Greenhouse Gas Inventories for Urban Operations in SE Asia

Challenges and Opportunities

Sonia Chand Sandhu
Sameer A. Kamal

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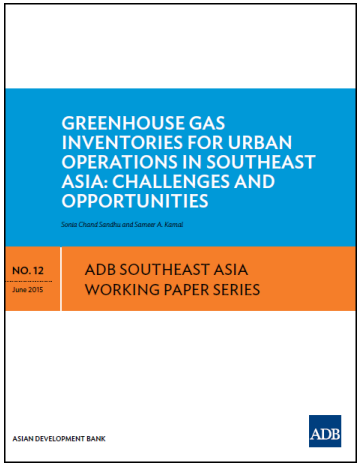


Peer Reviewed by:
Internal Review: Carbon Market Program, SDCC by *V.K Duggal, Darshak Mehta, Hemant Nandanpawar, Lingshui Mo, and Grendell Vie Magoncia*
External Review: Local Governments for Sustainability (ICLEI) by *Emani Kumar and Soumya Chaturvedula*

Introduction.

The paper discusses:

- Why document greenhouse gas (GHG) emissions?
- What are the key challenges for documenting GHG emissions for urban sector operations?
- What are the opportunities?
- What are the steps to estimate GHG emissions for urban sector projects, and report these as part of a city GHG inventory?
- What types of urban operations should consider this?

- A GHG is any gas that absorbs infrared radiation in the atmosphere, trapping, and building up heat (i.e. the greenhouse effect) - one of the leading causes of climate change
- Under the UNFCCC, GHGs include: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride, and nitrogen trifluoride
- GHG emissions reported as metric tons of each GHG, as well as CO_2 i.e. tCO_2e/year

Why? ADB's Safeguards Policy.

- The borrower and/or client *"will promote the reduction of project-related anthropogenic greenhouse gas emissions in a manner appropriate to the nature and scale of project operations and impacts."*

- For *"projects that are expected to or currently produce significant quantities of greenhouse gases,"* the borrower and/or client "*will quantify direct emissions from the facilities within the physical project boundary and indirect emissions associated with the off-site production of power used by the project.*"

- The policy defines "*significant quantities*" as "*generally 100,000 tons of carbon dioxide equivalent (tCO2e) per year*" which includes emissions from direct and indirect sources.

Why? ADB's Strategy 2020 & Commitments.

- Strategy 2020
  - Requires action on both mitigation (measures that reduce the magnitude of climate change) and adaptation (measures that reduce the vulnerability of people to climate change)

- Mid-Term Review of Strategy 2020
  - Investments in clean energy, sustainable transport
  - Building climate resilience of projects
  - Strengthen environmental policies and borrower capacity
  - Support DMCs to access global and regional climate funds

- ADB's Commitments as an administrator and/or user of international climate funds; and member of IFI Community

- Progress on mitigation cannot be measured without estimating GHG emissions

Why? The ADB's commitments.

- As an administrator and/or user of international climate funds
  - Climate Change Fund
  - Climate Investment Fund
  - Carbon Market Initiative
  - Clean Energy Financing Partnership Facility
  - Green Climate Fund
  - Urban Climate Change Resilience Trust Fund, etc.

- As a member of the IFI Community
  - IFI Framework for a Harmonized Approach to Greenhouse Gas Accounting
  - World Bank has developed guidance notes for GHG accounting for landfill gas capture and composting; to develop full value chain for solid waste; urban planning and land use.

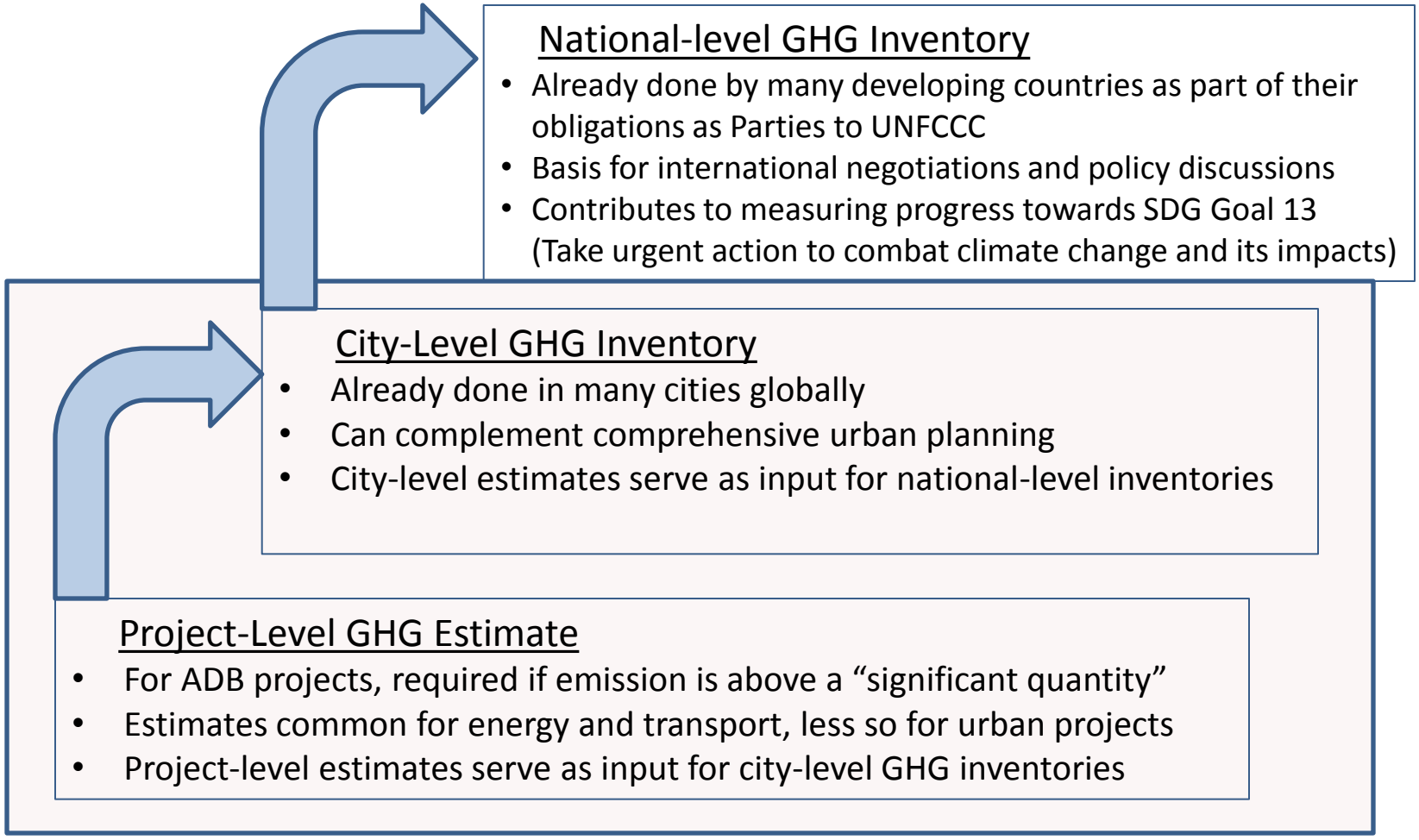
Why? GHG Emissions in Urban Operations.

- Capturing emission estimates in projects and cities has yet to be fully mainstreamed as a part of ADB's urban operations
  - In SE Asia, no urban operations with project GHG emissions calculated, or city GHG inventories, over the last 3-4 years

- Cities recognized as major contributors to global GHG emissions
  - Cover less than 2% of the earth's surface
  - Consume 78% of the world's energy
  - Contribute 60%+ of all carbon dioxide and significant amounts of other GHG emissions

- Many cities regularly measure, disclose their GHG emissions
  - 375+ cities reported to the carbon Cities Climate Registry (cCCR) in 2014
  - 100+ cities reported to the Carbon Disclosure Project in 2014
  - 2,450+ cities (mostly EU) report to the Covenant of Mayors

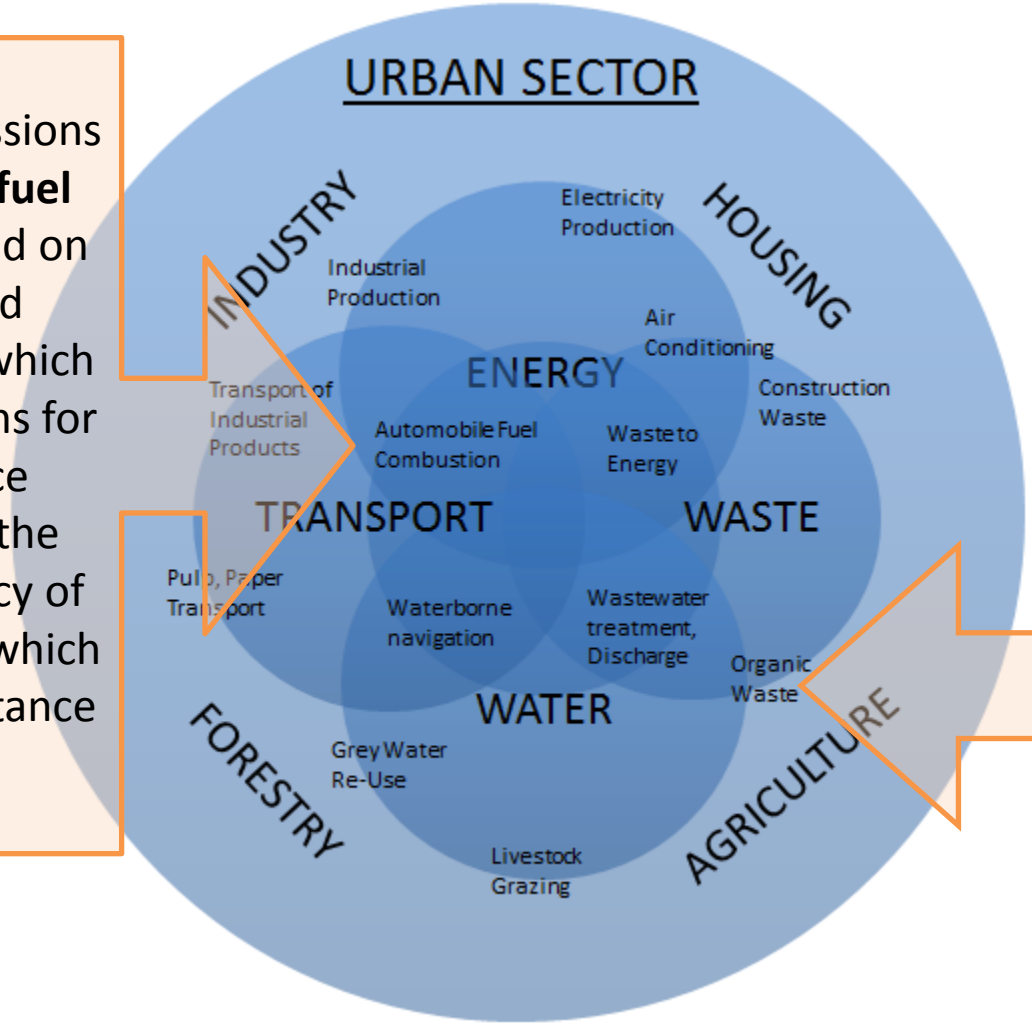
Project-Level, City-Level and National-Level GHG Estimates.



Challenges (1 of 3).

- The complex nature of the urban sector, which encompasses a range of subsectors

Example: GHG emissions from **automobile fuel combustion** depend on composition and standards of fuel (which determine emissions for a unit of distance traveled) and on the traffic and efficiency of the road network (which determines the distance traveled)



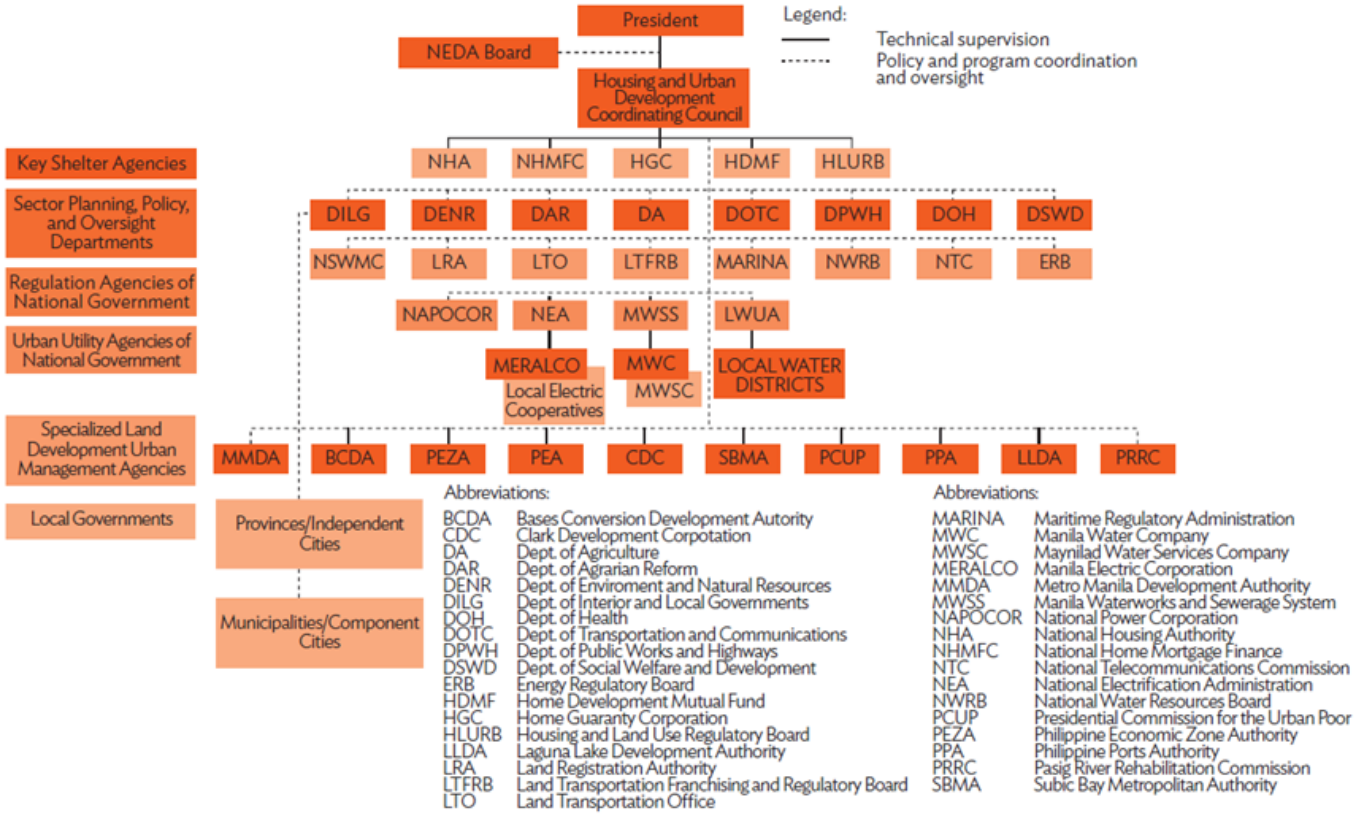
Example: A **solid waste management** project where organic waste would be composted to produce natural fertilizer

Challenges (2 of 3).

- The urban sector involves a range of institutions

The complex institutional structure for delivering urban development in the Philippines, which is illustrative of most countries in the region.

Chart 1. Institutional Structure for Delivering Urban Development



Source: ADB. 2009b. *Philippines Basic Urban Services Sector Project*. Final Report. Manila.

Source: Singru, R. N. and Lindfield, M. 2014. *Republic of the Philippines: National Urban Assessment*. ADB. Manila.

Challenges (3 of 3).

- **Perception** that emissions for individual activities or subprojects are limited in scope - quantifying them is not valuable, necessary or cost-effective

- Emissions estimates require the availability of **data** in a compatible format - may not be readily available

- Compiling a city-level GHG inventory takes **time and money**
  - 4-6 months for smaller cities, 9-12 months for large/mega cities
  - $40,000 to $120,000
  - Cost highest for first instance a GHG inventory is compiled

Source: ICLEI - Local Governments for Sustainability

Opportunities (1 of 3).

- Despite these challenges, there is a **strong case** for moving toward establishing and maintaining GHG inventories for cities in the long-term

- GHG emission estimates establish valuable **baselines**
  - In itself a valuable exercise
  - Determine which sectors, sources, and activities are responsible for GHG emissions
  - Understanding emission and pollution trends
  - Set targets

- **Quantify benefits** (both individual and cumulative) from activities that reduce emissions using appropriate methodologies
  - Understand trade-offs, for example with different technologies

Opportunities (2 of 3)

- GHG inventories can drive green investments, largely through the private sector, to make cities more competitive globally

- GHG inventories allow a city to leverage and access more **climate financing**.
  - ~$40 billion/year and expected to increase
  - 70+ existing funds provide financing specifically for urban
  - New financing sources, such as $10 billion Green Climate Fund

- GHG inventories facilitate access to the **global carbon market**
  - >1% of CDM projects credited to cities; potential for scaling up
  - GHG inventory can aggregate emissions to a scale suitable to access carbon markets
  - GHG inventories will help cities and their constituents to monitor, report, and verify emissions; avoid double counting

• Case Study: ADB Suva–Nausori Water Supply and Sewerage Project in Fiji

- Baseline scenario:

- Sewage/Sludge treatment in a biodigester; methane released to atmosphere

- With ADB-financing:

- Expansion of sewage treatment plant; installation of flaring system

- Annual GHG reductions estimated at 22,000 tCO2e/year
- Used to leverage $1.35m co-financing from ADB's Future Carbon Fund through pre-purchase of emission reductions
- Financing used for project implementation costs

Quick CDM Facts

Project type: Waste handling and disposal

Methodology: AMS-III.H. version 16—Methane recovery in wastewater treatment

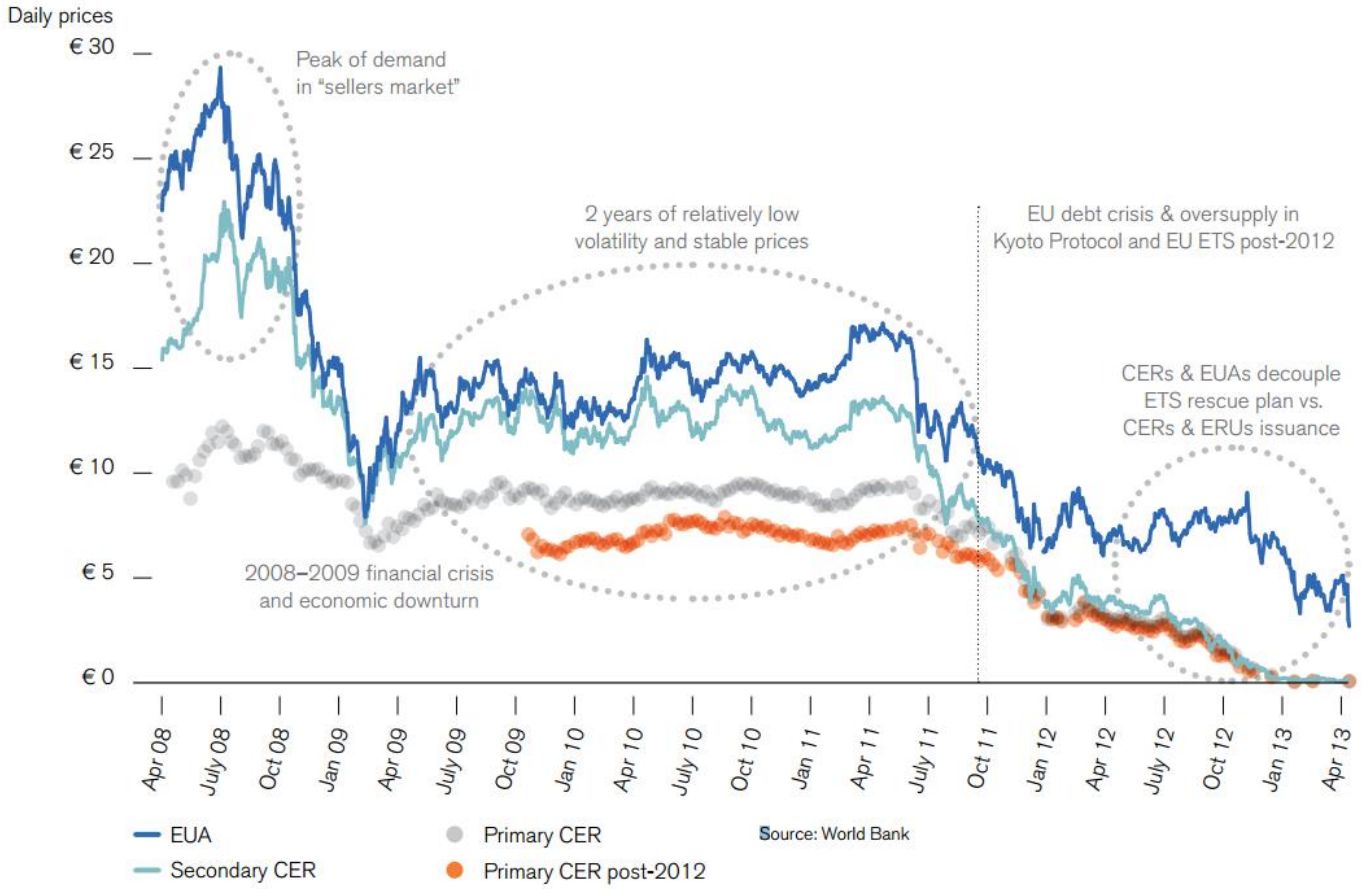
Current status: Registered (Project number 4552)
Start of crediting period: September 2011

Estimated average annual emission reductions: Approximately 22,000 tons CO_2 equivalent

Note on Price of Carbon.

- Note: The price of carbon has been falling since 2008 and is at historically low values at present; so may not be the most attractive incentive at this time.

Figure 4: EUA and CER prices (2008–2013)



← Current levels: <1 € per tCO2 equivalent

Source: World Bank. 2013. *Mapping Carbon Price Initiatives: Developments and Prospects*. Washington, DC: World Bank.

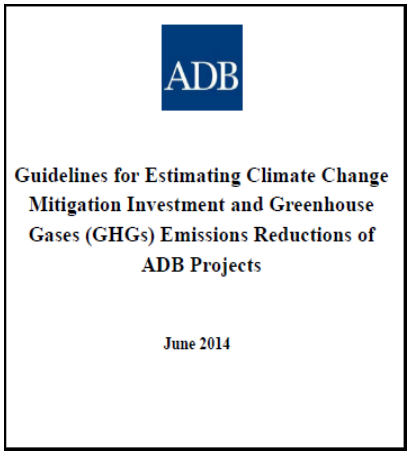
Opportunities (3 of 3).

- GHG inventories can help to **raise public awareness** and establish **green city brands**
  - Example: Melaka, Malaysia -> GHG inventory being developed in partnership with ICLEI

- GHG inventories can serve as a **platform for cross-sector integration, planning, and decision making**
  - Valuable snapshot of the major activities in a city
  - Input into a city's urban development planning processes and tools (e.g. climate action plans or green city action plans)
  - Identifying climate mitigation measures where this is a "coincidence of agendas" with a city's local priorities e.g. in terms of economic growth and service delivery

How? Step 1: Select the right methodology and tool.

- SPS 2009: “Internationally recognized methodologies”
- ADB Guidelines, June 2014, discuss standard methodologies and tools
- Efforts underway to harmonize amongst IFIs



- GHG emissions for most emissions sources are estimated by multiplying **activity data** by an **emissions factor**

  - **Activity data:** Quantitative measure of a level of activity during a specific time
  - **Emission factor:** Measure of the mass of GHG emissions relative to a unit of activity for a specific pollutant

Step 1: Select the right methodology and tool.

- The **boundary of the analysis** must be defined.
  - In the context of project-level emissions: What phases of a project life cycle can be captured? Are "associated facilities" included?
  - In the context of a citywide GHG inventory, the boundary can be used to differentiate between different sources depending on where these emissions are physically originating

- Several tools available, **selection of tool** is based on:
  - Sophistication of the tool ←→ data requirements
  - Reproducibility of the analysis and results
  - Tools customized for certain sectors or regions (e.g. global vs. regional/local emissions factors)

- Can be an iterative process

Step 2: Conduct the analysis using the selected tool.

- Collection of activity data
  - Selection of the base year
  - Top-down? Bottom-up? Hybrid?
  - Establish data collection and standardization processes
  - Often most time consuming step

- Confirming or updating emission factors
  - Review default global values and update if necessary / possible with local values

- Apply the tool to calculate anticipated GHG emissions
  - Iterative process → informs project design

Emission Factors: Global values vs. local values.

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China's Carbon Dioxide Emissions May Have Been Overstated by More Than 10%

By CHRIS BUCKLEY AUG. 19, 2015

The cooling towers of a thermal power plant in Fushun, China. The country's proposed commitments to curtail emissions are crucial to a new international agreement on global warming. Sheng Li/Reuters

Source: NY Times (cover) & BBC News (extract), August 19 2015.

- **Step 3: Documenting results as part of a citywide GHG inventory.**

- Project emissions, once estimated, can contribute to, or be compared with reference to, a citywide GHG inventory

- In practice, citywide emissions can be estimated by bringing together independent emissions estimates for several subprojects, projects and subsectors (*that may have been derived from different, specific tools*), or by estimating emissions from a tool designed specifically for cities

- A recent initiative with strong support from the international community is the GHG Protocol for Cities*
  - Covers Stationary Energy; Transportation; Waste; Industrial Process and Product Use; and Agriculture, Forestry and Land Use

** A standard protocol developed by the World Resources Institute, the C40 Cities Climate Leadership Group, and ICLEI, with strong endorsement from the international climate community, including the World Bank, UN Habitat, and the United Nations Environment Programme.*

Case Study: Proposed ADB Solid Waste Management Project in the Philippines.

- 4 Municipalities: 15,000 to 120,000 population
- Project scope: Rehabilitation and development of landfills, emission controls, material recovery, waste collection system, adoption of waste-to-energy technology. GHG emissions estimated under PPTA.

Step 1: Selection of Tool (IGES vs. IFEU – 2 tools for solid waste)

- Pros: IGES customized for use in SE Asia (emission factors), easier to adapt and use
- Cons: No provision for gas capture and waste-to-energy; outputs less compatible with GHG reporting regimes

Step 2: Analysis

Baseline calculated for 2014; Waste analysis and characterization survey and social survey used to characterize waste and estimate volumes.

Net emissions: ~20,000-25,000 tCO2e/year

Project impacts analyzed, including off-line calculations for waste-to-energy

- Use of landfills typically increases GHG emissions **(+)**
  Methane (CH_4) in landfills → 1 ton CH_4 equivalent to ~25 tons CO_2
- Enhanced recycling program + Waste-to-Energy **(-)**
- Composting organic waste – replaces processed fertilizer **(-)**

Net GHG emissions savings: 5,000 to 10,000 tCO2e/year

Way Forward (1 of 2).

- Given significant opportunities discussed, project GHG estimates are recommended for ADB projects with potential for mitigation

- City GHG inventories are recommended for ADB projects that provide comprehensive support to cities in urban planning and investment prioritization
  - Provide unique insights on activities, and trade-offs for city managers; provide platform for collaboration across structures
  - While citywide inventories take time and money, data have shown that these costs can be reasonable,
  - Information provided by GHG inventories can be used to leverage climate financing, a growing pot

Way Forward (2 of 2).

- ADB's ongoing and pipeline urban operations provide opportunities to replicate and upscale these experiences
- SE Asia: Proposed Viet Nam Secondary Cities Development Program (Green Cities) supports both (i) comprehensive urban planning and (ii) specific subprojects in three cities in Viet Nam
- SE Asia: Proposed Solid Waste Management project in the Philippines; GHG emissions estimated for projects in four municipalities
- East Asia: In Qingdao (PRC), GHG inventory prepared to inform strategy and blueprint for low-carbon development

Discussion.

- ADB is not currently a part of the "**GHG Protocol for Cities"**; a missed opportunity?

  - Experiences from other regions?
    - Challenges, constraints and barriers
    - Are there enabling regulations
    - Examples of any national-level initiatives
    - Possible entry points (policy dialogue, operations, country programming) for initiating GHG inventories

  - Resources during project processing (i.e. PPTA)
    - Could this be part of the PPTA ToR?
    - If not under PPTA, what other sources of financing available? -
    - How can these be accessed by operations divisions?