	1.00
Others	20.00
Total	92.00

- Total daily solid waste generation: **92 metric tonnes per day**
- Composition of waste generated: **Food Waste (64.00%); Paper (14.00%); Rubber & leather (1.00%); Wood (1.00%); Others (20.00%)**
- Treatment and Disposal by waste type: **Organic waste: composting; Rest all – open dumping**
- Total GHG emissions from waste treatment and disposal in 2013-14: **23,934.68 tonnes of CO<sub>2</sub>e**

