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# **India Community Protocol for Accounting & Reporting Greenhouse Gas Emissions**

**PUBLIC COMMENT DRAFT**

**Version 1.1 – December 2012**

**Developed By:**

**ICLEI- Local Governments for Sustainability, South Asia**

This document is prepared by: ICLEI Local Governments for Sustainability- South Asia Secretariat, in collaboration with ICLEI World Secretariat, Bonn, Germany

Basis: Global Protocol for Community – Scale GHG Emissions (GPC) prepared by C40 Cities Climate Leadership Group and ICLEI Local Governments for Sustainability in collaboration with: World Bank, UNEP, UN-HABITAT, World Resources Institute

India Community Protocol is prepared with support from British High Commission (BHC), India under project titled “***Integrating urban climate guidelines through clean technologies (RE&EE) at the state and city level to build sustainable low carbon cities***” in Rajasthan & Tamil Nadu States.

Local governments are invited to use this Protocol Pilot Version 1.0 to conduct their community GHG inventories. Other stakeholders are welcome to give their comments. All feedback should be sent to [iclei-southasia@iclei.org](mailto:iclei-southasia@iclei.org)

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## Abbreviations and Acronyms

AFOLU	Agriculture, Forestry, and Land Use
CO	Carbon monoxide
CO <sub>2</sub>	Carbon dioxide
CO <sub>2</sub> e	Carbon dioxide equivalent
FOD	First-order decay
g	Gram(s)
GHG	Greenhouse gas
GWP	Global warming potential
HCFC	Hydrochlorofluorocarbon
HFC	Hydrofluorocarbon
HV/AC	Heating ventilating, and air conditioning
ICP	Indian Community Protocol for Accounting & Reporting GHG emissions
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial process and Product Use
ISO	International Organization for Standardization
J	Joule
Kg	Kilogram(s)
kWh	Kilowatt-hour(s)
LHV	Lower heating value
LPG	Liquefied petroleum gas
MSW	Municipal solid waste
mt	Metric ton(s)
N <sub>2</sub> O	Nitrous oxide
NO <sub>x</sub>	Oxides of Nitrogen
PFC	Perfluorocarbon
SF <sub>6</sub>	Sulfur hexafluoride
UNFCCC	United Nations Framework Convention on Climate Change
UN- HABITAT	United Nations Human Settlements Programme
UNEP	United Nations Environment Programme
WRI	World Resource Institute
WBG	World Bank Group
TPD	Tonnes Per Day
VKT	Vehicles Kilometer Travelled
VMT	Vehicles Miles Travelled
IPPU	Industrial Process and Product Use Emissions

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# 1. Introduction & Background

Cities are rapidly growing as centers of innovation, energy consumption, population, and sources of global greenhouse gas (GHG) emissions. As a major source of emissions, cities also have a huge potential to drive emission reductions. To effectively manage emissions, cities must first measure and report them publicly. Planning for climate action at the city level starts with developing a GHG inventory. An inventory allows local policy makers and community members to understand which sectors are responsible for the highest level of GHG emissions in their city or community, and respond by developing action plans for those sectors.

Although many Indian cities have conducted a GHG inventory and set voluntary emission reduction targets, there is currently no consistent global guidance for conducting a city-level inventory. The resulting inconsistent inventories cannot be easily communicated between local, sub-national and national governments, financing institutions and the private sector. The lack of a common approach also prevents comparison between cities over time, and reduces the ability of cities to demonstrate the global impact of collective local actions.

The India Community Protocol for Accounting & Reporting Greenhouse Gas Emissions (ICP) is an ICLEI South Asia's initiative with support from Cities Climate Centre, ICLEI Local Governments for Sustainability, World Secretariat, Bonn, Germany. ICLEI South Asia has developed this protocol under the project titled “**Integrating Urban Climate Guidelines through Clean Technologies (RE & EE) at the State and City Level to build sustainable low carbon cities**” in Tamil Nadu and Rajasthan states. The project is supported by **British High Commission India, Department of Local Self Government, Government of Rajasthan and Commissioner of Municipal Administration, Government of Tamil Nadu.**

The ICP has been developed in line with the **Global Protocol for Community-Scale Greenhouse Gas Emissions (GPC)**, which is developed by ICLEI – Local Governments for Sustainability and C40 Cities Climate Leadership Group as part of their agreement to develop a standard approach for accounting and reporting GHG emissions that will boost cities ability to access funding and implement actions. Other core partners that participated in the development of GPC include the World Bank Group (WBG), United Nations-HABITAT (UN-HABITAT), United Nations (UNEP), the Organization for Economic Cooperation and Development (OECD), and the World Resources Institute (WRI).

## 1.1. Purpose of ICP

This Protocol provides requirements and guidance for Indian cities on preparing and publicly reporting their a GHG emission inventory. This is the first such document available for local governments in any developing country which will present standard pathways for Indian Cities on measuring, analyzing and reporting GHG emissions in an effective and transparent way. The planning of climate action at the city level starts with developing of a GHG inventory, which allows local policy makers and residents to understand, which sectors drive GHG emissions in their city or community, and respond by developing action plans that address those sectors.

The primary goal of ICP is to provide a standardized step-by-step approach to help cities quantify their GHG emissions in order to identify measures to manage and reduce their GHG impacts.

The ICP was developed with the following objectives:

- Help cities prepare a comprehensive and credible GHG inventory;
- Help cities develop effective strategies for managing and reducing their GHG emissions through a thorough understanding of GHG impacts from their human activities;
- Support consistent and transparent public reporting;
- Harmonize existing international protocols and standards for city level GHG inventories;
- Support cities ability to demonstrate the global impact of collective local actions, and to measure collective progress credibly over time.
- Support GHG accounting, reporting, and **trading** schemes at the local/sub-national/national level; and
- Facilitate access of local governments to climate finance opportunities.

## **1.2. Target Users**

The ICP is intended for adoption by local authorities or city governments who exercise jurisdiction over a defined geographic area. Local authority, as defined by ISO/TR-14069, is a public body recognized as such by legislation or by the directives of a higher level of government to set general policies, plans or requirements. Academics, NGOs, or other parties representing the local authority may also use the ICP. In the context of this document, local authority is used to represent any and all of these relevant audiences.

ICP can also be useful for sub-national entities such as towns, districts and states pursuant to appropriate modifications.

## **Indian Urban Governance Structure**

The Indian administration system is a three-tier system where the control flows from upward to downward, from Central government to state government, from state government to local government. The central government is the repository of maximum power, the laws and rules passed by center are implemented by the state and state is accountable to implement these rules with the help of local governance. The constitution divides areas for action in central, state and concurrent lists to define primary action responsibility.

The local governance performs at two levels at city level and rural level. At city level we have Municipal Corporation and Municipal Council depending upon population and area.

The main responsibility of all these government institutions is to provide better public amenities to its citizen and to maintain law and order in the state. Most attention is required by the local governance for delivering better amenities to its citizens.

## **1.3. Relationship to other Protocols/Standards**

The ICP is building upon the knowledge, experiences, and practices defined in previously published protocols and standards. These include the *International Local Government GHG Emissions Analysis Protocol*<sup>1</sup>, the *International Standard for Determining Greenhouse Gas*

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<sup>1</sup> ICLEI – Local Governments for Sustainability



*Emissions for Cities*<sup>2</sup>, the GHG Protocol Standards<sup>3</sup>, the *Baseline Emissions Inventory/Monitoring Emissions Inventory* methodology<sup>4</sup>, and the *Local Government Operations Protocol*<sup>5</sup>.

#### 1.4. India's Actions on Climate Change

The Indian Government attaches significant importance to climate change issues, and signed the United Nations Framework Convention on Climate Change (UNFCCC or Convention) in 1993. The first GHG emission estimates for India were made in 1991 and an update was prepared in 1992. Other important milestones are presented in the **Table 1** in Chronological order:

**Table 1: Important Milestones and Experience of GHG inventory Development in India**

Year	Category	Regulation/Scheme/Decision
1972	National	Constitution of 'National Committee on Environmental Planning and Coordination (NCEPC)'
1980	National	Formulation of the 'Forest Conservation Act'
1981	National	Formulation of the 'Air (Prevention and Control of Pollution) Act'
1982	National	Formation of Department of Non-Conventional Energy Sources (DNES)
1985	National	Formation of Ministry of Environment and Forest, Government of India
1986	National	Formation of the 'Environment (Protection) Act'
1987	National	Establishment of 'Indian Renewable Energy Development Agency (IREDA)' for providing financial assistance to renewable energy projects in India
1988	National	Preparation of the 'National Forest Policy (NFP)'
	National	Introduction of the 'National Forest Action Plan (NFAP)'
	National	Introduction of the 'Motor Vehicles Act'
1989	National	The Hazardous Wastes (Management and Handling) Rules
1989		The Manufacture, Storage and Import or Hazardous Chemical Rules
1991	National	First Inventory (Global Change Report No. 1, 1991, edited by A.P.Mitra) Fossil fuels combustion, rice cultivation and enteric fermentation sectors covered.
1992	National	Update (Global Change Report No. 4, edited by A.P.Mitra), additions of emissions from transport, coal mines, and 1991 methane campaign results included. IPCC tier-II approach followed for livestock related emission, land use change and forestry.
1996	National	Update (unpublished report, 1998, edited by A.P.Mitra and Sumana Bhattacharya), Animal manure, agriculture crop residue and waste included. Revised IPCC approach to methane emissions from rice paddy related and new approach in forestry and land use change emissions.

<sup>2</sup> United Nations Environment Program (UNEP), United Nations Human Settlements Program (UN Habitat), and the World Bank.

<sup>3</sup> World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD)

<sup>4</sup> The Covenant of Mayors Initiative

<sup>5</sup> ICLEI-USA

Year	Category	Regulation/Scheme/Decision
1998	National	India ALGAS report (ADB, June 1999), GHG inventory for 1990 using IPCC 1995 and 1996 methodology and included industrial emissions.
1998	National	The Biomedical Waste (Management and Handling) Rules
1999	National	The Recycled Plastics Manufacture and Usage Rules
1999	National	District level inventory paper submitted to Atmospheric environment, February 2000 (Amit Garg, P.R. Shukla, S.Bhattacharya and Sadhwal), regional and sectoral analysis of GHG emission for 1990 and 1995 covering all the Indian districts and all emission categories.
2000	National	The Municipal Solid Wastes (Management and Handling) Rules
2001	National	Launch of the 'Energy Conservation Act (ENCON 2001)'
2002	International	India ratifies the Kyoto Protocol by submitting the instruments of accession at the United Nations
	National	The Energy Conservation Act established a 'Bureau of Energy Efficiency (BEE)' in the Ministry of Power
2003	National	Launch of the 'The Electricity Act'
2004	International	India submits its initial 'National Communication (NATCOM)' to UNFCCC
	National	Establishment of 'Pollution Under Control (PUC)' Norms for in use motor vehicles
2005	National	National Steel Policy' was approved by the Cabinet Committee on Economic Affairs
	National	Formulation of the 'National Electricity Policy'
2006	National	Formulation of the 'National Environment Policy (NEP)'
	National	Formulation of the 'National Urban Transport Policy'
	National	Formulation of the 'National Urban Transport Policy'
2007	National	Launch of the 'Energy Conservation Building Code (ECBC)'
	National	Establishment of 'The Prime Minister's Council on Climate Change'
2008	National	India unveiled its 'National Climate Change Action Plan On Climate Change (NAPCC)'
2009	National	Launch of the 'National Bio-fuels Policy'
	National	Indian Network on Climate Change Assessment (INCCA)' was launched by the Ministry of Environment and Forests (MoEF)
	National	Notification of 'Environment (Protection) Seventh Amendment Rules', 2009 prescribing the standards for national ambient air quality for twelve pollutants
	National	The Bachat Lamp Yojana (BLY)' conceived as CDM Programme of Activity (PoA) for mass distribution of Compact Fluorescent Lamps (CFLs) in India
	National	Establishment of the 'Compensatory Afforestation Fund Management and Planning Authority (CAMPA)'

Year	Category	Regulation/Scheme/Decision
2010	Regional	SAARC Nations adopted the 'Thimpu Statement on Climate Change'
	National	Amendments to the 'Energy Conservation Act'
	National	Launch of the 'Jawaharlal Nehru National Solar Mission (JNNSM)'
	National	India's cabinet approved the 'National Mission on Enhanced Energy Efficiency (NMEEE)'
	National	Establishment of 'National Green Tribunal (NGT)' by MOEF
	National	Indian Network for Climate Change Assessment (INCCA)' was published
2011	International	India submits its second 'National Communication (NATCOM II)' to UNFCCC
	International	India's first pilot project identified under the UN's mechanism for 'Reducing Emissions from Deforestation and Degradation (REDD)'
2012	National	Launch of the 'Perform, Achieve and Trade (PAT)' mechanism

*(Data updated till March 2012)*

## 2. Accounting and Reporting Principles

Accounting and reporting for community scale GHG emissions shall be based on the following principles:

**Relevance:** The reported GHG emissions shall appropriately reflect emissions occurring as a result of activities and consumption from within the city's geopolitical boundary. The inventory shall also serve the decision-making need of the local authority, and take into consideration relevant local, sub-national, national, and regional regulations. The principle of relevance should be applied when determining whether to exclude any emissions. Local authorities should also use this principle when selecting data sources and deciding on the data quality.

**Completeness:** All emission sources within the inventory boundary shall be accounted for. Any exclusion of emission sources shall be justified and clearly explained. Notation keys should be used when an emission source is excluded, considered not relevant, and/or not occurring.

**Consistency:** Emissions calculations shall be consistent in approach, boundary, and methodology. Consistent methodologies for calculating GHG emissions will enable meaningful trend analysis over time, documentation of reductions, and comparisons between cities. Accounting of emissions should follow the standardized, preferred methodologies provided by the ICP. Any deviation from the preferred methodologies should be justified and disclosed.

**Transparency:** Activity data, emission sources, emission factors, and accounting methodologies should be adequately documented and disclosed to enable verification. The information should be sufficient to enable individuals outside of the inventory process to use the same source data and derive the same results. All exclusions need to be clearly identified and justified.

**Accuracy:** The calculation of GHG emissions should not systematically overstate or understate actual GHG emissions. Accuracy should be sufficient to give decision makers and the public reasonable assurance of the integrity of the reported information. Local authorities should reduce uncertainties in the quantification process to the extent that it is possible and practical.

**Measurability:** The data required to support completion of an inventory should be readily available or made available within reasonable time and/or cost. Any exclusion of emission sources shall be justified and disclosed. The use of proxy data and estimated figures should be justified and clearly disclosed.

In the practice of completing an inventory, sometimes conflicts may be encountered among these six principles, and tradeoffs between them may, therefore, be required. For example, achieving *complete* inventories may at times require using less accurate data. On the other hand, achieving the most *accurate* inventory may require excluding activities with low data accuracy thus, compromising overall completeness.

In these or similar scenarios, local authorities should strive to achieve an appropriate balance among the principles and objectives of conducting a GHG inventory. For instance, tracking performance towards a specific reduction target may require more accurate data. Over time, as both the accuracy and completeness of GHG data increase, the need for tradeoffs between these accounting principles will likely diminish.

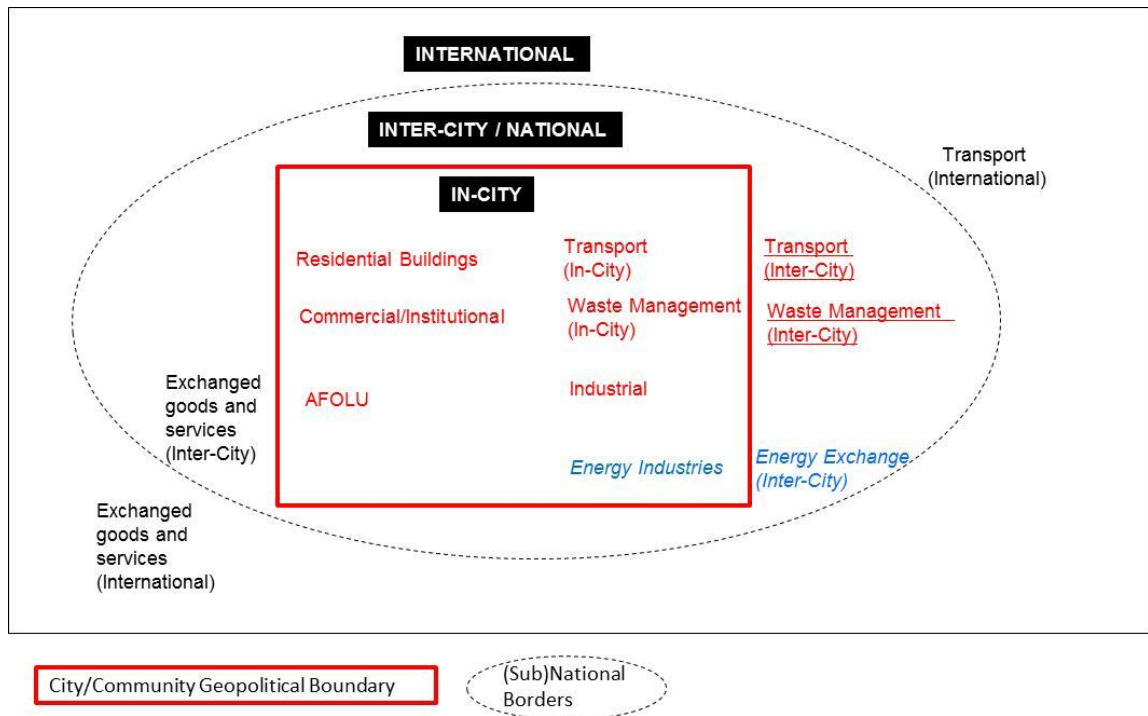
### 3. Boundary Setting

The inventory boundary shall be set according to the geopolitical territory, where the respective local authority (or local government) has full jurisdictional authority (generally speaking the city or community's boundary). One of the main challenges of this approach is that some activities within the boundary may result in emissions outside the city. To manage this, direct and indirect GHG emissions of communities should be addressed first:

- Direct emissions are emissions from sources within the city boundary.
- Indirect emissions are emissions that are a consequence of the activities within the city boundary, but occur at sources outside the city.

To help delineate the distinction between direct and indirect emissions, ICP adopts the GHG Protocol's *scope* framework, which is also elaborated in the *International Local Government GHG Emissions Analysis Protocol*, as such:

- **Scope 1:** All direct emissions from sources within the geopolitical boundary of the community.
- **Scope 2:** Energy-related indirect emissions that occur outside the community boundary as a consequence of consumption/use of grid-supplied electricity, heating and/or cooling within the community boundary.
- **Scope 3:** All other indirect emissions that occur outside the boundary as a result of activities within the community's geopolitical boundary, as well as trans-boundary emissions due to exchange/use/consumption of goods and services



**Figure 1. Sources and boundaries of community-scale GHG emissions**

**Figure 1** above illustrates the concept of direct and indirect emissions, and the relationship between a city inventory and a national inventory. Direct emissions (*scope 1*) include sources located within the city boundary (solid red-lined box). These include sources such as in-city transit systems, energy use from buildings, and emissions from industrial activities. The hashed-line represents the regional boundaries, such as state or provincial borders. Some activities in the city transcend the city boundary into other communities. Regional transportation systems, electricity generation and use, waste disposal, and exchanges of goods and services are examples of activities that may be shared between cities. These activities are indirect emissions (*scopes 2 and 3*) outside of the city boundary, but within the country boundary. The solid line black box indicates international boundaries, or global emissions. Activities indicated here could also be driven by a city, and may include international air or marine transportation and the import or export of goods and services.

## 4. Reporting

### Reporting by Sources

**ICP 2012 BASIC:** Covers all *scope 1* and *scope 2* emissions of stationary units, mobile units, wastes, and Industrial Processes and Product Use (IPPU), as well as *scope 3* emissions of waste sector. Dark green cells in the ICP 2012 Framework indicate these sources. In reporting the total by BASIC, Scope 1 emissions from Energy Generation (ICP I.3.1) are not included in order to prevent double counting since the total BASIC figure also includes Scope 2 emissions. However in reporting by ‘Scopes’, total Scope 1 emissions must also include Scope 1 emissions from energy generation (ICP I.3.1).

**ICP 2012 BASIC+:** Covers ICP 2012 BASIC as well as agriculture, forestry and land use (AFOLU) and *scope 3* emissions for mobile units.

**ICP 2012 EXPANDED:** Covers the entirety of *scopes 1, 2, and 3* emissions including trans-boundary emissions due to the exchange/use/consumption of goods and services.

### **Reporting by Scopes**

Regardless of whether local authorities choose to report BASIC, BASIC+, or EXPANDED, the GHG data shall be aggregated and reported by *scope 1, scope 2, and scope 3* separately.

#### **4.1. ICP 2012 BASIC Reporting**

Local authorities wishing to comply with the ICP pilot framework are required to account and report at least in the ICP 2012 BASIC and *scopes 1 and 2* categories. In order to ensure compliance with ICP 2012 BASIC, it is recommended that Notation Keys be used as appropriate, so that a lack of quantified GHG emissions in the respective source is justified.

The selection of sources that are included in ICP 2012 BASIC is based on the analysis of current best practices in different regions and the availability of internationally accepted GHG accounting methodology. There are readily available methodologies for all ICP 2012 BASIC categories and sources included in the table, as noted in the references to the *IPCC Guidelines for National GHG Inventories, 2006* or are included in other published documents.

In order to report through ICP 2012 BASIC+, further guidance is needed for accounting and reporting of agriculture, forestry and land use in urban spaces, as well as appropriate accounting and allocation of GHG emissions due to inter-city and international transport. These sources require further clarification and international consensus, which will be addressed in a future ICP update.

Reporting through ICP 2012 EXPANDED includes all *scope 3* categories based on full consumption-based and production-based accounting. This is a new area of work where accounting methodologies are either not available or require further development.

#### **4.2. Required Information**

**Emissions by Sources:** Total GHG emissions (in tCO<sub>2</sub>e). For sources included in ICP 2012 BASIC; if quantification is not possible, Notation Keys should be used. The total number of occurrences of each Notation Key and relevant ICP reference number should be indicated. If ICP 2012 BASIC+ or EXPANDED is chosen, sources that are included should be clearly indicated.

**Emissions by Scopes:** Indicate the scope of each emission source, and separate total emissions by *scope 1, scope 2, and scope 3*. It is noted that in reporting by ‘scopes’, complete Scope 1 emissions must be reported, including emissions from Energy Generation (ICP I.3.1).

**Gases:** Data for CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, and SF<sub>6</sub> in metric tons and in tons of CO<sub>2</sub> equivalent should be reported.

**Data quality:** *High (H):* localized emission factors and detailed activity data

*Medium (M):* national emission factors or generic activity data

*Low (L):* international/national emission factors and generic activity data

**Year:** Year of inventory or emission data

**Quantification:** Report source or sector-specific quantification methods used

### 4.3. Data Sources

In developing an emissions inventory, all emission sources should be considered in accordance with the principles of relevance, completeness and consistency. Although this should be interpreted within the context of each local government, this section provides guidance regarding an acceptable approach to inventory compilation. **Table 2** gives a picture of the various sources of data and the data requirement for developing the emissions inventory for Indian cities.

**Table 2 Community Scale-GHG Emissions Inventory Data Sources in Indian Context**

<b>Inventory</b>	<b>Concerned Person/Office</b>
<b>1. Residential/Commercial</b>	
Electricity	Executive Engineer (State Electricity Board/DISCOM/Electricity Distribution utility/Agencies/Power Departments )
LPG Distributor	Individual agencies [Indian Oil Corporation Limited(IOCL), Bharat Petroleum Corporation Limited (BPCL), Hindustan Petroleum Corporation Limited (HPCL), etc]
Petrol/Diesel	Individual agencies [Indian Oil Corporation Limited(IOCL), Bharat Petroleum Corporation Limited (BPCL), Hindustan Petroleum Corporation Limited (HPCL), etc]
Kerosene	City distributor/ civil supply departments, and Individual agencies [Indian Oil Corporation Limited(IOCL), Bharat Petroleum Corporation Limited (BPCL), Hindustan Petroleum Corporation Limited (HPCL), etc]
Coal	Individual agencies/distributor
Fuel Wood	Individual agencies or any other fuel distributor, secondary source: public govt. reports, research papers.
<b>2. Industrial</b>	
Type & Nos. of Unit.	Industrial Development Corporation/ Pollution control Department
Electricity	Executive Engineer (State Electricity Board/DISCOM/Electricity Distribution utility/Agencies/Power Departments )
Fuel Consumption	Industry associations/oil distribution companies
<b>3. Transportation</b>	
Type & Nos. of Vehicles	Development Authority/ Town and Country Planning Organization (TCPO) / Regional Transport Office (RTO)
Vehicles Kilometer Travelled	Research institute/ transport department or any Engineering College (Department of Civil Engineering)

<b>Inventory</b>	<b>Concerned Person/Office</b>
Fuel Consumption [Motor Spirit (MS), High Speed Diesel (HSD), Compressed Natural Gas(CNG)]	Regional Transport Office (RTO)/ oil and gas distribution companies.
<b>4.Waste</b>	
Solid Waste Generation	City Health Officer, Municipal Corporation and Urban Development departments
Management System	City Health Officer/Public health Engineering department
<b>5. Others</b>	
Public water Supply and sewage/Public lighting etc	Municipal corporation /Utility/Jal Board/Public Water Works etc
Buildings and facilities	Municipal Corporation/Public Works Departments

#### **4.4. Data Requirement**

##### **4.4.1. Stationary Units**

Stationary units refer to the emissions from energy consumption in buildings (residential, commercial and industrial) and sedentary (e.g., non-mobile) equipment or machinery. Emissions in this category can be produced directly from consumption of fuels combusted on-site or indirectly through consumption of grid-delivered electricity, heating and/or cooling.

Stationary combustion refers to the burning of fuels (solid, liquid or gaseous) in buildings or by any equipment or machinery that is in a fixed location. Sources of stationary combustion are located in all sectors of the economy (e.g., residential, commercial, industrial, etc.) and typically account for a large percentage of community GHG emissions. One of the most common sources of stationary combustion is the use of a boiler or furnace that is fueled by coal, natural gas, biomass or furnace oil. These devices consume carbon-based fuels on-site, resulting in direct emissions of carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O). Stationary combustion can also include a variety of industrial equipment, including kilns, ovens, generators, turbines and incinerators, or any other stationary equipment that burns fuel.

##### **a. Electricity consumption**

<b>Sectors</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>
	<b>Consumption (kWh)</b>	<b>Consumption (kWh)</b>	<b>Consumption (kWh)</b>	<b>Consumption (kWh)</b>
Residential				
Commercial				
Industrial				
Street Light				
Water Pumping Facility				
Sewerage Treatment facility				
Others (Agriculture etc.)				



**b. Fuel Consumption**

Fuel consumption under different sectors has a major share in overall city emissions, therefore, fuel consumption data is required for the last four to five years to represent trend and compile inventory of the base year.

Sectors	LPG	Kerosene	Fuel Wood	Coal	Biomass	Others
Residential						
Commercial						
Industrial						
Others						

*Note: (a) Data required for last four to five years for showcasing trend and growth; (b) Consumption unit may vary fuel to fuel. (c) In case of electricity and LPG write the total numbers of connection & please specify the unit for which you have filled the rate.*

**4.4.2. Mobile Units**

Mobile combustion refers to the burning of fuels by transportation devices and mobile equipment or machinery. Please note aviation sector is not covered here. Sources of mobile combustion include on- and off-road vehicles, as well as rail, air and water transport systems. Emissions from these sources can be produced directly from fuel consumed by vehicles or indirectly through utility-delivered electricity.

**a. Number of vehicles and VKT**

Type of Vehicles	Number of Vehicles	Annual VKT
Motorcycles/Scooters		
Cars/Jeep		
Light-duty vehicles		
Heavy-duty vehicles		
Buses		
Fire Fighting Trucks		
Waste collecting dumpers/trucks etc		
Others		

**b. Fuel consumption in vehicles**

Type of Vehicles	Fuel Consumption (KL, MT etc.)				
	MS	HSD	CNG	Auto LPG	Others
Motorcycles/Scooters					
Cars/Jeep					
Light-duty vehicles					
Heavy-duty vehicles					
Buses					
Fire Fighting Trucks					
Waste collecting dumpers/trucks etc					
Others					

#### 4.4.3. Waste Emissions Inventory Data requirement:

Community-generated waste can encompass a variety of waste types (e.g. household waste, industrial waste, construction and demolition waste, agricultural waste, etc.). This section focuses on the data required to estimate GHG emissions associated with the disposal of municipal solid waste (commonly known as trash or garbage) and wastewater handling and treatment.

Similar to inter-city issues associated with transportation, waste and wastewater emissions are complicated by the fact that in some communities waste and wastewater are treated both at facilities within the community and facilities located outside of the community's geopolitical boundaries. Further, other communities (located outside of the jurisdiction) may dispose of their waste and/or wastewater at facilities located within the community.

##### a. Waste generation and composition

Total waste generation from all concerned sectors of community scale and its composition of last four to five years were accounted to calculate GHG emission and showcase trend & growth in waste quantity generation.

Year	Solid waste Generated (TPD)	Waste Composition Delivered to Site					
		Paper Products (%)	Organic (%)	Plant debris (%)	Wood / Textiles (%)	Metal Glass (%)	Other Waste (inorganic) (%)
Year 1							
Year 2							
Year 3							
Year 4							
Year 5 (Latest year)							

##### b. What is the system of solid waste disposal?

City specific solid waste disposal system need to be examined along with different attributes like unit capacity and area covered etc.

S.N.	Type	Yes /No	Capacity
1	Small Open Dump		
2	Sanitary Land Filling		
3	Composting		
4	Incineration		
5	Any other		

#### 4.5. Emission factor and Energy density

Emission factors are used to convert energy usage into the associated emissions and so are central to the emissions analysis. They are usually expressed in terms of emissions/energy used (e.g. tonnes CO<sub>2</sub>/GJ). The energy density of fuels used is also required where the quantity of fuel used is expressed in mass or volume. The conversion to emissions follows the simple approach of:

Fuel consumed (activity data) x emission factor = GHG emissions

There are a variety of emission factors available from numerous sources. The reliability and accuracy of various sources of emission factors from different sources is an important consideration. Common sources are listed below.

- National Government agencies;
- Sub-national (state, county, etc) Government agencies;
- International agency (e.g. IPCC Tier 1);
- Universities or other research institutions;
- Non-government organizations;
- Corporate/industry associations

Table below provides the information on the available values for India specific energy density and emission factors. The information was collected from the various agencies and research organizations.

#### 4.5.1. Energy Density

A		Fuel	Unit	Value
A	Stationary	LPG	Gj/t	47.31
		Kerosene	Gj/t	43.75
B	Mobile	Gasoline	Gj/t	44.79
		Diesel	Gj/t	43.33
C	Waste	MSW	Gj/t	11.00
D	IPPU	Naphtha	Gj/t	45.01
		Propane	Gj/t	46.10

#### 4.5.2. Emission Factor

The emission factors used are a mix of default emission factors available in IPCC publications (1997, 2000, 2003 and 2006) and country specific emission factors referred from “India: Greenhouse Gas Emissions” INCAA, 2007 ([http://moef.nic.in/downloads/public-information/Report\\_INCCA.pdf](http://moef.nic.in/downloads/public-information/Report_INCCA.pdf)). Default emission factors have been used for gases and categories where country specific factors are not available.

#### 4.5.3. Emission Factor-Electricity

Emission Unit: Grams/kWh	Year/Gas	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>	NO <sub>x</sub>	SO <sub>x</sub>
NEWNE Grid Average electricity	2010-11	830	0.0087	0.0068	2.7666	2.2286
Southern Grid Average electricity	2010-11	760	0.0097	0.0076	3.2016	3.1589

#### 4.5.4. Emission Factor-Fuels

Sector	Fuel	Carbon Dioxide CO <sub>2</sub>	Nitrous Oxide N <sub>2</sub> O	Methane CH <sub>4</sub>
Residential	Kerosene	71900 kg/TJ	0.6 kg/TJ	10 kg/TJ
	Liquefied Petroleum gas	63100 kg/TJ	13 g/GJ	5 kg/TJ
Industrial	Charcoal	112000 kg/TJ	4 kg/TJ	200 kg/TJ
	Furnace Oil	42.79 TJ/KT	0.6 kg/TJ	3 kg/TJ
	Petroleum Coke	97500 kg/TJ	0.6 kg/TJ	3 kg/TJ
	Natural Gas	56100 kg/TJ	1 kg/TJ	240 kg/TJ
Commercial	Jet Kerosene	71500 kg/TJ	0.6 kg/TJ	10 kg/LTJ
	Anthracite Coal	98300 kg/TJ	1.5 kg/TJ	10 kg/TJ
	Charcoal	112000 kg/TJ	1 kg/TJ	200 kg/TJ
	Motor Gasoline	69300 kg/TJ	0.6 kg/TJ	10 kg/TJ

Sector	Fuel	Vehicle Type	Model / Standard	CO <sub>2</sub> (kg/GJ)
Transportation	Gasoline	Passenger Vehicle	Bharat IV	74.82
	Diesel	Passenger Vehicle	Bharat IV	76.8
	CNG	Passenger Vehicle		51.85
	LPG	Passenger Vehicle		59.03
	Diesel (ULSD)	Passenger Vehicle		74.1

Sector	Category	Methane CH <sub>4</sub>
Waste*	MSW	0.0182

\*Waste Emission Unit: tonnes/tonnes

## 5. Accounting and Reporting Pilot Framework

The ICP 2012 Accounting and Reporting Pilot Framework given in the Annexure presents a complete list of sources for a community scale GHG inventory and includes options for aggregation and reporting by sources, namely, ICP 2012 BASIC, ICP 2012 BASIC+ and EXPANDED and by Scopes namely Scope 1, 2, and 3.

In order to meet these requirements, local authorities may need to consider using a sub-set of BASIC sources or a combination of the BASIC and BASIC+ sources (see *Section 4 Reporting* for further details on these reporting options).

In these cases, however, local authorities are encouraged to include an additional set of results according to the ICP's requirements to ensure international comparability and to ensure full compliance with the ICP BASIC inventory.

Local authorities may also find that some of the emission sources indicated in the ICP do not exist within their defined community boundary, or that the emissions are not significant. Water-borne transport, for instance, does not exist in some inland cities. In such contexts, excluding or omitting emission sources that are not relevant to the objectives of the inventory should apply the principle of relevance. Notation keys should be appropriately used.

When local authorities encounter tradeoffs between principles or between the ICP and local/ sub-national/ national/regional requirements, they should revisit their objective of conducting a GHG inventory. Generally, local authorities should prioritize the city's inventory needs based on key objectives and significance of GHG emissions. While fulfilling minimum needs or requirements, local authorities should aim to improve completeness and accuracy over time to ensure full compliance with the ICP.

A credible GHG inventory report presents information based on the principles of relevance, completeness, consistency, transparency, accuracy, and measurability. To ensure comparability between cities, ICP requires local authorities to report their GHG emissions based on the ICP 2012 Accounting and Reporting Framework that is presented in Annexure along with the guidance provided under key accounting principles in *Section 2*.

Considering both local decision-making needs and the *IPCC Guidelines for National GHG Inventories*, the ICP 2012 Accounting and Reporting Framework includes six main categories: Stationary units, Mobile units (in the *IPCC Guidelines* these two categories are grouped under 'energy'), Waste, IPPU (industrial process and product use), AFOLU (agriculture, forestry, and land use), and Other indirect emissions. These emission sources are further categorized by *scopes* (see *Section 3 Boundary Setting*) to distinguish direct and indirect impacts.

For each source, the corresponding IPCC classification number is also provided. This enables local authorities to have a more active collaboration with their national governments in the preparation of national GHG inventories for submission to UNFCCC.

In order to ease the reporting process, and following the practice used by national governments in the IPCC and UNFCCC processes, ICP enables the use of Notation Keys. These are:

- **IE – Included Elsewhere:** Emissions for this activity are estimated and presented in another category of the inventory. The category where these emissions are included should be noted in explanation.
- **NE– Not Estimated:** Emissions occur but have not been estimated or reported; justification for exclusion should be noted.
- **NA – Not Applicable:** The activity occurs but does not cause emissions; explanation should be provided.
- **NO – Not Occurring:** An activity or process does not occur or exist within the community.

## Annexure: ICP 2012 Accounting and Reporting Pilot Framework

ICP No.	IPCC Class	Scope	GHG Emissions Sources	Accounting Approach	Notation keys				GASES						Total GHG Gases	Data Quality		
					IE	NE	NO	NA	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	HFC	PFC	SF <sub>6</sub>		CO <sub>2</sub> e	H	M
<b>I.</b>			<b>Stationary Units</b>															
I.1			<b>Residential Buildings</b>															
I.1.1	1A4b	1	Direct Emissions (Scope1)	In-Boundary Fuel Combustion														
I.1.2		2	Energy Indirect Emissions (Scope2)	In-Boundary Energy Consumption														
I.2			<b>Commercial/Institutional Facilities</b>															
I.2.1	1A4a	1	Direct Emissions (Scope1)	In-Boundary Fuel Combustion														
I.2.2		2	Energy Indirect Emissions (Scope2)	In-Boundary Energy Consumption														
I.3			<b>Energy Generation</b>															
I.3.1.	1A1	1	Direct Emissions (Scope1)	In-Boundary Fuel Combustion														
I.3.2		2	Energy Indirect Emissions (Scope2)	In-Boundary Energy Consumption														
I.4			<b>Industrial Energy Use</b>															
I.4.1	1A2+1A5+1A4c	1	Direct Emissions (Scope1)															
I.4.2		2	Energy Indirect Emissions (Scope2)	In-Boundary Energy Consumption														
I.5			<b>Fugitive Emissions</b>															
I.5.1	1B	1	Direct Emissions (Scope1)															
<b>II.</b>			<b>Mobile Units</b>															
II.1			<b>On-Road Transportation</b>															
II.1.1	1A3b	1	Direct Emissions (Scope1)	In-Boundary Fuel Combustion														
II.1.2		2	Energy Indirect Emissions (Scope2)	In-Boundary Energy Consumption														

ICP No.	IPCC Class	Scope	GHG Emissions Sources	Accounting Approach	Notation keys				GASES						Total GHG Gases CO <sub>2e</sub>	Data Quality		
					IE	NE	NO	NA	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	HFC	PFC	SF <sub>6</sub>		H	M	L
II.1.3		3	Indirect Emissions from Transboundary On-Road Inter-City or International Transportation Trips that Originate and/or Complete their Journey Within the Community (Scope3)															
II.2			<b>Railways</b>															
II.2.1	1A3c	1	Direct Emissions (Scope1)	Proportional Fuel Combustion														
II.2.2		2	Energy Indirect Emissions (Scope2)	Proportional Energy Consumption														
II.2.3		3	Indirect Emissions from Transboundary Inter-City or International Railway Trips that Originate and/or Complete their Journey Within the Community (Scope3)															
II.3			<b>Water-Borne Navigation</b>															
II.3.1.	1A3dii	1	Direct Emissions (Scope1)	Proportional Fuel Combustion														
II.3.2		2	Energy Indirect Emissions (Scope2)	Proportional Energy Consumption														
II.3.3		3	Indirect Emissions from Inter-City or International Water-Borne Navigation Trips that Originate their Journey Within the Community (Scope3)															
I.4			<b>Aviation</b>															
II.4.1	1A3aii	1	Direct Emissions (Scope1)	Proportional Fuel Combustion														
II.4.2		2	Energy Indirect Emissions (Scope2)	Proportional Energy Consumption														
II.4.3		3	Indirect Emissions from Inter-City or International Aviation that Originate and/or Complete their Journey Within the Community (Scope3)															
II.5			<b>Off-Road</b>															
II.5.1	1A3eii	1	Direct Emissions (Scope1)	In-boundary Fuel Combustion														
III.			<b>Waste</b>															
III.1			<b>Solid Waste Disposal</b>															

ICP No.	IPCC Class	Scope	GHG Emissions Sources	Accounting Approach	Notation keys				GASES						Total GHG Gases	Data Quality			
					IE	NE	NO	NA	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	HFC	PFC	SF <sub>6</sub>	CO <sub>2e</sub>	H	M	L	
III.1.1	4A	1+3	Option-1: First Order Decay (FOD) Method - Direct (Scope1-Current Year) and Indirect (Scope3-Previous Years) Emissions from Landfills Located Within the Community Boundary (excluding emissions due to incoming waste from other communities)	In-boundary Waste Generated and Proportional Waste Treated															
III.1.2		1+3	Option-2: Methane Commitment (MC) Method - Direct (Current Year) and Indirect (Scope3-Future Year) Emissions from Landfills Located Within the Community Boundary (excluding emissions due to incoming waste from other communities)	In-boundary Waste Generated and Proportional Waste Treated															
III.1.3		3	Indirect Emissions (Scope3) from Community Wastes Deposited in Landfills Located Outside the Community Boundary	Proportional Waste Treated															
III.3			<b>Biological Treatment of Waste</b>																
III.3.1	4B	1	Direct (Scope1) Emissions from Biological Treatment of Waste in the Community Boundary (excluding emissions due to incoming waste from other communities)	In-boundary Waste Generated and Proportional Waste Treated															
III.3.2		3	Indirect Emissions (Scope3) from Biological Treatment of Wastes Outside the Community Boundary	Proportional Waste Treated															
III.4			<b>Incineration and open burning</b>																
III.4.1	4C	1	Direct (Scope1) Emissions from Incineration and Open Burning of Waste in the Community Boundary (excluding emissions due to incoming waste from other communities)	In-boundary Waste Generated and Proportional Waste Treated															
III.4.2		3	Indirect Emissions (Scope3) from Incineration and Open burning of Wastes Outside the Community Boundary	Proportional Waste Treated															
III.5			<b>Wastewater Treatment and discharge</b>																
III.5.1	4D	1	Direct (Scope1) Emissions from WWT and discharge in the Community Boundary (excluding emissions due to incoming waste from other communities)	In-boundary Waste Generated and Proportional Waste Treated															



ICP No.	IPCC Class	Scope	GHG Emissions Sources	Accounting Approach	Notation keys				GASES						Total GHG Gases	Data Quality			
					IE	NE	NO	NA	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	HFC	PFC	SF <sub>6</sub>	CO <sub>2e</sub>	H	M	L	
III.5.2		3	Indirect Emissions (Scope3) from WWT and discharge Outside the Community Boundary	Proportional Waste Treated															
<b>IV.</b>			<b>Industrial Processes and Product Use (IPPU)</b>																
IV.1	2A+2B+2C+2E	1	Direct Emissions from Industrial Processes	In-boundary Production															
IV.2	2D+2F+2G+2H	1	Direct Emissions from Product Use	In-boundary Product use															
<b>V.</b>			<b>Agriculture, Forestry, and Land Use (AFOLU)</b>																
V.1	3	1	Direct Emissions from AFOLU	In-boundary areas															
<b>VI.</b>			<b>Other Indirect Emissions</b>																
VI.1		3	All other Scope3 Emissions from all sources																
VI.2		3	All transboundary Scope3 emissions due to exchange/consumption of goods and services																
			<b>ICP BASIC (tCO<sub>2e</sub>)</b>		IE	NE	NO	NA	No. of occurrence and ICP No. for Notation Keys (out of 28 entries)										
			<b>ICP BASIC+ (tCO<sub>2e</sub>)</b>						Sources included in BASIC+ (out of 5 data entries)										
			<b>ICP EXPANDED (tCO<sub>2e</sub>)</b>						Sources included in EXPANDED										
			<b>Scope1</b>																
			<b>Scope2</b>																
			<b>Scope3</b>																