

# Local Accountability for Kyoto goal S

## Local Government Greenhouse Gas Emissions Inventory Manual

This manual accompanies the easy-to-use  
“LAKs – Local Accountability for Kyoto Goals”  
Greenhouse Gas Inventory Tool  
(LIFE07 ENV/IT/000451)

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This Manual and the associated GHG Inventory Tool has been developed by:  
ICLEI European Secretariat GmbH (ICLEI), Leopoldring 3, 79098 Freiburg, Germany  
Phone +49 761 36 89 20, fax +49 761 36 89 219, web [www.iclei-europe.org](http://www.iclei-europe.org), e-mail [ccp-europe@iclei.org](mailto:ccp-europe@iclei.org)  
Legal representative: Wolfgang Teubner, General Manager  
Trade register: Amtsgericht Freiburg, HRB 4188

on behalf of the LAKs project team represented by:  
ARPA Emilia-Romagna, Environment Agency of Emilia-Romagna Region  
Technical Direction, Largo Caduti del Lavoro, 6, 40122 Bologna (BO)  
<http://www.arpa.emr.it>

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e-mail [ccp-europe@iclei.org](mailto:ccp-europe@iclei.org) or [laks@municipio.re.it](mailto:laks@municipio.re.it)

Version 2 of this manual has been modified to reflect changes in the LAKs GHG Inventory Tool including the addition of energy unit selection drop-down menus and further FAQ questions..

# LAKs Local Government Greenhouse Gas Emissions Inventory Manual

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## SECTION 1 GENERAL INTRODUCTION

### 1. Aim of the Document and LAKs Project

The objective of this Local Government (LG) Greenhouse Gas (GHG) Emissions Inventory Manual is to provide municipal staff with comprehensive advice and instructions for the use of the LAKs Emissions Inventory Tool to develop an emissions inventory that meets the requirements for completion of Phase 1 of the **Local Accountability for Kyoto goals** (LAKs) project process.

This Manual accompanies the easy-to-use LAKs LG GHG Emissions Inventory Tool which has been developed to assist local government staff to complete an inventory in a timely and cost-effective manner. Local government staff do not need to be 'climate experts' to use the Inventory Tool to prepare the essential two elements of any local government GHG Inventory, namely:

- a Government Operations Emissions Inventory, and
- a Community Emissions Analysis.

The Government Operations Emissions Inventory and Community Emissions Analysis will provide municipalities with valuable information to help develop a strategic approach to reducing GHG emissions. They will help to identify key priority areas and activities to address large emissions sources, and provide a reference from which you can measure achievements as your local government implements emissions reductions actions.

The LAKs inventory tool, and this manual, has been developed for use by municipalities in Italy, Poland and Spain. This easy-to-use inventory tool is based on the GHG accounting principles in the **International LG GHG Emissions Analysis Protocol**, and an associated **Country Supplement** for each of these countries (yet to be developed!).

The LAKs project aims to demonstrate the potential of cities in using existing opportunities and synergies to actively contribute to the achievement of the Kyoto Protocol goals (and the expected follow-up international agreement), and support the achievement of targets set by the European Union within the Climate and Energy package approved in December 2008. The LAKs project focuses on two issues which are the keys for a sustainability local policy: climate change and accountability. For more information on the LAKs project visit the website: <http://www.municipio.re.it/LAKs> or contact: [laks@municipio.re.it](mailto:laks@municipio.re.it)

The first phase of LAKs Project requires each municipality to produce a Government Operations emissions inventory and a Community emissions analysis that are complete, accurate and credible. As a local government operates within its community it is clear that the Government Operations emissions are a sub-set of the emissions of the whole Community.

The process for developing your **Government Operations Emissions Inventory** involves collecting energy usage data (from energy invoices paid by your municipality) plus records of quantities of waste disposed from Council facilities, and then entering this data into the easy-to-use LAKs Inventory Tool spreadsheet.

The process for developing a **Community Emissions Analysis** involves collecting community energy usage data plus waste-to-landfill disposal data and entering all this into the Inventory Tool. This tool, which is specifically developed for use by local governments, converts the input energy and waste data into information on the equivalent tonnes of carbon dioxide (tCO<sub>2</sub>e) released into the atmosphere by using nationally or regionally agreed emission factors.

This manual aims to provide detailed information on data sources and data collection techniques for development of your Government Operations segment inventory and general information on the development of your Community segment emissions analysis. It also provides a glossary of terms related to the analysis of GHG emissions and the development of inventories.

It provides information from international GHG guidelines and standards (UNFCCC and IPCC) and brief information about the methodological basis for GHG inventories and protocols, and also describes aspects of the International Local Government (LG) GHG Emissions Analysis Protocol, and the associated protocol supplement for your country. The supplement provides additional detailed information and specific local data that will allow your local government to develop a credible emissions inventory and community emissions analysis.

Some comment has been added, and the tool adapted, to help municipalities that have signed the Covenant of Mayors, report on their emissions to meet that commitment.

This manual will grow and develop as users of the tool encounter data collection and calculation issues that may also be applicable to others. Your feedback will make the tool and this manual better for all users and it will be appreciated.

## 1.1 Manual Structure

The Manual is structured to provide information on the two segments that make up your local government's GHG inventory and community analysis, and aims to provide guidance as follows:

- Section 1 provides a brief background to the LAKs Project and a general introduction to GHG protocols and inventories.
- Section 2 provides information on the development of the “Government Operations Emissions Inventory”. This Government Operations inventory is a record of all emissions that are the direct responsibility of your local government arising from your statutory and mandatory functions or responsibilities - these are sometimes called your “corporate” emissions.
- Section 3 provides information about the development of an analysis of all emissions produced within your local government's geopolitical area, or from purchased electricity or heat used within your area. This is referred to as the “Community Emissions Analysis”.
- A growing annex of Frequently Asked Questions (FAQ)
- Some guidance on extracting data for reporting to the Covenant of Mayors, and
- A Glossary of Terms related to GHGs, protocols and inventories.

## 1.2 The International Emissions Analysis Protocol for Local Government

Cities and municipalities all over the world are now responsible for more than 50% of all GHG emissions and local governments. Local governments have become a key focus area for greenhouse gas (GHG) mitigation and management. A need for common conventions and standardised approaches to quantifying GHG emissions led to the development of the **International Local Government GHG Emissions Analysis Protocol (IEAP)**.

The principles and philosophies used in the development of inventories needed to be aligned with international standards, and this International LG Protocol was specifically developed to address these principles and philosophies with a particular focus on the requirements of local governments and the emissions produced by communities. The experience gained by ICLEI – Local Governments for Sustainability since the inception of the Cities for Climate Protection Campaign in 1993, was used to develop this international emissions analysis protocol.

The IEAP document was extensively peer-reviewed by using the expertise and experience of a worldwide network of peer organisations plus comments from ICLEI's worldwide membership of over 1,000 local governments. Peer organisations around the world who reviewed this protocol included United Nations Environment Program, World Resources Institute, International Energy Agency, California Climate Action Registry, Federation of Canadian Municipalities and the Center for Neighborhood Technologies.

The protocol is based on international standard documents including:

- ISO 14064 Greenhouse Gases series of standards
- GHG Protocol Initiative Corporate Standard and Project Accounting Protocols
- IPCC 2006 methodological changes
- GRI Public Sector Agency Supplement.

The International Protocol (with text referred to throughout this document) describes the general principles and philosophy that any local government, regardless of location, should adhere to when developing an inventory of GHGs for its internal government operations and for its whole community. The emission sources that should be included in a GHG inventory and the methods used to quantify these sources need to be consistent between local governments. However, these sources and methods are unique when compared to other types of business entity that is developing an inventory.

The protocol is effectively in two parts: the International Protocol is a generic document that addresses issues related to all local governments, and a Country Supplement specifically developed for each country. Under this LAKs Project country supplements are being developed for Italy, Poland and Spain.

Each country supplement describes how the International Protocol is to be implemented in the specific country, and contains specific guidance on acceptable sources of data, nationally acceptable emissions factors for fossil fuels, waste and electricity, and methods for the analysis of sub-national emissions that reflect national requirements. Significant data included in your Country Supplement is extracted from each country's National Inventory Report as submitted to UNFCCC, and thus should also be compatible with data being used for corporate emissions inventories in your country. Each Country Supplement needs to go through a detailed review process, including review by representatives from appropriate national bodies – so this process may be operating in parallel with your municipality using the tool.

A copy of the latest issue of the Protocol can be downloaded from <http://www.iclei.org/ghgprotocol>. Country Supplements that have been published or updated will also be linked from that site.

### **1.3 Outline of LAKS “Climate Accountability System”**

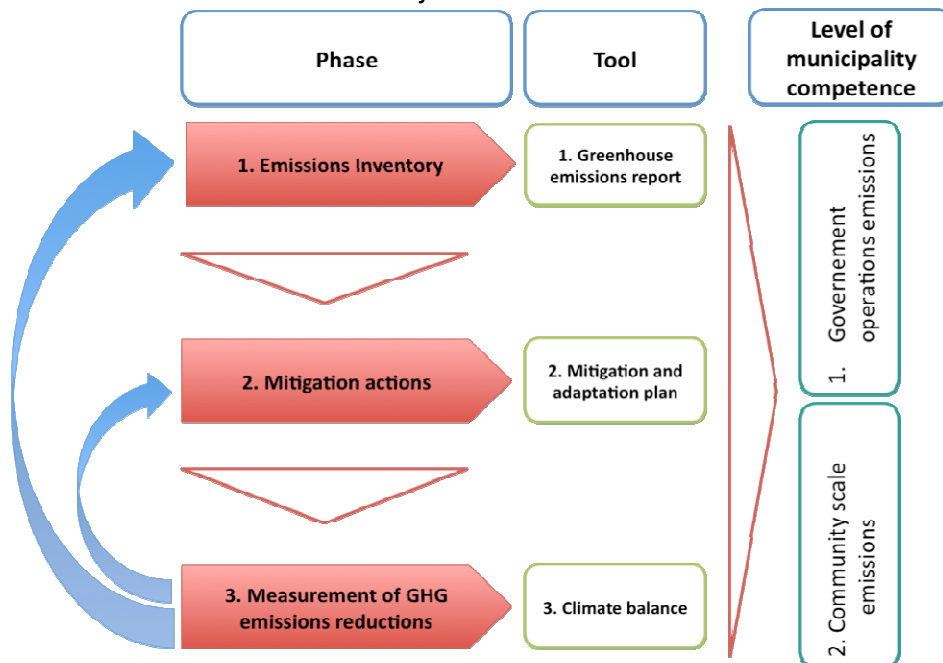
The focus of the LAKS project is on the implementation of a Climate Accountability System, which is a 3-phase process.

Each phase produces a specific tool and involves a specific level of competence in the Municipality, as described below:

1. Emissions Inventory: each city will complete a greenhouse emissions report based on an inventory of all the GHG emissions of the municipality.
2. Mitigation actions: the climate accountability system includes a specific phase to develop a strategy plan, including relevant actions that the Municipality will implement to reduce GHG emissions.

3. Measurement of GHG emissions reduction: the last phase of the climate accountability system foresees the measurement of emissions reduction obtained through the mitigation actions, in order to develop a “climate balance”. This balance will account for action implemented, GHG reduction, and cost of the investment.

Figure 1 below shows the structure of the system.



**Figure 1: The LAKs climate accountability system**

As shown in Figure 1, the system is not a linear process but is a cycle: the inventory needs to be updated periodically in order to appreciate the results obtained through the mitigation actions. In addition the effect of the mitigation actions will be calculated and in relation to these results a new mitigation and adaptation plan can be developed.

The LAKS Climate Accountability System is based on ICLEI’s Cities for Climate Protection (CCP) 5 Milestone Process, adapted to assist LAKS cities with the calculation of their "Government Operations" GHG emissions and the geo-political area "Community" GHG emissions. This choice is based on the synergies that could be created between the milestones foreseen in the CCP model and the phases in the LAKS model<sup>1</sup>.

<sup>1</sup> The CCP 5-milestone framework provides information necessary for determining a strategic approach to reducing emissions. It also serves as a reference against which to measure the local government’s achievements as progress is made through the five milestones:

- Milestone 1 is the development of an inventory of greenhouse gas emissions (GHG) from council’s own operations (‘Government Operations’ segment) and an analysis of the greenhouse gas emissions from the local governments geopolitical area as a whole (the ‘Community’ segment).
- Milestone 2 is the establishment of emissions reduction goals for the Government Operations and the Community segments.
- Milestone 3 is the development of local action plans to achieve the goals.
- Milestone 4 is the implementation of the action plan policies and measures.
- Milestone 5 is the monitoring, measurement and quantification of policies and actions (measures) completed and the reporting of progress towards the reduction goals. Completion of this milestone also requires the completion of a new inventory, a report on progress, and a re-commitment to the process of climate protection planning and action.

For more information on ICLEI’s Cities for Climate Protection (CCP) Campaign see [www.iclei.org/ccp](http://www.iclei.org/ccp)

In particular:

- LAKS “Emissions inventory” Phase 1 aligns with Milestone 1 of the CCP model (“Calculation of GHG emissions”).
- LAKS “Mitigation Actions” Phase 2 aligns with Milestones 2, 3 and 4 of the CCP model (“Set targets”, “Develop an Action Plan”, “Implement policy measures”)
- LAKS “Measurement of GHG Emissions Reductions” Phase 3 aligns with Milestone 5 of the CCP model (“Monitor progress”)

#### 1.4 Completing Phase 1 in the LAKs Project

To complete the LAKs Phase 1, each local government must develop a Government Operations inventory of greenhouse gas emissions for a base year (e.g. 2005) and a Community emissions analysis for a base year (e.g. 2001) and prepare a 'business-as-usual' forecast of emissions trends for a forecast year (e.g. 2015).

To complete this phase your Government Operations inventory should include at least four of the Government Operations sectors to ensure comparability of the results with other municipalities. The Community emissions analysis should also include four Community sectors.

If there are sectors missing from your initial inventory or community analysis, you should include an action to complete the gathering of data for the missing sectors as part of your Local Action Plan (as part of Phase 2).

Note that implementation of an Employee Commute analysis is a voluntary activity that provides additional information to focus the local government on actions that its own employees could take in partnership with the municipality. This sector is not a requirement, and the employee commute analysis is not counted as part of Government Operations emissions. Of course, employee commute emissions are a part of your community emissions analysis. However, completing an employee commute analysis can provide insights and starting-points for possible actions for community businesses.

#### 1.5 General Introduction to the LAKs Inventory Tool

This **manual introduces, and provides guidance for use of the easy-to-use spreadsheet LAKs Inventory Tool**. This has been developed to provide a cost-effective mechanism to support local governments develop their emissions inventory and quantify the size of their community emissions footprint.

The development of this LAKs Inventory Tool for the partners in the LAKs project followed an international review of tools and methods by ARPA Emilia-Romagna, after which the ICLEI Cities for Climate Protection (CCP) 5-milestone methodology was selected as a clear, effective approach in addressing local government climate protection with a general urban sustainability perspective.

The LAKs Inventory Tool is an easy-to-use spreadsheet which operates by **converting the energy and waste input data (fuel used, electricity used and waste materials produced) into GHG emissions using nationally acceptable emission factors**. The results are measured in tonnes (t) of carbon dioxide equivalent (CO<sub>2</sub>e), or tCO<sub>2</sub>e. CO<sub>2</sub>e is the internationally accepted unit for measuring the equivalent climate change impacts from CO<sub>2</sub> and other greenhouse gases.

The Inventory Tool is also divided into **two segments**: a Government Operations emissions segment and a Community emissions segment, and each of these segments is sub-divided into sectors appropriate for local government. See Table 1 below for a list of the sectors.



Other worksheets have been added to assist with calculation of emissions from agricultural activities, and from local energy generation sources as the partners suggested that these would help in their reporting to the Covenant of Mayors.

Table 1 – Local Government Sectors included in each Segment

Government Operations Segment	Community Segment
Buildings	Residential
Vehicle Fleet	Commercial
Employee Commute	Industrial
Street lights	Transport
Water/Sewage	Waste
Waste	Other
Other	

The relationship of each Government Operations and Community sector to the equivalent sectors used by the **Intergovernmental Panel on Climate Change (IPCC)** (i.e. the sectors used by national governments for their national inventories) is explained in Section 2.1 for the Government Operations segment, and Section 3.1 for the Community segment.

## 1.6 General Data Management Issues

It is important that you document the boundary decisions and data selection choices you make in each case (add a schedule in your inventory report). Producing an inventory based only on data that you can get access easily from in-house sources may be unacceptable in the future. When someone-else does a re-inventory to check progress it is likely that they will have different (even more urgent) drivers and the records from your data collection and emissions reductions project baseline decisions may need to be revisited.

### 1.6.1 Dealing with Missing Data

The data collection process often highlights gaps in the data that is being collected by your local government. It may also allow you to see inefficiencies in data collection systems being used. Keep a detailed record of these problems as you find them so that you can include actions to fix these problems in your Local Action Plan (e.g. climate, or sectoral action plan such as energy, transport, water). Fixing these system issues will allow you to be more efficient with collection of data collection in the future.

If there is specific data missing for a building or facility (e.g. missing invoices for three months) you may need to re-create (estimate) this data to produce a complete record for that year. However, it is essential that you explain how you did this in the record notes. It is recommended that actions to fix future occurrences of specific missing data is also included as part of the action plan.

Reasons for missing data during a re-inventory (i.e. after the base year) could include:

- Facility or site closed or no longer the responsibility of local government since base year (if so, explain when – date - and a comment – why etc.)
- No data available (explain why, and what is being done to follow this up?)

### 1.6.2 Data Boundaries

The choice of data boundaries for the emissions inventory is sometimes a complex matter to resolve. Data for buildings and facilities that are owned and or operated by the local government need to be included in your Government Operations inventory. However, decisions

regarding other facilities, related to your council in some way, but not directly controlled by your local government, may be more difficult to decide (and the data may be more difficult to obtain). Refer to the **International Protocol and your Country Supplement**. Below is a brief extract from the Protocol on boundary information related to the various control mechanisms that a local government has over separate entities (e.g. operational companies).

The International Protocol discusses recommendations on the inclusion of data for entities (organisations) that are related to your local government through “**Operational Control**” and/or “**Financial Control**” and/or through an “**Equity Share**”. The decisions you make need to be recorded as part of your inventory report. The following boundary definitions are described in more detail in the GHG Protocol.

Your local government has **operational control** over an entity if your council or one of your subsidiaries has full authority to introduce and implement operating policies, or holds an operating license for those functions. Local governments reporting according to operational control would be responsible for reporting emissions from 100 percent of the activities of which they had operational control.

You have **financial control** over an entity if you have the ability to direct the financial policies of the operation with an interest in gaining economic benefits from its activities. Local governments reporting according to financial control would be responsible for reporting emissions from 100 percent of the activities of which they had financial control.

You may also consider an **equity share** approach to the reporting of emissions on joint venture projects that are wholly owned and partially owned according to an equity shareholding.

If your local government has both **operational control** and an **equity share**, you should report 100 percent of the emissions but also record the percent equity share held in the operation.

### 1.6.3 Recording Notes for Each Data Record

It is **important that someone else can follow exactly what you did in collecting and entering data** to develop your inventory. Data credibility and clarity will result from a clear “data trail”. Recording notes for each record will assist if result needs to be audited, or will help the person who has to complete a future re-inventory to measure the results of emissions reductions activities.

Each sector worksheet has a ‘General Sector Notes’ field that enables you to **enter notes relating to the entire sector**. For examples you could record notes such as “the invoice data for these records was supplied by Francesco Blanco”, or that the “Numbers entered in the Buildings Sector ID field are the energy supplier number in the accounting system”.

The data entry spreadsheets have a column to include an ID, such as the unique meter number for that energy account, or the energy suppliers Account Number. The **unique meter number or premises number is the preferred data to record**, as this does not change if you change electricity supplier. Information such as the address of the facility, can be included in the Record Description field.

#### *TIPS:*

*Make best use of the fields or columns you add into the Inventory Tool worksheets. But, whatever decisions you make, please ensure they are recorded in either the “Individual Record Notes” or “General Notes” fields, and that you are **consistent** in your efforts in this regard.*

*You could also enter notes relating to each individual data record – a space is provided at the end of each record. For example – a grouped-data record may include a note “Five sheds - Memorial Gardens” or “Six heavy trucks - Parks Department”.*

*Individual record notes could also include the facility address if it is not clear from the building name. You could also record explanations such as “data for June & August estimated because of missing invoices”.*

#### **1.6.4 Recording Indicator Data**

Indicators provide an easy means of **comparing the energy consumed, or emissions released**, from a building or facility, with another similar function building or facility. If indicator information such as Operating Hours, Floor Area, Number of Occupants, or Number of Users are included in the inventory calculator this enables comparison of similar facilities within the same local government, or even possibly between similar facilities at different local governments. More complex factors such as heating (or cooling) degree-days may need to be used for comparisons between facilities in different locations.

Indicator factors can be a powerful tool to **help you prioritise actions**. A review of indicator outputs will allow staff to ask the questions such as: “Why is the energy per square metre for this office building so different from that other office? Or why is the energy per user for this swimming pool different from that swimming pool?” This could lead you to ask an Energy Manager for advice on this issue, and also about the use of degree-days to rationalise the comparison of heating or cooling energy data.

#### **1.6.5 Checking the Quality of Data**

Once the inventory and analysis has been completed, the LAKs team will use a checklist to **confirm that the standard of data used is acceptable** (only those partner cities selected for the project). A basic check is important, to identify potential data entry mistakes. The LAKs Project does not provide formal “verification” or “audit services” as defined under Kyoto or European Emission Trading Scheme rules. However our checks should provide each local government with confidence that the data input and the resultant outputs are credible<sup>2</sup>.

The LAKs project team does not, at this stage, recommend that cities use valuable resources to fully audit their inventory by engaging an independent verifier. The important focus from this project is rather to use the inventory as a **device to help develop credible action plans** and to start implementing emission reduction activities (which can also be done without having conducted an inventory!).

It is recognised that **changes to base year data may occur** over time for various reasons, and that corrections to baselines are sometimes required. Local governments are encouraged to update baseline data whenever it is relevant and justified. However be aware that changes to baseline data may need an explanation in future reports.

It is recommended that the staff responsible for preparation of the inventory also **prepare a report on the results of your inventory and analysis** for presentation to your Management and/or Councillors. This may be done in conjunction with the reporting on your proposed reduction targets and/or draft action plans.

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<sup>2</sup> Carbonn is the Bonn center for Local Climate Action and Reporting, and it is currently being established to take on the international function of recording local government emission reduction commitments, and record the results from local government inventories. For more information see – [www.carbonn.org](http://www.carbonn.org)

### **1.6.6 Emission Scopes**

This emissions inventory tool does not yet display the emissions broken down into the “Scopes” as defined in the International Local Government Emissions Analysis Protocol.

Scope 1 emissions are those produced from direct combustion of fuels by the municipality (or community). Scope 2 emissions are those indirect emissions produced elsewhere – and resulting from the use of purchased electricity or purchased reticulated heating or cooling services (district heating etc). Scope 3 emissions are those produced by someone else in providing services to your municipality or your community.

For the LAKs project all municipalities are requested to calculate their Scope 1 and Scope 2 emissions, and selected Scope 3 emissions – especially if these result from services being undertaken by a contractor on behalf of the council.

See sections 2.1 and 3.1 and the International Protocol for more information on these matters.

### **1.6.7 Local Energy Production**

A Local Energy Production worksheet has been added to this Inventory Tool to assist with the recoding of local generation of energy (and for reporting to the Covenant of Mayors). To avoid double-entry of data and “double counting” of emissions only a single worksheet is used to record all local energy production activities. Municipality-owned energy production plant should be included in this worksheet, as well as other privately-owned facilities. This worksheet will also allow you to report appropriately to the Covenant of Mayors on renewable and non-renewable energy production.

For each energy production plant, please record the percentage of municipality ownership, control or share so that an appropriate percentage of these emissions are allocated to your Government Operations emissions summary sheet. See Section 1.6.2 for more discussion on ownership boundaries.

The emissions that are not allocated to the municipality Government Operations summary sheet are recorded in the Community summary sheet, and more information on this is provided in Section 3.4.7 of this manual.

### **1.6.8 Other Emission Sources**

Calculators have been provided in the Community segment for agricultural non-energy emissions and, in the Community Industry Sector worksheet, for emissions from other sources of GHGs (SF<sub>6</sub>, CFCs, HCFCs etc).

A separate calculator for other GHGs has not been provided for your Government Operations inventory. If your local government has significant emissions from these sources (eg municipality owned farms) and you want to include these emissions in your Government Operations Inventory – please contact the LAKs team or ICLEI Europe to discuss further.

## SECTION 2 DEVELOPING YOUR GOVERNMENT OPERATIONS EMISSIONS INVENTORY

### 2.1 Introduction to Government Operations Segment

The Government Operations Segment is sub-divided into **a number of sectors considered most appropriate for the analysis of local government emissions**. These are:

#### Government Operations Sectors

Buildings  
Vehicle Fleet  
Employee Commute  
Street lights  
Water/Sewage  
Waste  
Other

The relationships between the **Government Operations sectors** and the [United Nations Framework Convention on Climate Change](#) (UNFCCC) sectors as noted in the International Protocol as shown in Table 2:

Table 2 – Relationship of Government Operations Sectors to UNFCCC Sectors

Macro Sector (UNFCCC)		Government Operations Sector
Energy	Stationary Energy	Buildings and Facilities
		Street Lighting and Traffic Signals
		Water and Wastewater Treatment, Collection and Distribution (energy only)
	Transport	Government Operations Vehicle Fleet Employee Commute (for info only)
	Fugitive Emissions	Other
Industrial Processes		Other
Agriculture		Other
Land Use, Land Use Change and Forestry		Other
Waste	Solid Waste Disposal	Waste
	Biological Treatment of Solid Waste	
	Incineration and Open Burning of Waste	
	Wastewater Treatment and Discharge	

It is important that staff developing an inventory document record the context and decisions that they make related to what is included, and what is not included in the inventory. See the section on ownership boundaries for more information. For your first inventory, it is especially important that you develop a list of all of your local government assets, part assets, joint ventures and partnerships – then you can clearly record on which of these you hold data, and the percentage of emissions you are including in your Government Operations Segment.

## 2.2 Selecting a Base Year for the Government Operations Segment

Before starting to collect data, you need to select a base year for your Government Operations inventory, against which future inventories will be **compared and measured**. The base year for the Government Operations segment can be a calendar year, or a financial year to match with other reporting processes of council.

Often the year 1990 is mentioned as base year, and the Covenant of Mayors suggests that this be used if possible. However, the most important factor that will influence your choice of base year selection will be the availability of **quality data**. Some local governments only have data available for a recent year. If you have available earlier data please consider the strategic issue of being able to report significant actions from that earlier base year.

**TIP:**

*If you have the baseline data available, you are advised to choose a base year before the start of major actions (or measures) were undertaken by your municipality to reduce emissions. The process is designed to measure the results of your climate change activities since your base year, allowing you to gain credit for these actions as part of achieving your climate protection goals. BUT you can only count measures that have been implemented by your local government after your inventory base year. The further back you go in setting your base year, the more already-started-or-completed measures that you can count towards achieving your reduction goal.*

Many local governments choose to collate base year data for their financial year (for example this may be the 12 months from 1 July to 30 June). This can simplify data collection from internal sources rather than using a calendar year. This can also mean that climate protection targets and reporting become aligned with the local government's normal reporting processes. National governments collect and report national data based on calendar years, as this is the requirement under the Kyoto Protocol reporting process. Some community data may only be available from national government sources for calendar year periods. However, in the longer term it makes little difference – as long as data is consistently for periods of 12 months.

## 2.3 Sources of Government Operations Data

Table 3 identifies places where you may find the data you need to complete your Government Operations inventory.

**Table 3 – Where to find data for your Government Operations Segment Inventory**

Sector	Data Required	Possible Data Sources
Buildings	Energy supplied – kWh or fuel quantity used plus cost data, plus energy account or meter or connection number*, for all local government owned and/or managed properties, and rented properties.  <i>Indicator inputs:</i> operating hours, facility users, building occupants, floor area)	<ul style="list-style-type: none"> <li>• Energy manager</li> <li>• Finance manager</li> <li>• Accounts department</li> <li>• Asset / Property manager</li> <li>• Electricity bills (invoices)</li> <li>• Energy retailer</li> </ul>
Vehicle Fleet	Fuel quantity used, fuel type, fuel account numbers, fuel cost info  <i>Indicator inputs:</i> vehicle kilometres travelled (VKT) per annum, number of vehicles	<ul style="list-style-type: none"> <li>• Finance department</li> <li>• Fleet manager</li> <li>• Fuel source / fleet cards</li> <li>• Individuals with fleet vehicles</li> </ul>
		Continued overleaf

**Table 3 (cont) – Where to find data for your Government Operations Segment Inventory**

Public lighting	<p>Energy supply meter or unique connection number, kWh used and cost data for the local government owned and/or managed lighting of streets, traffic signals, parks, public lighting.</p> <p><i>Indicator inputs:</i> types and numbers of street light fittings and/or lights (globes)</p>	<ul style="list-style-type: none"> <li>• Energy retailer</li> <li>• Traffic and Roads operational groups</li> <li>• Finance department</li> <li>• Electricity bills</li> </ul> <p>Note: public lighting circuits may be invoiced separately or all together. Check you do not miss any circuits.</p>
Water/ Sewage	<p>Energy supply meter or unique connection number, kWh used and cost data for water and sewage pumping facilities. Also energy used for other fuels used in this sector, including recovered methane.</p> <p><i>Indicator input:</i> output Mega-litres pumped</p>	<ul style="list-style-type: none"> <li>• Asset / Property manager</li> <li>• Energy retailer</li> <li>• Finance department</li> <li>• Electricity bills</li> <li>• Internal meters</li> </ul>
Waste	<p>Total Government Operations waste to landfill (tonnes). Do not include diverted waste such as recycled materials or inputs to a composting system.</p> <p>Waste composition data.</p> <p><i>Indicator input:</i> number of employees or area of offices etc</p>	<ul style="list-style-type: none"> <li>• Waste audits – by weight and composition.</li> <li>• Landfill manager.</li> <li>• Has the waste been weighed or measured by the cleaners?</li> </ul> <p>OR use generic waste-composition data as measured by another local government of similar size.</p>
Employee Commute	<p>Mode of transport, Distance traveled, fuels used, numbers of people in the vehicle, etc</p> <p>Note: Do not include travel to and from work in local government fleet vehicles, as the energy used in these vehicles should be captured in the Government Operations Vehicle Fleet sector.</p>	<p>Staff travel survey of private vehicle travel to and from the local government.</p> <p>Develop a travel survey form and survey your staff. The results will be interesting.</p>

There may be other sources specific to your local government – the above are just examples. Your local government may have other data needs and other data sources.

**TIP**

*If the staff person, or intern collecting the data, is a new or junior employee, then be aware that the ease of data collection may vary greatly depending on the **data systems in place in your municipality**. Use ideas from the table above, and the inventory tool data input sheets, plus your knowledge of your local government data management systems, and discussions with relevant staff to develop your data collection approach.*

*It is important that you ask each department for all the data required in a **single request** and that you negotiate a time line for them to provide you with this data. Data collection may require the involvement of other staff and this can require long lead times. Ensure you are ready to work on other tasks in the interim, such as the collection of indicator*

*information and to start to sketch your approach to the development of your action plan and ways to engage your local government staff in internal actions.*

*Developing an employee commute survey form – the results from this will help you gain an insight into ideas on how you could help reduce GHG emissions from community travel-to-employment. Inter-department competitions on best employee commute reductions can be positive for reducing emissions, and ideas like free public transport fares for staff gain widespread support and lead you to explore these ideas for the wider community.*

*One way to facilitate the data collection process, and begin engaging staff in your energy planning process, is to send out a notice informing relevant staff that you will be calling on them for help in collecting the data you need. This is particularly useful when a new staff member (or intern) is assigned to complete the analysis. Some local governments have found that a letter to all heads of departments signed by the Mayor or CEO, and stressing your local government's climate change commitments, will smooth the way to achieve rapid staff assistance and this also helps to raise the profile of your energy campaign. When you are requesting **energy usage information from other sections or departments, we suggest that you attach a copy of the Mayor's or CEO's letter.***

## **2.4 Using the Government Operations Inventory Tool**

To produce your Government Operations inventory using the Inventory Tool, you need to input all of the Government Operations energy and waste data for the given calendar or financial year.

The Inventory Tool can be used to **enter every energy invoice separately or the data may be grouped appropriately**. If your energy data is already grouped for some other purpose, such as in an energy management or accounting system, then you can use the grouped data. Try not to re-invent the wheel. It is preferable that separate energy data is entered for each of the largest buildings or facilities, and for each of the largest water/sewage pumping sites, as this allows you to see the emissions implication, and savings potential, from each of these large sites. This helps focus your mind when it comes to developing and prioritising actions in your action plan. However, if you have an energy management system and this individual large facility data is already being reviewed by someone else (like an energy manager) then that source of data can be your source of detail for developing your Action Plan.

To begin the inventory process, please download or copy the Inventory Tool spreadsheet to your computer, and rename the file to include your local government name. Please read the initial instructions detailed on the front sheet of the Inventory Tool spreadsheet.

### **2.4.1 General Info Worksheet**

On this worksheet enter:

- a) Enter the name of your local government,
- b) Select your country or region (The region is only needed if there are different emissions characteristics for electricity or other fuels in different parts of your country.)
- c) Select the year you have chosen as base year for your Government Operations Emissions Inventory (because you have good energy data for that year),
- d) Select the year for which you have data for your Community emissions analysis base year, and
- e) Select the methodology you think you will use for the Community Transportation analysis (but this can be changed later if you find you do not have data for one of the methods).
- f) Enter the area, population and date of that population census or assessment.



Entering the above data into the correct cells is important – this will ensure that **correct emissions factors for your base year(s)** are used in your emissions calculations.

#### 2.4.2 Buildings & Facilities Worksheet

Into the Government Operations Buildings Sector worksheet, enter the name of each building or group of buildings, and the total annual energy usage for each fuel used in that building or facility. From the invoices or energy data available, select the correct energy units for this sector from the drop-down menu (kWh, MWh, litres, m<sup>3</sup>, tonnes etc). Also enter the energy cost data.

If some of your building or facility data is grouped, you may enter this under a group name – for example “community halls in west town”, or “all suburban administrative offices”.

Please double check that you have data in the correct units. A unit selection feature is available, but only a single selection is available for each fuel on each sheet. If you have a mix of units for a sector (eg kWh and MWh) then you need to change some to one set of units. **A unit conversion calculator to allow you to change energy values from one unit to another is available in the last sheet of the Inventory Tool and other calculators are available on the web.** (For example, search Google with an expression such as “convert MJ to kWh”).

Note that for each record there is a place to record important ‘Indicator’ information, such as area of floor (m<sup>2</sup>) or number of employees in a building, or the number of users for a facility like a library or sports complex. This indicator data, if available, will provide useful information for benchmarking energy used between similar sites within your local government, or between similar facilities between different local governments<sup>3</sup>.

If you find you have **missing data**, or are aware of data gaps, please explain these and record an action to address this data gap (as part of your inventory report).

#### 2.4.3 Vehicle Fleet Worksheet

Enter your Government Operations Vehicle Fleet Sector energy usage (e.g. litres of gasoline or diesel) and cost data for a full year. An energy unit selection drop-down menu is available for each fuel.

This data can be entered separately for each vehicle, or for groups of vehicles. If you choose to group the vehicles, think how they should be arranged so that useful indices can be developed. It is suggested that the most useful groups are based on fuel type and the size of engine. For example “diesel passenger cars less than 1.5 litres capacity”, or “gasoline vehicles 1.5 litres to 2.5 litres capacity”, or “all gasoline-hybrid vehicles less than 2.5 litres capacity”, etc. BUT you may also like to group the vehicles as above AND by department ownership (e.g. “Planning Dept - gasoline vehicles less than 2 litres”. This will also allow you to develop inter-department competitions to determine the most efficient drivers.

For each vehicle record, please enter any ‘Indicator’ data that may be useful – such as number of vehicles, and/or km traveled for each vehicle or group of vehicles. This data, if available, will provide useful information for benchmarking energy used between different departments or different local governments.

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<sup>3</sup> If you find that you use fuels that are not included in the inventory tool worksheet please get advice from the LAKS and ICLEI technical support teams ([laks@municipio.re.it](mailto:laks@municipio.re.it) or [ccp-europe@iclei.org](http://ccp-europe@iclei.org)).

#### **2.4.4 Public Lighting Worksheet**

For the Government Operations Public Lighting Sector worksheet enter the energy (kWh) and cost data for each group of lights. The number of lights (globes or tubes) is the indicator data required for this sector.

If groups of lights are on un-metered supply lines, enter a note to describe the way in which the lighting energy in each circuit is calculated.

#### **2.4.5 Water and Sewage Worksheet**

Select the fuel units and enter energy usage (kWh, GJ, litres, tonnes etc) and cost data into the Government Operations Water & Sewage Sector worksheet. Small water or sewage pumping facilities data may be grouped and entered under a group name – for example “Suburb B water-pumping stations”, or “West Area Sewage Pumps”.

Once again an indicator value should be entered if suitable data is available. This may only be a quantity indicator (litres pumped) or it could be the number of residents served by this facility. Once again, this indicator data will provide useful energy or service benchmarking information.

#### **2.4.6 Waste worksheet**

Enter the total annual amount (tonnes) of waste being disposed to landfill from each of your Government Operations facilities. This total should be for all Government Operations facilities.

*TIP:*

*Working with staff across your municipality to complete several “single-night-audits” can be a way to produce an acceptable estimate.*

#### **2.4.7 Government Operations Inventory Summary**

As you enter data into the sector worksheets you will note that totals of all data entered is immediately available as a summary data report and summary graphs (pie charts) for the Government Operations Segment.

*TIP:*

*These graphs can be copied and pasted into other reports that require an image of your emissions inventory (just click, copy and paste!). Labels in the graphs can be moved for clarity – click and grab and drag.*

## SECTION 3 DEVELOPING YOUR COMMUNITY EMISSIONS ANALYSIS

### 3.1 Introduction to the Community Segment

The Community segment is broken down into the following six sectors:

#### Community Sectors

Residential  
Commercial  
Industrial  
Transport  
Waste  
Other

The following chart from the International Protocol indicates how the **Community sectors** relate to the UNFCCC sectors:

Macro Sector (UNFCCC)		Community Sector
Energy	Stationary Energy	Residential
		Commercial
		Industrial
	Transport	Transportation
	Fugitive Emissions	Other
Industrial Processes		Other
Agriculture		Agricultural Emissions or Other
Land Use, Land Use Change and Forestry		Other
Waste	Solid Waste Disposal	Waste
	Biological Treatment of Solid Waste	
	Incineration and Open Burning of Waste	
	Wastewater Treatment and Discharge	

### 3.2 Selecting a Base Year for Community Data

It is recommended that the Community emissions analysis is produced for a selected '**base year**' and that projections based on '**business-as-usual-trends**' are developed for a selected '**forecast year**'. This forecast year should be aligned with your local government's normal planning processes (e.g. 3-year, 5-year, or 10-year planning cycles).

The Community base year needs to be chosen with regard to the availability of data, and if possible will be standardised for all local governments within each country.

### 3.3 Sources of Community Data

**Acceptable sources** of Community data will be identified in more detail in the respective Country Supplements to the International Protocol.

The year chosen for the development of the Community data will be based on **available national or regional statistics and other sources of data**. This calculated Community data, derived from statistical sources such as census data, is sometimes called “proxy data”.

Note that community data input sheets also have an energy unit selection drop-down menu for each fuel.

Municipalities often find that proxy data is most cost-effectively developed at a provincial or regional level, and a contract with a local university may be appropriate to develop this data. At the provincial or regional level fuel sales statistics requested from commercial sources may be less “competitively sensitive” and thus easier to obtain. However, once this provincial or regional data has been developed all municipalities within the area need to meet to agree a breakdown to the local level. Using national data on a per-head-of-population basis is the crudest form of proxy statistic, and it is generally considered unsatisfactory by local governments.

For all community sectors, local or regional energy usage and production data should be used to replace or supplement national proxy data whenever it can be shown that the local or regional data is of better quality.

Community Waste data is not usually developed from national statistics because the staff working in your municipality waste department are likely to have more detailed local waste sector information. For the community waste sector your local **in-house data sources, or regional data, should be used to complete the Community waste sector**.

There may be other sources specific to your the local government, but also note that these are just examples. Your local government may have other data sources.

The emission factor used for the Community waste sector should be developed from local audit information (if available), or the National Inventory Report for your country (if available) or IPCC standards for Europe.

### 3.4 Using the Community Segment of the LAKs Inventory Tool

To produce your Community Inventory using the Inventory Tool, you need to input your community energy and waste data for a selected year.

#### 3.4.1 General Info worksheet

On the “General Info” worksheet select the correct Community Base Year so that appropriate emissions factors are used related to the community data you have available.

On this General Info worksheet you need to select the methodology to be used for community transport data. If you do not have Vehicle Kilometres Travelled (VKT) data then you can select “Fuel Sales”. This selection changes the worksheet from which the community transport totals data is chosen to be included in the Community Summary tables and graphs. (Note: you could enter data into both community transport worksheets – and select the methodology that provides the most accurate results, based on your assessment of the reliability of the available data.)

### 3.4.2 Residential sector worksheet

Enter available Residential sector energy use data into the Residential Sector worksheet. If the energy usage data for a specific fuel is not available separated for the residential, commercial or industrial sectors (eg you have total fuel oil sales data, but it is not split into Residential, Commercial or Industrial sectors) then you have two options. It would be desirable for you to attempt to split this data into sectors on some statistical basis, and record the basis of the split in your inventory report. Others can then follow up on your work and refine your statistical basis later. Examples of possible data split methods are provided in your Country Supplement.

Also enter the Residential Sector indicators data such as total municipality population and the number of households in your geopolitical area.

*TIP:*

*If it is not possible to split Residential and Commercial energy user data – some utility companies only provide data for “small consumers” - then enter the total as a single figure in one of the sectors, and use a note to describe this factor on the worksheet and in your inventory report. This will ensure that the total quantity of fuel and emissions will be included in the community summary. You could comment, in your Inventory Report or Local Action Plan, on possible actions that would provide you with an improved data split for use in your next GHG analysis.*

### 3.4.3 Commercial and Institutional sector worksheet

Enter available Commercial and Institutional Sector energy use data into the Commercial & Institutional Sector worksheet.

Also enter indicator data for the Commercial and Institutional sector if you have this information. This includes total sector floor-area in your municipality area, the total number of Commercial and Institutional sector employees, and the total number of Commercial and Institutional sector establishments (businesses and institutions).

For Covenant of Mayors reporting purposes - you could use this sector input table to only include “institutional facilities” such as hospitals, universities and schools (as defined by Covenant of Mayors (CoM) "Tertiary" facilities.) If these “institutional” facilities are owned or controlled by your local government they will also be included in the Government Operations segment.

However, if you use this worksheet to ONLY report on institutional facilities then you MUST include all other commercial activities (wholesale and retail shops, supermarkets, banks, insurance and service industries) as part of your "Residential" or "Industrial" sectors.

We recommend that you group institutional facilities on this worksheet and add some sub-total cells to facilitate your CoM reporting. BUT be careful this does not cause you to double count these emissions from this Commercial and Institutional sector. (We would prefer to get the CoM to consider the institutional facilities as an integral component of the whole commercial sector. ALSO note added complications if your municipality owns an institutional facility, as that facility should be entered on the Government Operations – Buildings and Facilities sector worksheet.

Explain the choices made in this regard as an element of your inventory reporting process.

### 3.4.4 Industrial sector worksheet

Enter the Industrial Sector energy-use related data, and also releases of industrial gases into the Industrial Sector worksheet.

To produce Industry Sector indicators, enter the indicator data such as: total area of industrial floor space; the total number of industrial sector employees; and the total number of industrial sector establishments in your municipality's geopolitical area.

#### Other industrial GHGs

Note that if you have data on other industrial GHG sources in your community – eg CFCs (hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride) then these should also be recorded on this worksheet.

This calculator includes IPCC-approved values for the Global Warming Potentials (GWP) of the main industrial and refrigeration gases. The worksheet calculates the CO<sub>2</sub>e emissions from these very potent CFC, HCFC and SF<sub>6</sub> gases released within your community. If you have data available on the releases of industrial gases in your community, select the appropriate industrial gas from the drop-down menu, and enter the amount of each gas released. Note these are measured in kg per year.

This worksheet can also be used to enter non-energy sources of CO<sub>2</sub> released into the atmosphere.

### 3.4.5 Transportation VKT and Fuel Sales Data worksheets

Two optional methodologies to calculate emissions from community transport are available in this LAKS Inventory Tool. The VKT option could be useful if “vehicle kilometres travelled” (VKT) data is available for all vehicles registered within your local government area. If such data is not available a “Fuel Sales Data” option is available, requiring the collection of transport fuel sales data for your community area.

For the VKT worksheet - you only need to enter a figure for the total distance travelled by all vehicles based in your local government area. This worksheet also requires information on the average vehicle energy efficiency, and a breakdown to provide the proportion of different classes of vehicles in your area. This data should be based on research done for your municipality, region or country, and the source of this data should be documented. Suitable sources will be included in your Country Supplement. Local information sources should be used if suitable and reliable data is available.

The Fuel Sales Data worksheet can be used in areas where VKT and vehicle-type breakdown data is not available. Be careful that you do not double count the transport fuel usage figures in another sector (eg the residential sector), especially where diesel is used as a heating fuel, or LPG is used for cooking etc.

**TIP:**

*Data from EITHER the VKT sheet OR the FUEL SALES DATA sheet will be used in the Community Summary according to which of these methodologies you have selected in the “General Info” worksheet. If you have entered data in one of the transport worksheets but the value for transport emissions on the Community Summary worksheet remains “0” this could indicate that you have not yet made a selection of transport energy methodology on the “General Info” worksheet.*

### 3.4.6 Agriculture sector (non-energy) worksheet

To calculate the non-energy agriculture sector emissions, you need to enter the totals of numbers of various animals and poultry into the Agricultural Sector worksheet.

The LAKS GHG Inventory Tool uses data on the numbers of animals within your municipality area as a proxy to calculate your municipality's share of your country's animal and non-animal agricultural sector emissions.

Energy-related emissions from the agriculture sector (eg from buildings and transport) should only be included in other community worksheets (Residential or Commercial sector for buildings and facilities and in the Community Transport worksheets).

The agriculture emissions calculation is a simple approximation for total non-energy emissions from your municipality area by using, as a proxy, the number of animals as the quantifying factor. Municipalities report that they have statistics for the number of animals located within their municipality area, so this has been chosen as the proxy for this calculation. The total emissions calculated from the animal numbers, is then scaled-up by the ratio of your country's "total animal emissions to total (non-energy) agricultural emissions". This ratio information is extracted from your country's National Inventory Report. This scaled-up total for the non-energy agriculture emissions is the figure transferred into your Community Summary worksheet.

Message to users of the LAKS Inventory Tool:

This simple proportional analysis technique needs to be checked for reasonable accuracy and your feedback on the accuracy of this calculation (if you have data or calculations from other sources) will be appreciated.

*TIP:*

*This agriculture worksheet also provides a convenient table for recording additions (or subtractions) of forestry and green areas within your municipality boundaries. However, no attempt has been made to calculate the potential carbon-off-set impacts from these changes in green areas. This worksheet may be a convenient place for you to record comments about the increases or decreases in green areas, and it is recommended that you include comments on this issue in your inventory report.*

*TIP:*

*An agriculture emissions worksheet has not been included for the Government Operations Segment. However, if your municipality owned facilities include significant numbers of animals (eg on regional parks which are also farmed) you may like to firstly enter the numbers of animals that your municipality owns (and note down resulting total emissions) and then add in the extra community owned animals. Record this information separately in your inventory report.*

### 3.4.7 Local Energy Production worksheet

To avoid double entry of data and "double counting" of emissions from community energy production facilities a single Community – Local Energy Production worksheet has been added to record all local energy production activities.

In Europe, many community energy production plants are municipality-owned, but other privately-owned facilities should be added to this worksheet. For each energy production plant, please record the percentage of municipality ownership, control or share of these emissions that are to be allocated to your Government Operations emissions summary sheet. See section 2.6.2 for more discussion on ownership boundaries.

The balance of emissions is assumed to be community emissions and they are recorded in the Community emissions summary sheet.

Although some energy production systems (electricity, heating or cooling services) are 100% owned by the municipality, many others are investor owned, or jointly owned between the municipality and private investors.

This local energy production calculation sheet also records energy production facility as a renewable energy or non-renewable (fossil fuel) based energy production facility in your municipality area, as required by the Covenant of Mayors.

Note that the Covenant of Mayors does not require that you report on large energy production plants (larger than 20 MW<sub>th</sub>) that are already included in the European ETS. We recommend that you also take this approach in your community inventory, but please add a note in your inventory analysis report to comment on the existence of these large emission sources that are not included in your inventory. If your municipality owns one of these large plants you may like to include it (even as a special note) in your Government Operations Inventory report to give your community a complete picture of emission sources you control.

### **3.5 Community Emissions Analysis Summary**

As you enter data into the community segment worksheets you will note that totals appear in the summary data report and summary graphs (pie charts) for the Community Segment.

These graphs can be copied and pasted into other documents or reports that would be enhanced by a chart of your community emissions (just click, copy and paste). Data labels can be moved (or deleted) as appropriate for better clarity of the results – just click and drag or click and delete.



## ANNEX 1 Frequently Asked Questions (FAQ)

This is a list of frequently asked questions about inventories and GHG emissions sources. Some questions just have a reference to a section of this manual, or other documents, and others are answered briefly below, with links to other sources as appropriate. We expect this list to grow and we welcome feedback and questions from users of this manual and the LAKs Inventory Tool.

**Question 1:** Does it matter which year we choose as our base year? Can we choose different base years for our Government Operations Inventory and our Community Emissions Analysis?

**Answer 1:** Developing baselines is essential for reporting progress on many environmental outcomes and it is essential if you want to measure results from activities designed to reduce greenhouse gas emissions.

However it does not matter which year you choose as your baseline, and the quality of available data is the most important factor in the selection process.

We recommend that you consider carefully the following strategic issue before finalising your choice of base year. For recording the performance of actions already taken, you can only count those as GHG reduction achievements if you select a base year before these actions occurred. See more information in Sections 2.2 and 3.2 of the LAKs GHG Inventory Manual.

The year chosen for your Government Operations baseline and your Community Emissions Analysis baseline can be different years. However also note that the Covenant of Mayors only allows selection of a single base year.

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**Question 2:** We have energy usage data for our buildings and facilities for one year, but the available data for our vehicle fleet is for the following year. Do we need to wait until we have all data for the same year before creating an inventory?"

**Answer 2:** Please start your inventory using the best data you have available now. Make sure that you record missing data or previous year data in the General Sector Notes for each particular worksheet.

Getting started with your first inventory is the most important thing. If you are aware that there is missing data, please include the name of the facility and, if possible, an estimated figure (maybe based on info from the following year?) and add a note in the data entry sheet about that specific entry. Please comment in your inventory report on recommend actions to solve this data problem for the next inventory.

A small error may result from using data from another year, but this data is likely to be close to the base year data. For significant data changes to your base year, your baseline inventory can be (must be!) modified appropriately whenever you use the updated inventory results for reporting your activities. **Remember the GHG accounting principles! Is it relevant, complete, consistent, transparent and accurate?**

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**Question 3:** The energy units used in the LAKs Inventory Tool were not the same as the energy units provided on our invoices. What can we do to change this?

**Answer 3:** While you needed to use an energy conversion calculator in an earlier version of this tool, Version 2 now allows you to select the appropriate units as you input data to the LAKs GHG Inventory Tool. But there is only one selection available for each sector – so you may need to use an energy unit conversion calculator if multiple units are used. Some conversions can be made using the conversion factors in the “eunits” worksheet in the LAKs Tool.

Solid energy forms like coal and coke may be invoiced by weight (tonnes or kg), and your energy supplier may provide an energy factor such as MJ/kg. These factors can also be adjusted in the tool. Sometimes the fuel description is important to provide you with the energy/weight factor eg “steam coal” but it is better to ask your supplier to confirm the average calorific value (MJ/kg).

Liquid fuels may be invoiced by volume (litres) or by weight (tonnes or kg) or by energy content (kWh, MWh, GWh, GJ, MJ etc).

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**Question 4:** How do we deal with complex local government organizational structures and shared ownership of facilities (eg landfills or small cogeneration plants) which produce GHG emissions?

**Answer 4:** Section 2.6.2 of the LAKs GHG Inventory Manual and Section 3.1.3 of the International Protocol contain a lot of information on this issue. The important thing to remember is that it is essential that you clearly document the “boundaries” that you use for your inventory, and particularly the reason for not including a particular facility in your inventory.

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**Question 5:** What is the difference between direct and indirect emissions and which indirect emissions should we report?

**Answer 5:** Direct emissions are those that “you” cause by the burning of fossil fuels. These are described as Scope 1 direct emissions.

Indirect emissions are those where someone else produces emissions in order to provide you with an energy form or a product that you want to use. The production of electricity and district heating or cooling services, by someone else (anywhere) are called Scope 2 indirect emissions.

Other indirect emissions are those caused by others (eg manufacturers or farmers) providing your municipality or community with the food, paper, concrete, building materials and products on which your city depends – these are Scope 3 indirect emissions, or “embedded emissions”. See the International Protocol for more information on these topics.

As a minimum, your Government Operations inventory must report on all your Scope 1 and Scope 2 emissions, but it should also include the municipality’s business travel and the community waste emissions (Scope 3). An inventory report should be prepared to describe what is included, and what is not included.

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**Question 6:** Should we report leased facilities and operations?

**Answer 6:** See the explanation on ownership and control and boundaries in Section 2.6.2 of the LAKs GHG Inventory Manual and Section and the discussion on boundaries in Section 3.1.3 of the International Protocol.

Make sure you include comment on what you decided to record (and not record) in your inventory report.

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**Question 7:** Our direct emissions have changed because we have “out-sourced” many of the tasks that were previously carried out in-house. How do we account for these changes?

**Answer 7:** The results of any local government inventory must meet standards of general accountability and ensure **the data is relevant, complete, consistent, transparent and accurate**. You must adjust your emissions inventory baseline and document the changes that have occurred. It is particularly important that you do not claim or report, without comment on the reasons, a large drop in your Government Operations emissions purely because of out-sourcing of the emissions source and that you no longer have data on this aspect (such as an energy production plant was sold, or the rubbish collection is now done by a private contractor). See the LAKs GHG Inventory Manual Section 2.6.2 on “Boundary Issues” and the International Protocol Section 3.1.3 for more comments on this issue.

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**Question 8:** We have merged with another local government and our baseline is no longer accurate or relevant. How do we account for these changes?

**Answer 8:** While you could try to merge the two baselines – if both municipalities have inventories. But you must make sure that this is achieved in a way that the combined inventory is complete, consistent, transparent and accurate.

ICLEI recommends that it is probably easier to start again and develop a new baseline inventory for a new baseline year. However, if there are comprehensive inventory reports available for both municipalities then this should be fairly easy to do.

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**Question 9:** What kinds of tools are there to help us calculate our emissions inventory?

**Answer 9:** The LAKs GHG Inventory Tool is an easy-to-use spreadsheet model which is ideal for medium to smaller local governments to use to get started on their climate change programme by making their first inventory. Larger cities often prefer to use an integrated database tool that can deal with greater complexities, and store and report on progress over multiple years.

The Carbonn Centre for Local Government climate reporting has a list of inventory tools offered to local governments on their website [www.carbonn.org](http://www.carbonn.org) Each of the tools mentioned there has a different characteristic or language and some have been developed to only produce a Government Operations emissions inventory and others only produce a Community emissions analysis. A report on the assessment of various inventory tools was completed at the start of the LAKs Project and is available at <http://www.municipio.re.it/LAKs>

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**Question 10:** How should we account for and report the growth of forestry as GHG off-sets?

**Answer 10:** This LAKs Inventory Tool does not account for emissions off-sets, although a table has been added to the Community–Agriculture worksheet to remind you to capture information of the increasing (or decreasing) size of your forestry sinks. How you report this information is a decision for each local government. We suggest that a qualitative comment on this issue is added to your inventory report.

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**Question 11:** How do you define “green electricity” and how do we account for this in our inventory?

**Answer 11:** Green electricity is usually sourced from 100% renewable energy sources such as wind and solar power, and small hydro-power. Biofuel resources and Municipal Solid Waste (MSW) can also be burnt to generate power which is sold as green electricity. Green electricity is usually sold at a premium price which helps support the development and operation of the renewable electricity generating systems.

Green electricity generated from your municipality’s own plant and equipment, and other renewable energy electricity generated within your geopolitical area is measured and recorded in the Local Energy Production worksheet, where any fuels or emission sources are also counted, and any green-electricity emissions can be off-set against grid electricity to reduce total emissions, and this is done in the Community Summary sheet.

Accounting for the “greenness” of purchased green electricity can be very complex so this has not been included in the LAKs Inventory Tool. However, we recommend that your green electricity purchases are recorded in your Inventory report, including a calculation of the total amount of electricity emissions that have been off-set through the purchase of green electricity.

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**Question 12:** Wood is a renewable resource so why does the inventory tool calculate CO<sub>2</sub>e emissions for the wood fuel we use in our boilers?

**Answer 12:** Biomass fuels are included in national energy and GHG emissions accounts for information only. Biomass that is harvested sustainably is considered to be a renewable resource. Biomass used as a source of energy is assumed to be harvested in a sustainable manner, and that the entire cycle is a reasonable energy balance. Because the CO<sub>2</sub> component of emissions from wood is ignored, the total emissions factor for wood is very small (but it is not zero).

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**Question 13:** How do we account for Landfill Gas recovery and use?

**Answer 13:** Waste incineration and capture of landfill gas are complex, but very important issues, and these are addressed in more detail in the Protocol.

Waste disposal in landfills produce significant environmental impacts including the release of large amounts of greenhouse gas emissions. The landfill gas (LFG) emissions from landfills can be mitigated by reducing the disposal of biodegradable waste and by composting. But the recovery, flaring and use of the LFG has to be considered essential, and is a requirement of EU Directive 1999/31/EC that LFG shall be collected treated and used or flared.

LFG can also be a valuable energy resource that can be used as a primary or supplementary fuel for the production of electric power, or to supply district heating or it may be added to pipeline-quality natural gas or used as a vehicle fuel.

When landfill gas is used as an energy source the resultant energy is considered as a renewable resource. The LAKs GHG Inventory Tool allows for landfill gas to be used for many energy purposes and in so doing produces carbon dioxide. This results in a drop of emissions, relative to the release of the gas directly to the atmosphere.

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**Question 14:** What do we do if we are having difficulty getting a split of “Commercial Sector” data? Our energy utilities will only supply combined “small consumer” data.

**Answer 14:** This is a problem for many cities. The most important thing is that all fuels are included so that the total emissions for the city are correctly accounted. If data split into residential and commercial (or commercial and industrial) is not available from an energy supplier, but they will give you a single figure, then enter the data in one section of the inventory OR split the amount on some basis as suggested below. Make sure you include a note about this issue in your inventory report.

To split the data try to find a proxy statistic as the basis for your analysis. Locally based proxy statistics can be useful for some things, and for others the best proxy data will be national or regional statistics. Data splits based on "locally based" factors are often more accurate than using proxy factors based on national statistics.

The best proxy figures for splitting commercial and industrial sector data are regionally based numbers of employees in these sectors. But this may also require some specific energy use data for each sector, such as factors generated from energy audits in those sectors. These should give some actual average energy data per employee figures that could be used to develop an ‘energy per employee’ proxy for the sector.

For "institutions" such as hospitals, schools and universities, proxy data can be based on numbers of hospital beds, or numbers of staff, or numbers of students. If these facilities are “owned” by the municipality then this data may be easy to obtain. (Developing proxy data for sectors makes a good project for a Masters student.)

Eurostats national data (NUTS1 data) is often used to provide “per population average” estimates, but more accurate results can often be achieved using NUTS 2 or NUTS 3 data, or local sources, if this data is available. For more information on this see the International Protocol and your Country Supplement.

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**Question 15:** What is “double counting”, and how do we avoid this?

**Answer 15:** Double counting can occur when there is confusion about where the sources of an emission arise. Care must be taken that a source of energy is not counted in two different sectors in the inventory.

An example in the Government Operations inventory would be when electric vehicles owned by the municipality are included in the vehicle data entry section, but the electricity used to charge these vehicles while the cars are at the office is most likely measured by the facility meters which are documented as part of the building sector. The LAKs Inventory Tool has a section on the Buildings Sector data entry sheet to allow you to check and subtract this electricity, if it is also recorded in the vehicle data entry sheet. It could also occur when streetlights are powered from the tram power supply circuit, and the amounts are counted in both the vehicle and streetlight sectors.

For the Community inventory, double counting could occur when a fuel such as coal is supplied to an industry for both energy and chemical process purposes. This is unlikely to impact on inventories produced by municipalities, although it pays to be aware of such situations.

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**Question 16:** What are the factors used to calculate indices in the tool and why do we collect that data?

**Answer 16:** Factors such as the floor area of a building, or the number of occupants, or the numbers of pupils in a school, or the numbers of users of a sports facility like a swimming pool can be very useful to compare (benchmark) the efficiency of different facilities of the same type (such as swimming pools or concert halls). This sort of indicator data must be used with care, but it could (for instance) provide you with the first quick assessment of the best and worst energy using schools in your city.

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**Question 17:** What staff training factors should we be considering related to our climate change work?

**Answer 17:** The development of appropriate human resources and staff training related to climate protection work is a new area for local governments HR departments. This issue is complex and if your municipality decides that it requires verified inventories for carbon trading purposes then the training will need to increase accordingly. A recent (2009) HR survey on this issue noted:

- The GHG accounting and climate change industry is projected to grow significantly as a "super sector" and carbon will be traded in large volumes.
- There is a significant shortage of qualified personnel and experts, and this creates a risk that carbon trading could face accounting scandals.
- Greenhouse gas accounting is expected to become professionalized like that of the IT industry, and grow very large and very rapidly.
- Educational institutions are not adequately training new graduates with GHG accounting and management skills to meet climate change demands.

Should you have any additional questions please send these to the LAKs and ICLEI technical support teams ([laks@municipio.re.it](mailto:laks@municipio.re.it) or [ccp-europe@iclei.org](mailto:ccp-europe@iclei.org)).

## ANNEX 2

# Glossary of Terms

## Related to GHG Protocols and Inventories

### Aim of this Glossary

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- Introduce new participants in the LAKs Project to the terminology that is used in the *International Local Government Greenhouse Gas Analysis Protocol (IEAP)* and various technical documents related to the development of local government GHG inventories.
- To develop consistent language related to *GHG protocols* and *inventories* by all project participants.
- If appropriate, details on areas where this standard terminology may differ for a specific country will be included in each *IEAP Country Supplement*.
- Text in *italics* refers to other terms listed in this glossary
- For more terminology associated with the UNFCCC, IPCC, Kyoto Protocol or emissions trading schemes please go to: <http://www.carbonpositive.net/viewarticle.aspx?articleID=44>

### Terminology List for Protocols, Inventories and Measures

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**Abatement:** refers to the potential or actual greenhouse gas emissions reductions from implementation of an activity. The word '*reduction*' is often used instead of 'abatement'.

**Analysis:** a study of greenhouse gas emissions by *sector*, based on technical data as well as clearly stated assumptions. 'Analysis' is used to describe *Community segment* of greenhouse gas emissions measuring and reporting. [Note that '*Inventory*' is the term used for the *Government Operations segment*.]

**Anthropogenic emissions:** GHG emissions created as a result of human activity.

**Atmosphere:** the gaseous envelope surrounding a planet. The Earth's atmosphere consists of nitrogen (N<sub>2</sub>, 78%), oxygen (O<sub>2</sub>, 21%), and argon (Ar, 0,93%) plus many other very influential components including water (H<sub>2</sub>O, 0-1%), and the "greenhouse" gases, Ozone (O<sub>3</sub>, 0,00006%), and Carbon Dioxide (CO<sub>2</sub>, 0,038%).

**Base Year:** also referred to as baseline, the year for which a local government conducts a baseline emissions inventory and community analysis. It is recommended that the baseline(s) should be a year for which mostly complete data can be obtained. This can be a financial year or a calendar year, although local governments may like to align with the calendar years used by national governments for Kyoto Protocol or UNFCCC reporting. Different years can be used for Community and Government Operations base years.

**Carbon Dioxide (CO<sub>2</sub>):** a gas that is essential to living systems; is released by respiration and removed from the atmosphere by photosynthesis in green plants. The proportion of CO<sub>2</sub> in the atmosphere has increased by about 25% since the burning of coal and oil began on a large scale. Atmospheric CO<sub>2</sub> varies seasonally by a small amount, and the oceans contain many times more dissolved CO<sub>2</sub> gas than is in the atmosphere.

**Carbon Dioxide Concentration:** the atmospheric CO<sub>2</sub> concentration, at 353 *ppmv* (parts per million by volume) in 1990, is now about 25% greater than the pre-industrial (1750-1800) value

of about 280 *ppmv*, and is higher than at any time in at least the last 160,000 years. The CO<sub>2</sub> concentration is rising at about 1.8 *ppmv* (0.5%) per year due to *anthropogenic* emissions.

**Carbon dioxide equivalent (CO<sub>2</sub>e):** is the term for comparing the *Global Warming Potential*, or 'greenhouse intensity', of various *greenhouse gases*. Emissions of each greenhouse gas are converted to tonnes of carbon dioxide equivalent (tCO<sub>2</sub>e) by multiplying the mass of each gas emitted by the *Global Warming Potential* of the gas.

**Chlorofluorocarbon (CFC):** a compound of carbon similar to carbon tetrachloride (CCl<sub>4</sub>) or methane (CH<sub>4</sub>) but containing some chlorine and some fluorine. These gases are non-poisonous and inert at ordinary temperatures and easily liquefied under pressure, which make them excellent refrigerants, solvents, foam-makers and for use in aerosol sprays. Chlorofluorocarbons (CFCs) do not occur naturally; they are synthetic products used in various industrial processes and also as propellant gas for sprays. Unfortunately they also damage the Ozone Layer of the atmosphere and the production and use of CFCs is now governed by international agreement (Montreal Protocol).

**Cities for Climate Protection (CCP):** refers to the international CCP Campaign developed and operated by ICLEI – Local Governments for Sustainability (ICLEI). In some countries this campaign is called Communities for Climate Protection.

**Climate Change:** is a preferred term to describe the effect and impacts of heat retention in the lower atmosphere as a result of absorption and re-radiation by clouds and gases (e.g. water vapour, CO<sub>2</sub>, CH<sub>4</sub>, and CFCs) of long-wave terrestrial radiation. Incoming short-wave radiation, including visible light and heat, is absorbed by materials that then behave as black bodies re-radiating at longer wavelengths. Certain substances (e.g. CO<sub>2</sub>) absorb long-wave radiation, are heated by it, then begin to radiate, still as long-wave radiation, in all directions, some of it downwards. 'Climate Change' is the preferred term to describe the effects of anthropogenic greenhouse gas emissions rather than '*greenhouse effect*' or '*global warming*'.

**Community Segment:** relates to the municipality, district or regional geopolitical area covered by the local government, i.e. the area within the local authority boundaries. The *Community Segment* includes the following sectors: residential, commercial, industrial, transport, waste and other (including agriculture).

**Corporate Segment:** see *Government Operations Segment*.

**Covenant of Mayors:** is a commitment by signatory towns and cities to go beyond the objectives of EU energy policy in terms of reduction in CO<sub>2</sub> emissions through enhanced energy efficiency and cleaner energy production and use. Signatories pledge to implement a Sustainable Energy Action Plan, including a baseline emissions inventory. For more information see <http://www.eumayors.eu/>

**Emissions:** means Greenhouse Gas Emissions

**Emissions Factors:** a measure of the amount of CO<sub>2</sub>e emitted per unit of energy consumed (for each fuel source, or for electricity used), or for each unit of waste added to a landfill. A combined emissions factor may provide a CO<sub>2</sub>e value, or separate factors may be supplied for CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O for each fuel.

**Emissions Analysis:** the *International Protocol (IEAP)* requires the development of a *baseline inventory* for the *Government Operations Segment* and an *emissions analysis* for the *Community Segment* for each local government. (See *Protocol* for more information on IEAP.)



**Employee Commute:** the travel modes for council staff to and from work. This should not include travel in vehicles which are a part of the councils' own vehicle fleet as that travel will be analysed under the 'Vehicle Fleet' sector.

**Equity Share:** a boundary issue for inventories related to the operation of an entity that is wholly owned or partially owned according to an equity share in the entity. Local governments should report emissions according to their control or equity share of the entity. When an entity is shared between local governments the emissions should be reported on an agreed basis which may be equity, or control, or some other basis that ensures the total emissions are reported, but not double counted. See also *Operational Control* or *Financial Control* or more information in the *Protocol* or your *Country Supplement*.

**Financial Control:** is a boundary issue for inventories related to the operation of an entity that may not be owned by local government but there is full authority to introduce and implement its operating policies. Local governments reporting according to financial control would be responsible for reporting emissions from 100 percent of the activities of which they had financial control. See also *Operational Control* or *Equity Share* or more information in the *Protocol* or your *Country Supplement*.

**Forecast Year:** the year for which participant local governments conduct their emissions forecast analysis. It is recommended that the year be appropriate to standard national or local government planning periods.

**Framework:** the GHG reduction process that local government participants undertake after they join the LAKs Project.

**Global warming:** see *Climate Change*.

**Global Warming Potential (GWP):** a measure of the potency of *greenhouse gases* to allow them to be compared. For example, CO<sub>2</sub> has a GWP of 1 and CH<sub>4</sub> has a GWP of 21, indicating that CH<sub>4</sub> is 21 times as potent than CO<sub>2</sub> as a greenhouse gas, therefore 1t of CH<sub>4</sub> = 21tCO<sub>2</sub>e.

**Government Operations Segment:** refers to emissions from a local government's own operations including facilities and vehicles owned or managed by council. The *Government Operations* segment includes the following sectors: buildings, vehicle fleet, employee commute, water/sewage, public lighting (streetlights), waste and other (including agriculture if applicable). This segment is sometimes called the *Corporate Segment*.

**Green Electricity:** also referred to as Green Power, this is the mechanism whereby a local government self generates from renewable energy resources or where they choose to pay an additional cost (premium) for electricity certified as generated from 100% renewable energy sources. Green electricity should be recorded in the appropriate section of the inventory tool so that the electricity used is accounted for, but the emissions factor will be considerably lower than grid electricity.

**Greenhouse Effect:** see *Climate Change*.

**Greenhouse Gases (GHG):** are gases that reduce the amount of earth's radiation that escapes to space, with consequent warming of the lower atmosphere and the Earth's surface. The concentration of the most important anthropogenic greenhouse gas, carbon dioxide (CO<sub>2</sub>), has already increased by 25% since the beginning of industrialization and particularly the combustion of fossil fuels. Deforestation also causes an imbalance between the absorption and release of CO<sub>2</sub> by vegetation. Other greenhouse gases being released into the atmosphere in

increasing amounts are methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O) and the chlorofluorocarbons (CFCs eg hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride).

**Greenhouse Gas Emissions:** refer to releases of gases as a direct result from council and community activities such as CO<sub>2</sub> from burning petrol, the release of CH<sub>4</sub> from landfill sites, and the indirect release of greenhouse gas emissions that result from using electricity from non-renewable sources such as coal.

**Halogenated Substance:** in the context of climate change, this is a reference to the chlorinated and fluorinated compounds (CFC's, HCFC's) formed when halogens (especially chlorine, fluorine) combine with hydrocarbon molecules, thus becoming "halogenated".

**HCFC:** hydrochlorofluorocarbon: see *chlorofluorocarbon*.

**HFC:** hydrofluorocarbon: see *chlorofluorocarbon*.

**IEAP:** see *Protocol*.

**Indicator:** provides a means of comparing the energy consumed, or emissions released, by buildings or facilities, or vehicles, of different function or size. See Section 2.6.4

**Inventory:** is a detailed, itemised report on amounts of greenhouse gas emissions from various fuels and for various sectors. 'Inventory' is the term used to describe the *Government Operations Segment* greenhouse gas emissions measurement and reporting. [The word 'Analysis' is used to refer to the emissions report for the *Community Segment*.]

**LAKs:** means **L**ocal **A**ccountability for **K**yoto goal**S**, and is a project developed to help selected European cities measure their inventories and implement their GHG reduction targets. The LAKs project is co-funded by LIFE+, the European Commission's Financial Instrument for the Environment.

**Local Action Plan (LAP):** is a plan of action for a local government to document proposals that will result in the reduction of GHG emissions. Preparation of the LAP is Phase 2 of the LAKs Project Framework and this plan documents the results of the local government's GHG *Inventory* and community emissions *Analysis*, and the Emissions Reduction Goals, as well as the Emissions Reduction Implementation Strategy. The LAP outlines the strategic directions of the local government for achieving the reduction goals, and specific near-term actions and budget allocations. It is recommended that the LAP be approved by council to increase the political commitment to this project.

**Local Government:** a sub-national local authority responsible for the governance of a defined geopolitical area of a country. Local governments may be called cities, municipalities, towns, boroughs, counties, districts, regions or councils.

**Measures:** These are actions planned or undertaken to reduce the emissions of greenhouse gases.

**Methane (CH<sub>4</sub>):** a gas produced by anaerobic decomposition of organic materials in wetlands, urban landfills, and rice paddies, and also in the stomach of cattle and other ruminant animals. CH<sub>4</sub> is the principal constituent of natural gas. The methane concentration in the atmosphere has been rising steadily for several centuries, keeping pace with the increase in the world population and expansion of the world economy. Major sources of methane emissions include leakage and venting from oil and gas production, agricultural emissions from enteric

fermentation and animal wastes, and (of most relevance in cities) methane emissions from urban landfill sites.

**Municipal Solid Waste (MSW):** the waste material collected within a city and taken to landfill or to an incinerator.

**Nitrous Oxide (N<sub>2</sub>O):** is a potent greenhouse gas produced in relatively small quantities from sources such as fuels burnt in motor vehicles and from the use of agricultural fertiliser. Nitrous oxide should not be confused with nitrogen oxides (NO<sub>x</sub>).

**Operational Control:** is a boundary issue for inventories related to the operation of a local government controlled entity or a subsidiary that has the full authority to introduce and implement its operating policies. The entity that holds the operating license for an operation typically has operational control. See also *Financial Control* or *Equity Control* or more information in the *Protocol* or your *Country Supplement*.

**Ozone:** an ozone molecule consists of three atoms of oxygen (O<sub>3</sub>), in contrast to normal oxygen in the atmosphere (O<sub>2</sub>). Ozone is much more reactive than oxygen and is toxic to human beings and living matter. As a pollutant at ground level it is causing some damage to forests. Ozone absorbs strongly in certain wavebands, and therefore prevents damaging ultraviolet radiation from reaching the ground. In the stratosphere it functions both as a greenhouse gas and as a filter for ultra-violet radiation. A fall in the total ozone concentration in the atmosphere, and consequent rise in the penetration of ultra-violet radiation, causes deleterious effects such as increased rates of skin cancer.

**ppmv:** parts per million by volume

**Protocol:** means the International Local Government GHG Emissions Analysis Protocol (*IEAP*). This protocol can be downloaded from <http://www.iclei.org/ghgprotocol>

**Quantification:** relates to the measurement, calculation and reporting of greenhouse gas emissions inventories and reductions from GHG reduction measures.

**Ramp-in:** this term used to describe the progressive introduction rate of a *measure*. For example, a measure to insulate all houses within a municipality from 2010 to 2015 would be said to be "ramped-in" over 5 years.

**Record:** data entered into an inventory tool that may be from a single meter, or site or facility, or a group of sites or facilities.

**Reduction:** the potential or actual lowering of the level of *greenhouse gas emissions* through the implementation of a *measure*. The term 'Reduction' may be used in place of 'Abatement'.

**Segment:** the scope of emissions that are analysed (e.g. *Government Operations* segment or the *Community* segment).

**Sector:** a sub-division of areas within the *Government Operations* or *Community* segments such as buildings, vehicle fleet, residential, commercial, transportation, etc.

**Stratosphere:** the layer of the atmosphere above the troposphere extending to a height of about 50 km.

**Target:** the goal(s) for the reduction of emissions established by your council. It is recommended that local governments establish, as a minimum, the national targets on renewable energy and greenhouse gas emission reductions established in March 2007 by the European Council. These targets include:

- a reduction of at least 20% in greenhouse gases (GHG) emitted by 2020 – rising to 30% if there is an international agreement committing other developed countries to "comparable emission reductions and economically more advanced developing countries to contributing adequately according to their responsibilities and respective capabilities".
- a 20% share of renewable energy consumption by 2020 and an additional target of 10% renewable energy in transport (under certain conditions).

**Troposphere:** is the lowest layer of the atmosphere, where almost all weather phenomena develop. It takes its name from the Greek word 'tropos' meaning 'a turn'. It is the atmospheric layer where turning and convective mixing is dominant.

**Verification:** is the independent data review process defined under the Kyoto Protocol and the European Emissions Trading Scheme (ETS). For the LAKs Project it is important for local governments undertake a substantial internal data review process to confirm the validity of their inventory. However it is NOT recommend that local governments implement an expensive full verification review (at this stage). See the *Protocol* or your *Country Supplement* for more information.

**VKT: Vehicle kilometres Travelled** is a data source that may be used in developing the *analysis* of the *Community* transportation emissions.