Global Protocol for Community-scale greenhouse gas emissions

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About C40

- The C40 Cities Climate Leadership Group (C40) is a network of the world's megacities committed to addressing climate change
- **70 cities** across **seven regions**: Europe, North America, Latin America, Africa, East Asia, South East Asia & Oceania, and South & West Asia
- **7 initiatives**: Transport, Energy, Solid Waste, Finance & Economic Development, Sustainable Communities, Adaptation & Water, and Measurement & Planning
- Deliver through **networks**: active working groups of C40 cities with commonly identified opportunities, interests or priorities

Measuring city-level emissions

- GPC stands for the **Global Protocol for Community-scale greenhouse gas emissions**
- Standard for developing an emissions inventory for cities, which builds on existing methodologies
- Consistent with the 2006 IPCC Guidelines for National GHG Inventories
- Launch 8 December 2014, Lima
- Collaboration between C40, the World Resources Institute, and ICLEI – Local Governments for Sustainability
- Adopted in the GHG Protocol

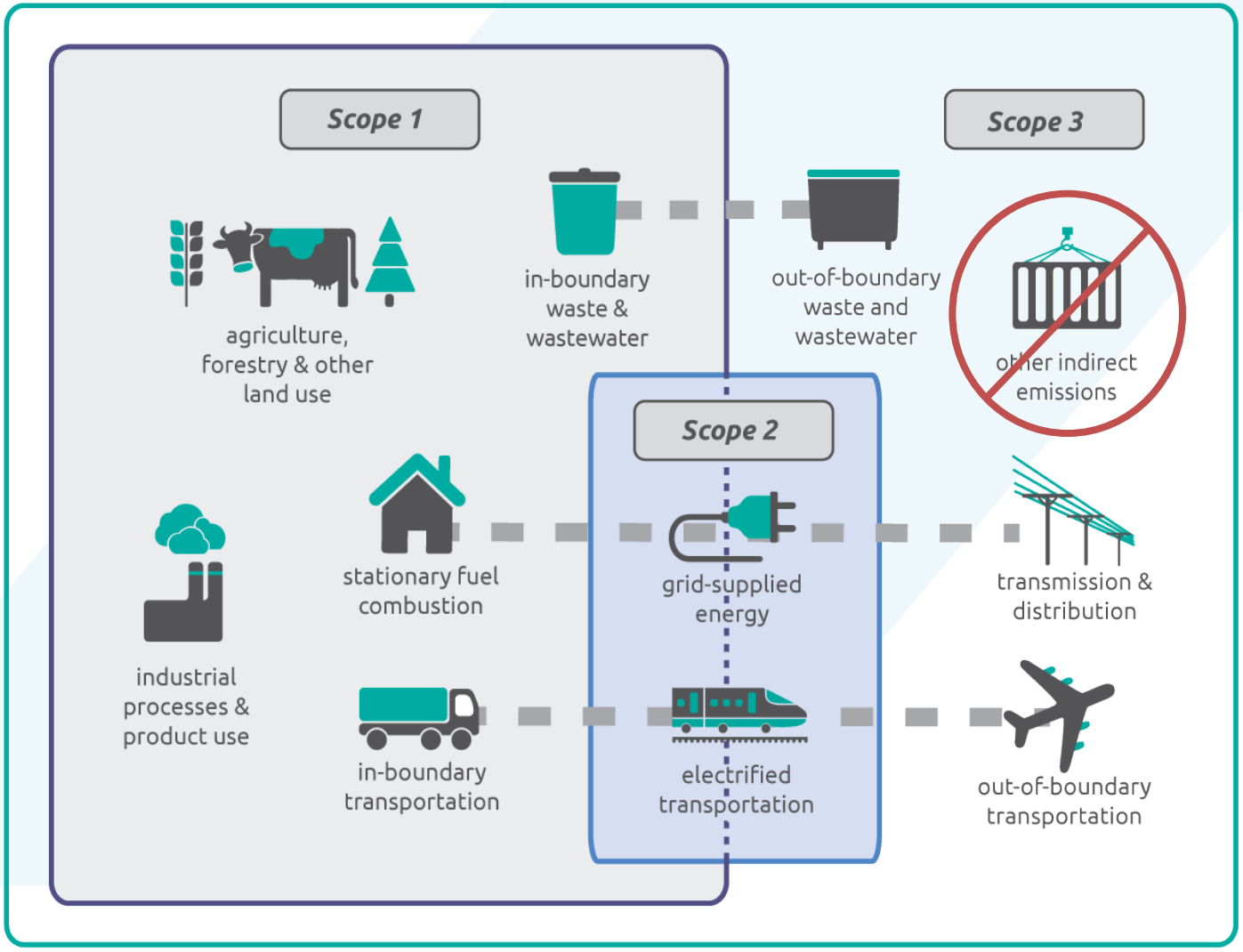
Key features of the GPC

- Defines requirements for measuring city-scale emissions
- Broad coverage of GHGs and **emission sources**
- **Two reporting levels: BASIC and BASIC+**
  - BASIC covers stationary energy, inboundary travel and waste
  - BASIC+ additionally covers transboundary travel, industrial processes and product use (IPPU) and agriculture, forestry and land use (AFOLU)
- GPC allows use of **notation keys to accommodate and explain data limitations, and requires cities to record all activity data used and carry out a data quality** assessment
- Also requires cities to report on all inboundary emissions separately (to enable aggregation of multiple inventories)

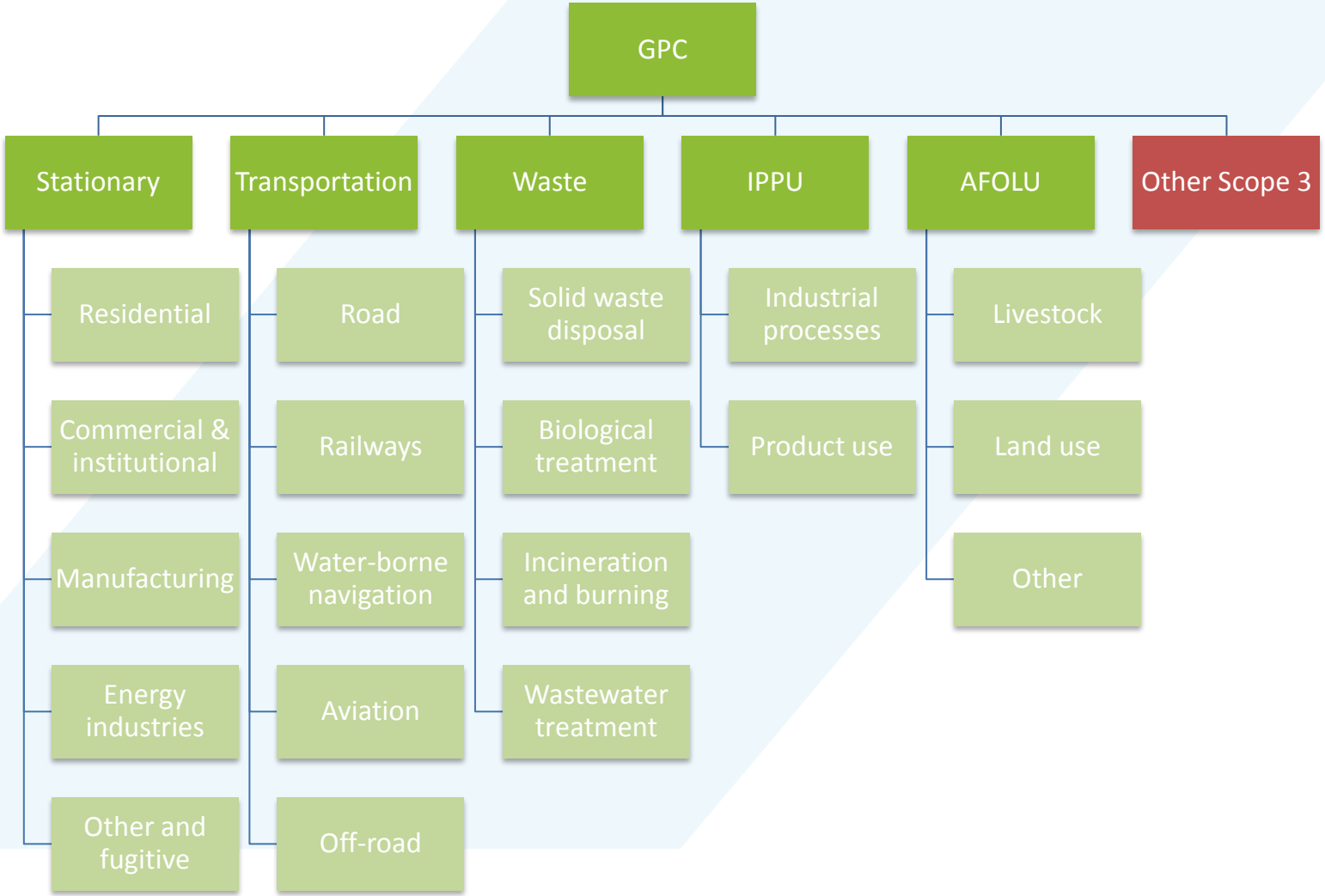
Inventory boundary

Spatial	Geo-political boundary of city	
Temporal	Continuous 12-month period	
GHGs	CO_2, CH_4, N_2O, PFCs, HFCs, SF_6 and NF_3	
Emission sources	**BASIC**	**BASIC+**
	Stationary energy Inboundary travel Waste	Stationary energy Inboundary travel Transboundary travel Waste IPPU AFOLU

Boundaries and scopes



Breakdown of sectors



Transportation

Transportation emissions accounting should include:

- **Inboundary journeys** – All people and freight transportation occurring within the city boundary.

- **Transboundary journeys –** out-of-city portion of all trips that either originate or terminate within the city boundary. This includes large regional transit hubs (e.g., airports or seaports) serving the city, but located outside of the city boundary.

Emissions from energy use in buildings or facilities related to transportation, such as docks, mass transit stations, airports and marine ports, shall be reported under Stationary Energy.

Categories

- **On-road transportation**, including electric and fuel-powered cars, taxis, buses, etc.
- **Railway**, including trams, urban railway subway systems, regional (inter-city) commuter rail transport, national rail system, and international rail systems, etc.
- **Water-borne transportation**, including sightseeing ferries, domestic inter-city vehicles, or international water–borne vehicles.
- **Aviation**, including helicopters, domestic inter-city flights, and international flights, etc.

Methodologies

- Fuel sales method
- City-induced method
- Geographic (or territorial) method
- Resident activity method

Fuel sales method

- This method calculates on-road transportation emissions based on the total fuel sold within the city boundary.
- This approach treats sold fuel as a proxy for transportation activity.

City-induced method

- This method seeks to quantify transportation emissions *induced* by the city, including trips that begin, end, or are fully contained within the city (usually excluding pass-through trips).
- The method relies on models or surveys to assess the number and length of all on-road trips occurring – both transboundary and in-boundary only.
- This yields a vehicle kilometers traveled (VKT) figure for each identified vehicle class. It also requires information on vehicle fuel intensity (or efficiency) and fuel emission factors.

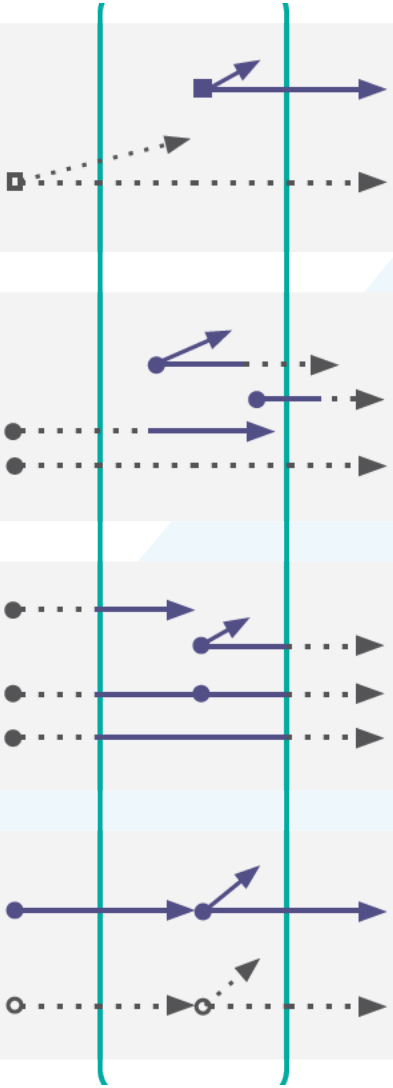
Geographic method

- This method quantifies emissions from transportation activity occurring solely within city boundaries, regardless of the trip's origin or destination.
- Some European traffic demand models quantify these emissions primarily for local air pollution estimates or traffic pricing.
- Although no out-of-boundary trips are assessed or quantified, additional surveys could be combined in order to report portion of out-of-boundary transit.

Resident activity method

- This method quantifies emissions from transportation activity undertaken by city residents only.
- It requires information on resident VKT, from vehicle registration records and surveys on resident travels.
- While these kinds of surveys may be more manageable and cost-effective than traffic models, their limitation to resident activity overlooks the impact of non-city resident traffic by commuters, tourists, logistics providers, and other travelers.

Comparison I



Fuel sales: the volume of fuel purchased within the city boundary.
Typical geographic coverage for activity data from fuel distributors, fuel sales tax recipts, and city-wide fuel statistics.

Induced activity: in-boundary trips and 50% of transboundary trips that originate or terminate within the city boundary.
Typical geographic coverage for some U.S. travel demand models.

Geographic: all on-road travel occuring within the geographic boundary.
Typical geographuc coverage for city border VKT surveys and some European travel demand models

Resident activity: a measurement of the transport activities of city residents.
Typical geographic coverage for household surveys, vehicle registration data (city or regional), and vehicle inspections (e.g., sample odometer readings).

Comparison II

Methodology	Advantages	Disadvantages
Fuel sales	• More consistent with national inventory practices • Well-suited to aggregation with other city's transportation inventories if all fuel sold in-boundary is classified as scope 1 • Less costly and time-consuming to conduct • Does not require high level of technical capacity	• Does not capture all on-road travel, as vehicles may be fueled at locations outside city • Does not disaggregate the reasons for travel emissions, e.g. origin, destination, vehicle efficiency changes, modal shift • Does not demonstrate mitigation potential • Does not allow for allocating emissions by scope (w/o additional steps)
VKT and model-based (induced activity, territorial, resident activity)	• Can produce detailed and more actionable data for transportation planning • Integrates better with existing city transport models and planning processes	• More expensive, time consuming, and less comparable between cities due to variation in models used

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