Energy and Emissions Data Collection

A Guide for Developing Cities

This project is funded by the European Union

About CoM SSA

The Covenant of Mayors in Sub-Saharan Africa (CoM SSA) is an initiative launched by the European Union (EU) to support local authorities in Sub-Saharan Africa in their fight against climate change and in their efforts in ensuring access to clean energy. Started in 2015, the initiative is shaped by local authorities for the local authorities to reflect the local context and specifics.

Under the CoM SSA, local authorities are invited to make a voluntarily political commitment to implement climate and energy actions in their communities and agree on a long-term vision to tackle 3 pillars, namely access to energy, climate mitigation and climate adaptation.

In order to translate the political commitment into practical measures, CoM SSA signatories commit to produce and implement a Sustainable Energy Access and Climate Action Plan (SEACAP).

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Why Collect Data?

- To provide a baseline picture of emission sources, climate impacts and energy consumption patterns.
- Through collecting data, a city can identify the key sustainable energy and climate issues they face and where response actions would have the most impact.
- This assists in the development of a strategy with targets and goals.
- The data collected helps develop a picture of energy use and waste generation across all the economic sectors. This type of data picture is essential for integrated service delivery in the long term as well as climate action planning.

How to Collect Data?

The time and effort required to collect data and the institutional and budgetary requirements are often overlooked. The key aspects are as follows:

- Establish the budget, the process and the team that will engage in the data collection
- Ensure good communication and relationship building
- '**Validation**' which is the process of checking data quality and, where possible, working with the providers of the data to make improvements and clarifications
- In order to make the data usable now and in the future it is essential that at the point of data collection, the source, methodology, timescale and scope are specified.
  This is called '**metadata**'
- Persistence and patience throughout the 10 steps shown on the next page:

Purpose: This guide aims to assist developing cities that are still building their capacity to collect data for climate change action planning by focusing on the most important data sources and providing guidance on where and how to get this data.

Data collection: A 10-step process

1 Get a budget

and a team together

Think and discuss

2 Generate the data specification

Map the stakeholders (especially data suppliers)

3

Communicate

4

Relationships and agreements (First engagements don't always work so flexibility is key. This means that alternative sources of data should always be developed.)

5

Any paperwork required to release the data. For instance a non-disclosure agreement.

6

Get the data

7

Analyse and check

8

Questions and clean up:

- Clarify sources and methodology
- Clear up any apparent errors

9

Finalise/generate metadata (ensure that the source, methodology, timescale and scope of the data are clearly specified)

10

Your data, with its metadata, is now ready for use.

Data Collection in 10 Steps

STEP	ACTION
Step 1	Arrange a capable team and adequate budget/ funding will be key to success
Step 2	• Identify and specify the data that is needed and determine how to set about collection. • Identify the key stakeholders, mapping them to the data they might supply, their power and influence and a strategy for engagement.
Step 3	Connect with the right people/organisations to get the data. This might be in person (preferable) or through telephonic or email requests (least preferable). Workshops can be useful in finding out what stakeholders have and building relationships with them.
Step 4	Build a relationship with the data-providers and come to an agreement on data provision. Be careful not to rely on one supplier. Be flexible. Have alternatives.
Step 5	Written agreements (such as non-disclosure agreements) are sometimes needed in order to get data. These need to be followed up strongly as they are sometimes used as delaying tactics.
Step 6	Get the data.
Step 7	Analyse, sort and check the data. Remember : Garbage in = Garbage out (GIGO)
Step 8	Usually, it is necessary to ask more questions about the data if: • There seem to be errors in the data or data is missing. • The data provider has not given all the information on the data e.g. units are missing
Step 9	Create and finalise metadata. Metadata is information about the data, for example where it came from, what year and area it covers, etc. This is very important as it allows you to use the data in the future and be more confident about the quality of the data. That's why metadata has the golden key symbol in the diagram above.
Step 10	Use the data.

What Data is Needed?

Emissions are largely caused by the burning of fossil fuel and the decomposition of waste.

Sometimes, that fossil fuel is burnt within city boundaries which is termed “Scope 1” emissions, but the cross-boundary emissions caused by activities inside, called “Scope 2” are also important.
“Scope 3” entirely relates to emissions outside the boundaries like waste that is landfilled outside boundaries

Supply- and demand-side data is necessary. Supply-side data gives information on the total amount of fuel supplied to the area (example: total electricity sold within the municipality), while demand-side data gives information on where this fuel is consumed (example: electricity consumption in the residential, commercial or industrial sectors).

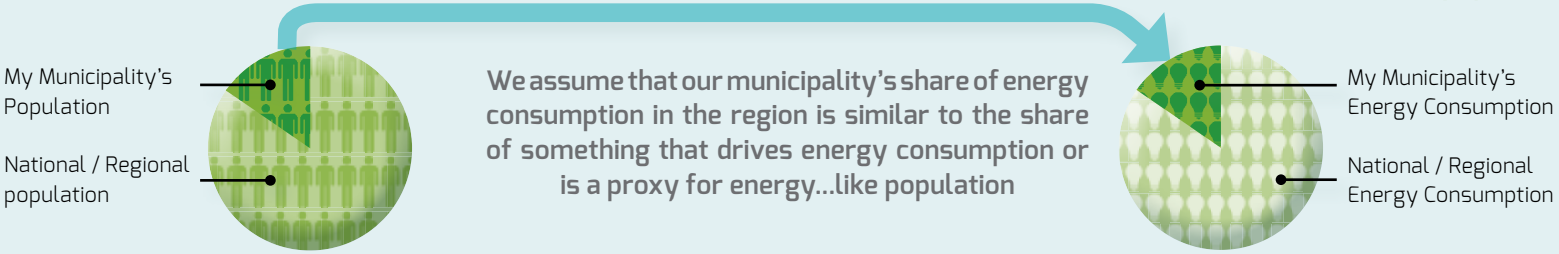
The essential data requirements for a basic greenhouse gas inventory or energy plan are listed in the table below.

What Data? – The Essentials List

DATA	DESCRIPTION	NOTES
Supply-side data		
Electricity sales	Total electricity sales to customers in city boundaries (usually in kWh).	This should be available for a city or metropolitan area. It is best not to scale this data. Typical supplier: Utility or Energy Ministry.
Liquid fuel and gas sales	Sales by fuel type (petrol/gasoline, diesel, LPG, paraffin/kerosene, jet fuel, aviation gasoline, heavy/residual furnace oil, etc.) within city boundaries (data usually in litres, tonnes, kg or GJ).	Typical suppliers: Petroleum Regulatory Authority or Energy Ministry. Potential problem: There can be a great many suppliers of petroleum fuels active.

DATA	DESCRIPTION	NOTES
Demand-side data		
Population & No. of Households	Household count can be estimated by dividing population by typical household size	This information can be used to scale national/regional data and to create energy or emissions indicators (example: emissions per person). Typical source: Census or City/Metropolitan Authority.
Size & Growth Rate of the Economy	Gross Domestic Product (GDP) and historical growth rates of GDP by sector (commercial, industrial, agricultural, transport) if available. Typical supplier: Census or City/Metropolitan Authority.	This can be used to scale data (by using the proportion of the local economy when compared to the national economy), to create energy or emissions indicators and develop scenarios of possible future economic growth for projecting emissions and energy demand.
Electricity demand by sector	Electricity consumption by each sector (residential, commercial, industrial, agricultural, etc.). Typical supplier: Utility or Energy Ministry	Usually the tariff type can indicate the sector where the electricity is sold/consumed. Example: Sales on a high-voltage tariff is usually to the industrial sector.
Liquid fuel and gas demand by sector	Liquid fuel (petrol/gasoline, diesel, LPG, paraffin/ kerosene, jet fuel, etc.) and gas demand by sector (residential, commercial, industrial, agricultural, transport, etc.) by sub-sector (if available).	Generally: petrol (gasoline), jet fuel and aviation gasoline is transport. Diesel is use in transport and electricity generation (utility & backup). LPG is mostly used in residential and commercial (cooking) and possibly industrial and transport sectors. Fuel oil is typically used in industrial (boiler fuel) and marine (ships bunkers) applications. Paraffin/kerosene is usually used in the residential sector.
Energy use in the residential sector	Share of households using different fuels: electricity, wood, paraffin/kerosene, etc. and any information on how often and how much they use these fuels and how much they cost	Splitting the household consumption of fuels by income group is very useful when developing scenarios of the future. Typical source: Census, academic studies or City/Metropolitan Authority.
Solid fuel demand by sector	Solid fuel (charcoal, coal, wood, etc.) demand by sector (residential, commercial, industrial, agricultural, transport, etc.) and by sub-sector (if available e.g. public cars, income levels etc.)	Difficult to get. Often best to scale from regional data (see below) or else calculate bottom up (no. of households/businesses X estimated daily consumption)
Solid Waste	Tonnes of solid waste committed to landfill, dumped, burnt in the open, incinerated or some biological treatment applied	The type of landfill can be important, whether it is flared or there is waste to energy
Liquid Waste	Megalitres/litres, of liquid waste (sewage etc)	Whatever goes to waste water works to be treated. Untreated waste can be estimated from the number of households not served by waste water treatment.

Data Gaps, Method 1 – Scaling



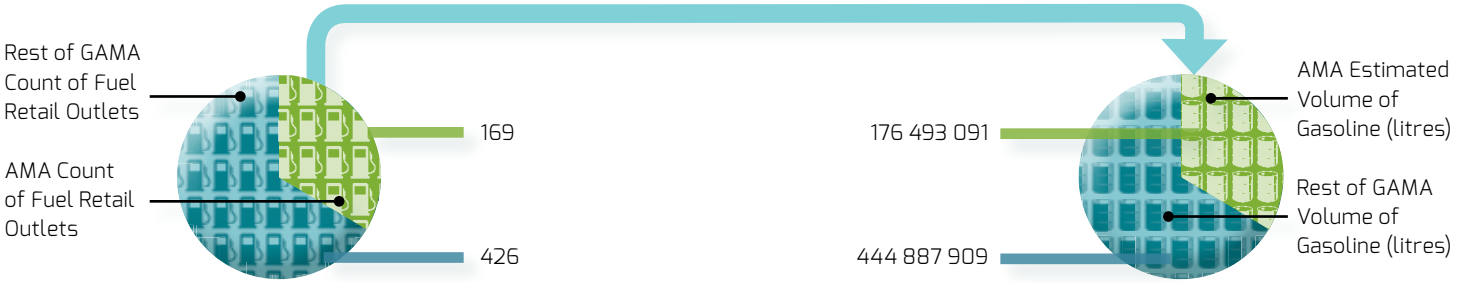
Case study

Accra Metropolitan Assembly Demand for Liquid Fuels

FUEL STATIONS	NUMBER
AMA Count of Fuel Retail Outlets	169
GAMA (including AMA) Count of Fuel Retail Outlets	595
Scaling Factor	28 %

The Accra Metropolitan Assembly assumed their liquid fuel demand was proportional to their share of retail fuel stations in the Greater Accra region (Greater Accra Municipal Assembly – GAMA). Consumption data in litres was available for GAMA

AMA Volume of Gasoline Consumed (litres) Estimated by Scaling	176,493,091
GAMA (including AMA) Volume of Gasoline Sold (litres)	621,381,000



Data Gaps, Method 2 – Bottom-up Estimates

What if we have some data about how energy is used like the share of households cooking with charcoal?

We call the data about how energy is used "activity data" and it can be used to make an estimate of demand for energy that might be more reliable than scaling. The method used is called a "bottom-up" calculation, because it works from the bottom up using the number of devices or users and their typical consumption of fuel.

The "Bottom-up" Methodology:

We use different fuels for different uses, which we call "energy services". We can estimate the total energy used by a sector as follows:

Energy consumption of a fuel used by a sector for a certain energy service = **Share** of the sector using a fuel for that service (%) **X 'Activity Level'** of the whole sector using the service (say number of households, tons of steel or miles of travel) **X 'Energy Intensity'** – The amount of fuel typically used for the service (tonnes of charcoal per household per year or litres of fuel per kilometre travelled)

An Example

Say a local study or the statistics bureau has surveyed households in your city with the following results:

We can get this from a similar area or city although the result will be much more uncertain. Local data is always better.

But not this. This can be very different from place to place

How come the shares don't add up to 100%?

Many households use more than one fuel

FUEL	AMOUNT OF FUEL USED FOR COOKING PER HOUSEHOLD PER YEAR (KG)	Share of households using fuel for cooking
Wood	729	13%
Charcoal	311	86%
LPG	125	69%

Source: Data for Ga East in Ghana from http://www.samsetproject.net

Say a local census indicated that your city has 5 million people with an average of 5 people per household so 1 million households

Estimated Annual Household Fuel Consumption:

Wood Consumption = 13% X 1 million households X 729 kg/household = 95 million kg = 95,000 tonnes*

Charcoal Consumption = 86% X 1 million households X 311 kg/household = 267 million kg = 267,000 tonnes*

LPG Consumption = 69% X 1 million households X 125 kg/household = 86 million kg = 86,000 tonnes*

* Rounded to the nearest thousand tonnes

CoM SSA is a Regional Covenant of

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