



Cobenefits Approach to Urban Air Quality Management and GHG reduction in Asian cities

Cornie Huizenga and May Ajero
Secretariat
Clean Air Initiative for Asian Cities

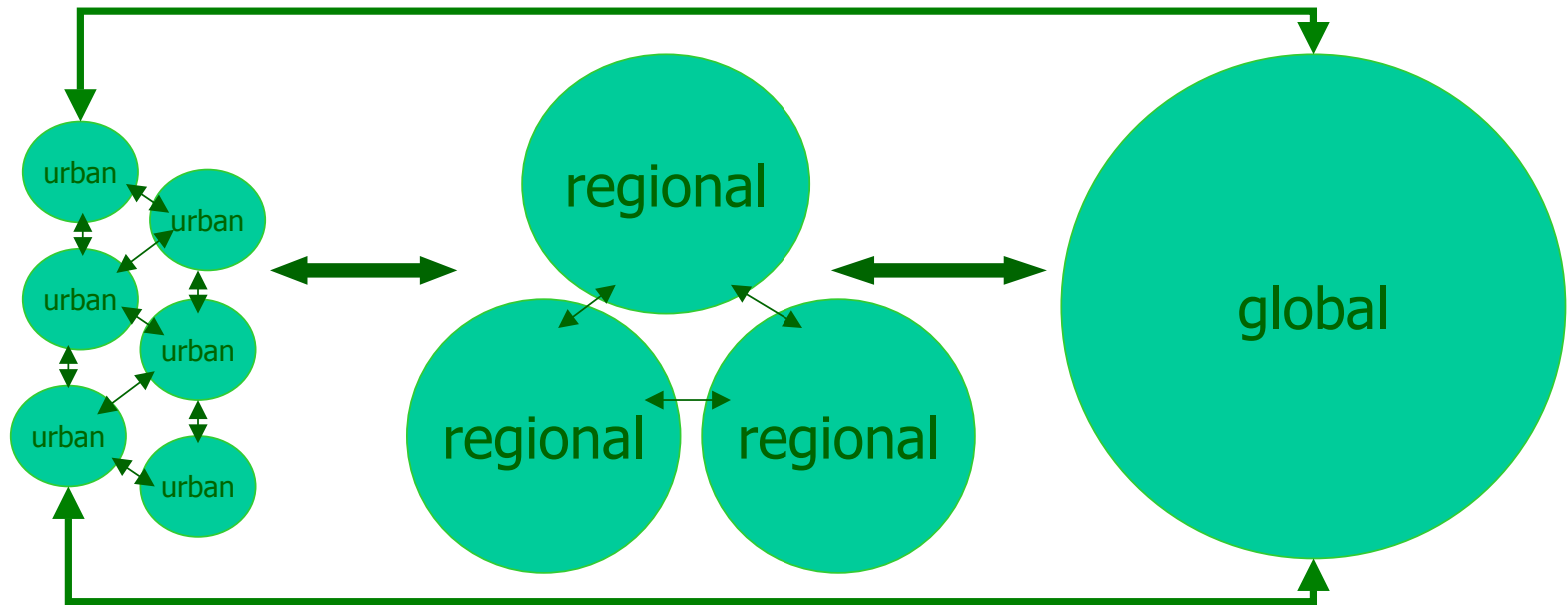
The 15th Asia-Pacific Seminar on Climate Change
11-15 September 2005
Yokohama, Japan

Overview of Presentation



- How does air pollution affect climate?
- Why pursue the cobenefits approach to UAQM and Climate Change mitigation?
- What are the current cobenefits tools and instruments?
- What are potential next steps for CAI-Asia?

What is Air pollution?

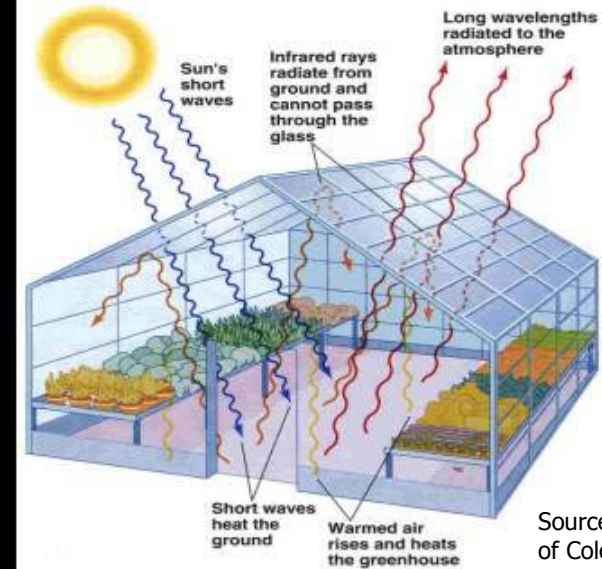


- Urban air pollution is a problem that goes beyond the city limits
- Any given area's pollution is a combination of background pollution, local pollution and transboundary pollution
- Transboundary pollution can be attributed from city, region and global sources
- Long range transport of air pollution from Asia to US and Europe has been extensively studied

What is Climate Change?



- Climate change is attributed mostly to the rapidly increasing concentration of greenhouse gases (GHG) such as CO₂ from human activities in the agriculture, forestry, energy, waste and industry sectors
- Energy (power and transport), Waste and Industry, sectors which contribute greatly to GHG emissions, are urban-related activities

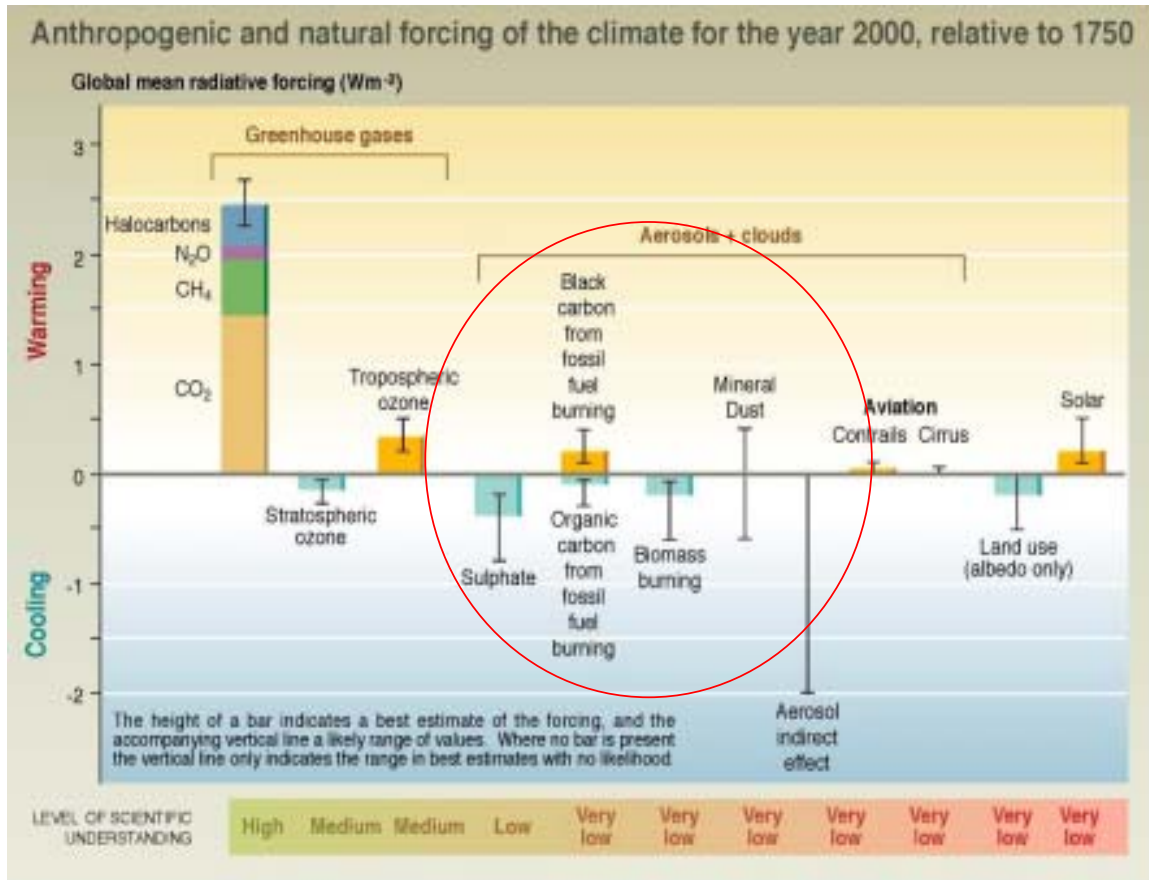


Source: University of Colorado



Source: Government of Canada website

How does air pollution affect climate?: UNFCCC Process



- The IPCC Working Group I in its 2001 Third Assessment Report has recognized that dust, tropospheric ozone, black C, sulphates and other aerosols and PM have impact on climate but level of scientific understanding on this is still low
- Working Group I Outline for The Fourth Assessment Report** (to be completed in 2007) will devote a specific section on "Air Quality and Climate Change" (under Chapter 7).
- This may suggest, then, that air pollution problem has or will have in the future a more substantial impact on climate and will require more in-depth attention

Image Source: IPCC, 2001. Third Assessment Report – The Scientific Basis

*Outline for the IPCC Working Group I Contribution to the Fourth Assessment Report

Climate Change 2007: The Physical Science Basis - <http://www.ipcc.ch/activity/wg1outlines.pdf>

How does air pollution affect climate?: Basic Science

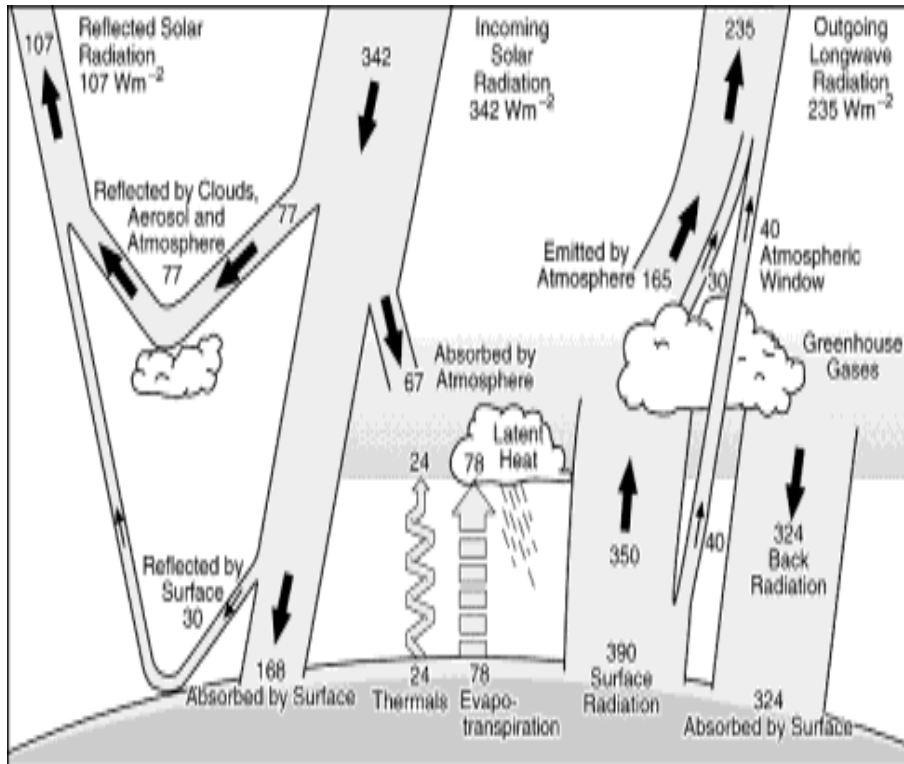


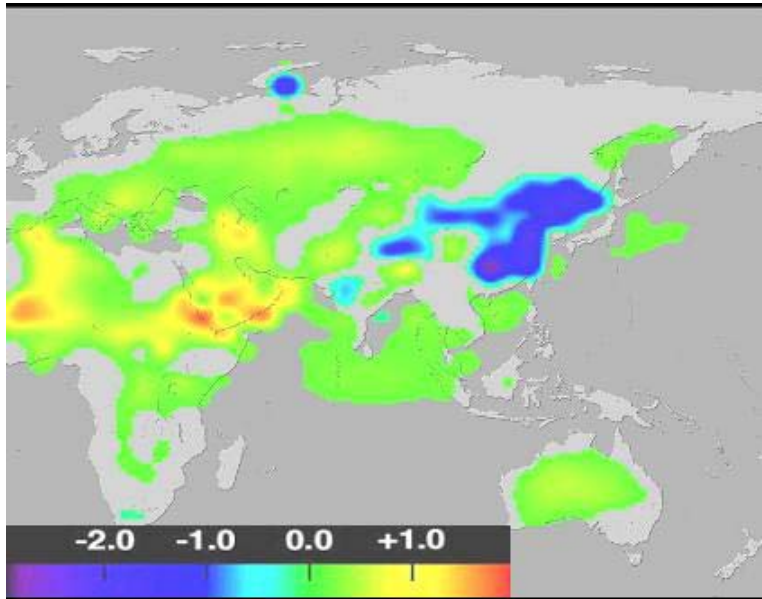
Image Source: Kiehl and Trenberth, 1997

- Depending on size, vertical position and concentration, PM may cause positive (warming effect) or negative (cooling effect) radiative forcing.
- Smaller particles have higher radiative forcing than bigger particles because they scatter and absorb solar and infrared radiation more efficiently.
- The composition of the particulate also have varying effects on the climate - tropospheric ozone and sulphates are relatively more significant than the other aerosols
- The net effect of PM on the climate is not as great as the greenhouse gases, but may be expected to become more and more significant as the load of pollutants in the atmosphere is expected to continually increase

Air Pollution links with Climate: Examples of Supporting Evidence (1)

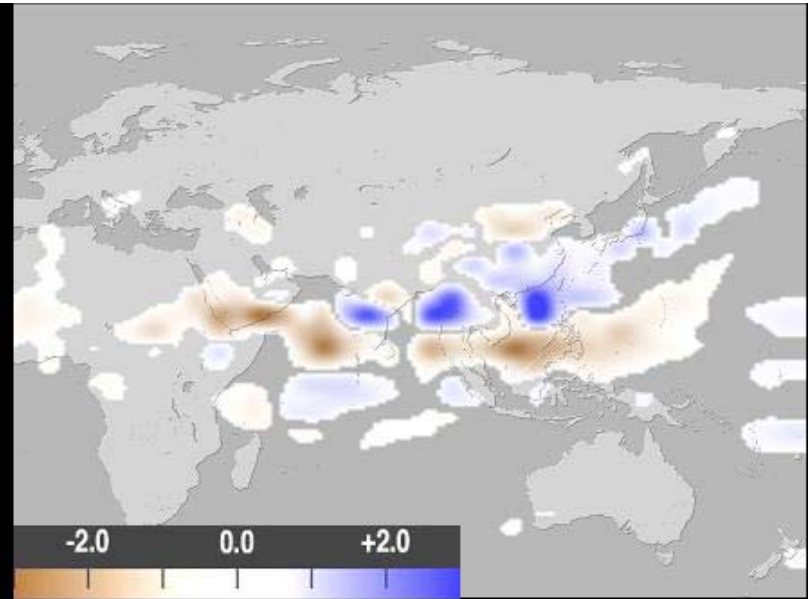


Evidence that PM affects temperature and weather patterns



Soot changes ground temperatures in Asia

(in degrees Celsius)



Soot intensifies floods and droughts in Asia

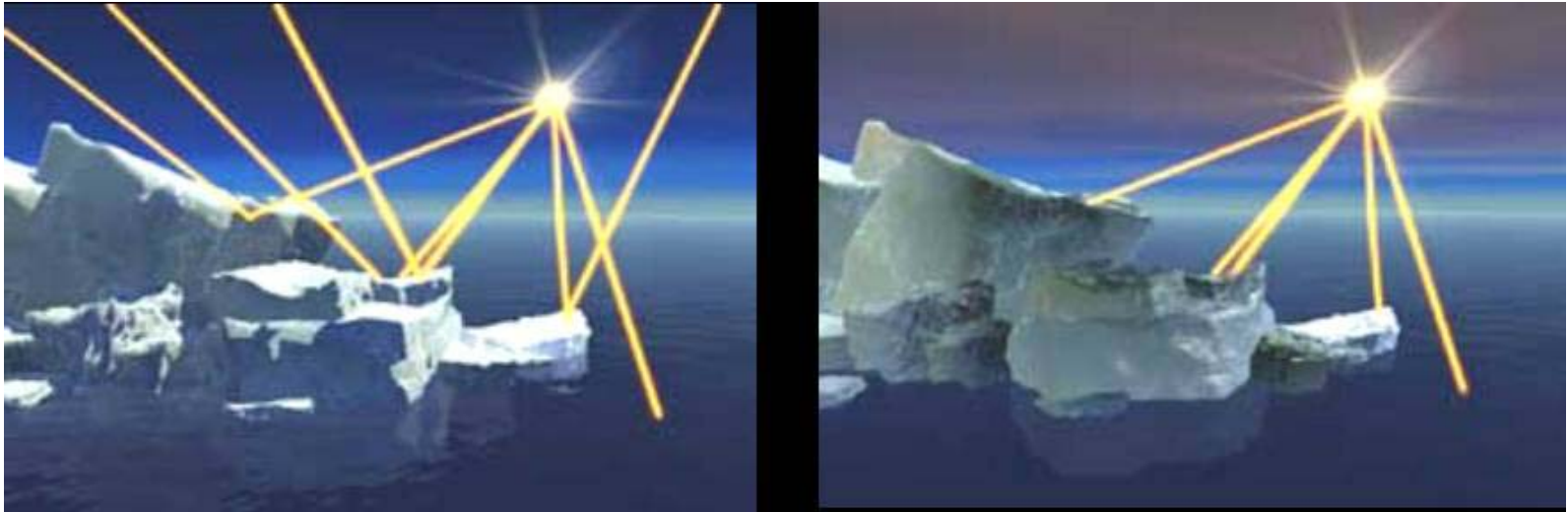
(in inches rainfall)

- black carbon can affect regional climate by absorbing sunlight, heating the air and thereby altering large scale atmospheric circulation and the hydrologic cycle.
- NASA climate study reveals that large amounts of black carbon (soot) particles and other pollutants are causing changes in precipitation and temperatures over China

Air Pollution links with Climate: Examples of Supporting Evidence (2)



Evidence that PM affects albedo and causes melting of ice



- As the dark soot falls on the ice surface, it increases the albedo, reduces its capability to reflect back radiation thereby causing increase in temperature and melting of the ice
- Warming of the Arctic and diminishing of the sea-ice cover and glaciers have been attributed to changing weather and effects of pollution. Black carbon (soot) has been implicated to play a role in the melting of ice and snow.
- Research in the Arctic atmosphere reveals that about one-third of the soot comes from South Asia, one-third from burning biomass or vegetation around the world, and the remainder from Russia, Europe and North America.

Conceptual Logic of Cobenefits of UAQM and CCM



- **Drivers:** Climate change and Urban air quality problems have common drivers such as urbanization and population growth, energy consumption and mobilization
- **Pressure:** Emissions of GHGs and air pollutants from different sources continue to increase
- **State:** Both GHG and air pollutant concentrations in the atmosphere are exhibiting increasing trends
- **Impact:** Both climate change and UAQ problem have human health, environmental (agricultural) and economic impacts
- **Response:** *With these commonalities, it would be logical that the framework or approach to address these two problems would be similar or ideally integrated → Cobenefits approach*

Pragmatic Logic of Cobenefits of UAQM and CCM



- There is a scarcity of resources and capacity to work on air quality management. The same scarcity is true for climate change.
- Expansion of AQ management activities (quantity and quality) will require substantive funding. Likewise expansion of climate change mitigation activities will require substantive funding
- Air pollution community and GHG community need to improve communication towards policy-makers and decision-makers
- Emissions inventory is key to both problems. Integrated development of emissions factor, collection of activity data and inventory training can reduce cost of capacity building
- Alternative funding sources such as GEF may be explored to cofinance co-benefits projects
- There is no need to further wait for more extensive atmospheric research to establish linkages between GHGs, PM and climate change. At this point there is enough information to suggest that an integrated approach to UAQM and Climate Change mitigation can be a win-win solution.

Current Status of Cobenefits Approach in Asia



Air Quality Management	Climate Change Mitigation
<u>Perception</u>	
*Generally perceived as a local problem	*Global problem very seldom perceived as local
*“Health Benefits”	*“Climate benefit”
<u>Monitoring</u>	
*PM, NO _x , SO ₂ , O ₃ , CO and Pb	*CO ₂ , N ₂ O, CH ₄ , sulphur hexafluoride (SF ₆), hydrofluorocarbons (HFC), perfluorocarbons (PFC)
*AQ monitoring is in the cities, AQ modeling on city, regional or global scale	*Monitoring/modeling activities of GHGs is global and at times on regional scale
*Emissions inventory on city scale	*Emissions inventory on national scale
*Poor quality of activity data and emission factors	*Poor quality of activity data and emission factors
<u>Management</u>	
*UAQ planning and management on city-scale	*Climate action plans are drafted on national scale
*Monitoring progress of UAQM is indicated by ambient AQ monitoring and source apportionment techniques	*Monitoring targets and climate action points rely heavily on the baseline and “perceived” reduced emissions outcome

Previous common approaches to resolve UAQ and CC problems, however, have been independent of and disconnected from each other. This practice requires more resources thereby benefits are not maximized.

Cobenefits Tools and Instruments



USEPA-Integrated Environmental Strategies (<http://www.epa.gov/ies/>) - The program promotes the analysis and local support for implementation of policy measures with multiple public health, economic and environmental benefits.

- Used in Argentina, Brazil, Chile, China, India, Mexico, the Philippines and South Korea.

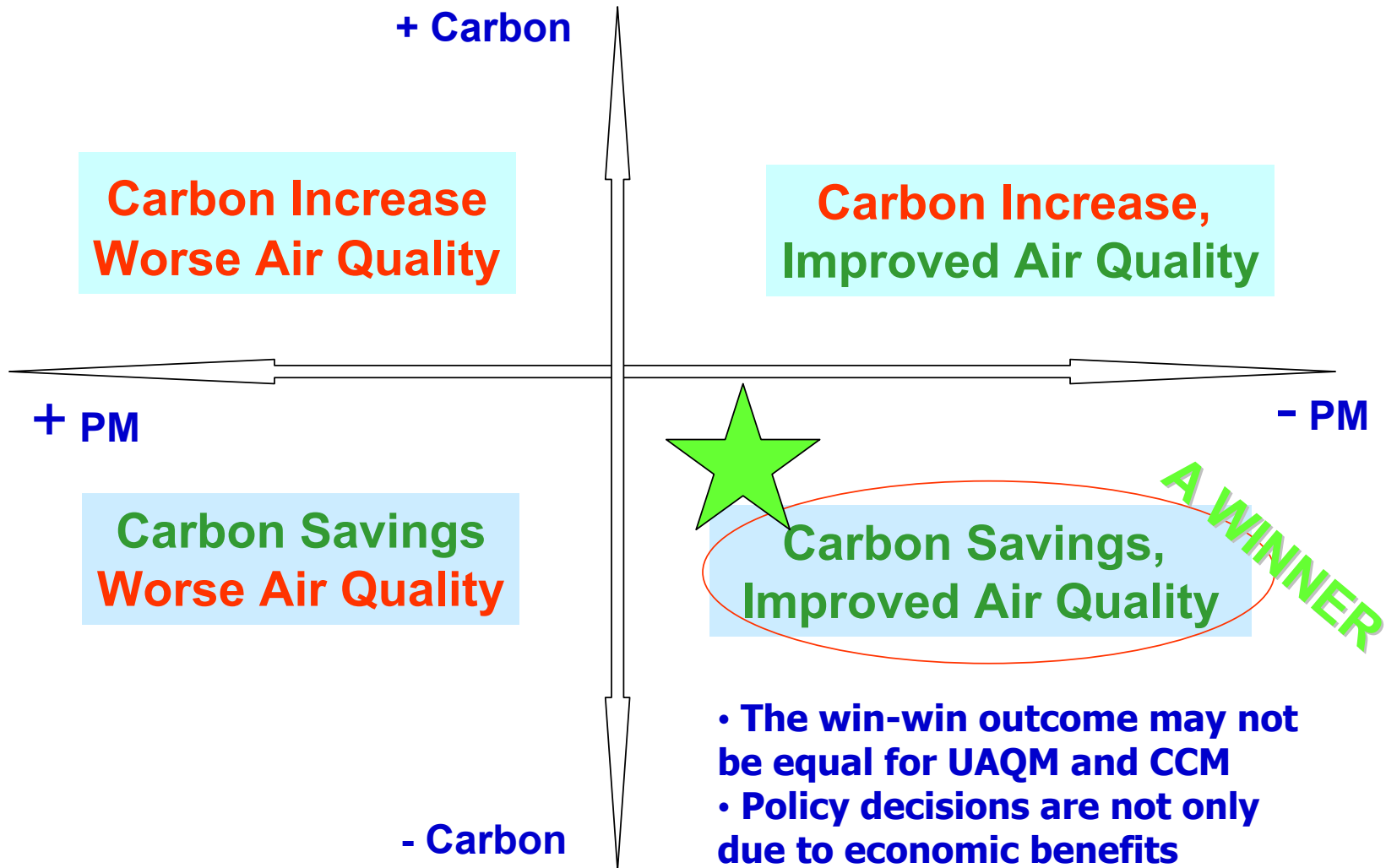
ICLEI Cities for Climate Protection (<http://www.iclei.org>) works with local governments to understand how local actions and practices contribute to the emissions that cause air pollution and global warming.

- Clean Air Project (CAP) Software and Harmonized Emissions Analysis Tool (HEAT) Software are emissions calculation tools used to track local government targets.

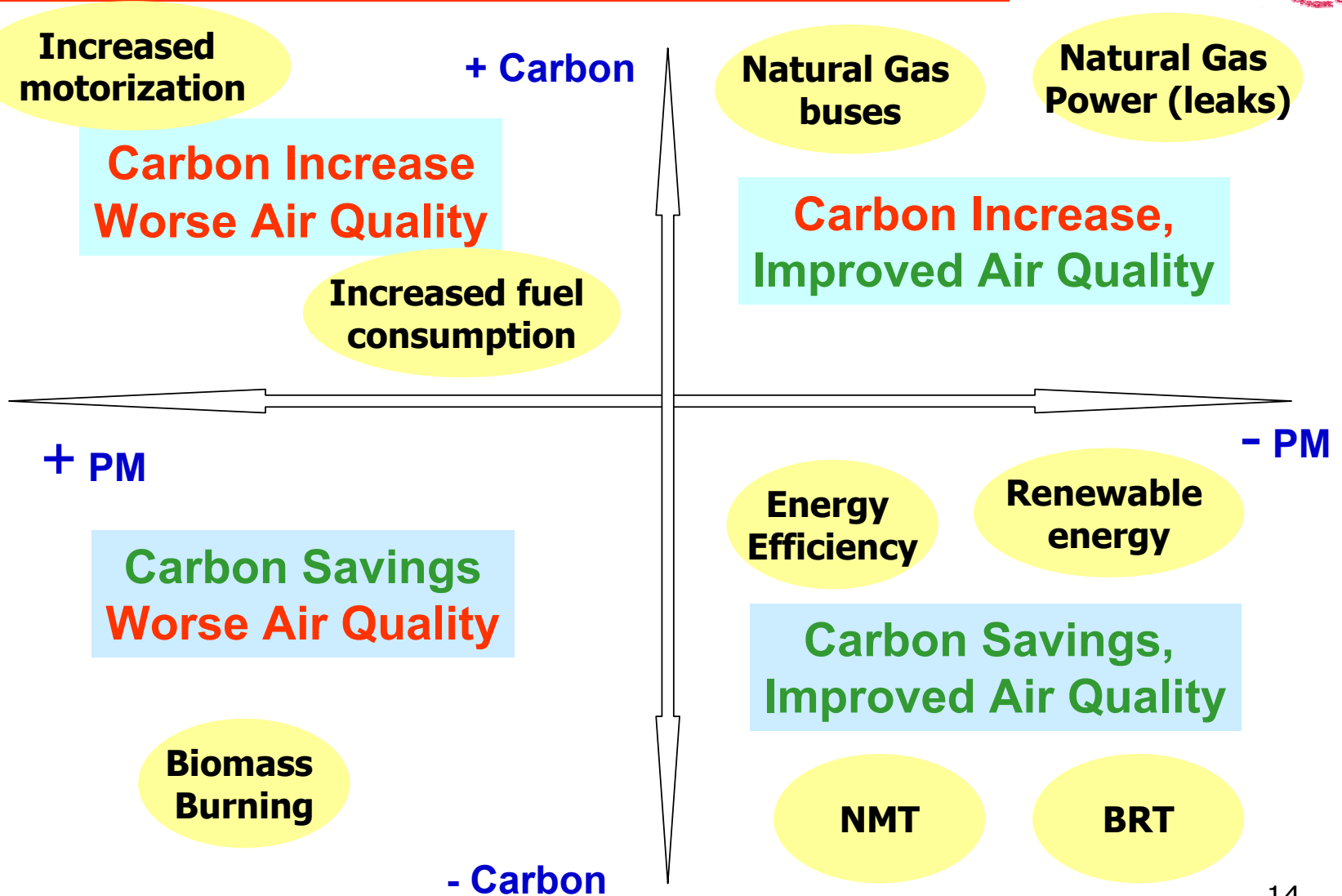
Lifecycle Emissions Model - estimates energy use, criteria pollutant emissions, and CO₂-equivalent greenhouse-gas emissions from a variety of transportation and energy lifecycles.

- It includes input data for up to 20 countries, for the years 1970 to 2050, and is fully specified for the U. S.
- **Regardless whether segregated or integrated tools, there is need for good quality inputs (activity data, emissions factor, etc)**
- **Tools are still relatively untested**
- **Few, if any, have examples of actual policy impacts**

Graphical Representation of Cobenefits



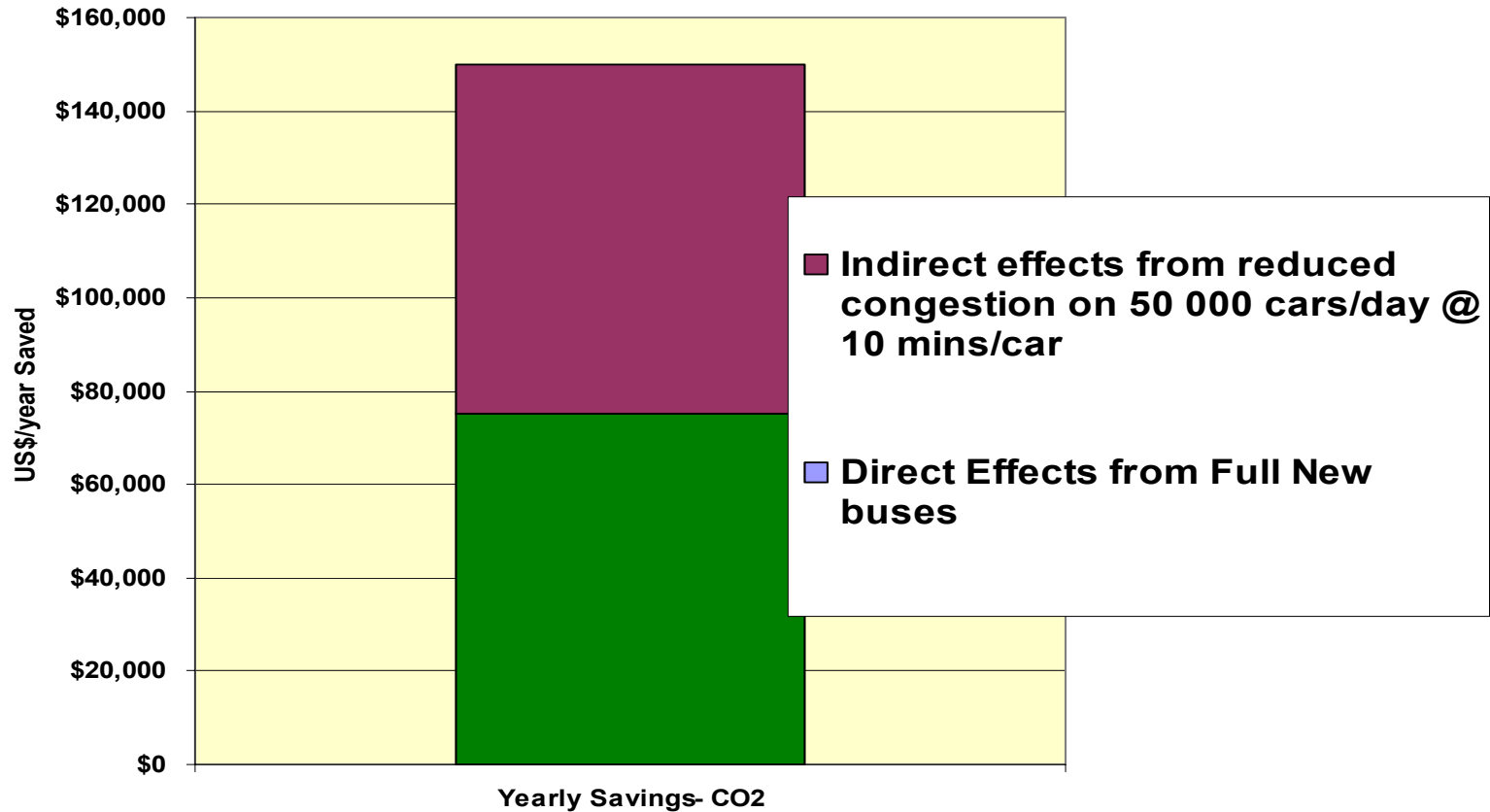
Graphical Representation of Cobenefits



Application of Cobenefits Approach in BRT (1)



GHG Savings at \$5/Tonne: Hypothetical Corridor

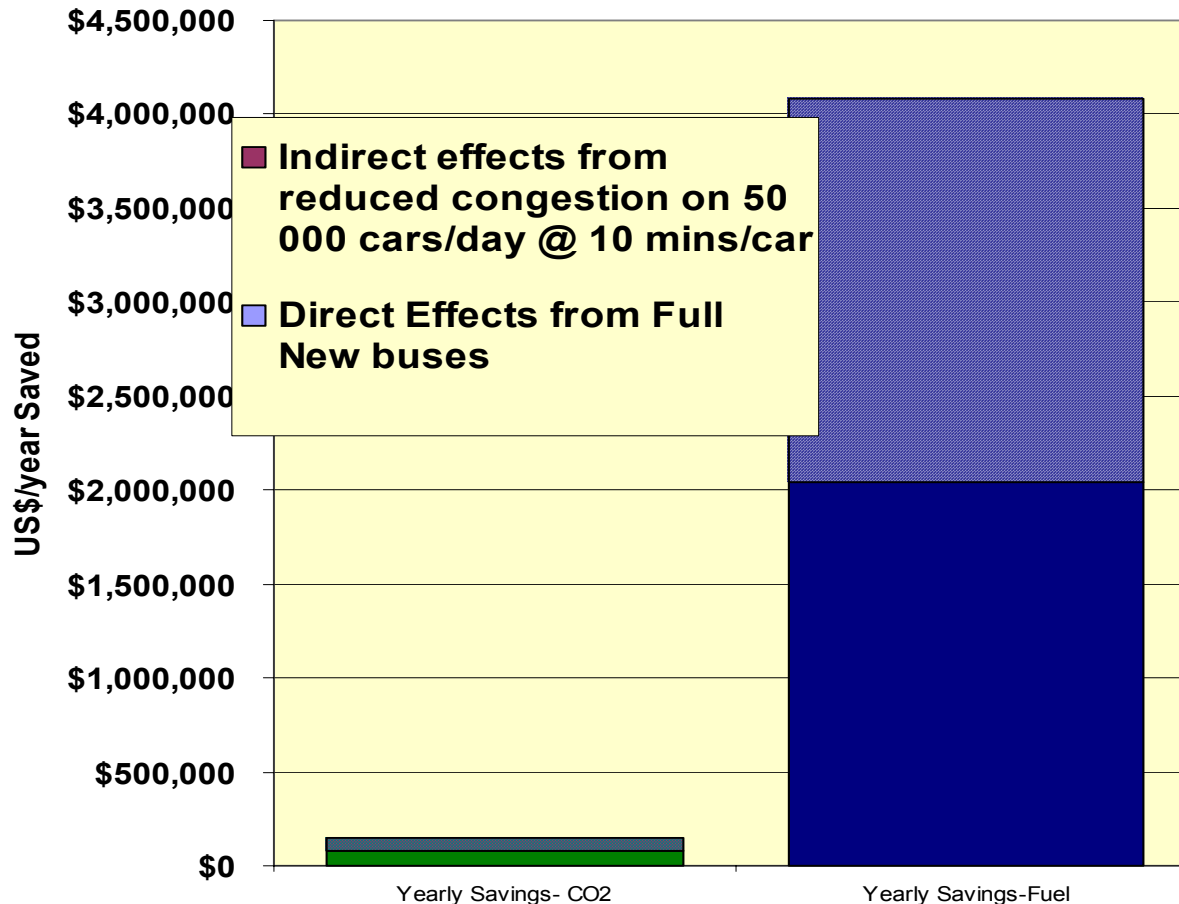


Source: EMBARQ

Application of Cobenefits Approach in BRT (2)



GHG, Fuel Savings (\$340/tonne): Hypothetical Corridor

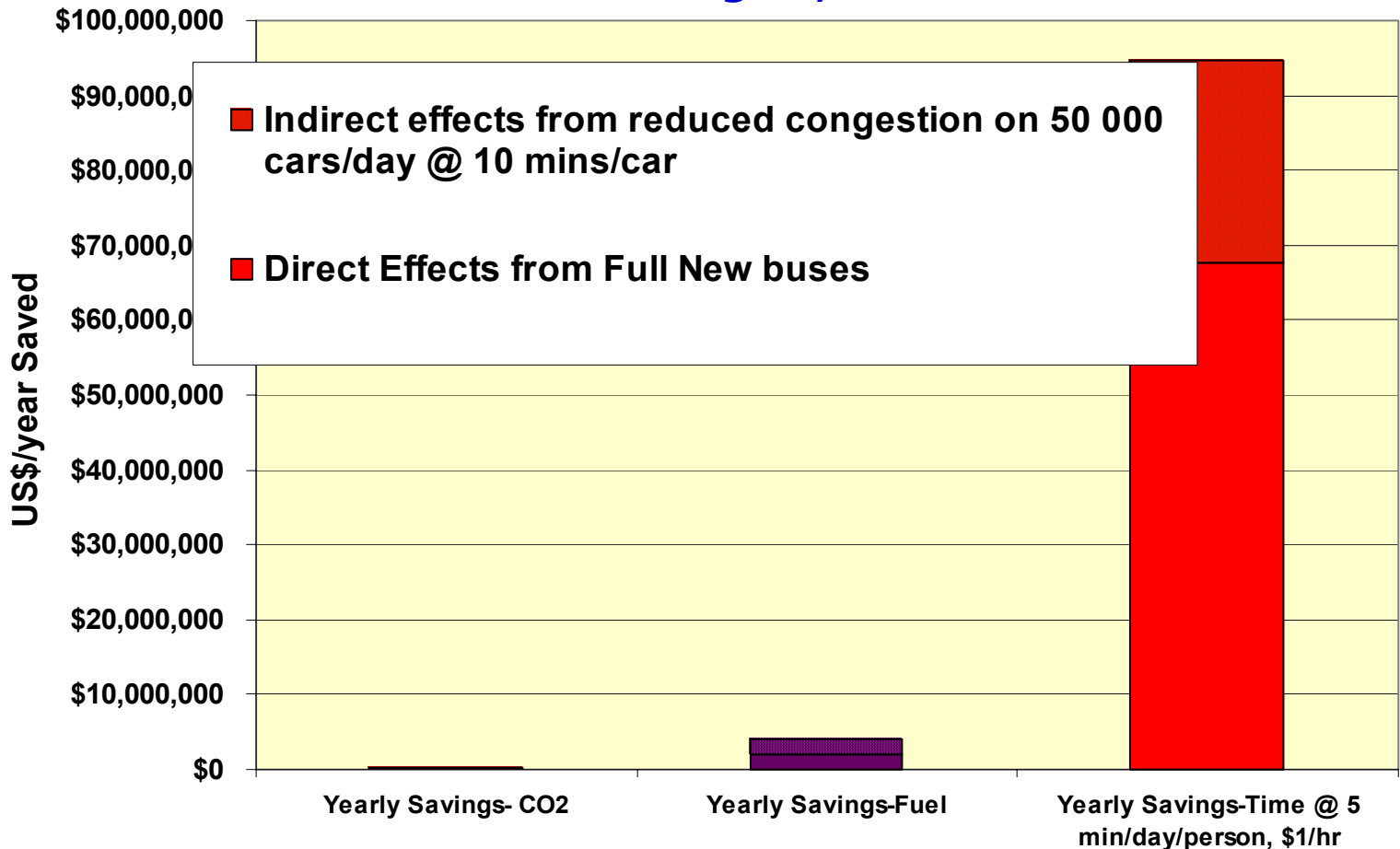


Source: EMBARQ

Application of Cobenefits Approach in BRT (3)



GHG, Fuel, Time (\$1/hour) Savings Corridor Bus Passengers, car drivers



Source: EMBARQ

What are potential next steps of CAI-Asia? (1)



Awareness Raising

- Discuss cobenefits during BAQ 2006 and other workshops
- Knowledge management e.g. website
(<http://www.cleanairnet.org/caiasia/1412/propertyvalue-14675.html>)

Capacity Building

- Training workshop on cobenefits (in coordination with other organizations – IES, ICLEI through CATnet - Asia)

Instrument Development

- Assessment of common tools used for cobenefits on whether they are suitable for use in Asia
- Coordinate with other organizations working on cobenefits to develop tools or disseminate existing tools
- Develop integrated indicators or explore the possibility of using indicators of AQ improvement as indicator of GHG reduction improvement
- Address baseline issue for transport sector

What are potential next steps of CAI-Asia? (2)



Emissions Inventory

- Lobby to refine emissions inventory in national communications, disaggregate emissions factor, include local vs national level inventory

Networking

- OECC, IGES, USEPA – IES, ICLEI, etc
- Facilitate improved communication between Air pollution community and GHG community
- Promote among its members the integration of local air quality management with GHG abatement

Funding

- Work with ADB and other interested parties in developing joint proposal to GEF on sustainable urban transport (OP11)