



GLOBAL PROTOCOL FOR COMMUNITY-SCALE GREENHOUSE GAS EMISSION INVENTORIES

TRAINING MODULE: BASIC CONCEPTS
2018

Developed by ICLEI Oceania in partnership with C40 Cities, the City of Melbourne and Ironbark Sustainability

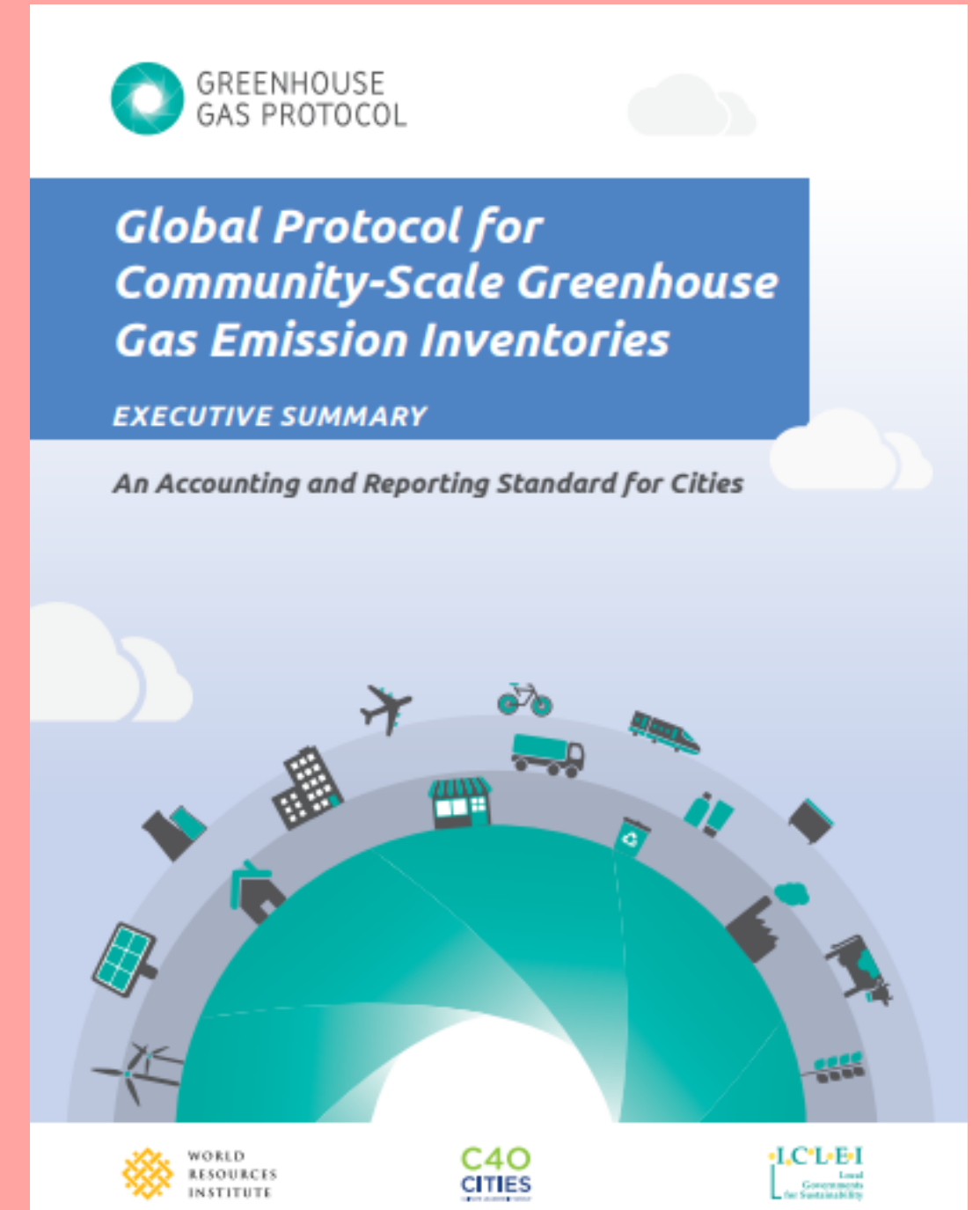




WHAT IS THE 'GPC'

GPC stands for the 'Global Protocol for Community Scale Greenhouse Gas Emissions Inventories'

It is an internationally recognised framework that allows local governments to transparently measure and report their city's emissions.

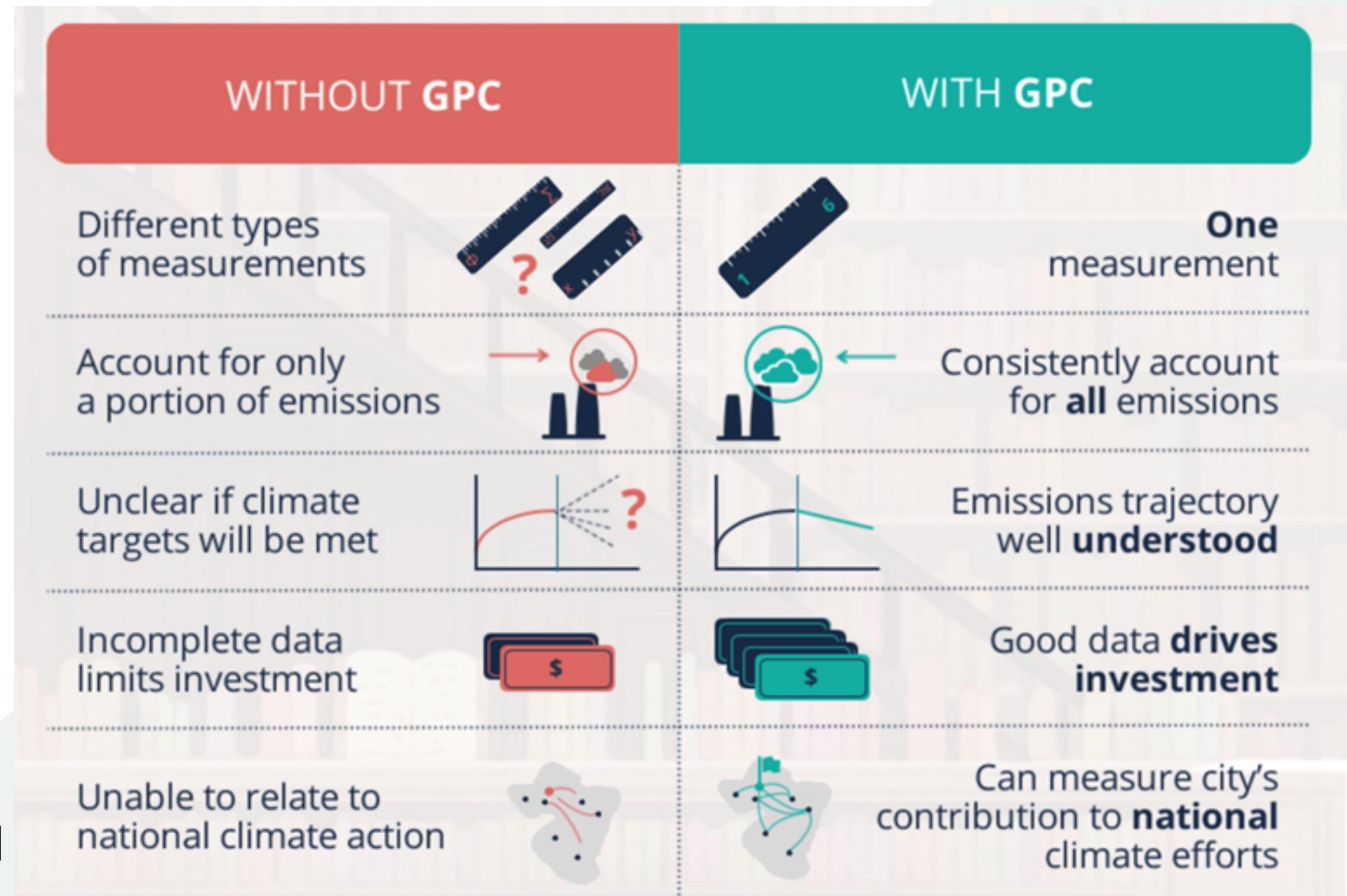


[Read the executive summary](#)

WHY THE GPC

A city's ability to take effective action on mitigating climate change and monitor progress depends on having access to reliable and comprehensive data on GHG emissions. Planning for climate action begins with developing a GHG inventory.

However, inventory methods are often inconsistent, which makes comparing and aggregating data difficult. To allow for more credible and meaningful reporting, the GPC offers a clear framework for calculating and reporting city GHG emissions.



"Planning for climate action begins with developing a GHG inventory"

BOUNDARIES

EMISSIONS

SCOPES

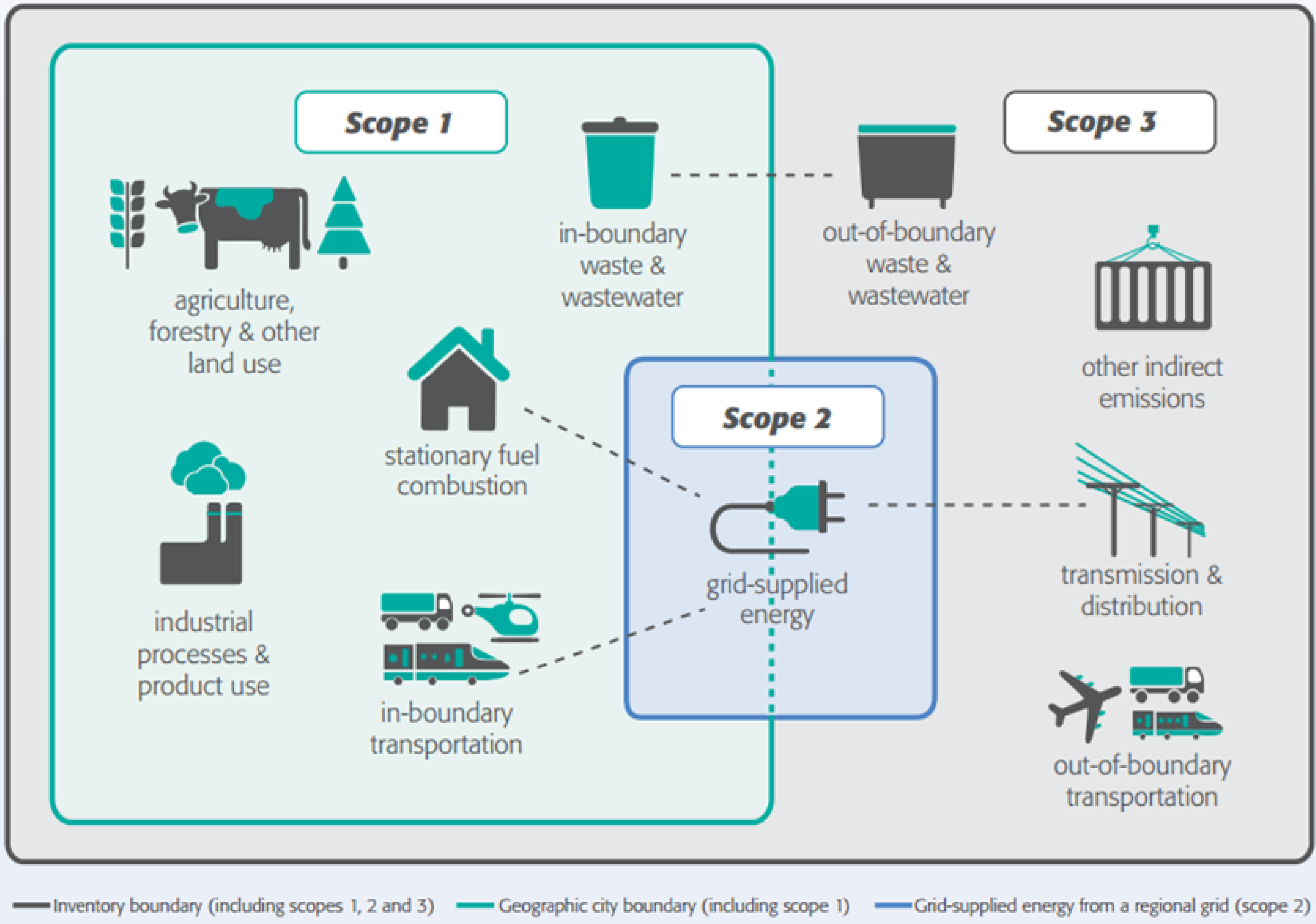
SECTORS

Hi there! I'm Bess, you may have seen me around... let's start with B for Boundaries.

Bess 

The first concept to grasp is the inventory boundary (the black line) which shows the emissions attributed to the city. This is a conceptual boundary, not physical, as it includes emissions from a city's activities. The inventory boundary represents a city's total emissions.

Within this inventory boundary emissions can be broken down into 3 different scopes. This will be explored later on.



Overview

Cities must report in two ways, these are:

1. Emissions with respect to a geographical boundary (territorial), and
2. To a city's activities (city-induced)

Let's say you wanted to create an inventory of your house. You could report emissions that occurred just within the boundary of your house, or emissions that occurred due to activities within the house, which may result in emissions outside of the confines of the house. The first is a measure of your emissions occurring within the house (territorial); the second is a measure of emissions from household activities (city-induced)

REPORTING
EMISSIONS

city boundary

1. TERRITORIAL

city's activities

2. CITY-INDUCED

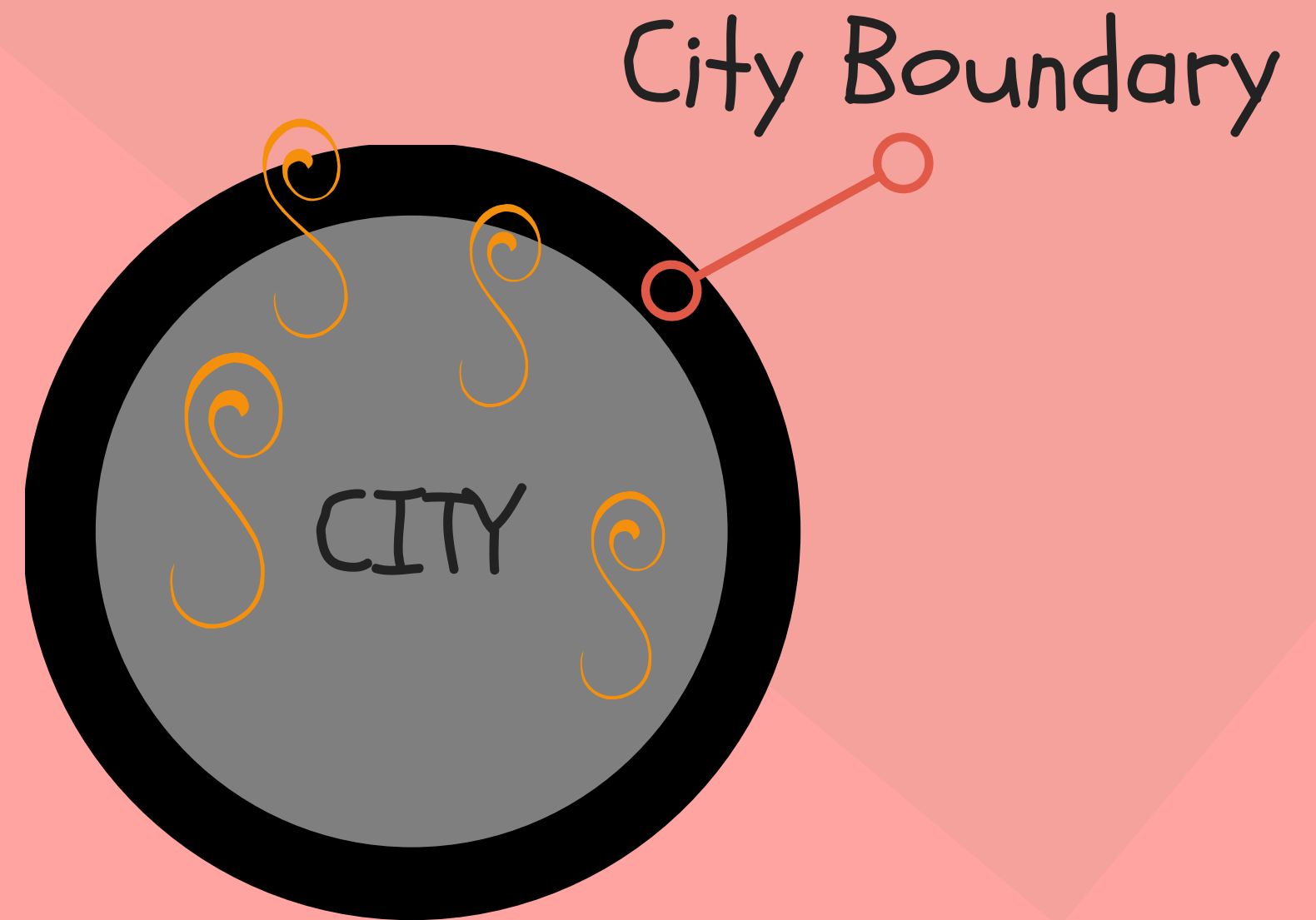
GPC INVENTORY

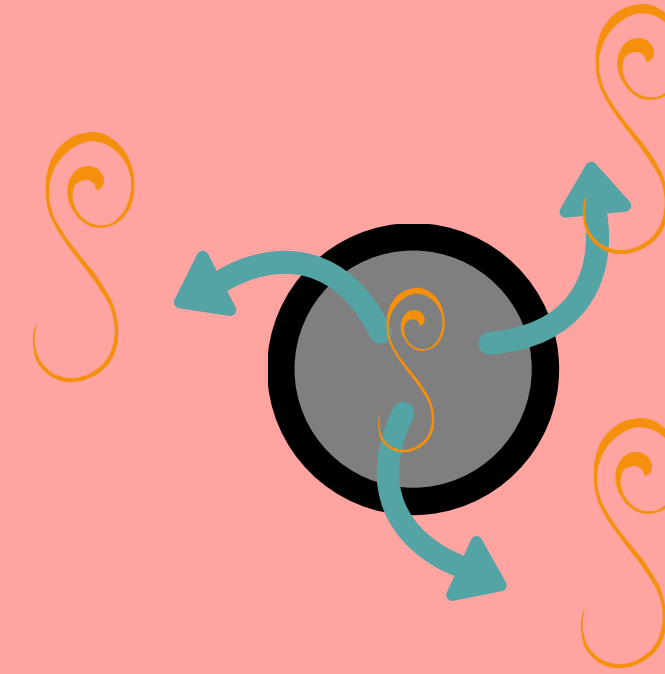
TERRITORIAL

The territorial boundary includes all emissions within a city's boundary.

WHY?

Territorial accounting is used to measure the emissions within a specific boundary. This is useful when estimating national-level emissions as it prevents double-counting.





CITY-INDUCED

City-induced reporting counts emissions caused by a city's activities (in other words they are *induced* by the city) regardless of where they occur.

EXAMPLE

Emissions from *imported* waste which is processed within the city boundary would *not* be counted as city-induced because they weren't produced by that city's activities, but by the city it was imported from.

On the other hand, emissions from waste exported by the city that was processed outside of the city *would* be counted because they were induced by the city's activities.



Hmm... so territorial are emissions that come from within a city boundary... and city-induced come from a city's activities. Ok!!!

CITY-INDUCED

Two levels of city-induced reporting



BASIC

Covers scope 1 + 2 emissions from stationary energy and transportation, and scope 1 +3 emissions from waste.

BASIC+

Involves more challenging data collection and calculations, also includes emissions from Industry (IPPU) & Agriculture (AFOLU) and transboundary transportation

BOUNDARIES

EMISSIONS

SCOPES

SECTORS

Did you get all that? Test yourself! Click the button.

TEST

Alright, time to learn about Emissions then.

Bess



COMMON GASES AND THEIR GLOBAL WARMING POTENTIAL (GWP) COEFFICIENTS

Various gases in the atmosphere contribute more to warming than others. Therefore, individual greenhouse gases should be converted into carbon dioxide equivalents by multiplying by the 100-year Global Warming Potential (GWP) coefficients (listed below) so that their relative impact on warming can be compared. For example, methane's GWP is 28 times that of carbon dioxide, meaning that one molecule of methane has 28 times the warming potential compared to one molecule of carbon dioxide.

Gas name	Global Warming Potential, carbon dioxide equivalents (CO ₂ e) (IPCC Fifth Assessment Report 2014)	Formula
Carbon dioxide	1	CO ₂
Methane	28	CH ₄
Nitrous oxide	265	N ₂ O
Hexafluoroethane	11,100	C ₂ F ₆
Hydrofluorocarbon-23	12,400	CHF ₃
Sulphur hexafluoride	23,500	SF ₆

The GPC requires all greenhouse gas emissions to be reported as metric tonnes of each greenhouse gas as well as the carbon dioxide equivalents.

EMISSIONS PROFILE

Once emissions are converted into carbon dioxide equivalents, we can begin comparing sectors. This amounts to an emissions profile.

A profile may help councils make more informed decisions of how to have the highest impact on lowering emissions.

After converting to carbon dioxide equivalents, we can see in the example that the transport sector contributed the largest amount of carbon dioxide equivalent emissions.

This information is highly useful for decision-makers who may wish to focus on reducing emissions from a sector that is contributing more significantly to their emissions profile.

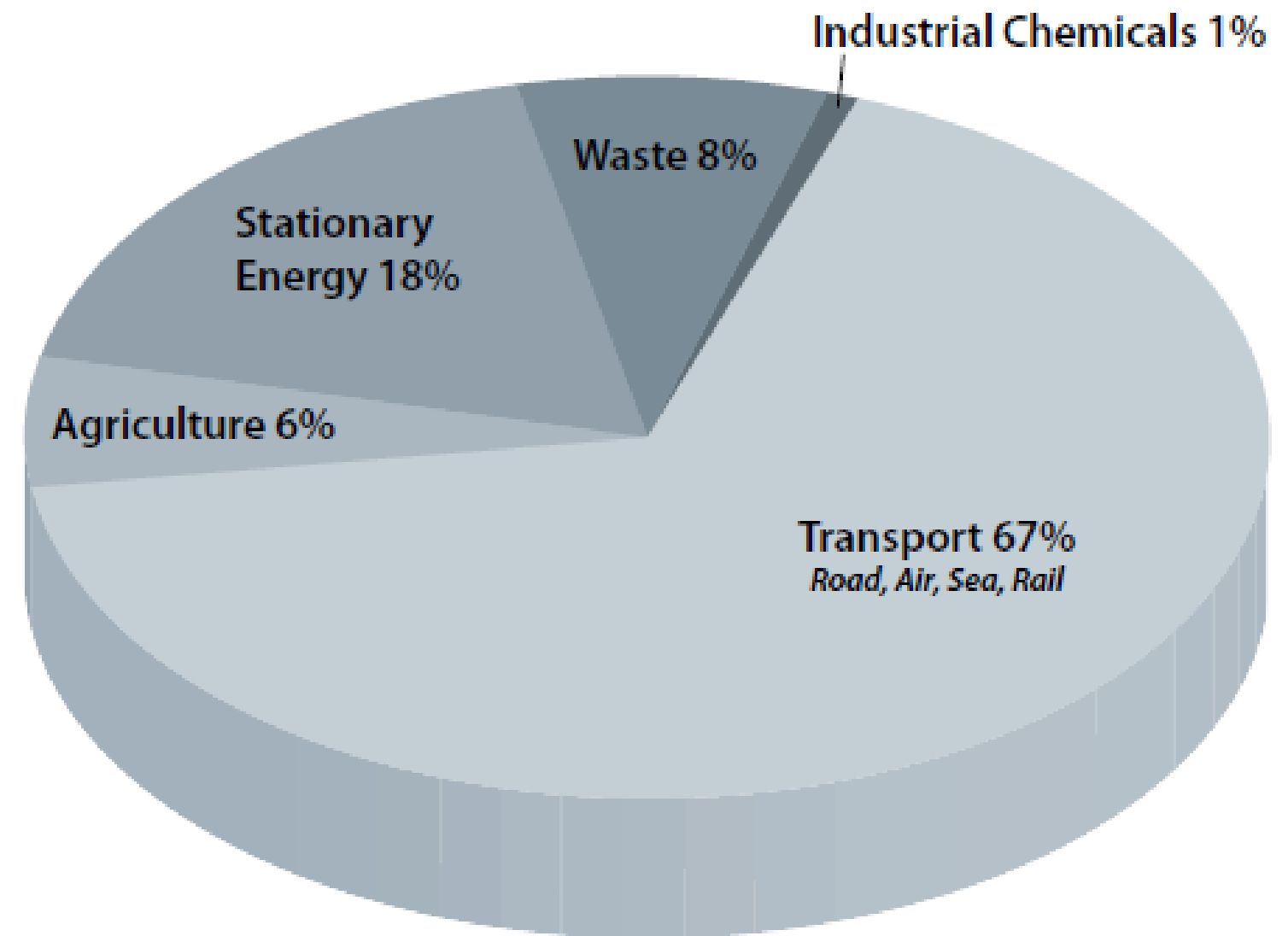


Figure 2. Total Christchurch greenhouse gas emissions by source in 2008 (3.6 million tonnes)

EMISSIONS GOAL TYPES



Base year emissions:

A percentage reduction of emissions compared to base year emissions

Fixed level:

An absolute emissions reduction to a specific level in a target year (e.g. zero net emissions by 2020)

Base year intensity:

A percent reduction of emissions intensity compared to base year of emissions intensity (e.g. emissions per GDP/population)

Baseline scenario:

A reduction in emissions relative to a predicted baseline scenario (often a business as usual scenario)



BOUNDARIES

EMISSIONS

SCOPES

SECTORS

TEST

Good job, now moving onto
Scopes!

Bess



THE SCOPES FRAMEWORK

Table 2 Scopes definitions for city inventories

Scope	Definition
Scope 1	GHG emissions from sources located within the city boundary
Scope 2	GHG emissions occurring as a consequence of the use of grid-supplied electricity, heat, steam and/or cooling within the city boundary
Scope 3	All other GHG emissions that occur outside the city boundary as a result of activities taking place within the city boundary



The scopes framework is a useful way to breakdown direct and indirect emissions.

Any greenhouse gas emission, whether it be from farm equipment, residential home, or industrial waste, will fit into either scope 1, 2 or 3.

All emissions from scopes 1-3 ultimately make up the 'inventory boundary' of a city.

Scope 1 are direct emissions that occur within a city's boundary.

SCOPE 1



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EXAMPLES

- Emissions from a fruit canning factory within the city boundary.
- Emissions from flaring of methane from an industrial plant within the city boundary.
- Emissions from waste produced by another city that is processed within the city boundary.

SCOPE 2



EXAMPLES

Table 2 Scopes definitions for city inventories

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- Emissions from electricity that is supplied by the grid, such as turning on a light in your bedroom or appliance in the kitchen.
- Some cities have 'district heating or cooling' where hot or cold water is pumped directly to homes and businesses from a central facility.
- Note that the direct emissions source (e.g. power plant) may be within or outside of the city boundary.

SCOPE 3



EXAMPLES

- Emissions from national & international flights or cruises primarily outside of the city boundary.
- Emissions from waste being processed outside of the city boundary, but produced by the city.
- Emissions associated with electricity transmission and distribution losses.

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BOUNDARIES

EMISSIONS

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TEST

The final section! Great work! Sectors is next

Bess

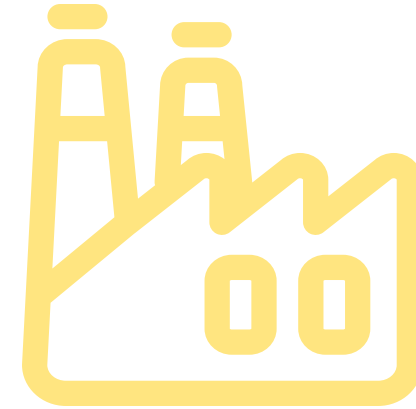


6 SECTORS

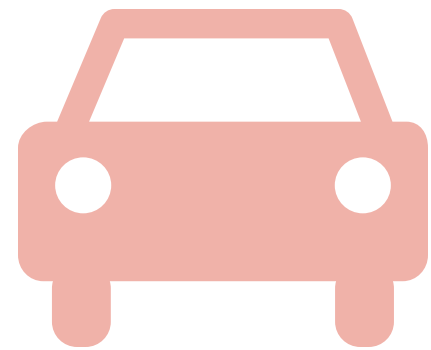
The GPC includes six main emissions sectors



Stationary Energy



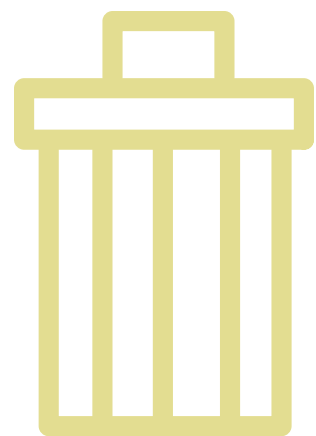
Industrial Processes & Product Use



Transport



Agriculture, Forestry & Land Use



Waste



Other indirect emissions

1. STATIONARY ENERGY



Direct emissions from:

Residential, commercial, institutional buildings

Energy, manufacturing industries and construction

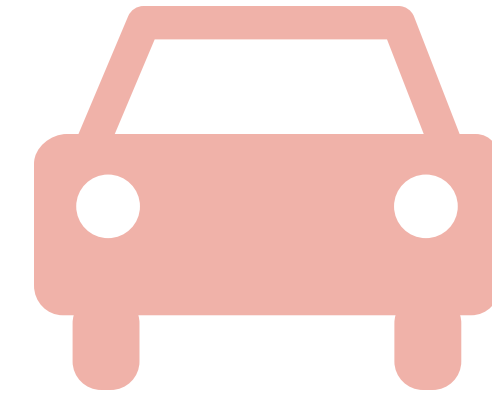
Agriculture, forestry, and fishing activities

Fugitive* emissions from mining, processing, storage, and transportation of coal, and oil and natural gas systems

**Fugitive emissions are the unintended release of emissions from exploration, extraction, processing, distribution of oil, natural gas and coal. Emissions result from leakage, evaporation and storage losses, and venting and flaring activities.*



2. TRANSPORT



Direct emissions from:

On-road traffic: cars, trams, freight (including electric cars)

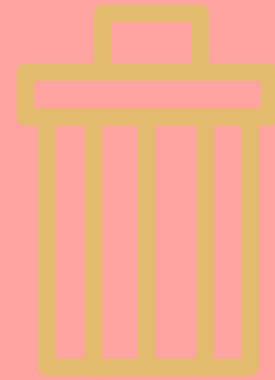
Railways: overland trains, metro, trams

Waterborne navigation: e.g. ferries, container ships, recreational boats

Aviation: including helicopters, domestic & international flights; (includes emissions from flights departing airports that serve the city)

Off-road: e.g. farm tractors, airport ground support equipment, forklifts, snowmobiles

3. WASTE



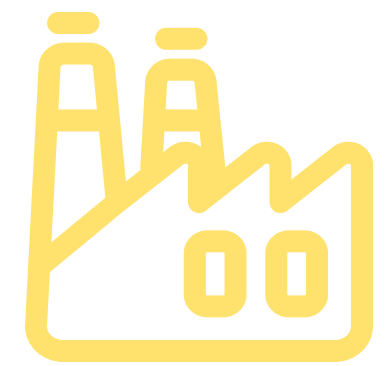
Direct emissions from:
Solid waste disposal
Biological treatment of waste
Incineration and open burning
Wastewater treatment and discharge

Note

Emissions from transport of waste is included under the *transport* sector.

Emissions from energy used in processes of waste disposal is included under *stationary energy*.



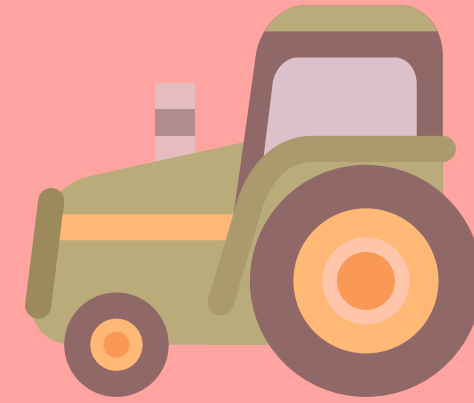


4. INDUSTRIAL PROCESSES & PRODUCT USE

Direct emissions from:
Aluminium smelting
Cement manufacturing
Refrigeration
Air conditioning equipment



5. AGRICULTURE, FORESTRY, LAND USE



Direct emissions from:

Enteric fermentation (gas from livestock)

Decomposition of manure

Disturbance of soil by cropping

Release of nitrous oxide from fertilisers

Burning of agricultural residues (e.g. stubble)





6. OTHER INDIRECT EMISSIONS



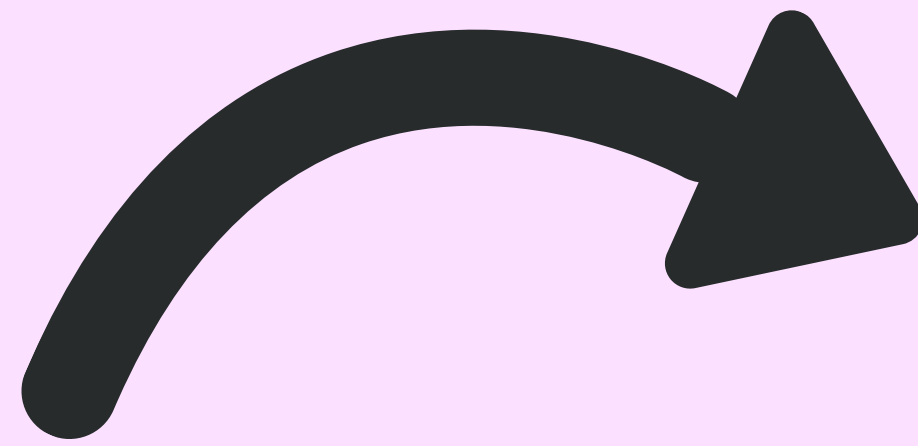
Anything else not covered by the first five sectors.



Let's recap: So there are 6 main sectors, what are they again?



TEST



Final TEST

BOUNDARIES

EMISSIONS

SCOPES

SECTORS

Remembering the GPC basics,
just think of me!

I think you're ready for the
final test, good luck! *woof



Bess

TRAINING MODULE 1



Material developed in 2018 by ICLEI Oceania in partnership with C40 Cities, the City of Melbourne and Ironbark Sustainability.

