



**Global
Platform for
Sustainable
Cities**

16 September 2019 | São Paulo, Brazil

City Academy

GHG inventory compilation & integrated MRV

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WORLD BANK GROUP
Social, Urban, Rural & Resilience



**WORLD
RESOURCES
INSTITUTE**

AGENDA



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ABOUT ICLEI



ICLEI – Local Governments for Sustainability (ICLEI) is a global network of more than 1,750 local and regional governments committed to sustainable urban development.

Active in 100+ countries, we influence sustainability policy and drive local action for low emission, nature-based, equitable, resilient and circular development.

Our Members and team of experts work together through peer exchange, partnerships and capacity building to create systemic change for urban sustainability.

1750+ local and regional governments

100+ countries

300+ experts in 23 offices worldwide

THE FIVE ICLEI PATHWAYS



LOW EMISSION
DEVELOPMENT



NATURE-BASED
DEVELOPMENT



EQUITABLE
AND PEOPLE-
CENTERED
DEVELOPMENT



RESILIENT
DEVELOPMENT



CIRCULAR
DEVELOPMENT

FIVE ICLEI PATHWAYS - designed to create **SYSTEMIC CHANGE**.

These are a framework for designing **INTEGRATED SOLUTIONS** that balance patterns of human life and the built and natural environments.

The pathways encourage **HOLISTIC THINKING** to ensure that ICLEI optimizes our impact.

Greenhouse gases (GHGs)

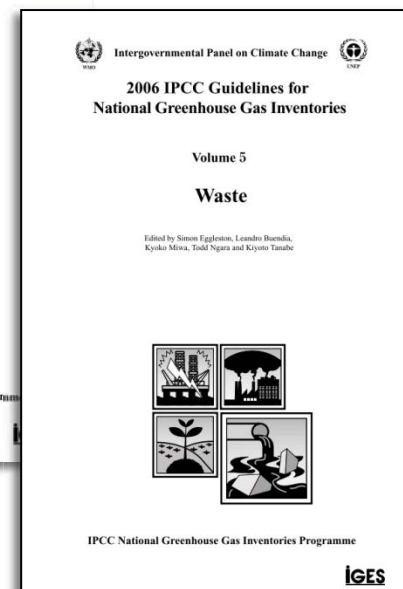
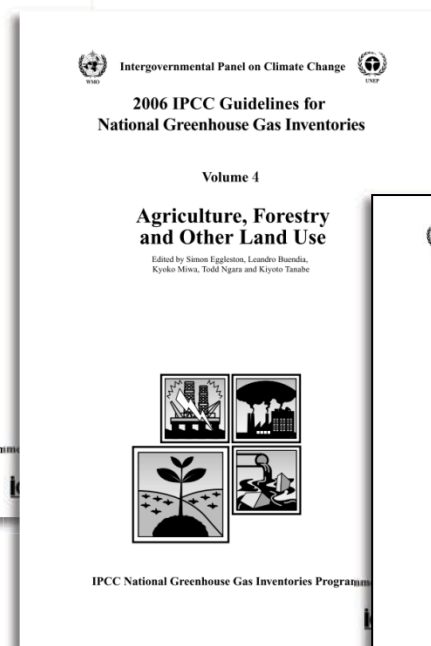
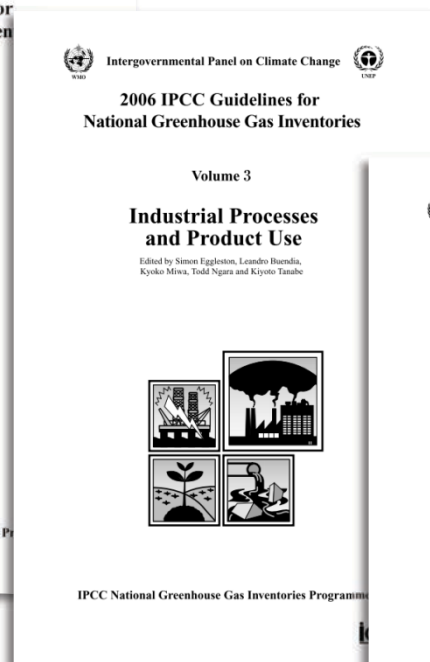
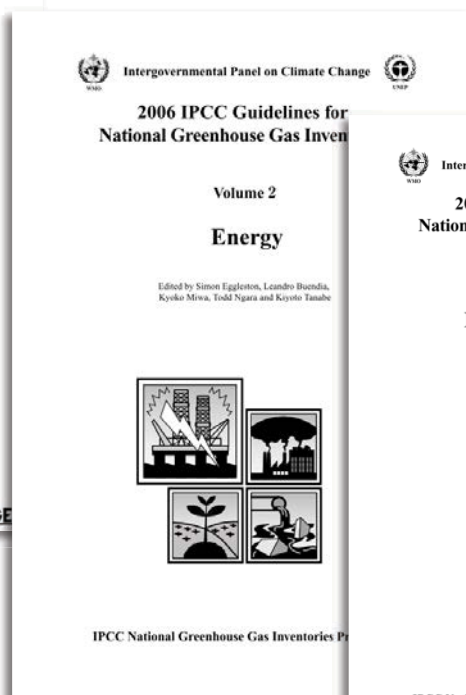
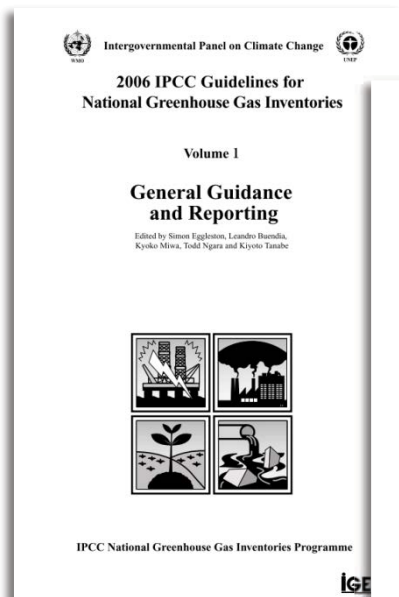
GHGs covered in the 2006 IPCC Guidelines:

- carbon dioxide (CO₂)
- methane (CH₄)
- nitrous oxide (N₂O)
- hydrofluorocarbons (HFCs)
- perfluorocarbons (PFCs)
- sulphur hexafluoride (SF₆)
- nitrogen trifluoride (NF₃)
- trifluoromethyl sulphur pentafluoride (SF₅CF₃)
- halogenated ethers (e.g. C₄F₉OC₂H₅, CHF₂OCF₂OC₂F₄OCHF₂, CHF₂OCF₂OCHF₂) and other halocarbons not covered by the Montreal Protocol including CF₃I, CH₂Br₂ CHCl₃, CH₃Cl, CH₂Cl₂

2006 IPCC Guidelines for National GHG Inventories

I.C.C.L.E.I
Local
Governments
for Sustainability

carbonnTM
center.org



City level behaves different to country-level:

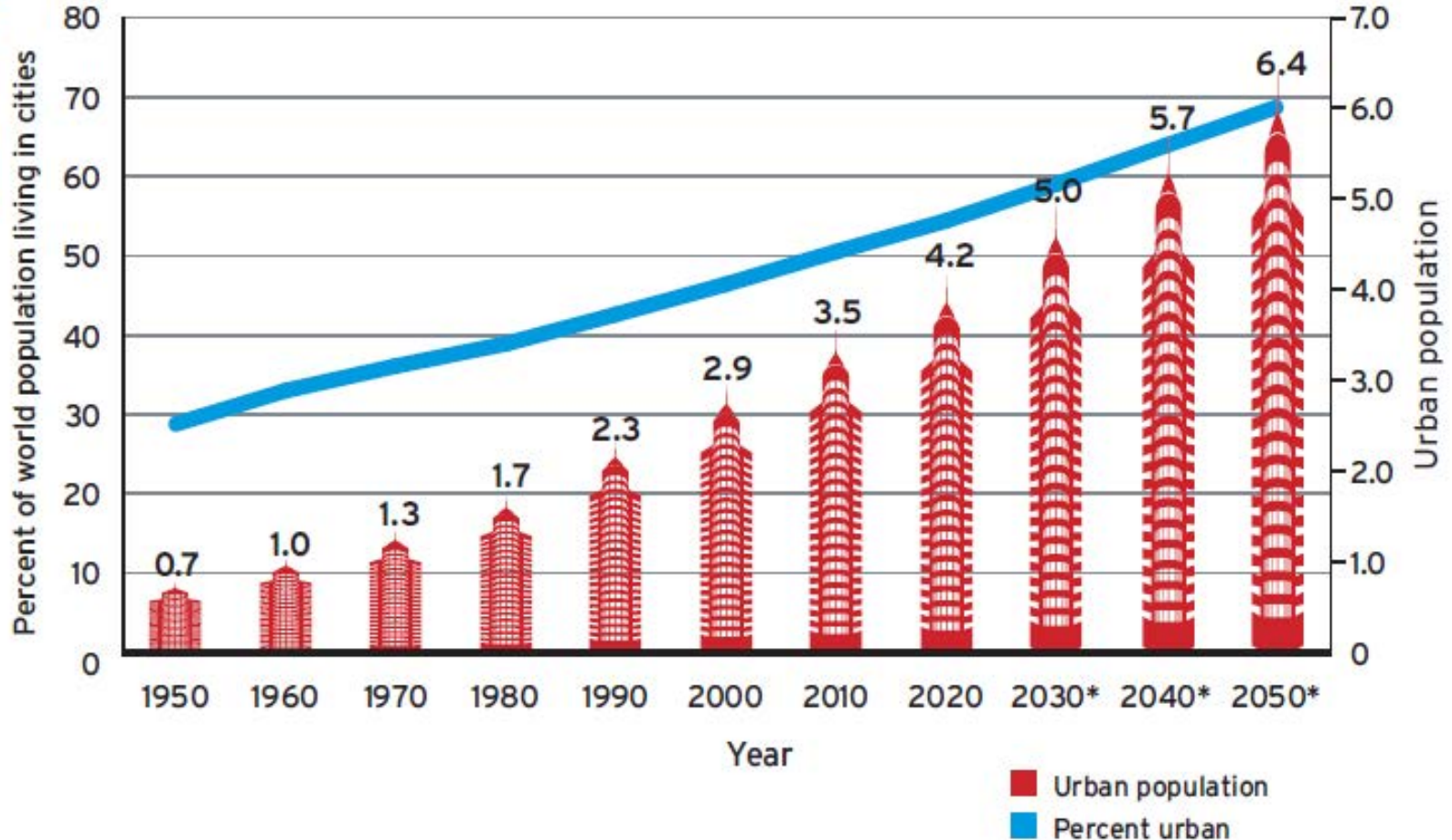
- Faster response rates and action at the local level
- Context-specific policy development
- Sectoral approaches may differ
- Needs clean data and accurate sectorization
- Can provide first hand data
- Eases aggregation process from bottom-up
- Eases horizontal cooperation; comparability and replication

Examples:

- All countries have airports but not all cities have airports
- Not all cities have fluvial transportation
- Not all cities have industrial parks
- Public transportation varies from city to city
- Public policies may vary from city to city
- Project implementation varies from city to city

Population growth trends

Figure 6
People Living
in Cities
(percentage of
world population
and total)



Source: UN, Department of Economic & Social Affairs, Population Division.

What are Urban GHG inventories used for?

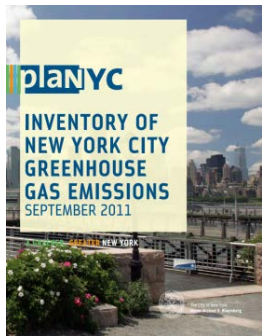


Community-scale GHG emission inventories have multiple purposes:

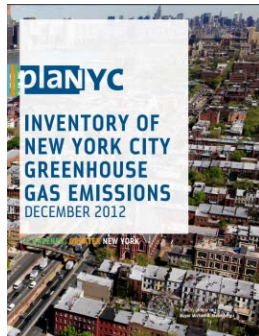
- **Identify key action areas:** Identify key emission categories and GHG emission sources within the jurisdiction.
- **Guide decision-making:** Establish the foundation for setting GHG reduction targets and developing GHG mitigation strategies, also relevant to access international finance.
- **Connect to a monitoring system:** Establish the foundation to track progress towards reducing emissions and meeting targets.
- **Enable integrated MRV:** Provide a consistent framework for comparison of GHG emission inventories and mitigation efforts from other jurisdictions, and vertically integrated reporting in-country.

Good Practice

New York City releases an annual publications of its GHG inventory



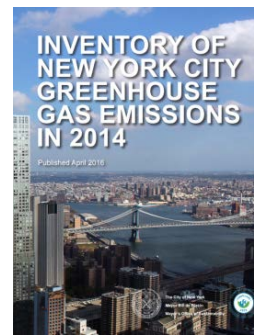
2011



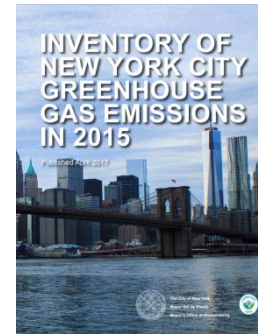
2012



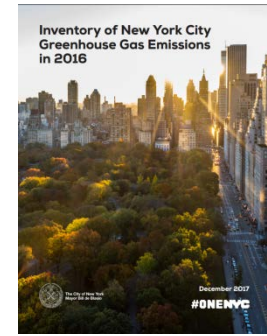
2013



2014



2015



2016

Rio de Janeiro compiles a GHG inventory every two years

2013

Centro Clima
UNIVERSIDADE FEDERAL DO RIO DE JANEIRO
INSTITUTO DE CIÊNCIAS E TECNOLOGIA

COPPE
UFRJ

RIO
DE JANEIRO

**INVENTÁRIO DAS EMISSÕES DE GASES DE EFEITO ESTUFA DA
CIDADE DO RIO DE JANEIRO EM 2012 E ATUALIZAÇÃO DO
PLANO DE AÇÃO MUNICIPAL PARA REDUÇÃO DAS EMISSÕES**

Resumo Técnico

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Subsecretário Municipal de Meio Ambiente
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Eiza Ramos – Diagramação

Dezembro de 2013

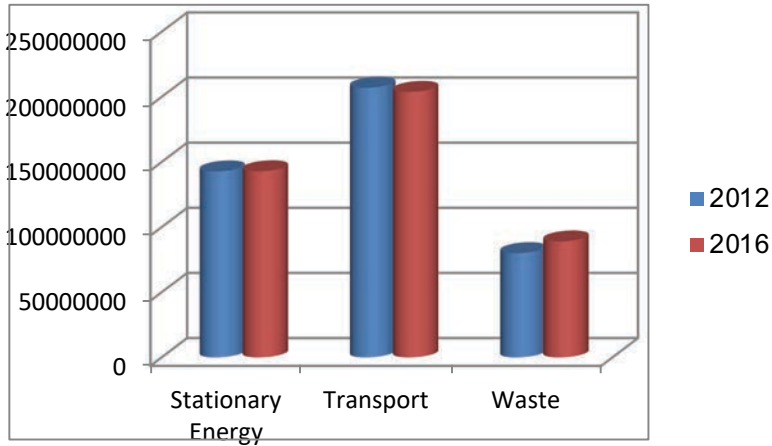
2015

**Inventário de Emissões de
Gases de Efeito Estufa (GEE)
do Estado do Rio de Janeiro - 2015**

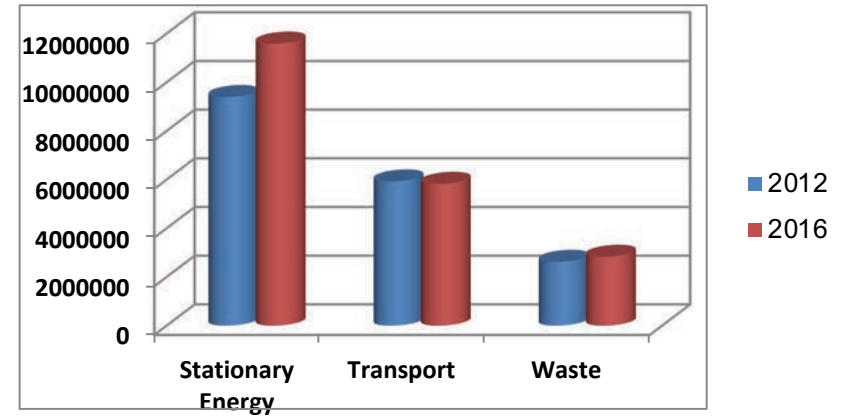
Resumo Técnico

Gov. do Rio de Janeiro **Secretaria de Ambiente** **inea** **COPPE UFRJ** **DISMPE/UECE** **CENTRO CLIMA** **PORTO DO AÇU**

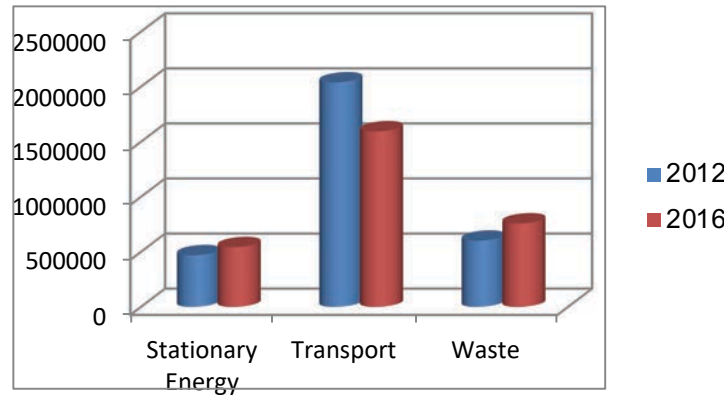
Downscaling is not always beneficial



Brazil emissions model using SEEG data



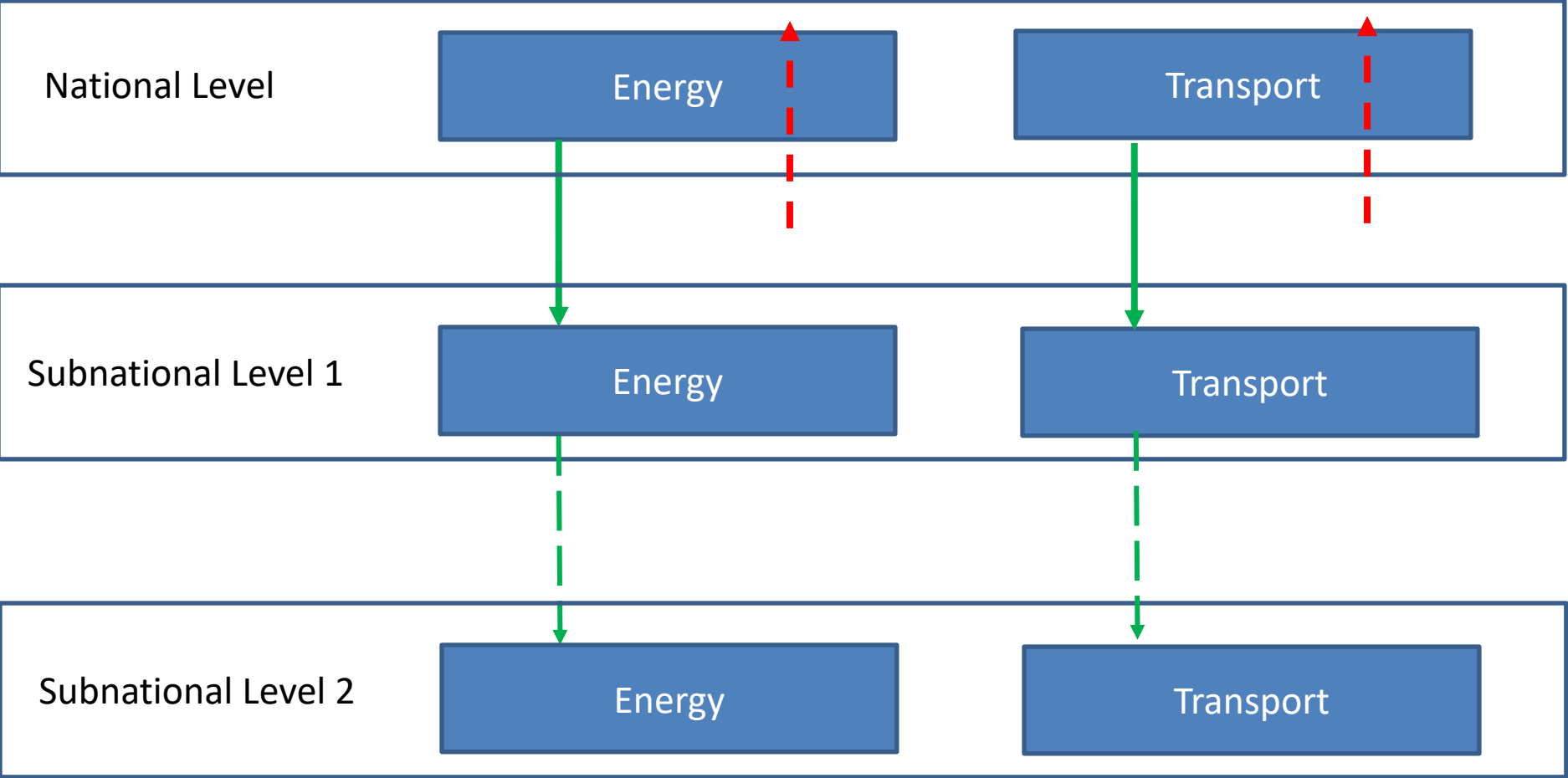
Pernambuco emissions model using SEEG data



Recife's reported inventories via Urban LEDS project

Reality not always reflected correctly.

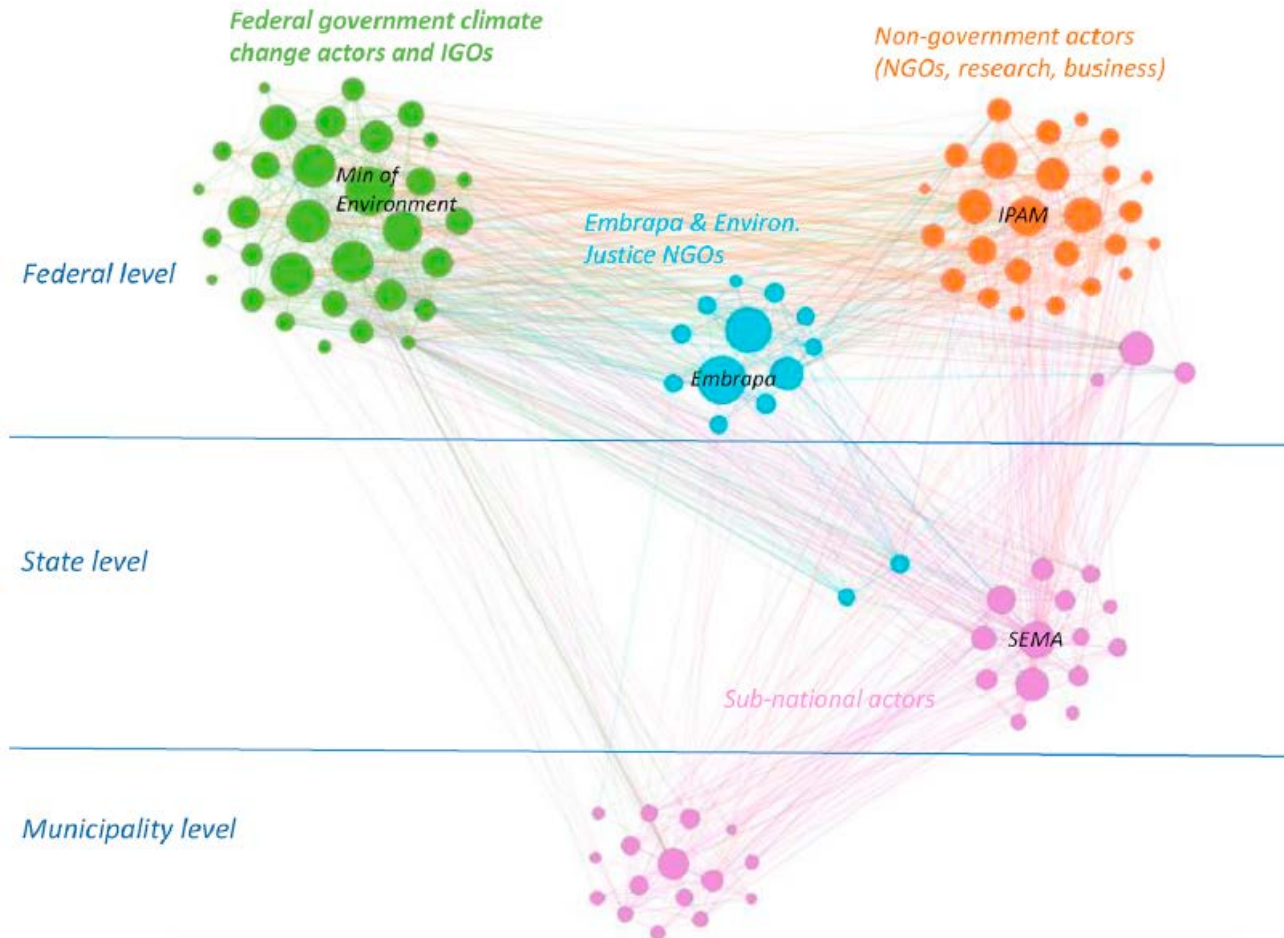
Subnational Context



Subnational Context



National Context Brazil – institutional interaction



Source: Multi-level governance and power in climate change policy networks Monica Di Gregorio^{a,b,*}, Leandra Fatorellia, Jouni Paavola^a, Bruno Locatelli^{b,c}, Emilia Pramov^b, Dodik Ridho Nurrochmat^d, Peter H. Maye, Maria Brockhaus^f, Intan Maya Sarib, Sonya Dyah Kusumadewia

National Context Brazil

– institutional interaction

Brazil

L1=Federal level (n=73), L2=State Level
(n=16), L3=Municipality level (n=16)

Communication

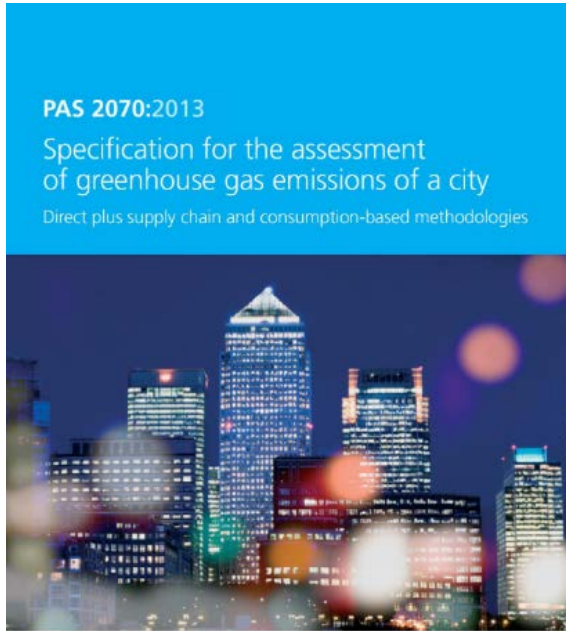
Collaboration

		Communication			Collaboration		
		L1	L2	L3	L1	L2	L3
Mitigation	L1	.20*	.06	.03	.13*	.05	.03
	L2	.16	.38*	.16	.12	.29*	.09
	L3	.07	.16	.23*	.03	.13	.21*
Adaptation	L1	.17*	.04	.02	.11*	.03	.02
	L2	.12	.22*	.14	.09	.17*	.08
	L3	.06	.14	.18*	.03	.11	.18*

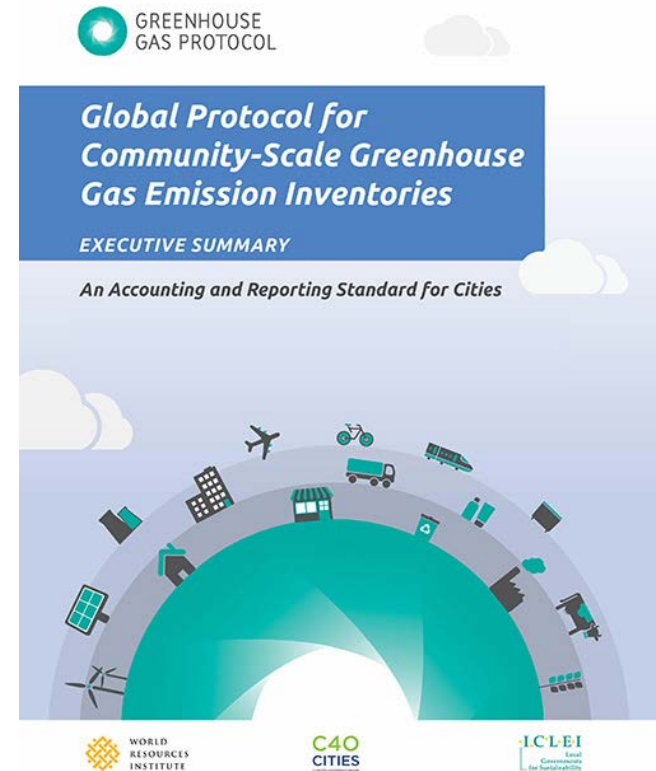
Density tables of cross-level interactions (* denotes presence of homophily at a statistically significant level with $p < 0.05$).

Source: Multi-level governance and power in climate change policy networks Monica Di Gregorio^{a,b,*}, Leandra Fatorellia, Jouni Paavola^a, Bruno Locatelli^{b,c}, Emilia Pramova^b, Dodik Ridho Nurrochmat^d, Peter H. Maye^e, Maria Brockhaus^f, Intan Maya Sarib^g, Sonya Dyah Kusumadewia

City Dedicated Guidelines & Frameworks

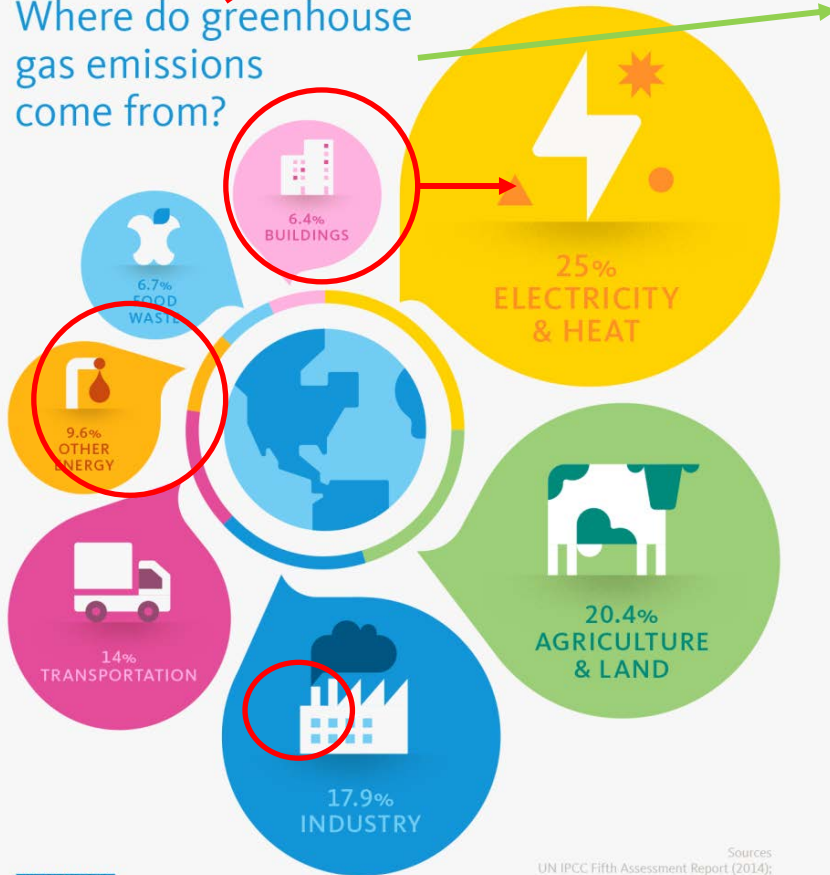


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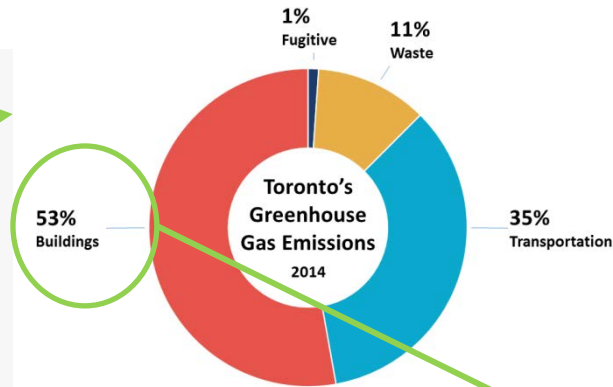
City Dedicated Guidelines & Frameworks

Where do greenhouse gas emissions come from?

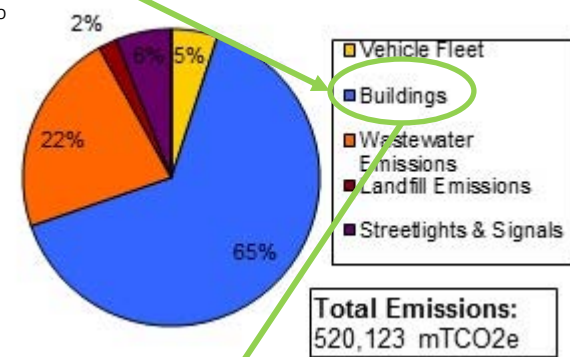


UNIVERSITY OF CALIFORNIA
Learn more at climate.universityofcalifornia.edu

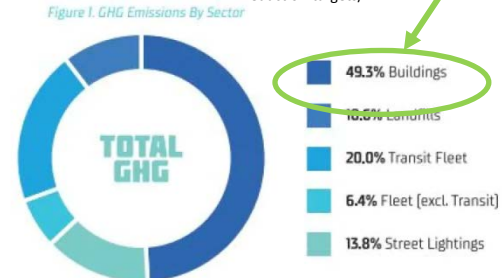
Sources:
UN IPCC Fifth Assessment Report (2014);
UN FAO Food Wastage Footprint (2013)



Source: <http://www.climatefast.ca/carbonfreeTO>

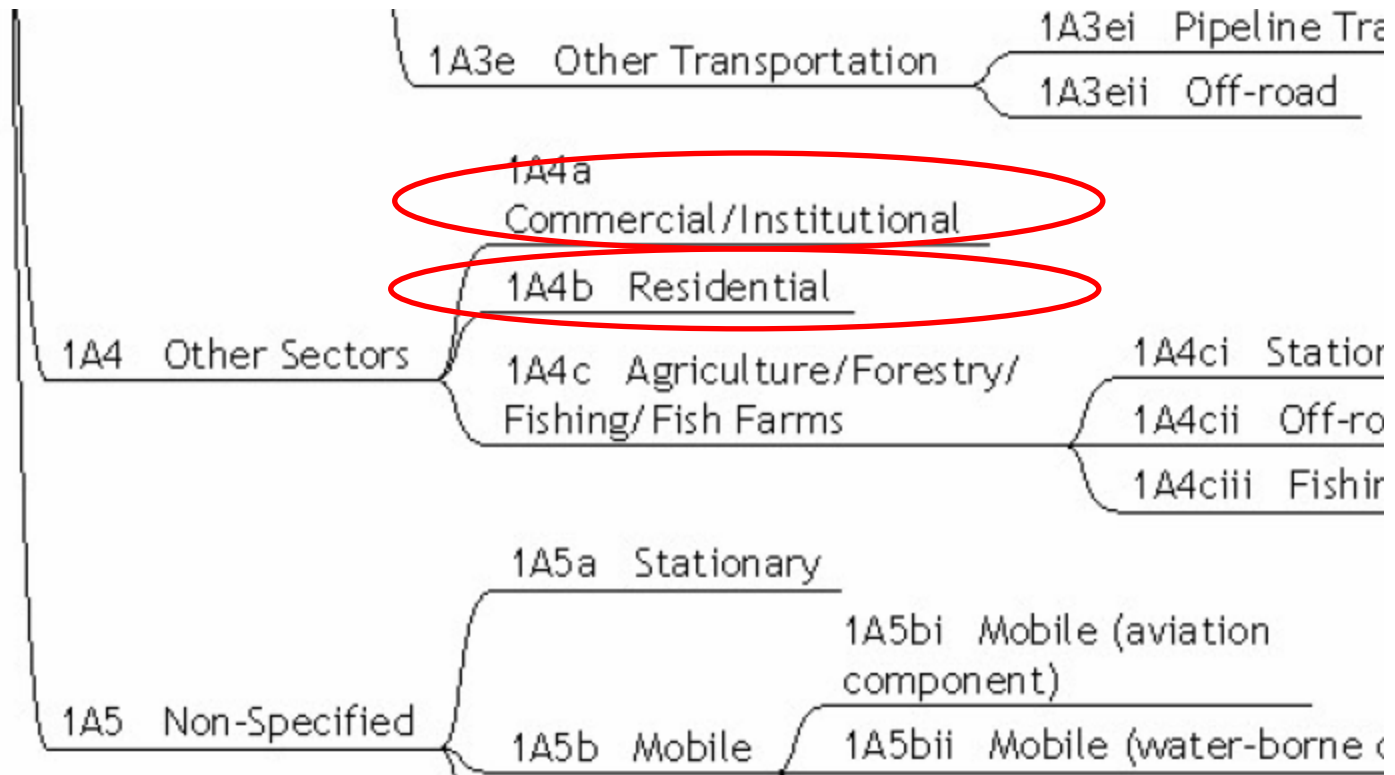


Source: <https://atlantacclimateactionplan.wordpress.com/ghg-emissions-and-reduction-targets/>



Source: <https://www.cbc.ca/news/canada/edmonton/greenhouse-gas-edmonton-1.4673511>

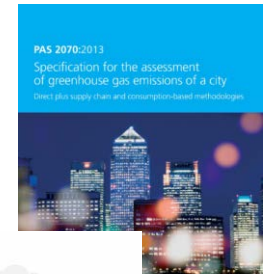
City Dedicated Guidelines & Frameworks



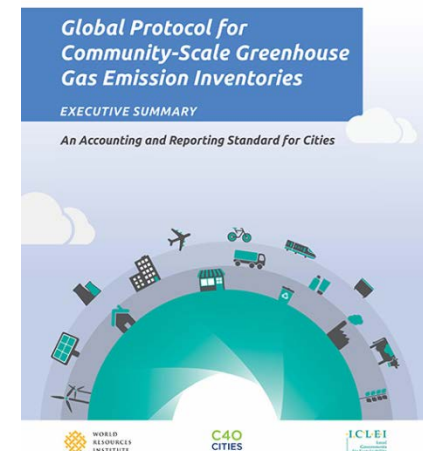
City Dedicated Guidelines & Frameworks



- Transparency
- Completeness
- Consistency
- Comparability
- Accuracy



bsi.



Use of the GPC

- ICLEI and C40 advocate for the use of GPC and developed tools for its use: **CIRIS (offline), ClearPath Global (online) and HEAT+ (online)**.
- Compact of Mayors in 2014 adopted the GPC as standard methodology. The GPC is a cornerstone of the **Global Covenant of Mayors Data Standard and its Common Reporting Framework (CRF)** released in 2019.
- Country developments:
 - **RAMCC** – Argentinian network of municipalities - adopted GPC as its de facto protocol.
 - **Costa Rica** national guidelines are based on GPC.
 - **Korean Environmental Corporation (KeCo)** adapted its national GHG tool for cities to produce IPCC and GPC based inventories.
- **ICLEI's GreenClimateCities™ Program** and projects such as Urban-LEDS recommends the use of the GPC as standard methodology.
- **Review of 200+ inventories** from cities of all sizes around the globe using GPC - combined ICLEI and C40 efforts.
- **City Climate Planner Program**, started by The World Bank, offers a training and certification system for GPC experts.

GCoM Common Reporting Framework

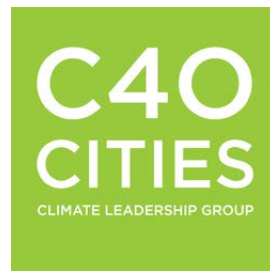


Common Reporting Framework was developed as a unified approach to reporting for all cities

GCoM Common Reporting Framework



GCoM Data Technical Working Group Subgroup on Emissions and Targets



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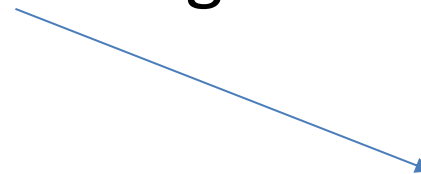


Main improvements

Sectoral approach National Level



Sectoral approach + refined geographic approach for policy making at subnational level



Sectoral approach
+ refined geographic approach
+ ease of reporting
+ energy pillar

Main differences

Scope	GHG Emissions Source (By Sector and Sub-sector)	Status
STATIONARY ENERGY		
Residential buildings		
1	Emissions from fuel combustion within the city boundary	X
2	Emissions from grid-supplied energy consumed within the city boundary	X
3	Transmission and distribution losses from grid-supplied energy	X
Commercial and institutional buildings and facilities		
1	Emissions from fuel combustion within the city boundary	X
2	Emissions from grid-supplied energy consumed within the city boundary	X
3	Transmission and distribution losses from grid-supplied energy	X
Manufacturing industries and construction		
1	Emissions from fuel combustion within the city boundary	X
2	Emissions from grid-supplied energy consumed within the city boundary	X
3	Transmission and distribution losses from grid-supplied energy	X
Energy industries		
1	Emissions from energy production used in power plant auxiliary operations within the city	X
2	Emissions from grid-supplied energy consumed by energy industries	X
3	Emissions from transmission and distribution losses from grid-supplied energy used in power plant auxiliary operations	X
1	Emissions from energy generation supplied to the grid	X
Agriculture, forestry and fishing activities		
1	Emissions from fuel combustion within the city boundary	X
2	Emissions from grid-supplied energy consumed within the city boundary	X
3	Transmission and distribution losses from grid-supplied energy consumption	X
Unspecified sources		
1	Emissions from fuel combustion within the city boundary	X
2	Emissions from grid-supplied energy consumed within the city boundary	X
3	Transmission and distribution losses from grid-supplied energy consumption	X
Fugitive emissions from mining, processing, storage, and transportation of coal		
1	Emissions from fugitive emissions within the city boundary	X
Fugitive emissions from oil and natural gas systems		
1	Emissions from fugitive emissions within the city boundary	X

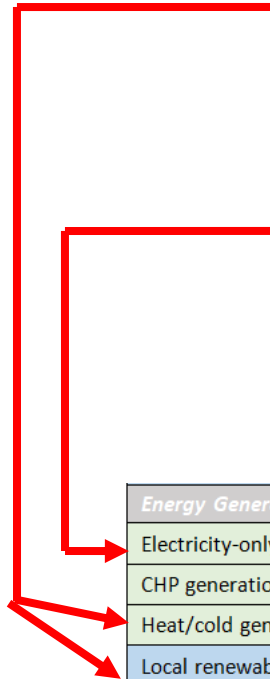
Energy Generation			
Electricity-only generation	Yes		This means disclosure of information on activity and emissions specifically related to energy generation within the city boundary or outside the boundary but can be controlled or influenced by the city. It is for information only and not added to the total emissions.
CHP generation	Yes		
Heat/cold generation	Yes		
Local renewable generation	Optional	Optional	1A1

<i>Stationary energy</i>
Residential buildings
Commercial building and facilities
Institutional buildings and facilities
Industrial buildings and facilities
Agriculture
Fugitive emissions

Data splitting

Energy industries	
1	Emissions from energy production used in power plant auxiliary operations within the city
2	Emissions from grid-supplied energy consumed by energy industries
3	Emissions from transmission and distribution losses from grid-supplied energy used in power plant auxiliary operations
1	Emissions from energy generation supplied to the grid

Energy Generation				
Electricity-only generation	Yes		This means disclosure of information on activity and emissions specifically related to energy generation within the city boundary or outside the boundary but can be controlled or influenced by the city. It is for information only and not added to the total emissions.	1A1
CHP generation	Yes			
Heat/cold generation	Yes			
Local renewable generation	Optional	Optional		



Data merging

Fugitive emissions from mining, processing, storage, and transportation of coal	
1	Emissions from fugitive emissions within the city boundary
Fugitive emissions from oil and natural gas systems	
1	Emissions from fugitive emissions within the city boundary

<i>Stationary energy</i>
Residential buildings
Commercial building and facilities
Institutional buildings and facilities
Industrial buildings and facilities
Agriculture
Fugitive emissions



Comparability

Sectors and sub-sectors in GCoM reporting framework	IPCC (ref no.)	GPC (ref no.)
Stationary energy		
Residential buildings	1A4b	I.1.1, I.1.2
Commercial building and facilities	1A4a	I.2.1, I.2.2
Institutional buildings and facilities	1A4a	
Industrial buildings and facilities	1A1, 1A2	I.3.1, I.3.2, I.4.1, I.4.2
Agriculture	1A4c	I.5.1, I.5.2
Fugitive emissions	1B1, 1B2	I.7.1, I.8.1
Transportation		
On-road	1A3b	II.1.1, II.1.2
Rail	1A3c	II.2.1, II.2.2
Waterborne navigation	1A3d	II.3.1, II.3.2
Aviation	1A3a	II.4.1, II.4.2
Off-road	1A3e	II.5.1, II.5.2
Waste		
Solid waste disposal	4A	III.1.1, III.1.2
Biological treatment	4B	III.2.1, III.2.2
Incineration and open burning	4C	III.3.1, III.3.2
Wastewater	4D	III.4.1, III.4.2
Industrial Process and Product Use (IPPU)		
Industrial Process	2A, 2B, 2C, 2E	IV.1.1
Product Use	2D, 2F, 2G, 2H	IV.2.1
Agriculture, Forestry and Other Land Use (AFOLU)		
Livestock	3A	V.1.1
Land use	3B	V.2.1
Other AFOLU	3C, 3D	V.3.1
Energy Generation		
Electricity-only generation	1A1	I.4.4
CHP generation		
Heat/cold generation		
Local renewable generation		

Reporting



**CDP-ICLEI unified reporting system
used by many initiatives and projects**



**Transformative
Actions
Program**

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