Welcome back

31 March 2021

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RE-CAP

Module G: CIRIS

Module G: CIRIS

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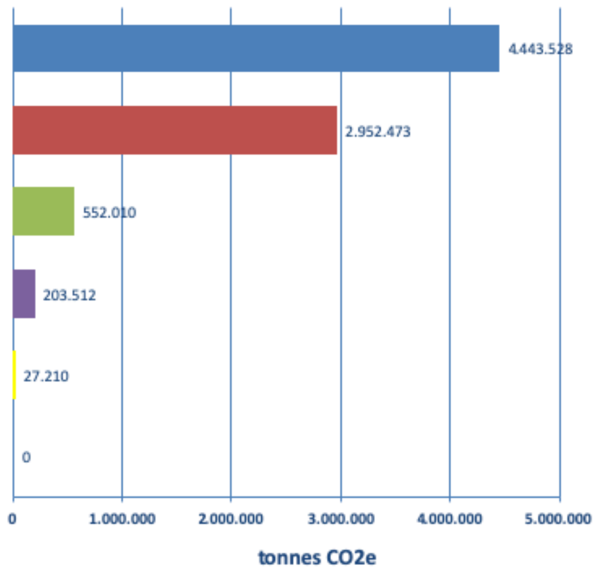
Practical

Task: Create a draft GHG inventory in CIRIS for your city using your workbook data	
1	Define your inventory boundary ✓
2	Define your data sources and emission factors ✓
3	Add IPPU and AFOLU with data from Module F. Use notation keys for all other activities
4	Update Stationary energy with data from Module C. Use notation keys for all other activities
5	Update Transportation with data from Module D. Use notation keys for all other activities
6	Update Waste with data from Module E, choosing your preferred methodology (CIRIS, scaled national data, proxy city). Use notation keys for all other activities
7	Complete data quality assessment
8	Review your results. Do the results make sense to you? Are they what you expected?

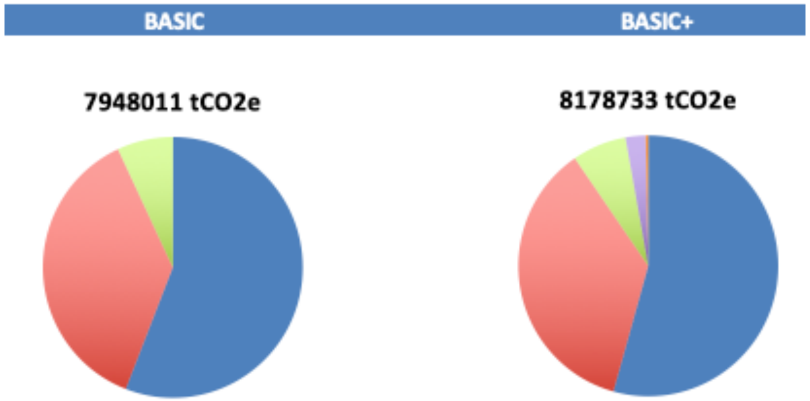
Results: Summary

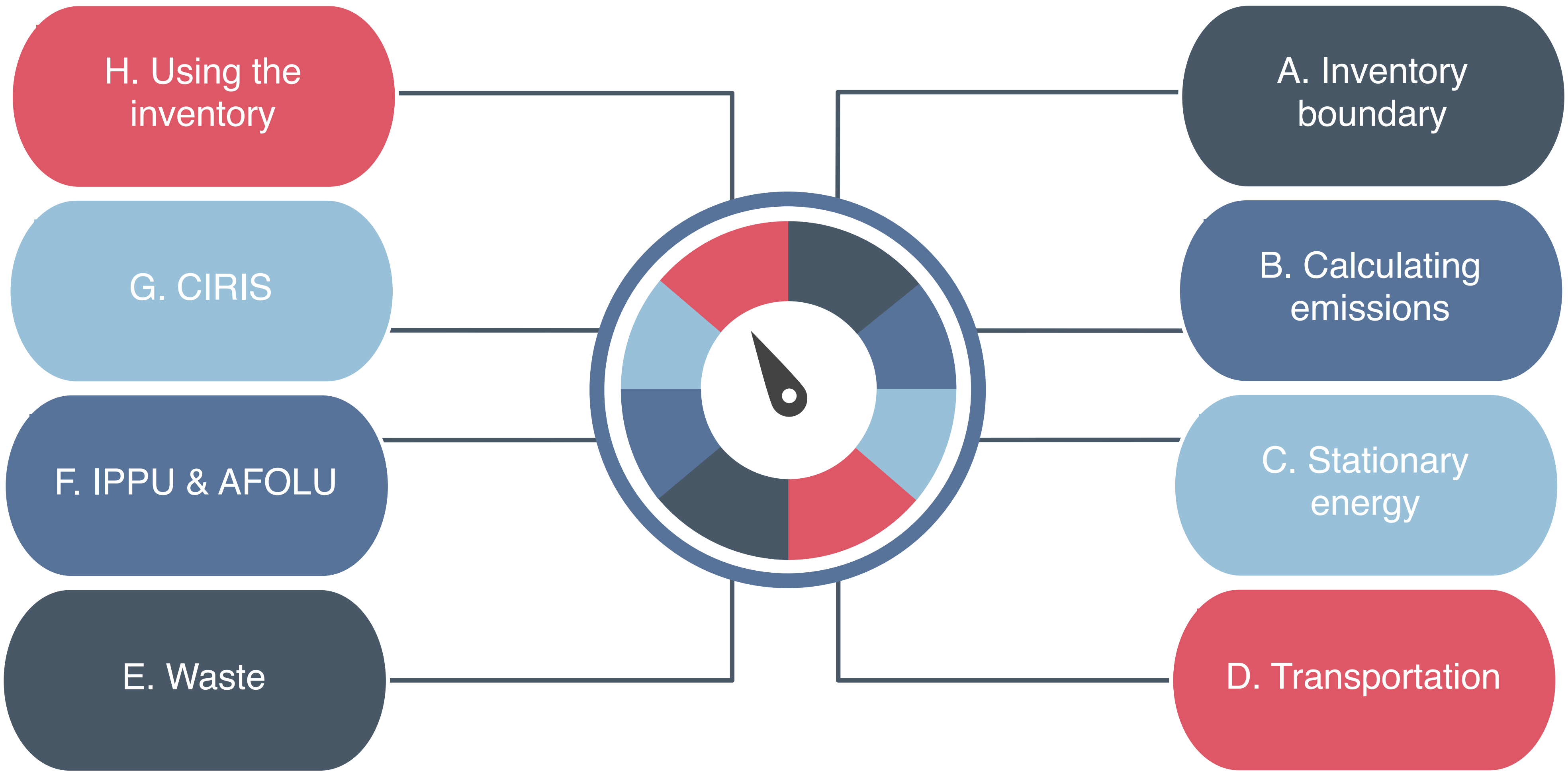
tCO2e	BASIC+	Scope 1	Scope 2	Scope 3
	Stationary	381.028	4.062.500	
	Transportation	2.911.523	40.950	
	Waste			552.010
	IPPU	203.512		
	AFOLU	27.210		
	Other Scope 3			
	TOTAL	8.178.733		



Results: Summary

GHG Emissions Source (By Sector)		Total GHGs (metric tonnes CO2e)					
		Scope 1	Scope 2	Scope 3	BASIC	BASIC+	BASIC+ S3
STATIONARY ENERGY	Energy use (all emissions except I.4.4)	381.028	4.062.500		4.443.528	4.443.528	4.443.528
	Energy generation supplied to the grid (I.4.4)						
TRANSPORTATION	(all II emissions)	2.911.523	40.950		2.952.473	2.952.473	2.952.473
WASTE	Waste generated in the city (III.X.1 and III.X.2)			552.010	552.010	552.010	552.010
	Waste generated outside city (III.X.3)						
IPPU	(all IV emissions)	203.512				203.512	203.512
AFOLU	(all V emissions)	27.210				27.210	27.210
OTHER SCOPE 3	(all VI emissions)						
TOTAL		3.523.273	4.103.450	552.010	7.948.011	8.178.733	8.178.733




H. Using the inventory
G. CIRIS
F. IPPU & AFOLU
E. Waste
A. Inventory boundary
B. Calculating emissions
C. Stationary energy
D. Transportation

02
MODULE H

Using the inventory

Module H: Using the inventory

Inventory management 01	Data management 02	Communicating inventory results 03	Setting targets 04
Self verification toolkit 05	Action plan 06		

Module H

Using the inventory

01

Inventory management

What can go wrong?

"We forgot to review our inventory and only noticed after it had been published that we used the wrong emission factors"

"The Highways Agency shared data with us last year but now we can't find it"

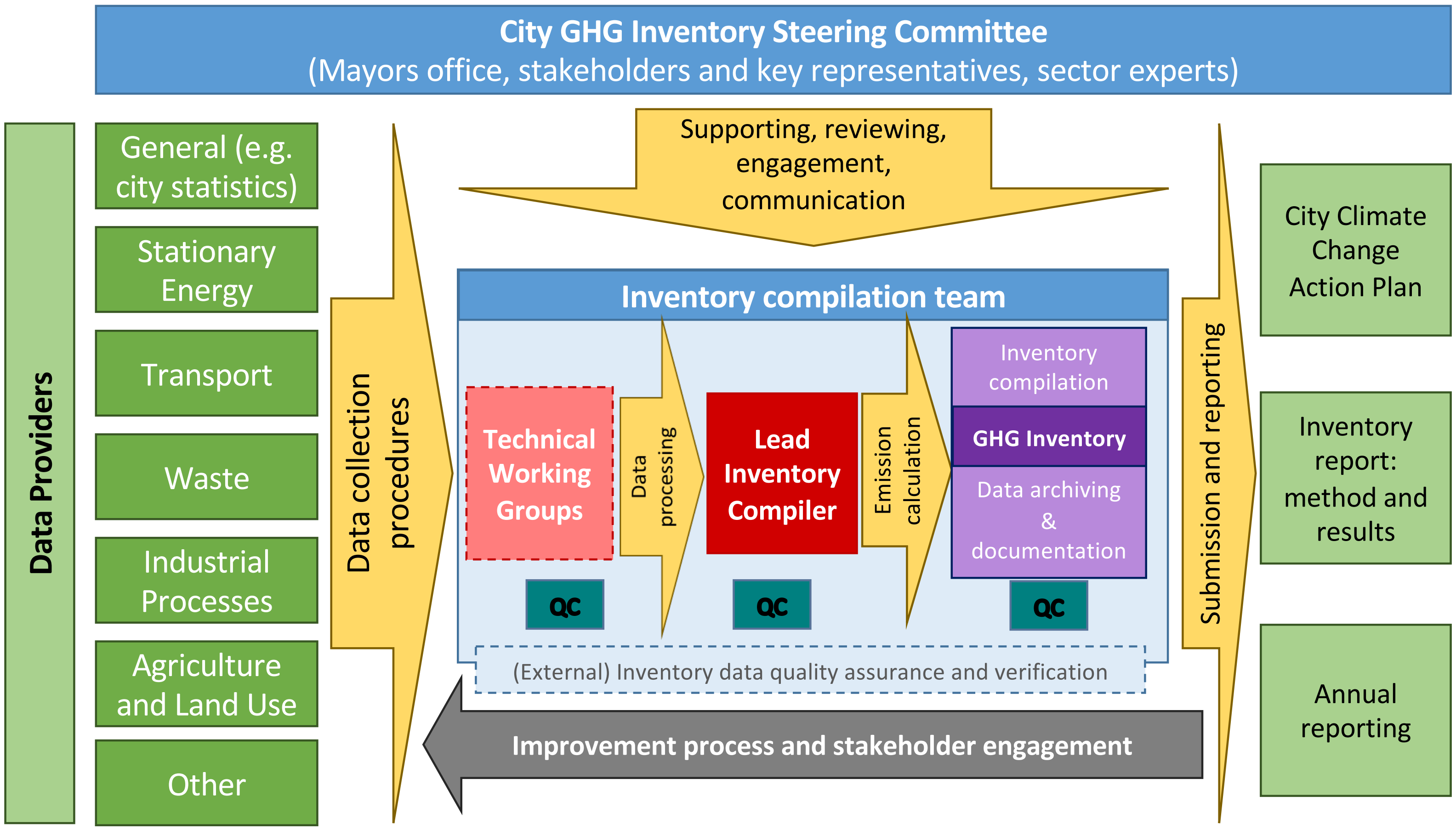
"Our consultants gave us a report, but we don't have the data"

"Mr Duncan updated some numbers and formulas, however we are not sure why or how he did that"

"Our last inventory was managed by someone who has now left"

"My laptop stopped working and it has all our inventory data on it"

Inventory management system



Source: IPCC

Steps to an inventory management system

1. Identify all individuals / organisations to be involved	2. Define implementation procedures	3. Define reporting objectives
• Appoint city inventory team • Allocate responsibilities for inventory management • Define formal approval process • Secure partners and support needs	• Make arrangements to collect data from suppliers • Agree timeline • Define data processing steps • Create quality assurance/quality control plan • Establish storage system • Create improvement log	• To who? • What are the outputs? • When are the deadlines?

City information

Requirements	Definition
Inventory boundary	Geographic area Time span Population GDP Area (+ map)
Activities (by subsector)	Stationary Energy (scope 1 and 2) In boundary travel (scope 1 and 2) Waste (scope 1 and 3)
Gases	CO_2, CH_4 and N_2O

Inventory management plan

Role	Lead	Co-lead
Inventory Coordinators		
Lead Inventory Compilers		
Technical Working Group		
Reviewers		
Steering Group		

Inventory management plan: New York City

New York city plan their inventory each March

This involves defining roles and responsibilities of the inventory team, sending data requests and building a timeline up to their mid-September deadline

Obstacles such as data availability and agreeing contracts between the inventory team (private consultants) and the city government have often caused delays to the inventory plan however, showing that even a good plan must include contingency time, can be challenging to deliver, and should take account of possible issues in setting timescales and deadlines

Module H

Using the inventory

02

Data management

Overcoming data barriers

- Start by undertaking a systematic review of data available to establish who may hold what data that you require
- Establish a working group of key data providers to develop data provision arrangements and resolve issues
- Implement data supply agreements (dsa's) with key data providers outlining what they will provide and when (these do not have to be complex)
- Aggregate data to a level where it no longer is deemed as commercially sensitive – e.G. Grouping data in order that individual sites and companies can no longer be identified

Engaging data suppliers

It is good practice to engage data suppliers in the process of compiling an inventory:

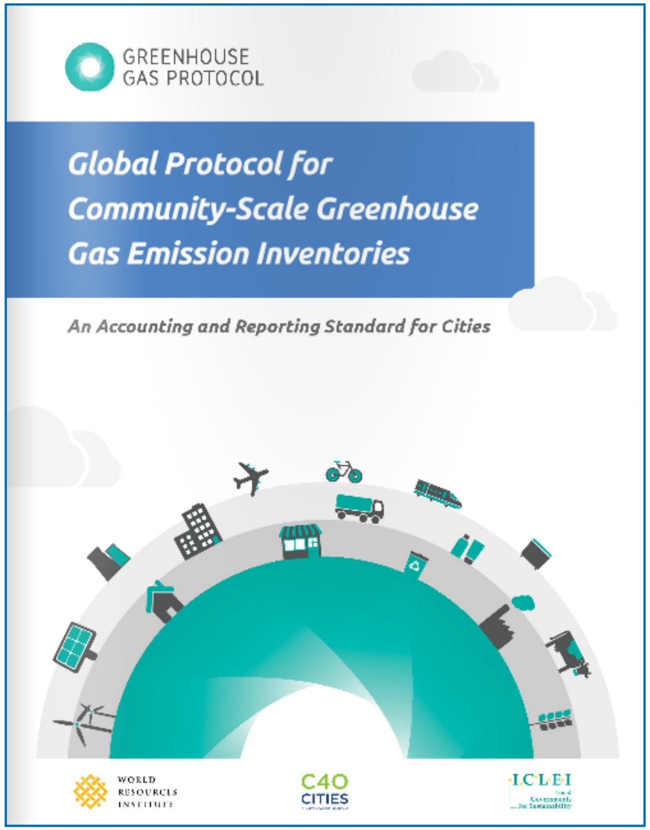
- Establish a working group of key data providers
- Arrange a meeting / call to discuss your data needs
- Identify co-benefits for data suppliers
- Agree format of data, process and frequency

  - No agreement – publically available e.g. Web, published report
  - Informal agreement e.g. Verbal
  - Semi-formal agreement, e.g. By email
  - Formal "data supply agreement (DSA)" or "memorandum of understanding (MOU)"
  - (Legal agreement or contract)

Documenting data

It is important to have a good system for documenting your data:

"… High quality, transparent documentation is particularly important to credibility. If information is not credible, or fails to be effectively communicated to either internal or external stakeholders, it will not have value. Cities should seek to ensure the quality of these components at every level of their inventory design."



Documenting data

Example of clear documentation of assumptions and data exclusion

Note – this does not replace the need to reference in CIRIS but is good practice and allows more information on assumptions and methods to be recorded

Sector/Category	Assumptions and Exclusions
Stationary energy emissions	
Residential, commercial and industrial stationary energy emissions	• Coal and biomass related emissions have been estimated using a top down approach, applying the national average consumption for commercial and residential coal use, estimated based on population figures. • Due to the lack of heavy industry within the Region, it was assumed that there are no emissions from industrial coal consumption. • Consumption of natural gas and electricity data are based on total energy distributed to grid exit points within the Region. The energy provided to these grid exit points have then been allocated to individual Cities and Districts. This may in some cases mean that energy used in one City or Districts may be counted in a different City or Districts, depending on the distribution network for gas and electricity, which may not match City or Districts boundaries in all cases. • Emission per user group (i.e. residential, commercial and industrial) was estimated based on national average energy use split between these groups as reported by MBIE (2013b).
Electricity generation	• Emissions from renewable electricity generation from wind and water are assumed to be zero. • CH_4 and N_2O emissions from combustion of landfill gas are assumed to be insignificant and have not been included. • Brooklyn Wind Turbine generation data prior to 2011/12 was estimated based on data provided for 2011-2013. • Data for West Wind was estimated for 2009-2012 based on data provided for 2012/13. • Electricity generation data for the Hau Nui wind farm was sourced from the Meridian Energy website and based on the installation/construction stages of the wind farm. • National emission factor for electricity generation was estimated based on data published by MBIE in their quarterly electricity and liquid fuel emissions table (MBIE 2013a).
Industrial Emissions	• Not included in reporting boundary, as it is assumed that there are no relevant emissions from stationary industrial energy generation occurring within the Region.
Fugitive Emissions	• Not included in the Inventory, as there is no production of oil or gas occurring within the Region.
Mobile emissions	
Road transport	• Total volume of fuel sold within the Region was provided by Wellington City Council and Masterton Districts Council. Volumes of fuel sold within each Districts were estimated based on the share of km travelled within each Districts, compared to the total Regional distances, using VKT data from Greater Wellington Regional Council. This may not necessarily correspond with the actual amount of fuel sold within each area, but has been chosen by the participating Councils as the best representation of fuel sales for the individual Cities and Districts

Source: http://wellington.govt.nz/~/media/services/environment-and-waste/environment/files/greenhouse-gas-inventory-web.pdf

Quality assurance and quality control

Requirements	Definition
Quality control (QC)	A system to ensure regular and adequate checking of data and information
Quality assurance (QA)	A system of regular independent reviews

- **Plan**: create a list of checks to undertake when data received and person to do this
- **Implementation**: undertake checks of data and actions required e.g. gap filling, adjustment
- **Documentation**: document actions taken and improvements needed for next time

QA/QC checks in practice

Calculating emissions and checking calculations
Check a sample of input data for transcription errors
Identify spreadsheet modifications that could provide additional controls or checks on quality
Ensure that adequate version control procedures for electronic files have been implemented
Data documentation
Confirm that bibliographical data references are included in spreadsheets for all primary data
Check that copies of cited references have been archived
Check that assumptions and criteria for selecting boundaries, base years, methods, activity data, emission factors and other parameters are documented
Check that changes in data or methodology are documented

QA/QC checks in practice

Calculating emissions and checking calculations
Check whether emission units, parameters, and conversion factors are appropriately labeled
Check if units are properly labeled and correctly carried through from beginning to end of calculations
Check that conversion factors are correct
Check the data processing steps (e.g., equations) in the spreadsheets
Check that spreadsheet input data and calculated data are clearly differentiated
Check a representative sample of calculations, by hand or electronically
Check some calculations with abbreviated calculations (i.e., back of the envelope calculations)
Check the aggregation of data across source categories, sectors, etc.
Check consistency of time series inputs and calculations
Others

Data management best practice

Archiving inventory database / spreadsheets
Archiving source data
Linking and referencing to source data – avoid copy > paste
Restricted access to database / files
System of codes / colours to note changes
Backups
Version control
Central storage / server / cloud
Contacts database / central list
Trained staff and limited access

QA/QC summary

Have a good, clear, well documented QA/QC plan: this is the foundation of all activities, responsibilities and processes (it does not have to be complex!)

Embed a system of checking procedures (QC) from the beginning

Set up a central system for storing data, transparently documenting data activities

Consider the most appropriate form of review (QA)

Module H

Using the inventory

03

Communicating inventory results

Communicating Inventory results

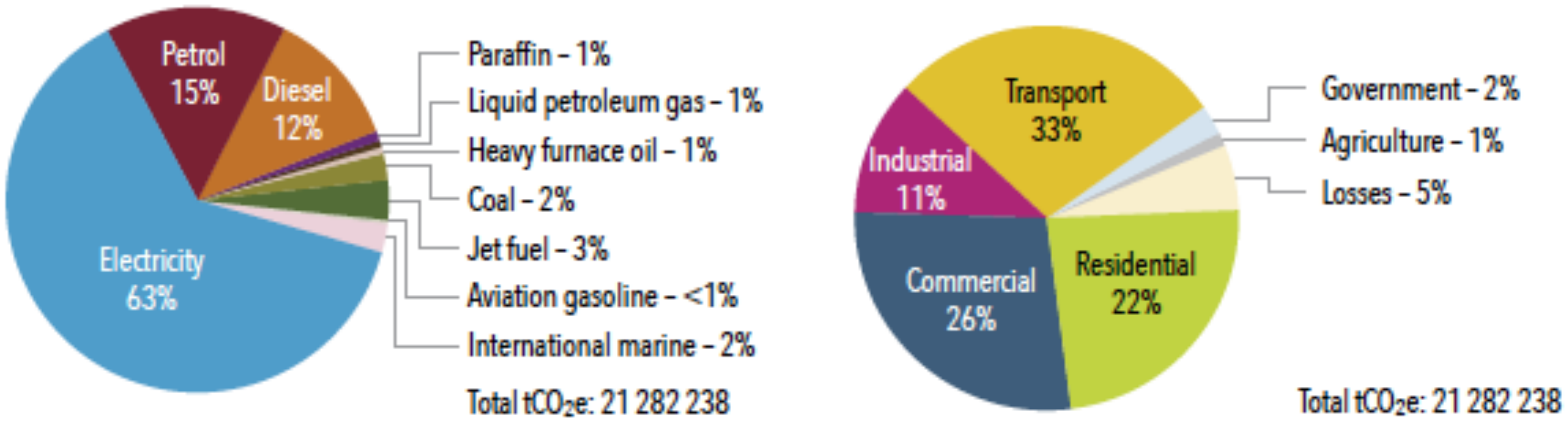
Consider:

- Audience: internal and external stakeholders
- Data: emissions, activity data, targets, actions etc
- Resources

Examples

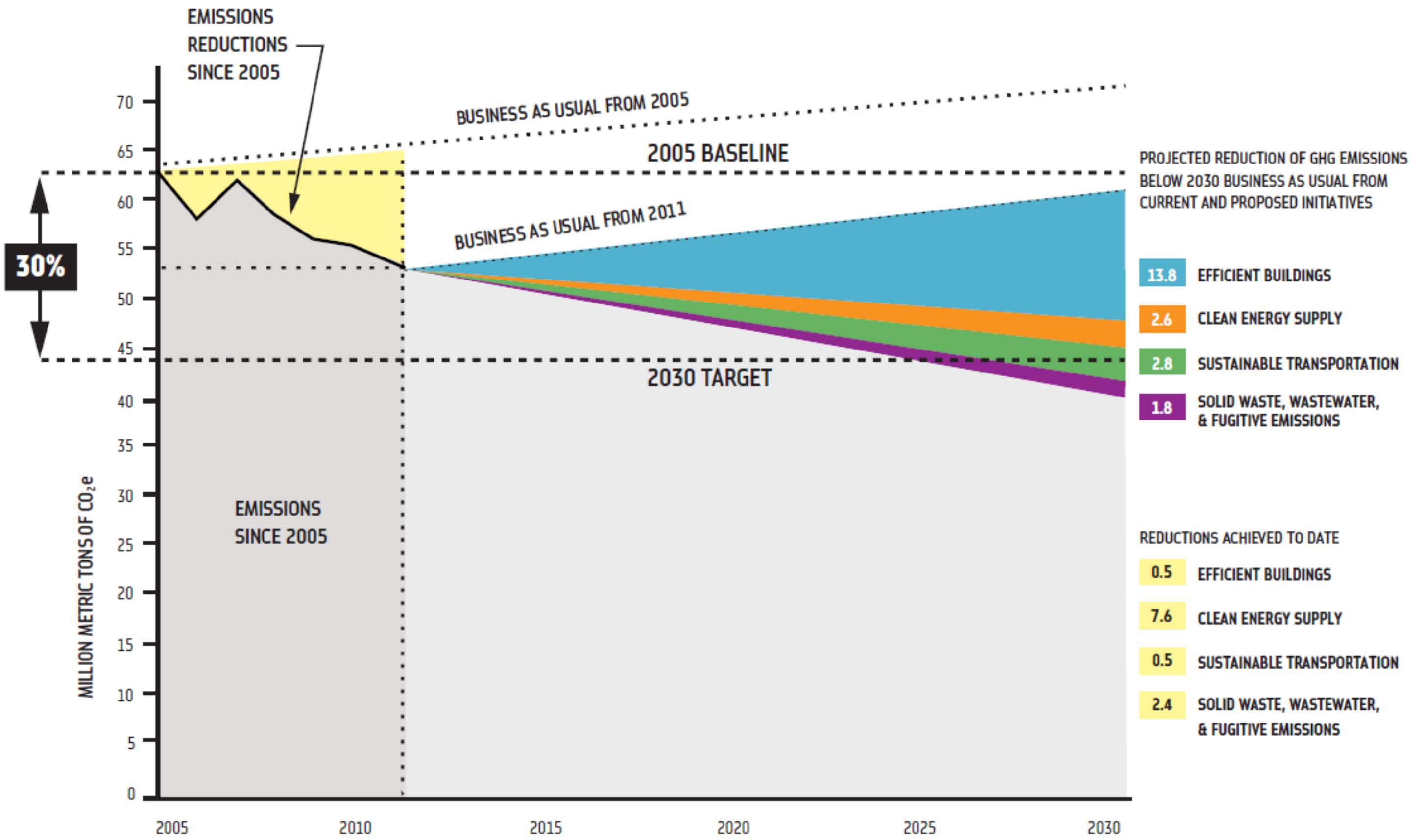
- Cape Town, New York, London, Sydney, Seoul, Melbourne and Portland

Cape Town: emissions by source and sector



Source: Cape Town

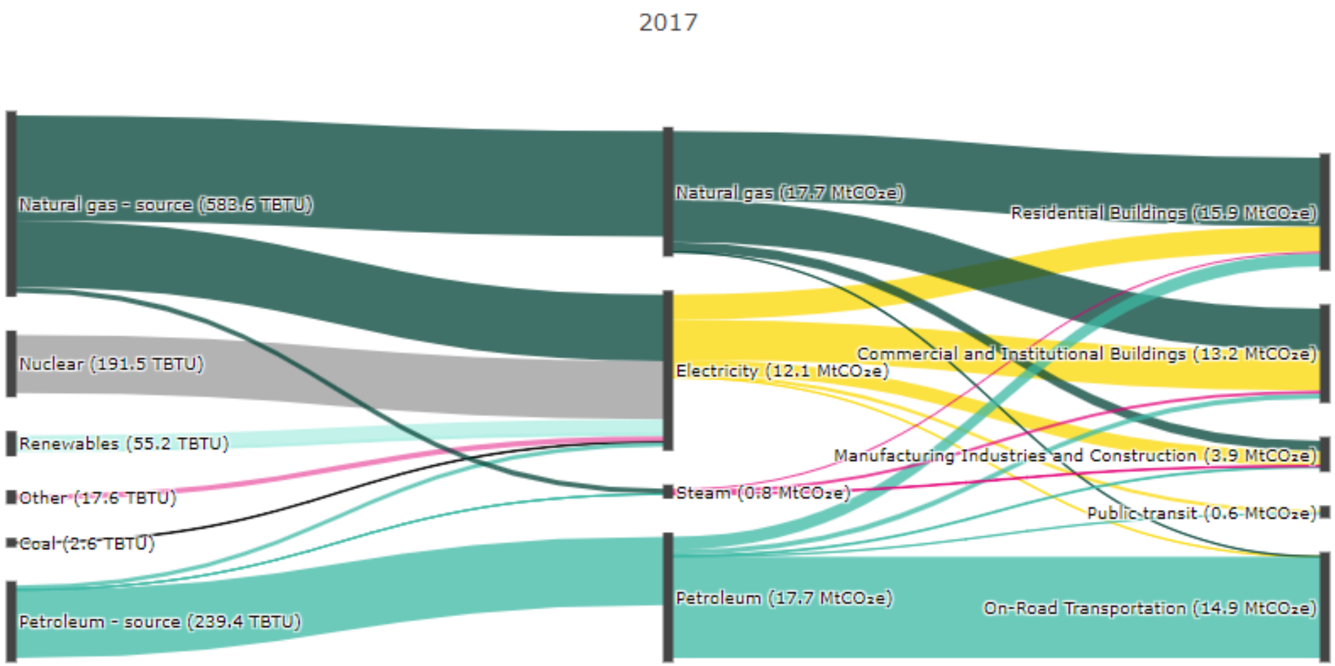
New York City GHG emission forecast



Source: NYC Mayor's Office and M.J. Beck Consulting, LLC

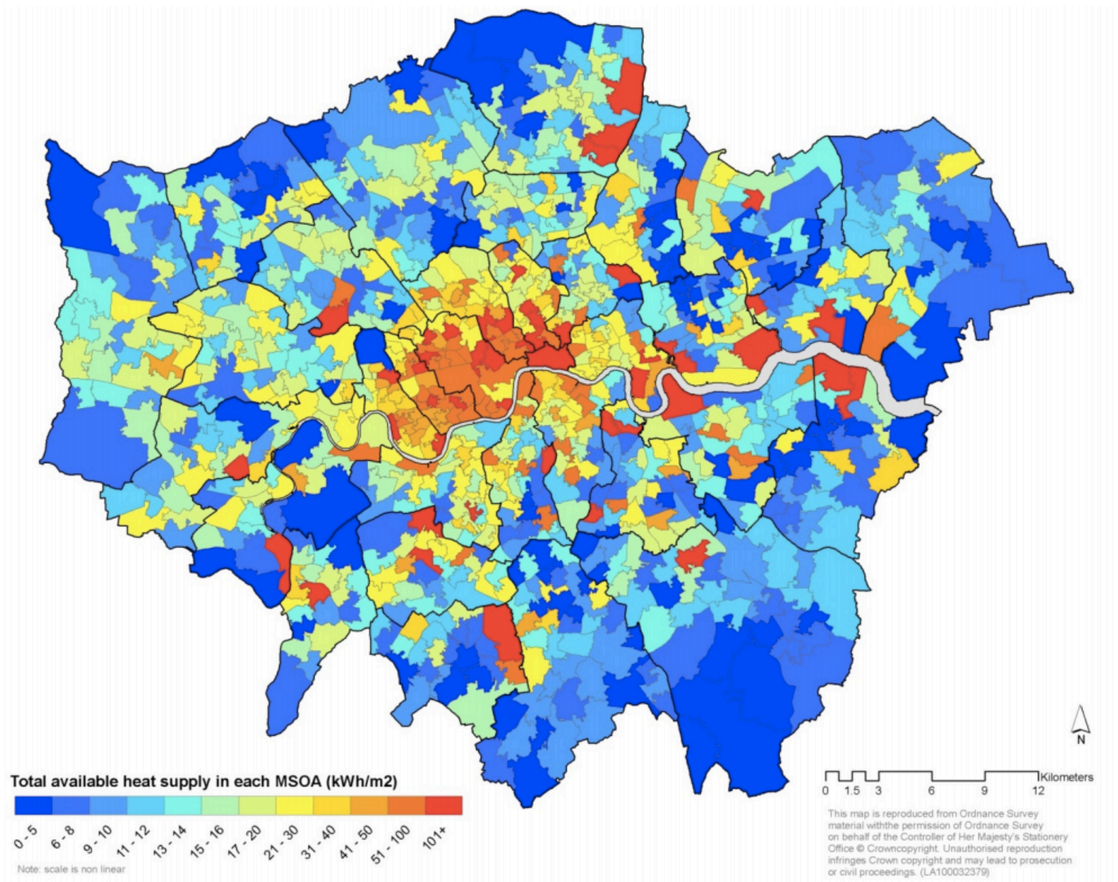
Source: NYC

New York City energy flow chart



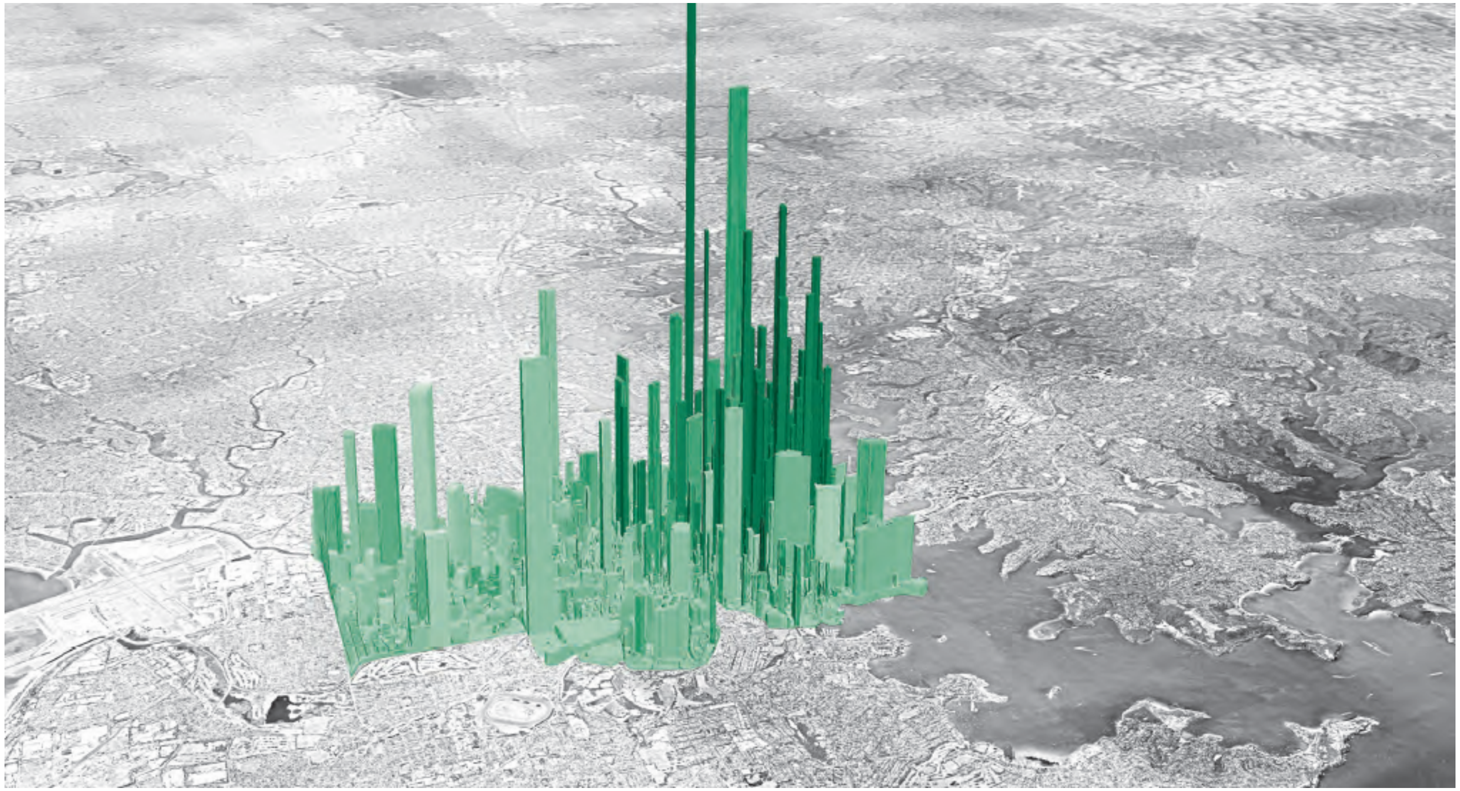
Source: https://nyc-ghg-inventory.cusp.nyu.edu/#energy-flow

London heat map



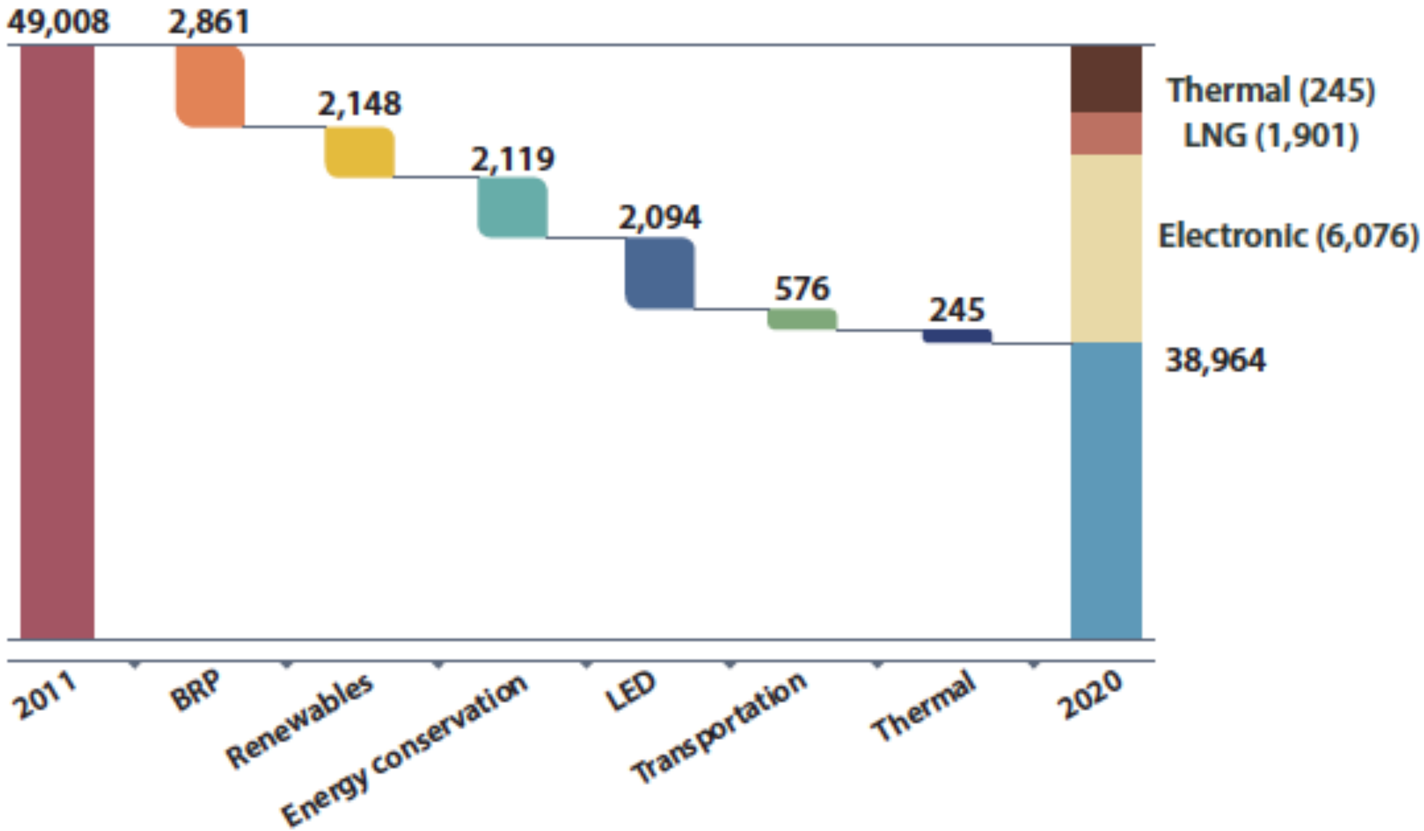
Source: London

Sydney energy demand



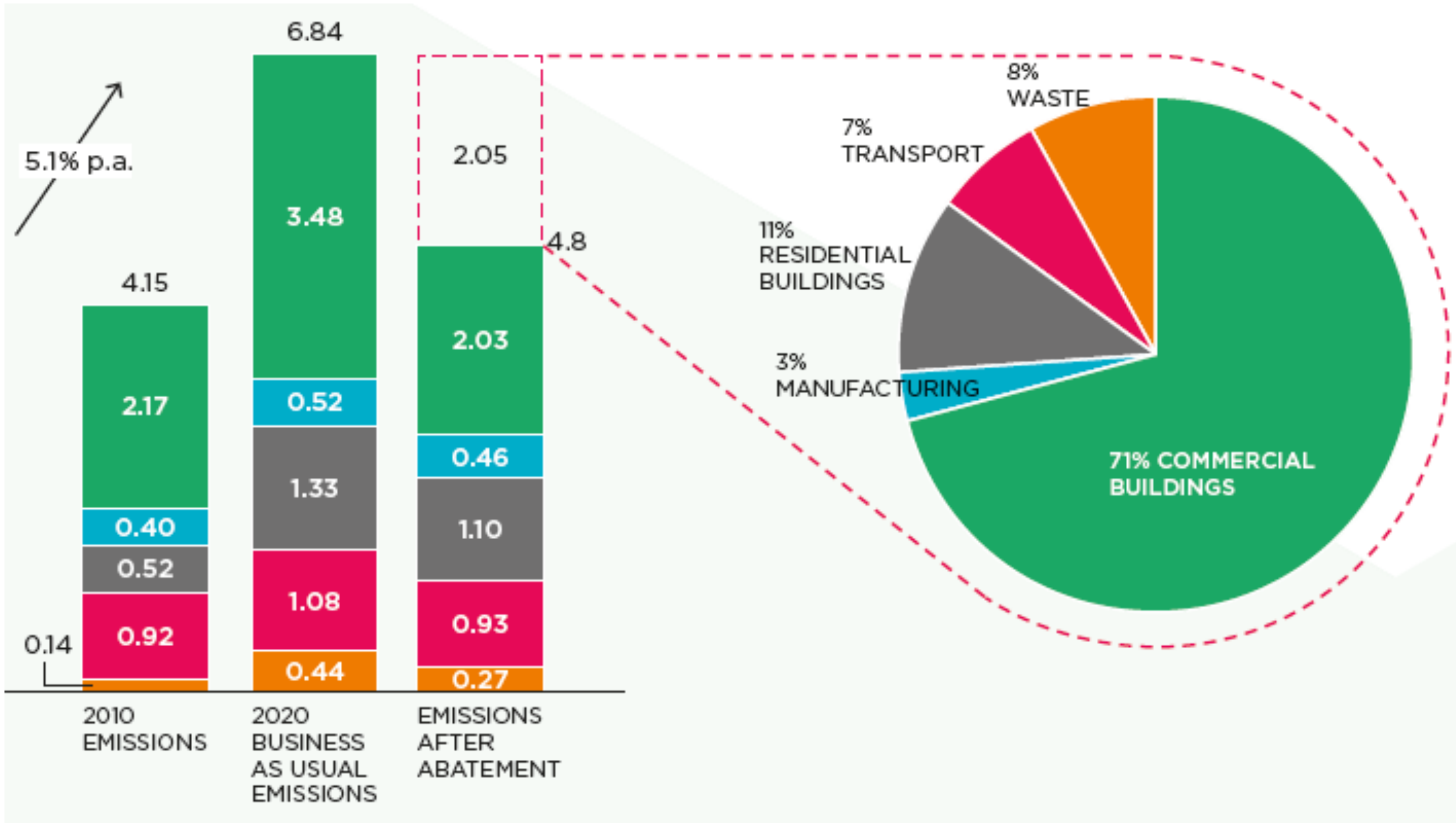
Source: Sydney

Seoul GHG emission reduction target



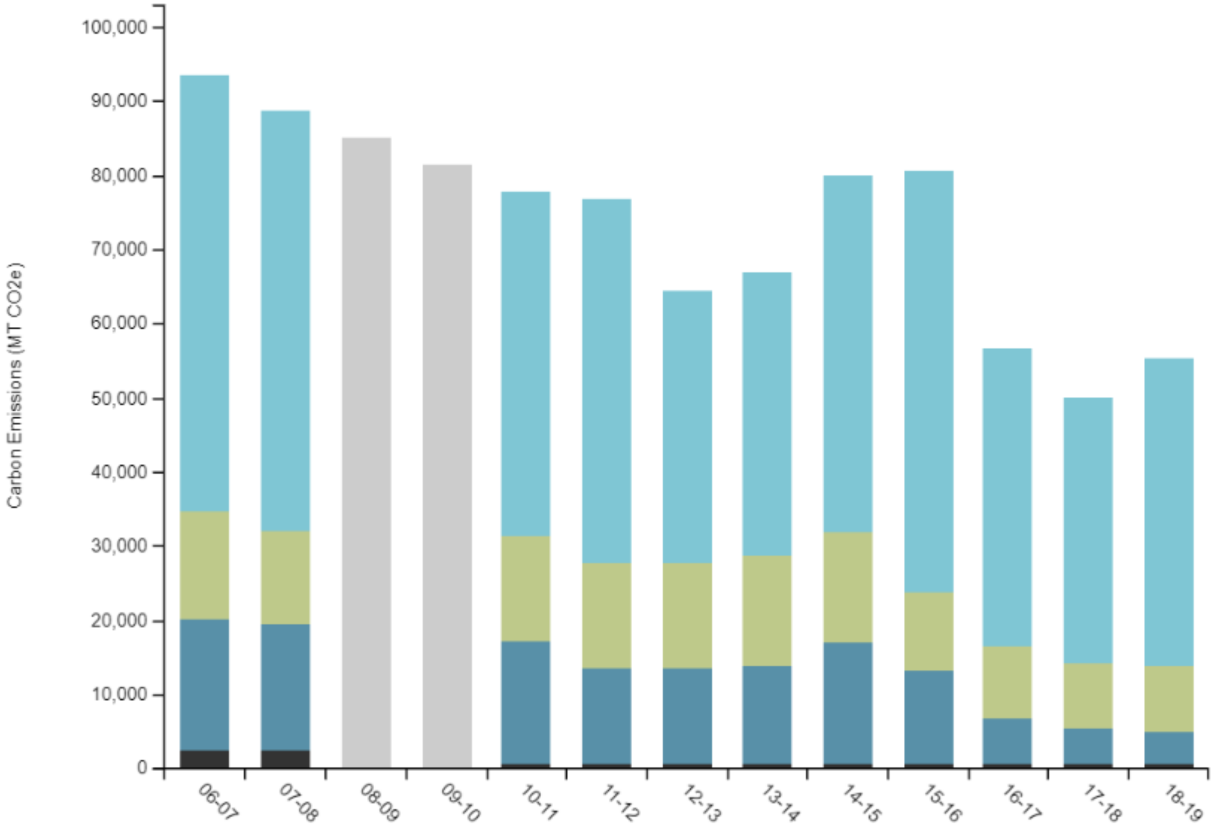
Source: Seoul

Melbourne GHG emission reduction target



Source: Melbourne

Portland – change in GHG emissions



Source: https://beta.portland.gov/bps/scg/carbon-emissions

Exercise: Communicating inventory results

Audience	
Key messages	
Media	
Format	
Who	

Module H

Using the inventory

04

Setting targets

Four types of targets

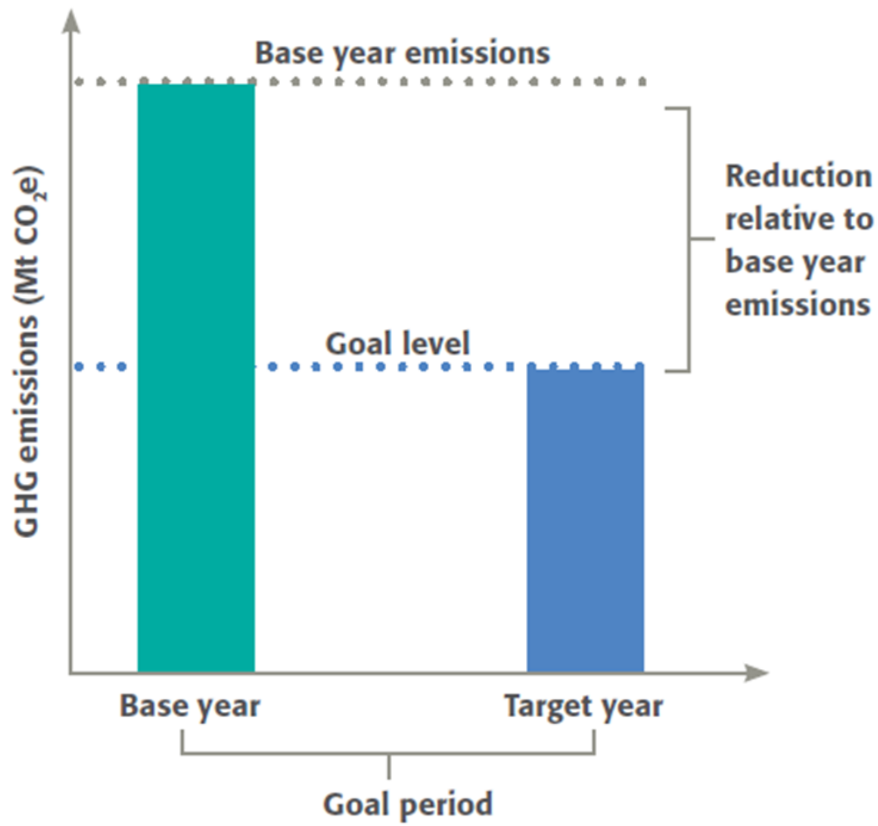
Target type	Reduction in what?	Reductions relative to?	Example
Base year	Emissions	Historical base year emissions	25% reduction in emissions from 1990 levels by 2020
Fixed-level (absolute)	Emissions	No reference level, absolute value	Net-zero emissions by 2050
Base year intensity	Emissions intensity	Historical base year emissions	40% reduction in emissions per capita by 2020, compared to per capita in 1990
Baseline scenario	Emissions	Projected baseline emissions scenario	30% reduction from business-as-usual emissions in 2020

Base year target

Reduction in emissions relative to an emissions level in a historical base year

Framed in terms of a percent reduction and corresponds to an absolute reduction in emissions

For example: a 25% reduction from 1990 levels by 2020



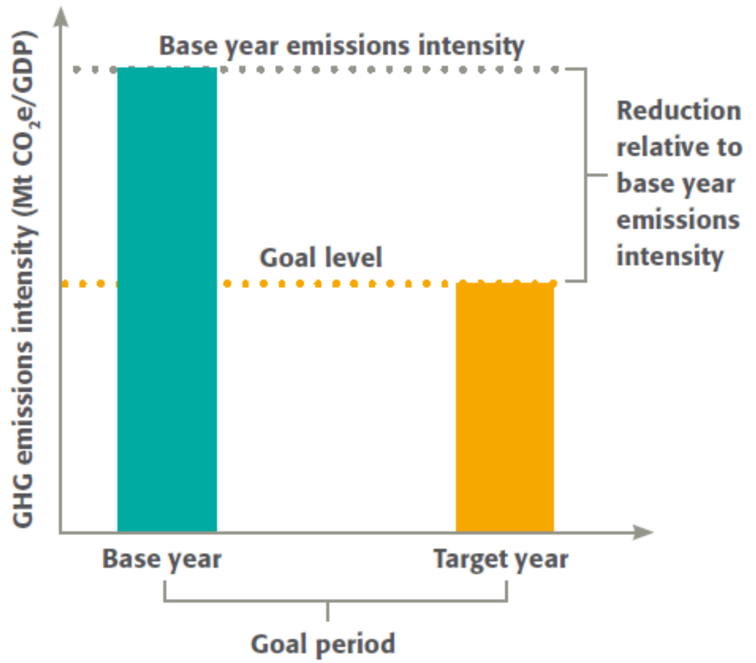
Base year emissions intensity target

Reduction in emissions intensity relative to an emissions intensity level in a historical base year.

Emissions intensity is emissions per unit of output. e.g. GDP, population, energy use.

Framed in terms of a percent reduction and correspond to an absolute reduction in emissions intensity.

For example: a 40% reduction in emissions per capita by 2020, when compared against emissions per capita in 1990



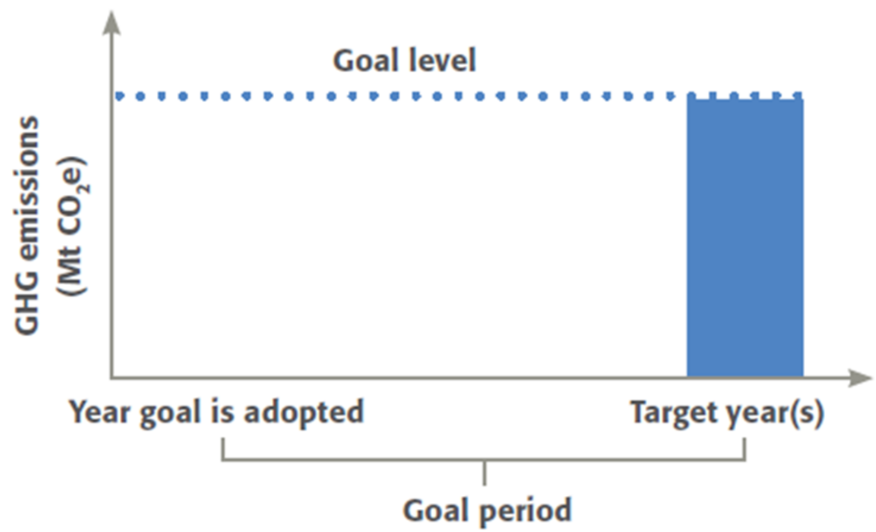
Fixed-level (absolute) target

Reduction in emissions to an absolute emissions level in a target year

Fixed level goals do not include a reference to an emissions level in a baseline scenario or historical base year.

For example: To achieve carbon neutrality – zero net emissions – by 2050

Figure 11.2 Example of a fixed-level goal



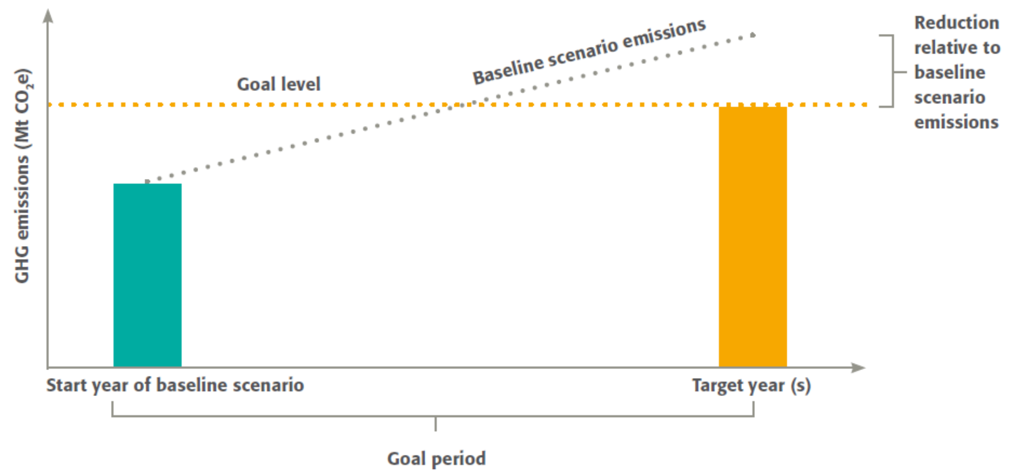
Baseline scenario (BAU) target

Reduction in emissions relative to a baseline scenario emissions level (business-as-usual forecast)

Framed in terms of a percent reduction of emissions from the baseline scenario

May not correspond to an absolute reduction in emissions

For example: 30% reduction from baseline scenario emissions in 2020.



City targets

City	Target	Target year	Type
Melbourne, Australia	100%	2020	Fixed level / absolute (neutrality)
Boston, USA	100%	2050	Fixed level / absolute (neutrality)
Oslo, Norway	50% 95%	2020 2050	Base year (1990 baseline)
Moshi Municipal Council, Tanzania	60%	2025	Business as usual Local Government Operations
Cape Town, South Africa	13% 29% 37%	2022 2030 2040	Business as Usual (2012 baseline) Energy-related emissions
Kampala, Uganda	22%	2030	Business as Usual (2012 baseline) All sectors
Hong Kong	65%	2030	Emissions Intensity (2005 baseline) - equivalent to 26% to 36% absolute, and 3.3-3.8 t/capita

Defining targets

Step	Description
Prepare for target setting	Understanding the needs and opportunities to reduce emissions
Define the target boundary	The geographic area, emission sources and GHGs covered by the target
Choose the target type	Base year emissions target, intensity target, scenario target or Fixed-level target
Set the target timeframe	Target year and Base year
Set the level of ambition	Minimum requirements, local mitigation opportunities use of transferable emissions

Exercise: Target type

Target	Type
80% reduction by 2040 from 2000	
60% from BAU in 2030	
25% reduction in GHG per $1000 GDP by 2030	
Carbon neutrality	
Halving per capita emissions by 2030	
30% reduction in the next ten years	
100% reduction by 2050	
70% lower than forecasted emissions by 2035	

Module H

Using the inventory

05

Self-verification toolkit

Self-verification toolkit

Reviewing GHG emissions inventories

To demonstrate that a GHG emission inventory has been developed in accordance with the requirements of the GPC, and provide assurance to users that it represents a faithful, true, and fair account of their city's GHG emissions, cities may choose to verify their inventory. This involves an assessment of the completeness, accuracy and reliability of reported data. C40's **GPC inventory self-verification toolkit** enables practitioners to assess whether their inventory is compliant with the requirements and principles of the GPC before uploaded to a public reporting platform.

Toolbox

Resources

GPC Inventory Self-Verification Toolkit

Version 1.1 Updated in March 2021. Assess your inventory against the GPC requirements (for internal review purpose) and benchmark against other C40 cities. The database below must also be downloaded to allow benchmarking

Download

C40 Greenhouse Gas Emissions Dashboard Database

Updated in March 2021. Required to use the GPC Inventory Self-Verification Toolkit

Download

Source: www.resourcecentre.c40.org

Module H

Using the inventory

06

Action plan

Stationary energy

GPC	Data	Where from?	Action	Lead
Residential buildings				
Commercial buildings and facilities				
institutional buildings and facilities				
Manufacturing / construction				
Energy generation supplied to the grid				
Fugitive emissions from oil and gas				

Transportation

GPC	Data	Where from?	Action	Lead
On-road				
Railways				
Waterborne navigation				
Aviation				
Off-road				

Waste

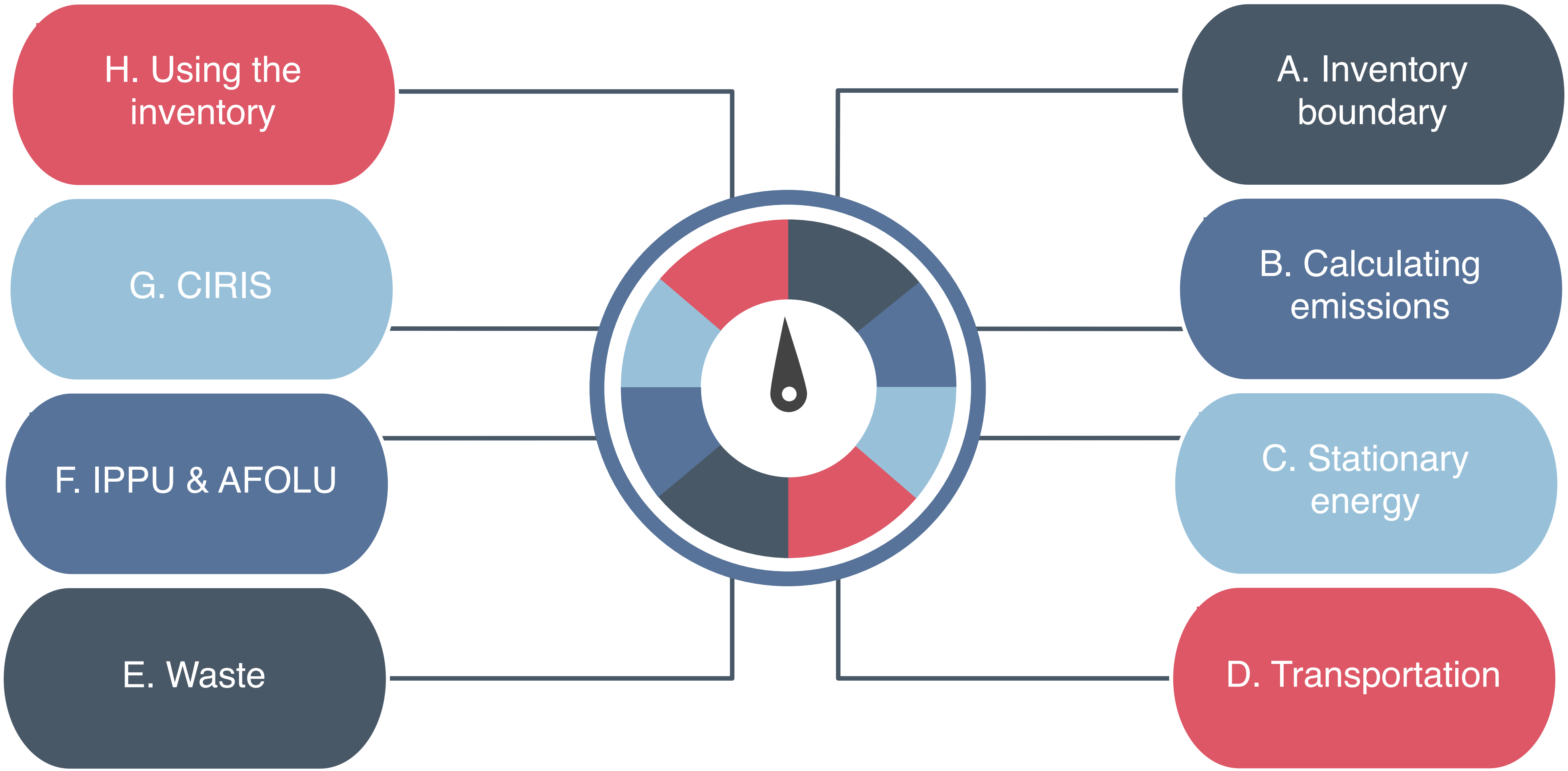
GPC	Data	Where from?	Action	Lead
Solid waste				
Biological treatment				
Incineration and open burning				
Wastewater				

03
SUMMARY

Module H: Using the inventory

Module H: Using the inventory

- 01 Inventory management
- 02 Data management
- 03 Communicating inventory results
- 04 Setting targets
- 05 Self-verification toolkit
- 06 Action plan


H. Using the inventory
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E. Waste
A. Inventory boundary
B. Calculating emissions
C. Stationary energy
D. Transportation

Exercise: Malaysia national inventory

Activity	A	B	C	D
Total emissions excluding removals (in tonnes CO_2e)	335 million	251 million	153 billion	439 million
% GHG emissions from Waste sector	25%	40%	15%	8%
Population of Malaysia (in millions)	31.6	40.6	52.5	73.4
Rate of urbanization	80%	46%	75%	63%
Total electricity consumption (in GWh)	211,000	117,000	53,000	363,000
Number of vehicles registered (in millions)	16	27	43	21
% GHG emissions from Road transportation	51%	5%	15%	17%
% GHG emissions from Rice cultivation	2%	5%	<1%	8%

The end