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eThekweni Greenhouse Gas Emissions Inventory

Management Plan

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Developed by:



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1 Introduction

1.1 Inventory Management Plan

WSP Environment and Energy was appointed by the eThekweni Municipality Energy Office to develop the Municipality's 2010 Greenhouse Gas (GHG) Inventory. A component of the project scope was the development of a customised MS Excel-based GHG Inventory Reporting System to facilitate the future compilation of the inventory by the Municipality. To guide the Municipality in using the Inventory Reporting System WSP created an Inventory Management Plan (IMP; this document) to enable the municipality to update and manage the GHG inventory process.

The IMP is a step-by-step guidebook that documents the details of the GHG inventory calculation process and includes guidance on:

- ❖ Base year and emissions recalculation;
- ❖ Management tools, including roles and responsibilities and document retention and control;
- ❖ Data management and collection processes;
- ❖ Data entry and potential data improvement options;
- ❖ Emission quantification methodology; and
- ❖ Emission factors and other constants.

1.2 Protocols

The eThekweni Municipality's GHG Inventory Reporting System was based upon the two Local Government GHG Emissions Analysis Protocols developed by ICLEI – Local Governments for Sustainability, namely the:

- ❖ International Local Government GHG Emissions Analysis Protocol Version 1.0 (Appendix 1); and
- ❖ Local Government Operations Protocol for the Quantification and Reporting of Greenhouse Gas Emissions Inventories Version 1.1 (Appendix 2).

Although this IMP is based on the ICLEI protocols, the actual protocols may need to be referred to for specific inventory compilation details not included in the IMP.

In addition to the two protocols identified above, ICLEI is set to release the Community-Scale GHG Emissions Accounting and Reporting Protocol in 2012. eThekweni's GHG Inventory Reporting System may require updating based on the emission calculation methods and reporting formats published within this protocol.

2 Base Year

A meaningful and consistent comparison of emissions over time requires that eThekweni Municipality set a performance datum with which to compare current emissions. This performance datum is referred to as a base year. It is advised by WSP that eThekweni Municipality use the 2010 GHG inventory as the Municipality's Base Year due to the greater reliability and completeness of data included in the 2010 inventory compared to the 2005/06 inventory (Appendix 3)

Any emission reduction activities put in place before the base year are considered to be part of the status quo and will not be seen as a reduction against an emission reduction target that may be adopted by the Municipality in the future.

2.1 Updating the Base Year

Over time, there may be changes that affect eThekweni Municipality's emissions, such as annexing previously unincorporated areas, outsourcing activities that generated GHG emissions, or improvement in the accuracy of emission factors. These changes will be reflected in the Municipality's current GHG inventory, but should also be reflected in the base year inventory.

It is a requirement of ICLEI that once a base year has been identified, local governments should develop a base year emissions recalculation policy. It is advised by WSP that the eThekweni Municipality's Emissions Recalculation Policy entail recalculating emissions consistent with the circumstances outlined in Table 1.

Table 1: Factors to be incorporated into eThekweni's Emissions Recalculation Policy

Trigger	Example
Significant change to scope of operations	The privatisation of wastewater treatment facilities previously owned by the Municipality
Changes to an emission calculation method	The ICLEI protocols update the solid waste emission models
Discovery of major errors or omissions or a large number of minor errors or emissions	Either error within the GHG Inventory Reporting Program or data collection errors identified by a Department / data source.
Conversion factors updates	The National Department of Energy publishes country specific emissions factors for fuel manufactured within South Africa
For all the above circumstances a recalculation significance factor of 5% of a sector's emissions scope should be adhered to.	

3 Control

To ensure the integrity of the GHG Inventory Reporting System safe guards need to be installed by the Energy Office focused on inventory protection and user and version control.

3.1 Inventory Protection

In order to ensure the integrity of calculations within the program the GHG Inventory Reporting System has been protected to allow access to data entry cells only.

To unprotect a sheet click on the **Review** tab in the top toolbar and click on the **Unprotect Sheet** button. A password request will appear. Please refer to the Energy Office for the password

Once the required changes to the inventory have been made the sheet must be protected using the same password. Click on the **Protect Sheet** button in the **Review** tab and enter the password

The password cannot be changed without updating the VBA macro calculation equation.

3.2 User Control

A GHG Inventory Reporting System Champion, with sole authority to save changes to the inventory, should be appointed by the eThekweni Energy Office.

Circumstances which require changes to be made to the inventory include:

- ❖ Updating the base year following requirements of the eThekweni's Emissions Recalculation Policy; and
- ❖ Annual compilation of a GHG inventory using the GHG Inventory Reporting System.

When carrying out these changes the procedures outlined below should be followed by the Inventory Champion at all times.

3.3 Base Year Update Procedure

When updating the base year inventory the updated inventory should be saved as a new version and named according to the following nomenclature:

2010_eThekweni GHG Inventory_Version [number e.g 1.1]

Changes included within the new inventory version should be recorded by following the procedure outlined below.

Step 1: Ensure that the inventory has been saved (i.e. as a new version name) following the procedure above before any changes are implemented.

Step 2: On the Inventory's Home page click on the **Version Control** button in the top right hand side corner of the page.

Step 3: Record all details of the new version within the appropriate box.

Motivation for changes should include triggers which were met in the Recalculation Policy.

Details of changes made should include which sheet the changes were made to, as well as exact details of the actual change.

Step 5: Click on the **Save** button

Step 6: Return to the inventory by clicking on the **Return to Inventory** button

Step 7: Ensure that the Inventory heading includes the correct version number on the Home page.

3.4 Annual Inventory Compilation

When compiling a new inventory the most up-to-date version of the previous year's Inventory should be saved under a new name and version according to the following nomenclature:

[new inventory year]_eThekweni GHG Inventory_Version 1.0

Before entering data into the new inventory ensure that the following steps are followed:

Step 1: Confirm that you have saved the inventory under the new name following the procedure outlined above.

Step 2: Click on the **Version Control** button. Delete all previously input data from the Version Control sheet and start a new record.

Step 3: Click on the **Return to Inventory** button

Step 4: Deleted all data throughout the inventory that has been input into the data entry () cells. When doing this ensure that all other cells are locked so that calculations are not altered.

Step 5: Follow the data collection and entry process outlined within Section 4 of this IMP.

4 Data Collection and Entry

This section provides a step-by-step guide to collecting and entering data within a new inventory. Before beginning the data entry process ensure that the steps outlined in Section 3.3 have been completed.

4.1 Fuel

- ❖ On the Home page click on the  button to navigate to the Fuel data entry sheet. Fuel data for both the municipal and community sectors is entered in this sheet.
- ❖ Once in the Fuel page, to return to the Home page click the  button in the top left-hand corner.
- ❖ To navigate to another page in the program click the relevant button in the top right-hand corner of the Fuel page.



4.1.1 Municipal Data

4.1.1.1 Municipal Stationary Fuel Combustion Data Collection

For the 2010 GHG inventory stationary combustion fuel data for the entire Municipality was received from the Procurement Department. To improve on data completeness and accuracy for future inventories each municipal department should be approached individually to supply stationary fuel consumption data.

Data requirements for each Department are outlined in Table 2.

Table 2: Municipal stationary combustion data requirements

Fuel Type	Units	Quantity
Heavy Fuel Oil	Litres	Monthly consumption for the calendar year by each Department
Bitumen	Litres	
Natural Gas	Cubic meters	
LPG	Litres	
Coal	Tonnes	
Coke	Tonnes	
Illuminating Paraffin	Litres	
Paraffin Wax	Litres	

4.1.1.2 Stationary Fuel Combustion Data Entry

Stationary fuel combustion data needs to be categorised into seven ICLEI sectors before being entered into the program.

❖ Entering stationary fuel combustion data:

❖ Stationary Fuel	Step 1: To open each facilities data sheet click on the [+] on the extreme left of the sheet in line with the sectors name.
ICLEI Sectors: Water Delivery Facilities Power Generation Facilities Solid Waste Facilities Wastewater Facilities Port Facilities	Step 2: Enter monthly stationary fuel data for the facility within the cells. Do not enter data within the Total column, as the program will calculate totals automatically. Ensure that data being entered is in the units specified with the Units column.
	Step 3: To close the data sheet click on the [-] button that has appeared in place of the [+].

4.1.1.3 Stationary Fuel Combustion Emission Calculations

Stationary fuel combustion emission sources owned and operated by the municipality are classified as scope 1 emissions. To view the emissions generated by each source within each ICLEI sector click on the **Scope 1** button in the top right hand corner of the sheet.

The standard equation used to calculate these emissions is:

$$\frac{(\text{Quantity of fuel consumed [unit A]} \times \text{fuel specific emissions factor [kg CO}_2\text{e / per unit A]})}{1000} = \text{tCO}_2\text{e}$$

4.1.1.4 Mobile Fuel Combustion Data Collection

Municipal mobile fuel combustion data can be obtained from the City Fleet Department for both internal¹ and external² refuelling for all municipal departments excluding council busses (council bus data is obtained from the private contractor eThekwini Bus). Contact details and data requirements for each data sources are provided in Table 4.

¹ Refuelling of municipal vehicles from municipal bowsters

² Refuelling of municipal vehicles at BP

Table 4: Mobile fuel combustion data requirements

Data Source	Category	Fuel	Requirements	Contact Details
City Fleet Ranjeev Nursingh	Internal Refuelling	Petrol (Litres) Diesel (Litres)	Monthly consumption by all Departments	(031) 311 7518 appalsamyg@durban.gov.za
City Fleet Neeren Juganath	External Refuelling	Petrol (Litres) Diesel (Litres)	Monthly consumption broken down by account numbers	(082) 378 0875 juganathn@durban.gov.za
eThekwini Bus John Wilkinson	Council Bus Refuelling	Diesel (Litres)	Monthly consumption by all busses in fleet	john@ethekwiniibus.co.za

When obtaining data from the City Fleet Department ensure that the dataset includes refuelling data for: the Water Department, Solid Waste Department and Electricity Department. These Departments' vehicle fleet are not managed by the City Fleet Department however they do provide the City Fleet Department with refuelling data on an annual basis.

A complete and up-to-date inventory of the entire Municipality's fleet linked to fuel consumption data would have enabled the Transit and Non-transit fleet to have been reported separately in the 2010 inventory. For future inventories if a complete vehicle inventory linked to fuel consumption is obtained, categorise terrestrial vehicles into on-road (excluding transit vehicles), off-road vehicles (bulldozers etc) and transit vehicles (i.e. the bus fleet).

4.1.1.5 Mobile Fuel Combustion Data Entry

Mobile combustion data is categorised within the sectors Vehicle Fleet and Transit Fleet.

❖ Entering mobile combustion data for the **Vehicle Fleet** category:

❖ **Vehicle Fleet**

Data Type:
Internal Refuelling

Step 1: Click on the [+] in line with the Internal Refuelling heading.

Step 2: Enter monthly petrol and diesel consumption within the cells.

Do not enter data within the Total column, as the program will calculate totals automatically.

Ensure that data being entered is in the units specified within the Units column.

Step 3: To close the data sheet click on the [-] button that has appeared in place of the [+].

❖ **Vehicle Fleet**

Data Type:
External Refuelling

Step 1: Click on the [+] in line with the External Refuelling heading. Two datasheets will appear, one for petrol (the top data sheet) and one for diesel (the bottom data sheet).

Step 2: Enter monthly petrol and diesel consumption within the cells in the applicable datasheet for each Municipal account.

A total petrol and diesel consumption value will automatically be calculated in the dark blue headings above each data sheet.

Step 3: To close the data sheets click on the [-] button that has appeared in place of the [+].

❖ Entering mobile combustion fuel data for the **Transit Fleet**:



Step 1: Click on the [+] in line with the Council Buses heading.

Step 2: Enter monthly diesel consumption within the cells. In the 2010 inventory the contractor was only able to provide an approximate annual figure so no monthly data has been entered.

Do not enter data within the Total column, as the program will calculate totals automatically.

Ensure that data being entered is in the units specified within the Units column.

Step 3: To close the data sheet click on the [-] button that has appeared in place of the [+].

4.1.1.6 Mobile Fuel Combustion Emission Calculations

Mobile fuel combustion emission sources owned and operated by the municipality are classified as scope 1 emissions however, as council busses are privately operated these emissions are classified as scope 3 emissions. To view the emissions generated by the Vehicle Fleet and Transit Fleet sectors click on the **Scope 1** and **Scope 3** buttons in the top right hand corner of the sheet.

The standard equation used to calculate these emissions is:

$$\frac{(\text{Quantity of fuel consumed [litres]} \times \text{fuel specific emissions factor [kg CO}_2\text{e / litre]})}{1000} = \text{tCO}_2\text{e}$$

4.1.1.7 Business Flight Data Collection

Business flight data can be obtained from the travel agents contracted to the Municipality. Contact details and data requirements for each data source are provided in Table 5.

Table 5: Business flight data requirements

Data Source	Category	Requirements	Contact Details
XL Turners Travel	International Flights	Number & route of flights boarded by municipal workers	(031) 368 8000
Vasanti Ridhoo			vasantir@turnergroup.co.za
Rennies Travel	National Flights	Number & route of flights boarded by municipal workers	(031) 251 5340
Tammy Heher			Tammy.Heher@renniestravel.com

To confirm that the travel agents listed in Table 5 are still contracted to the Municipality contact Danny Govender (031 311 2143; govenderdanny@durban.gov.za). First class, business class and economy class flights have not been separated out in the 2010 inventory. This can possibly be undertaken in future.

4.1.1.8 Business Flights Data Entry

Within the Inventory Reporting Program flights routes are identified by the official airport acronyms. The order in which the airport codes appear (for a given route) do not reflect the direction of the flights. For example the route AMS/LHR can either represent a flight from Amsterdam Schiphol Airport to London Heathrow or a flight from London Heathrow to Amsterdam Schiphol Airport.

A one way journey counts as a single flight. A return flight counts as two single flights.

❖ Entering mobile fuel combustion data for business flights:

<p>❖ Business Flights</p> <p>Domestic Flights ≤ 463 km</p> <p>Short-haul Flights < 463 km ≤ 1108 km</p> <p>Long-haul Flights >1108 km</p>	<p>Step 1: Click on the [+] in line with the Domestic, Short-haul or Long-haul headings and search for the flight journey.</p> <p>Step 2: Enter the monthly number of flights boarded in the <input style="width: 40px; height: 15px; background-color: #ffffcc;" type="text"/> cells.</p> <p>Connection flights should be separated from the main international route and counted as separate domestic or short-haul flights.</p> <p>Ensure that each flight entered is a one way flight and not a return flight.</p> <p>Step 3: To close the data sheet click on the [-] button that has appeared in place of the [+].</p>
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4.1.1.9 Business Flight Emission Calculations

Emissions generated by employee airline commute are classified as a municipal scope 3 emission. To view the emissions generated by business flights click on the **Scope 3** button in the top right hand corner of the sheet.

The standard equation used to calculate these emissions is:

$$\text{Number of flights per route} \times \text{distance of route [km]} \times \text{emission factor [kg CO}_2\text{e / km]} / 1000 = \text{tCO}_2\text{e}$$

4.1.2 Community Data

4.1.2.1 Stationary Fuel Combustion Data Collection

Stationary fuel data is received from the National Department of Energy for each magisterial district on a quarterly basis. Magisterial Districts included within eThekweni are; Chatsworth, Durban, Inanda, Pinetown, Umlazi and Umbumbulu. In the 2005/06 inventory Camperdown was included, however it has been confirmed by the Municipality that the district does not fall within the municipal boundary.

Data requirements and contact details for the National Department of Energy are provided in Table 6.

Table 6: Community stationary fuel combustion data requirements

Data Source	Fuel	Units	Requirements	Contact Details
National Department of Energy Dr Philip Goyns	Heavy Fuel Oil	Litres	Quarterly consumption by each magisterial district for the calendar year	(012) 444 4258 philip.goyns@energy.gov.za
	Bitumen	Litres		
	Natural Gas	Cubic meters		
	LPG	Litres		
	Coal	Tonnes		
	Coke	Tonnes		
	Illuminating Paraffin	Litres		
	Paraffin Wax	Litres		

As the Department of Energy took over data collection from SAPIA during 2010 the format in which data is available may vary for future inventories. Discussions will have to be entered into with the Department to determine the type and format of data available for the next inventory.

4.1.2.2 Stationary Fuel Combustion Data Entry

❖ Entering stationary fuel data for each magisterial district:

❖ Stationary Fuel
• Chatsworth
• Durban
• Inanda
• Pinetown
• Umlazi
• Umbumbulu

Step 1: Click on the [+] in line with the magisterial districts name.

Step 2: Enter the quarterly fuel consumption data in the cells.

Ensure that data being entered is in the units specified within the Units column.

Step 3: To close the data sheet click on the [-] button that has appeared in place of the [+].

❖ Data Completeness:

For the 2010 inventory data could not be obtained from the National Department of Energy, National Department of Minerals, National Department of Trade and Industry or the Fossil Fuel Association for coal, coke or refinery gas consumption. To overcome this, assumptions were made based on data provided in the 2006 eThekweni State of Energy Report and the 2005/06 eThekweni GHG Inventory. As this data could not be broken down to the magisterial district level, rows were inserted to allow for bulk values to be included. In future inventories if data is obtained for magisterial districts these can be entered within the space provided under each magisterial district. In such a case the inventor must ensure that the Bulk row is equal to zero (Figure 1).

Umbumbulu			January	February	March	April	May	June
Type of Fuel	Classification	Unit	January	February	March	April	May	June
Heavy Furnace Oil			-			-		
Bitumen	Stationary Combustion	Litres	-			-		
Natural Gas	Stationary Combustion	Cubic metres	-			-		
LPG	Stationary Combustion	Litres	-			-		
Coal	Stationary Combustion	tonnes	-			-		
Coke	Stationary Combustion	tonnes	-			-		
Illuminating Paraffin	Stationary Combustion	Litres	-			-		
Paraffin Wax	Stationary Combustion	Litres	-			-		
Refinery Gas	Stationary Combustion	GJ	-			-		
Coal (Bulk)								
eThekweni State of Energy Report 2006				643 621 tonnes				
Coke (Bulk)								
2005/006 eThekweni GHG Inventory				170982 tonnes				
Refinery Gas (Bulk)								
State of Energy Report 2006				27 311 558 GJ				

Figure 1: Coal, coke and refinery gas data input

❖ Improved Reporting:

If the National Department of Energy is able to provide data on a monthly basis opposed to a quarterly basis for future inventories, modify the inventory to allow for monthly data input by:

Step 1: Select the data input cells within each magisterial districts data sheet;

Step 2: Click on the **All Borders** button within the Quick Access Toolbar.

4.1.2.3 Community Stationary Fuel Combustion Emissions Calculations

Emissions from the stationary combustion of fuel are classified as community scope 1 emissions. To view the emissions for each magisterial district click on the **Scope 1** button in the top right-hand corner of the screen.

The standard equation used to calculate these emissions is:

$$\text{(Quantity of stationary fuel [unit A] x fuel specific emissions factor [kg CO}_2\text{e / unit A]) / 1000} \\ = \text{tCO}_2\text{e}$$

4.1.2.4 Community Mobile Fuel Combustion Data Collection

Mobile combustion data for ground, air and marine transport systems can be obtained from the National Department of Energy for each Magisterial District. Data requirements and contact details are provided in Table 7.

Table 7: Community mobile combustion data requirements

Data Source	Fuel	Units	Requirements	Contact Details
Department of Energy Dr Philip Goyns	MOG 93 Octane LRP	Litres	Quarterly consumption by each magisterial district for the calendar year	(012) 444 4258 philip.goyns@energy.gov.za
	MOG 93 Octane ULP	Litres		
	MOG 95 Octane LRP	Litres		
	MOG 95 Octane ULP	Litres		
	Diesel 0.005%S	Litres		
	Diesel 0.05%S	Litres		
	International Jet Fuel	Litres		
	Jet Fuel (Local)	Litres		
	Aviation Gasoline	Litres		
	Marine Automotive Diesel	Litres		
	Marine Diesel Oil	Litres		
	Marine Fuel Oil	Litres		

4.1.2.5 Community Mobile Fuel Combustion Data Entry

Mobile fuel combustion data is categorised into the sectors, Transit & Non-transit (ground) Vehicles, Air Transport Systems and Water Transport Systems.

❖ To enter mobile combustion data in the **Transit & Non-transit** sector:

❖ **Mobile Fuel Combustion**

Sector:
Transit & Non- Transit Vehicles

Step 1: Click on the [+] in line with the Transit and Non-transit Vehicles heading.

Step 2: Enter quarterly petrol and diesel consumption within the cells. Ensure that data being entered is in the units specified within the Units column.

Step 3: To close the data sheet click on the [-] button that has appeared in place of the [+].

A total petrol and diesel consumption value will automatically be calculated in the light blue rows above the data sheet.

❖ To enter mobile combustion fuel data for **Air Transport Systems**:

❖ **Mobile Fuel Combustion**

Sector:
Air Transport Systems

Step 1: Click on the [+] in line with the Air Transport Systems heading.

Step 2: Enter quarterly fuel consumption within the cells. Ensure that data being entered is in the units specified within the Units column.

Step 3: To close the data sheet click on the [-] button that has appeared in place of the [+].

❖ To enter mobile combustion fuel data for **Water Transport Systems**:

❖ **Mobile Fuel Combustion**

Sector:
Water Transport Systems

Step 1: Click on the [+] in line with the Water Transport Systems heading.

Step 2: Enter quarterly fuel consumption within the cells.

Ensure that data being entered is in the units specified within the Units column.

Step 3: To close the data sheet click on the [-] button that has appeared in place of the [+].

❖ Improved Data Resolution

If the National Department of Energy is able to provide data on a monthly basis opposed to a quarterly basis for future inventories, modify the inventory to allow for monthly data input by:

Step 1: Select the data input cells within each transport subdivision’s data sheet;

Step 2: Click on the **All Borders** button within the Quick Access Toolbar.

4.1.2.6 Community Mobile Fuel Combustion Emissions Calculations

Emissions from the mobile combustion of fuel by ground transport systems are classified as community scope 1 emissions. Emissions generated by air and marine transport systems are classified as community scope 2 emissions. To view the emissions for each magisterial district click on the relevant **Scope 1** and **Scope 2** buttons in the top right-hand corner of the page.

The standard equation for calculating these emissions is:

$$(Quantity\ of\ fuel\ [litres] \times fuel\ specific\ emissions\ factor\ (kg\ CO_2e\ /\ litre)) / 1000 = tCO_2e$$

4.2 Electricity

- ❖ On the Home page click on the Electricity Use button to navigate to the Electricity data entry sheet. Electricity data for both the municipal and community sectors is entered in this sheet.
- ❖ Once in the Electricity page to return to the Home page click the Home button in the top left-hand corner.
- ❖ To navigate to another page in the program click the relevant button in the top right-hand corner of the Electricity page.

Data Input Forms			Calculations			Results		
Fuel	Electricity	Solid Waste	Conversion Factors	Scope 1	ICLEI	Carbonn	Analysis	
Wastewater	Process	Agriculture		Scope 2				
				Scope 3				

4.2.1 Municipal Data

4.2.1.1 Municipal Electricity Consumption Data Collection

Municipal electricity consumption data is available from the municipal Treasury and Electricity Departments. For the 2010 inventory data supplied by the Treasury Department was not used due to concerns regarding reliability of data and was rather obtained from a building mapping exercise undertaken by the Energy Office in 2010. However, for future inventories data will need to be obtained from the Treasury Department.

Electricity consumption by traffic lights and streetlights is not metered by the municipality. Consumption is therefore calculated based on bulb numbers, wattage and estimated time usage per month.

To ensure the completeness of data that is obtained all data requirements outline in Table 8 need to be adhered to.

Table 8: Municipal electricity consumption data requirements and contact details

Data Source	Data Type	Description	Potential Issues	Contact Details
Treasury Department Wally Bentley Peet DuPlessis	Buildings & Facilities	Dept. identifies all E-numbers (Business & General) and CE-Numbers (Bulk) being billed to a municipal department.	Not all municipal accounts have an E-Number or CE-Number. Data sorting should be done based on account numbers and not E/CE-Numbers. All municipal account numbers have been included in the inventory.	(031) 322 1878 (031) 311 1140 BentleyW@durban.gov.za DuPlessisP@durban.gov.za
Eskom Troy Govender	Buildings & Facilities	Consumption by buildings / facilities which are supplied directly by Eskom.	N/A	(031) 710 5260 GovendP@eskom.co.za
Electricity Department Craig Smith	Streetlights	Consumption determined from streetlight number & wattage inventory	Ensure that LED retrofit progress is included in streetlight count	(031) 311 9538 SmithC@elec.durban.gov.za
Eskom Troy Govender	Streetlights	Consumption by streetlights owned by Eskom	N/A	(031) 710 5260 GovendP@eskom.co.za
Traffic Authority A.J. Cronje	Traffic Lights	Consumption determined from traffic light number & wattage inventory	Ensure that LED retrofit progress is taken into account	(031) 311 7674 cronjea@durban.gov.za
Electricity Department Leshan Moodliar	Transmission & Distribution Losses	Losses are determined by the Electricity Dept. by subtracting bulk purchase (Eskom & Landfill) from overall sales (internal & external)	Streetlight & traffic light consumption estimates are greatly underestimated by the Electricity Dept. When calculating losses streetlight & traffic light consumption should be based on wattage calculations.	(031) 311 9286 MoodliarL@elec.durban.gov.za

4.2.1.2 Municipal Electricity Consumption Data Entry

Electricity consumption data is categorised into the eleven ICLEI municipal sectors.

❖ To enter monthly municipal electricity consumption data:

❖ Business & General
Buildings
Streetlights & Traffic Signals
Water Delivery Facilities
Port Facilities
Airport Facilities
Vehicle Fleet
Transit Fleet
Power Generation Facilities
Solid Waste Facilities
Wastewater Facilities
Other Facilities.

Step 1: Click on the [+] in line with the sector heading for which you are entering data. A summary of each subsector's consumption will appear.

Step 2: Click on the [+] in line with each subsector. A list of account numbers categorised within the subsector will appear.

Step 3: The datasheets for each subsector provides space to enter electricity supplied by the eThekweni Electricity Department data as well as electricity supplied directly by Eskom.

Enter annual electricity data consumption for each account within the cells.

Step 3: To close the data sheet click on the [-] button that has appeared in place of the [+]. Repeat the data entry procedure within each sector.

4.2.1.3 Municipal Electricity Consumption Emissions Calculations

Emissions generated by internal electricity consumption are categorised as scope 2 emissions. Included within this scope are emissions generated from electrical transmission distribution and losses as the Municipality owns the majority of electricity distribution infrastructure within the EMA. Emissions generated by Eskom owned streetlights are categorised as municipal scope 3 emissions. To view the emissions for each of the ICLEI sectors click on the **Scope 1** and **Scope 3** buttons in the top right-hand corner of the page.

The standard equation used to calculate these emissions is:

$$(Electricity\ consumption\ [kWh] \times Eskom\ emissions\ factor\ [kg\ CO_2e / kWh]) / 1000 = tCO_2e$$

It is important to remember that to avoid double counting the Eskom emissions factor used must **not** take into account transmission and distribution losses.

4.2.2 Community Data

4.2.2.1 Community Electricity Consumption Data Collection

Within the EMA community members either receive electricity from the eThekweni Electricity Department or directly from Eskom. Data sources and requirements are provided in Table 9.

Table 9: Community electricity consumption data requirements

Data Source	Data Type	Description	Contact Details
Eskom Troy Govender	Residential, Commercial and	Monthly consumption by all facilities supplied directly by Eskom	(031) 710 5260 GovendP@eskom.co.za

	Industrial Facilities		
Electricity Department Leshan Moodliar	Residential, Commercial and Industrial Facilities	Monthly consumption by facilities supplied by the Electricity Department	(031) 311 9286 MoodliarL@elec.durban.gov.za

4.2.2.2 Community Electricity Consumption Data Entry

ICLEI requires community electricity consumption to be categorised within three sectors. Further subdivisions are required for Carbonn reporting, namely:

- ❖ Residential – Single-family homes; Multi-family homes;
- ❖ Commercial – Offices, Hotels, Educational institutions, Shops and Terminals; and
- ❖ Industrial – Power generation facilities and other industrial plants.

Although Eskom is able to categorise consumption into the Carbonn subsectors eThekweni's Electricity Department is only able to categorise consumption into the three ICLEI sectors.

- ❖ To enter electricity consumption data:

- ❖ Electricity
- Residential
- Commercial
- Industrial

Step 1: Click on the **[+]** in line with the sector heading for which you are entering data.

Step 2: The datasheets for each category provides space to enter electricity supplied by the eThekweni Electricity Department data as well as electricity supplied directly by Eskom data.

Enter monthly electricity data consumption within the cells.

Step 3: To close the data sheet click on the **[-]** button that has appeared in place of the **[+]**. Repeat the data entry procedure within each sector.

- ❖ Improved Data Resolution

If the eThekweni Electricity Department is able to provide data within each Carbonn subsector for future inventories enter the data within the subcategories rather than in the Business and General and Bulk categories. Make sure that the Business and General and Bulk rows are left as zero.

4.2.2.3 Community Electricity Consumption Emission Calculations

Emissions generated by electricity consumption are classified as scope 2 community emissions. To view these emissions click on the **Scope 2** button within the top right-hand corner of the page.

The standard equation used to calculate these emissions is:

$$(\text{Electricity consumption [kWh]} \times \text{Eskom emissions factor [kg CO}_2\text{e / kWh]}) / 1000 = \text{tCO}_2\text{e}$$

It is important to remember that to avoid double counting the Eskom emissions factor used must **not** take into account transmission and distribution losses.

4.3 Solid Waste Disposal

- ❖ On the Home page click on the  button to navigate to the Solid Waste data entry sheet. Solid Waste data for both the municipal and community sectors is entered in this sheet.
- ❖ Once in the Solid Waste page to return to the Home page click the  button in the top left-hand corner.
- ❖ To navigate to another page in the program click the relevant button in the top right-hand corner of the Solid Waste page.



4.3.1 Municipal Data

4.3.1.1 Municipal Solid Waste Data Collection

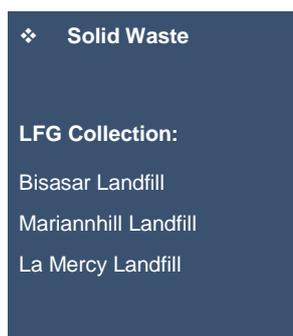
eThekweni Municipality has four landfills. The model used to determine fugitive methane emissions from these landfills is dependent of the LFG system in place at the landfills. Data to input into the models can be obtained from the Solid Waste Department (Table 10).

Table 10: Solid waste data requirements

Data Source	Landfill Type	Data Requirements	Contact Details
DSW Marc Wright	Landfills with LFG collection systems	<ul style="list-style-type: none"> LFG Collected Fraction of methane in LFG Methane destruction efficiency of the system 	(031) 263 1371 marcwr@dmws.durban.gov.za
DSW John Parkin	Landfill with no LFG collection systems	<ul style="list-style-type: none"> Annual disposal of waste during the inventory year 	(031) 311 8820 JohnPa@dmws.durban.gov.za

4.3.1.2 Municipal Solid Waste Data Entry

- ❖ To enter data for landfills with LFG collection systems:



Step 1: Click on the [+] in line with the LFG Collection row.

Step 2: Enter monthly LFG Collection data into the  cells for both baseline and project wells.

Do not enter data within the MMSCF row or the Total column, as the program will convert Nm³ to MMSCF and calculate totals automatically.

Ensure that data being entered is in the units specified within the Units column.

Step 3: Click on the [-] button to close the LFG Collection datasheet.

Step 4: Click on the [+] in line with the Fraction Methane in LFG row.

Step 5: Enter monthly percentage methane content in LFG in the cells.

Step 6: Click on the [-] button to close the Fraction Methane in LFG datasheet.

Step 7: Click on the [+] in line with the Flare Efficiency row.

Step 8: Enter monthly proportion on gas combusted in flare in the cells.

Step 9: Click on the [-] button to close the Flare Efficiency datasheet.

❖ To enter data for landfills without LFG collection systems:

❖ **Solid Waste**
No LFG Collection:
 Buffelsdraai Landfill

Step 1: Click on the [+] in line with the Waste Disposal 2011 row to open the datasheet.

Step 2: Enter monthly waste disposal data for each waste category in the cells.

Step 3: Click on the [-] button to close the Waste Disposal 2011 datasheet.

Step 4: Use the 2011 IPCC's Mathematically Exact First-Order Decay Model to calculate fugitive emissions by clicking on the *2011 FOD* button and navigating to the new model.

4.3.2 Community Data

4.3.2.1 Community solid waste data collection

Two privately operated landfills have been included in the inventory. For the 2010 inventory landfill specific data was requested from the private landfill owners, however none was obtained. For future inventories private landfill owners should be re-approached for data. To obtain data for Landfill A contact Enviroserv (Clive Kidd) on 082 779 6318 and for Landfill B contact Wasteman (Reg Gerber) on 082 462 4475. Data requirements for each landfill are outline in Table 11.

Table 11: Solid waste data requirements

Data Requirements		Specific Requirements
LFG Collection Status	No LFG Collection	<ul style="list-style-type: none"> Annual waste disposal for the inventory year
	LFG Collection System in place	<ul style="list-style-type: none"> Quantity of LFG collected during the inventory year Methane destruction efficiency of the system Uncollected surface area of the LFG collection system Collected surface area of the LFG System

❖ To enter data for landfills without LFG collection systems:

❖ **Solid Waste**
No LFG Collection:
Landfill A

Step 1: Enter annual waste disposal within the appropriate cells.

Step 2: Use the 2011 IPCC's Mathematically Exact First-Order Decay Model to calculate fugitive emissions by clicking on the *2011 FOD* button and navigating to the new model.

4.4 Wastewater Treatment

- ❖ On the Home page click on the  button to navigate to the Wastewater data entry sheet. Wastewater data for both the municipal and community sectors is entered in this sheet.
- ❖ Once in the Wastewater page to return to the Home page click the  button in the top left-hand corner.
- ❖ To navigate to another page in the program click the relevant button in the top right-hand corner of the Wastewater Treatment page.



4.4.1 Municipal Data

The eThekweni Municipality operates 27 wastewater treatment plants (WWTP) and two treatment lagoons within the municipal area. Greenhouse gas emissions are generated from these sources as follows:

- Methane emissions are generated through the incomplete combustion of digester gas at WWTP with anaerobic digesters and from wastewater treatment lagoons.
- Nitrous oxide emissions are generated by WWTP's with and without nitrification / denitrification and through effluent discharge to rivers and estuaries.

Models specified by ICLEI are used to estimate emissions from each of these sources. Data to input into the model can be obtained from the Water and Sanitation Department (Table 12).

Table 12: Wastewater data requirements

Data Source	GHG Source	Data Required	Contact Details
Water and Sanitation Mohammed Dildar	Incomplete Combustion of digester gas at a centralised WWTP with anaerobic digestion of biosolids	Population served Flared or vented	(031) 311 8671 DildarMo@dmws.durban.gov.za
	Anaerobic and facultative treatment lagoons	Population served	
	Centralized WWTP with nitrification / denitrification	Population served Presence of industrial effluent	
	Centralized WWTP without nitrification / denitrification	Population served Presence of industrial effluent	
	Effluent discharge to receiving aquatic environment	Population served Presence of industrial effluent	

- ❖ To enter data for **WWTP with anaerobic digesters**:

❖ **Wastewater Treatment**

CH₄ Emissions:

Stationary Emissions from anaerobic digestion

Step 1: Under the heading Stationary Emissions from Incomplete Combustion of Digester Gas click on the [+] in line with the Emissions row to open the datasheet.

Step 2: Verify with the Water and Sanitation Department that all the facilities named in the datasheet have anaerobic digesters.

Step 3: For each facility with an anaerobic digester enter the population served in the Pop. column.

Step 4: Click on the [-] button to close the datasheet.

❖ To enter data for **wastewater treatment lagoons:**

❖ **Wastewater Treatment**

CH₄ Emissions:

Process Emissions from Wastewater Treatment Lagoons

Step 1: Under the heading Process Emissions from Wastewater Treatment Lagoons click on the [+] in line with the Emissions row to open the datasheet.

Step 2: Verify with the Water and Sanitation Department that the facilities do not receive industrial effluent. If a facility does receive industrial effluent the population served will need to be corrected using the factor for industrial and commercial co-discharge given in the Input Data sheet.

Step 3: For each lagoon enter the population served in the Pop. column.

Step 4: Click on the [-] button to close the datasheet.

❖ To enter data for **WWTP with nitrification / denitrification:**

❖ **Wastewater Treatment**

N₂O Emissions:

Process Emissions from WWTP with Nitrification / Denitrification

Step 1: Under the heading Process Emissions from WWTP with Nitrification / Denitrification click on the [+] in line with the Emissions row to open the datasheet.

Step 2: Verify with the Water and Sanitation Department that the facilities that are categorised as receiving industrial effluent do receive industrial effluent and *vice versa*. If a facility does receive industrial effluent, the population served will need to be corrected using the factor for industrial and commercial co-discharge given in the Input Data datasheet and *vice versa*.

Step 3: For each facility enter the population served in the Pop. column.

Step 4: Click on the [-] button to close the datasheet.

❖ To enter data for **WWTP without nitrification / denitrification:**

❖ **Wastewater Treatment**

N₂O Emissions:

Process Emissions from WWTP without Nitrification / Denitrification

Step 1: Under the heading Process Emissions from WWTP without Nitrification / Denitrification click on the [+] in line with the Emissions row to open the datasheet.

Step 2: Verify with the Water and Sanitation Department that the facilities that are categorised as receiving industrial effluent do in fact receive industrial effluent and *vice versa*. If a facility does receive industrial effluent the population served will need to be corrected using the factor for industrial and commercial co-discharge given in the Input Data datasheet and *vice versa*.

Step 3: For each facility enter the population served in the Pop. column.

Step 4: Click on the [-] button to close the datasheet.

❖ To enter data for **effluent discharge to rivers and estuaries:**

❖ Wastewater Treatment

N₂O Emissions:

Process Emissions from effluent discharge to rivers and estuaries

Step 1: Under the heading Process Emissions from Effluent discharge to Rivers and Estuaries click on the [+] in line with the Emissions row to open the datasheet.

Step 2: Verify with the Water and Sanitation Department that the facilities that are categorised as receiving industrial effluent do receive industrial effluent and *vice versa*. If a facility does receive industrial effluent the population served will need to be corrected using the factor for industrial and commercial co-discharge given in the Input Data datasheet and *vice versa*.

Step 3: For each discharge point enter the population served in the Pop. column.

Step 4: Click on the [-] button to close the datasheet.

4.5 Process Emissions

- ❖ On the Home page click on the  button to navigate to the process emissions data entry sheet. Process emissions data for is entered in this sheet.
- ❖ Once in the Process Emissions page to return to the Home page click the  button in the top left-hand corner.
- ❖ To navigate to another page in the program click the relevant button in the top right-hand corner of the Process Emissions page.



4.5.1 Material Industrial Process Identification

Industrial processes produce a range of GHG emissions depending on the materials and methods used. Industrial processes identified by ICLEI as possible major GHG sources are:

- ❖ Adipic Acid Production
- ❖ Aluminium Production
- ❖ Ammonia Production
- ❖ Cement Production
- ❖ HCFC-22 Production
- ❖ Iron and Steel Production
- ❖ Lime Production
- ❖ Nitric Acid Production
- ❖ Pulp and Paper Production
- ❖ Refrigerating and Air Condition Equipment Manufacturing
- ❖ Semiconductor Manufacturing

However, process emission sources not identified by ICLEI may be material to the eThekweni Municipality compared to those identified in the list. To determine which industrial emission sources are material to the eThekweni Municipality an investigation of the industrial processes active within the municipal area needs to be undertaken. Once material processes have been identified guidance on how to include these emissions within the inventory can be obtained from the [2006 IPCC IPPU Manual](#). This resource also contains Excel spread sheets containing models for each emissions source.

4.6 Agriculture & Land Use Emissions

- ❖ On the Home page click on the  button to navigate to the Agriculture and Land Use data entry sheet. Agriculture and Land Use data for community sectors is entered in this sheet.
- ❖ Once in the Agriculture and Land Use page to return to the Home page click the  button in the top left-hand corner.
- ❖ To navigate to another page in the program click the relevant button in the top right-hand corner of the Agriculture and Land Use page.



4.6.1 Community Data

Greenhouse gas emissions are generated from a number of sources and processes within the agriculture and land use sectors. Included in the 2010 inventory are the emissions sources enteric fermentation and pre-harvest sugar cane burning only. Once more information is available to calculate emissions from other systems, these can be built into the program. Guidance and models on how to do this can be obtained from the [2006 IPCC AFOLU Manual](#).

4.6.1.1 Community Agriculture Data Collection

Data sources and requirements to calculate emissions from enteric fermentation and pre-harvest cane burning are provided in Table 13.

Table 13: Agricultural sector data requirements

Data Source		Data Required	Units	
National Department of Agriculture, Forestry and Fisheries Selebogo Leshoro		Quarterly numbers of goats, cattle and sheep present within the municipal area	heads	(021) 319 8037 SelebogoL@nda.agric.za
Environmental Management Department Alistair McInnes		D'MOSS imagery for the inventory year	n/a	(031) 311-7468 mcinnesa@durban.gov.za

4.6.1.2 Community Agriculture Data Entry

❖ To enter enteric fermentation data:

❖ Agriculture
Enteric Fermentation

Step 1: Click on the [+] in line with the Goat, Cattle or Sheep row.

Step 2: For each animal type enter the quarterly animal survey count within the cells.

The program will automatically calculate the total number of animals for each magisterial district in the Total column. Note that this is an average of the quarterly survey numbers.

Step 3: To close the data sheet click on the [-] button that has appeared in place of the [+]. Repeat the data entry procedure within each animal type.

To enter pre-harvest sugar cane burning data:

❖ Agriculture
Pre-harvest Cane Burning

Step 1: Click on the [+] in line with the Input Data row.

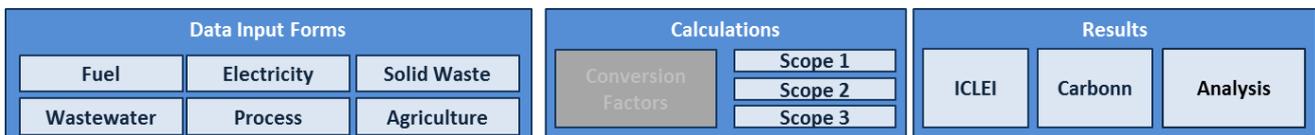
Step 2: Within the cells enter the area of cane burnt (taken as the area under cane within the eThekweni Municipality for that year) and the mass of fuel available for combustion.

Note that this model assumes that the cane within the eThekweni municipal area is burnt on an annual basis.

Step 3: To close the data sheet click on the [-] button that has appeared in place of the [+].

5 Conversion Factors

- ❖ On the Home page click on the  button to navigate to the Conversion Factors sheet. Emission conversion factors are stored within this sheet.
- ❖ Once in the Conversion Factor page to return to the Home page click the  button in the top left-hand corner.
- ❖ To navigate to another page in the program click the relevant button in the top right-hand corner of the Conversion Factor page.



5.1 Updating Conversion Factors

Conversion factors are continuously being updated by the organisations by which they are developed.

- ❖ To update a conversion factor within the inventory:

Step 1: Click on the [+] in line with the sector of the conversion factor that is being updated.

Example: If the petrol conversion factor is being updated click on the [+] in line with the Road Transport Fuel row.

Step 2: Within the  cells update the CO₂, CH₄, N₂O and Total CO₂e conversion factors.

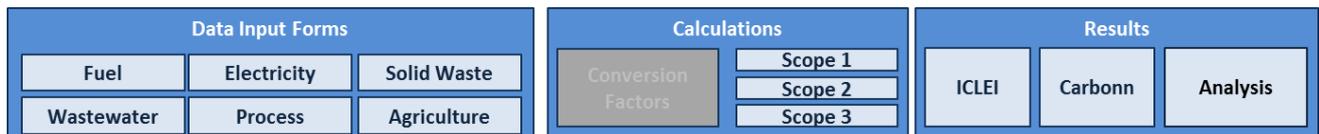
Ensure that the conversion factors for all of the GHG emissions are in **CO₂e**.

The program will automatically update the inventory based on the new emissions conversion factor that is entered.

Step 4: Close the conversion factor datasheet by clicking on the [-] button that has appeared in place of the [+].

6 Results Analysis

- ❖ On the Home page click on the  button to navigate to the results analysis sheet.
- ❖ Once in the results analysis page to return to the Home page click the  button in the top left-hand corner.
- ❖ To navigate to another page in the program click the relevant button in the top right-hand corner of the Results Analysis page.



6.1 Customising Results Analysis

The emissions included in the inventory are grouped into three formats within the results page:

1. Sectors broken down by emission scopes;
2. Emissions scopes; and
3. Sectors (scope one, two and three combined).

- ❖ To customise the graphic displayed under the pivot table for each grouping:

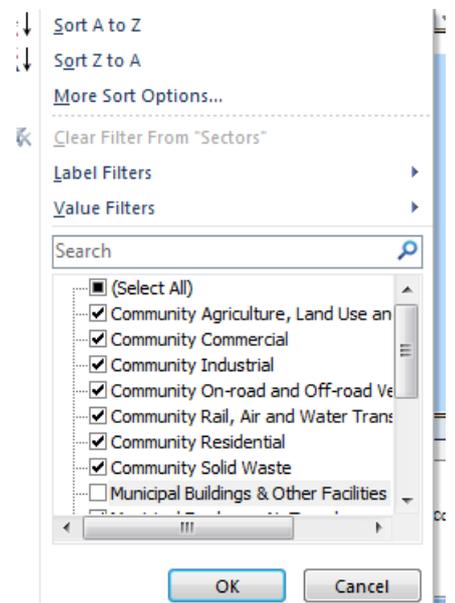
Step 1: Click on the draw down menu within the pivot table (Figure 2).

Sectors	
Sectors	Sum of Emissions
Community Agriculture, Land Use and Forestry	65 384
Community Commercial	2 936 896

Figure 2: Pivot Table draw down menu

Step 2: Tick all categories that are to be included within the analysis. Untick all categories that aren't to be included in the analysis.

Step 3: Ensure that all data labels are visible in the image. If labels are congested click on a label and move it to an open area within the graphic (the sheet will need to be unprotected to do this).



6.2 Customising Graphics

The program is currently set up to display the results analysis as a pie chart. To change the style of chart:

Step 1: Unprotect the sheet

Step 2: Click on the chart.

Step 3: In the main heading toolbar click on the **Design** tab that appears.

Step 4: Click on the **Change Chart Type** button in the far left of the toolbar.

Step 5: Select a chart type and press okay.

Figure 3: Filtering categories within a pivot table

6.3 Refreshing Data in Pivot Tables

If a change is made to the inventory the pivot tables will automatically update to show these changes when you close the program. To update the pivot table data without closing the program click on the **Refresh All** button in the MS Excel *Quick Access Toolbar*.

7 Raw Data

7.1 2010 Raw Data

To view the raw data sources and details for the 2010 inventory click on the Raw Data button in line with the sector heading which you wish to view.



7.2 Update Raw Data

To update the raw data linked to the program first save all raw data obtained for each emission source (i.e. stationary fuel combustion, mobile fuel combustion, electricity consumption etc) within separate Excel Spread sheets. Label these Spread sheet using the following format:

*[inventory year]_eThekwini GHG Inventory Municipal Data Stationary Fuel Combustion_
[date saved]*

Return to the Raw Data sheet in the inventory and right click on the relevant **Data** button. In the drop down list that appears click on *Edit Hyperlink* to open the Edit Hyperlink box (Figure 4).

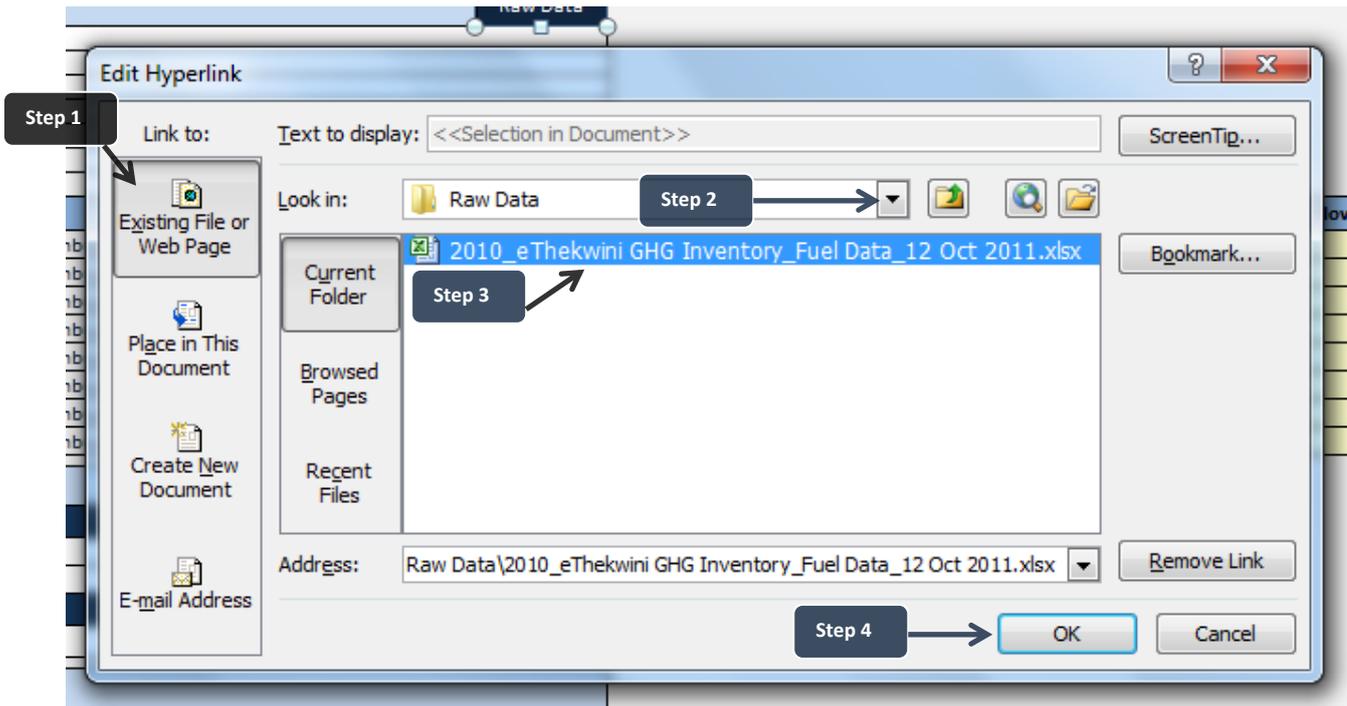


Figure 4: Edit Hyperlink box

Step 1: Under **Link to** click on *Existing File or Web Page*

Step 2: Using the **Look in** navigation menu scroll down to the file in which the raw data is saved.

Step 3: Within the display window select the raw data Excel file

Step 4: Click **OK**

The **Data** button within the inventory should now lead you to the new data and no longer the 2010 data.

8 Appendix A

The 2010 eThekweni GHG Inventory represents significant progress by the Municipality in terms of quantifying municipal and community emissions. Areas improved upon in the 2010 Inventory in comparison to the Municipality's last inventory, undertaken in 2006, are summarised in Table 14.

Table 14: Data improvements in the 2010 inventory compared to the 2005/2006 inventory

Municipal Emission Sources	2005 / 2006 Inventory Data	2010 Inventory Data
Stationary Fuel Combustion	<ul style="list-style-type: none"> Not included 	<ul style="list-style-type: none"> Included
Mobile Fuel Combustion	<ul style="list-style-type: none"> Internal refuelling by City Fleet 	<ul style="list-style-type: none"> Internal refuelling by City Fleet, Electricity Department and Solid Waste Department External Refuelling (BP) by all departments Fuel consumption by council busses
Business Flights	<ul style="list-style-type: none"> Not included 	<ul style="list-style-type: none"> Comprehensive flight data obtained from Travel Agents
Electricity Consumption	<ul style="list-style-type: none"> Excludes bulk electricity purchases and consumption by facilities with an account number only (no E-number). Electricity consumption by municipality owned streetlights 	<ul style="list-style-type: none"> Includes bulk electricity purchases and facilities with no E-numbers Electricity consumption by municipality and Eskom owned streetlights Electricity consumption by traffic lights
Wastewater Treatment	<ul style="list-style-type: none"> Emissions from anaerobic digestion quantified 	<ul style="list-style-type: none"> Emissions from anaerobic digestion, wastewater treatment lagoons, WWTP with nitrification/denitrification, WWTP without nitrification/denitrification and emissions generated during effluent discharge to rivers and estuaries quantified
Community Emission Sources	2005 / 2006 Inventory	2010 Inventory
Stationary Fuel Combustion	<ul style="list-style-type: none"> Excluded marine transport systems fuel consumption 	<ul style="list-style-type: none"> Included combustion of marine fuel
Electricity Consumption	<ul style="list-style-type: none"> Electricity consumption provided by eThekweni Electricity Department 	<ul style="list-style-type: none"> Electricity consumption provided by the eThekweni Electricity Department and Eskom
Agricultural Emissions	<ul style="list-style-type: none"> Not included 	<ul style="list-style-type: none"> Emissions from enteric fermentation and pre-harvest cane burning

