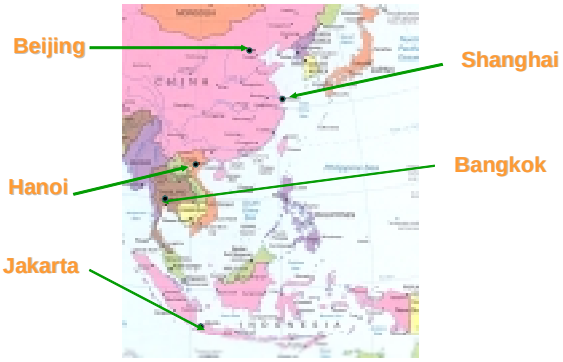
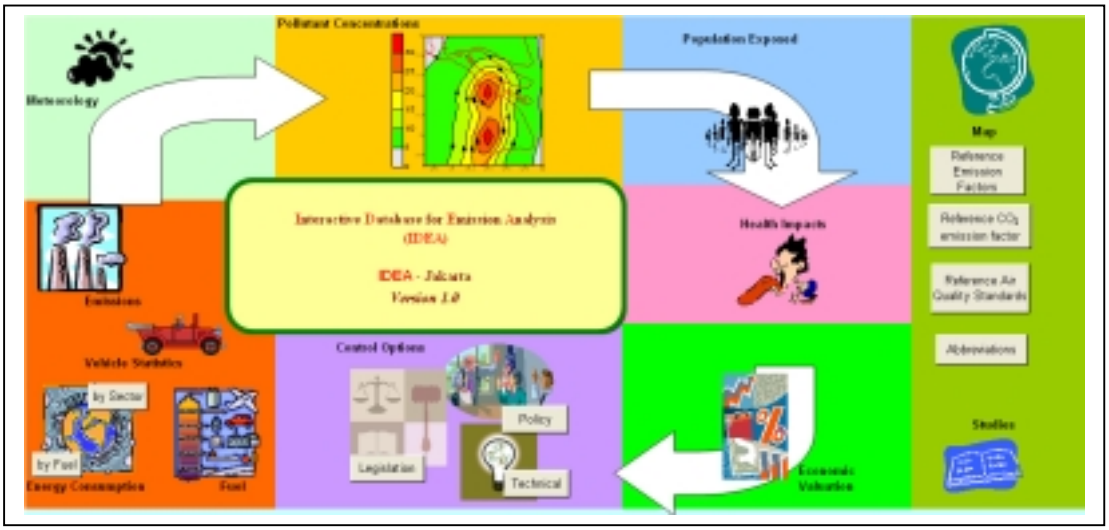
Interactive Database for Emission Analysis (IDEA)

A Brief Introduction

Introduction: Urban air pollution is a significant environmental issue in the developing world and contributes to the burden of disease. This initiative is aimed at developing a systematic knowledge base on urban air pollution in selected cities accessed through an interactive tool. It is expected that this evolving tool would be a key source of information for those involved in air quality management and other environmental assessment activities relating to the cities targeted so that the management options can be evaluated from appropriate economic, social and environmental perspectives.



Integrated Air Quality Management: The problems of air quality need to be analyzed in an integrated manner. In a typical city, including in Megacities, the information available on various aspects of integrated air quality management is usually scattered, fragmented, of uncertain quality and are often inaccessible to those working to improve air quality in these cities. Currently, there is no single public access source for even basic information that would be essential for effective integrated air quality management in practically any city in the developing world.



The IDEA Initiative: The Clean Air Initiative is embarking on an activity to collate existing information on selected cities (initially starting with the five cities of East Asia shown in the adjoining map). This includes general information on these cities (e.g. maps, demography, relevant legislation, air quality projects, studies, etc.), as well as technical information on emissions, dispersion, health impacts, and pollution management options. These data, organized in an interactive EXCEL spreadsheet for easy public access, can be used to get a more synoptic perspective of air quality in the cities as well as to interface with models of air quality where the various economic, technical and policy options could be analyzed in an integrated manner for more informed decision making. The key elements of IDEA are outlined in the following figure.

IDEA: An Outline

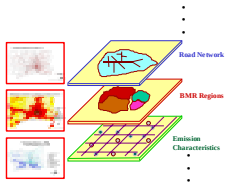
Emissions

Inputs

- Total Fuel Use – Coal, oil, gas, natural gas, alternatives
  - Industrial Fuel Use
  - Electricity Demand
- Vehicle Number by Age/Type
  - Vehicle Km Traveled
  - Trends
- Road Network
- Emission Factors for key pollutants – PM_{10}, SO_2, NO_x, CO_2
- Point Source Locations & Emissions
- Emission Control Scenarios/Options

Emissions

Emission Estimation for Key Pollutants



Outputs

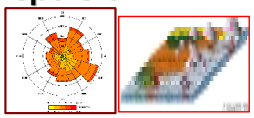
- Emissions apportionment by source
- Spatial distribution
- Projections under various scenarios
- Control vs Cost estimates for key pollutants

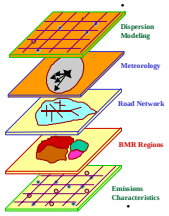
...input into **Dispersion Models**

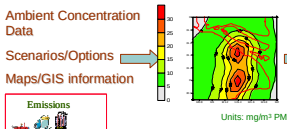
Dispersion

Inputs

- Emission Inventory
- Meteorology
- Ambient Concentration Data
- Scenarios/Options
- Maps/GIS information





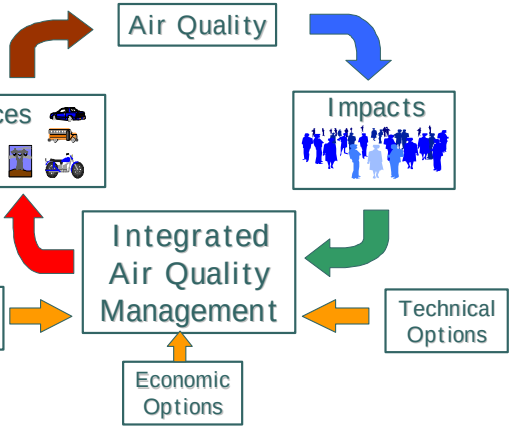


Spatial Distribution of Ambient Concentrations

Outputs

- Ambient Concentrations
- Projections under various scenarios
- Spatial patterns
- Exposure levels

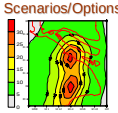
...input into **Exposure Models**



Exposure

Inputs

- Ambient Concentrations
- Population Distribution
- Distribution of other sensitive receptors
- Scenarios/Options



Impact/Exposure Assessment

Outputs

- Health Damages
- Projections under various scenarios

...input into **Economic Analysis Models**

Typical Options for IAQM

- **Economic**: taxes, subsidies, pricing, charges, fines, tradable permits
- **Administrative**: emission, energy efficiency and fuel quality standards, restrictions on operation, inspection and maintenance, industrial compliance
- **Policy**: monitoring, compliance, transport systems, traffic management, public transport, NMT, industry, zoning, land-use
- **Technological**: fuel improvements, cleaner technologies, end-of-pipe control devices, cleaner production

Economic Analysis

$$$

Inputs

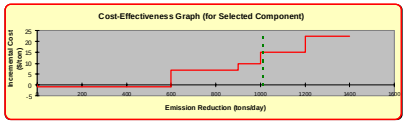
- Health and Other Damages and Valuation under various scenarios/options
- Costs of various options

Economic Analysis of Various Management Options

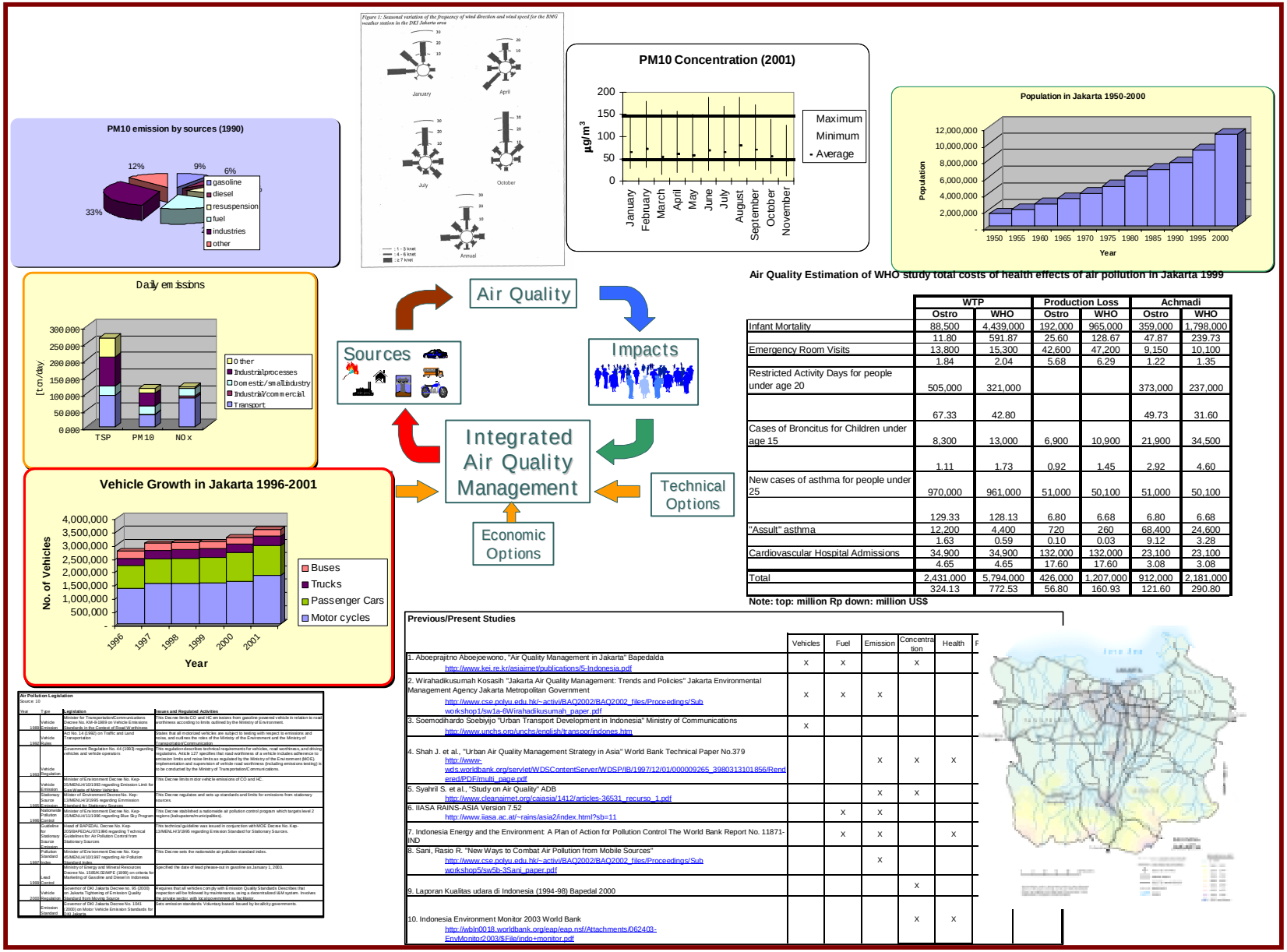
Outputs

- Cost-Effectiveness of various options
- Net Benefits of various options

...input for **Decision Support**



An IDEA Example: Some Elements of a Jakarta Database



Air Quality Estimation of WHO study total costs of health effects of air pollution in Jakarta 1999

	WTP		Production Loss		Achmadi	
	Ostro	WHO	Ostro	WHO	Ostro	WHO
Infant Mortality	88,500	4,439,000	192,000	965,000	359,000	1,798,000
	11.80	591.87	25.60	128.67	47.87	239.73
Emergency Room Visits	13,800	15,300	42,600	47,200	9,150	10,100
	1.84	2.04	5.68	6.29	1.22	1.35
Restricted Activity Days for people under age 20	505,000	321,000			373,000	237,000
	67.33	42.80			49.73	31.60
Cases of Broncitus for Children under age 15	8,300	13,000	6,900	10,900	21,900	34,500
	1.11	1.73	0.92	1.45	2.92	4.60
New cases of asthma for people under 25	970,000	961,000	51,000	50,100	51,000	50,100
	129.33	128.13	6.80	6.68	6.80	6.68
"Assult" asthma	12,200	4,400	720	260	68,400	24,600
	1.63	0.59	0.10	0.03	9.12	3.28
Cardiovascular Hospital Admissions	34,900	34,900	132,000	132,000	23,100	23,100
	4.65	4.65	17.60	17.60	3.08	3.08
Total	2,431,000	5,794,000	426,000	1,207,000	912,000	2,181,000
	324.13	772.53	56.80	160.93	121.60	290.80

Note: top: million Rp down: million US$

Air Pollution Legislation
Source: 10

Year	Type	Legislation	Issues and Regulated Activities
1993	Vehicle Emission	Minister for Transportation/Communications Decree No. KM-9-1993 on Vehicle Emissions Standards in the Control of Road Worthiness	This Decree limits CO and HC emissions from gasoline powered vehicle in relation to road worthiness according to limits defined by the Ministry of Environment.
1992	Vehicle Rules	Act No. 14 (1992) on Traffic and Land Transportation	States that all motorized vehicles are subject to testing with respect to emissions and noise, and outlines the roles of the Ministry of the Environment and the Ministry of Transportation/Communication
1993	Vehicle Regulation	Government Regulation No. 44 (1993) regarding vehicles and vehicle operators	This regulation describes technical requirements for vehicles, road worthiness, and driving regulations. Article 127 specifies that road worthiness of a vehicle includes adherence to emission limits and noise limits, and is regulated by the Ministry of the Environment (MOE). Implementation and massive-test of vehicle road worthiness (including emissions testing) is to be conducted by the Minister of Transportation/Communications.
1993	Vehicle Emission	Minister of Environment Decree No. Kep-35/MENLH/10/1993 regarding Emission Limit for Gas Waste of Motor Vehicles	This Decree limits motor vehicle emissions of CO and HC.
1995	Stationary Source Emission	Minister of Environment Decree No. Kep-13/MENLH/3/1995 regarding Emission Standard for Stationary Sources	This Decree regulates and sets up standards and limits for emissions from stationary sources.
1995	Nationwide Pollution Control	Minister of Environment Decree No. Kep-15/MENLH/11/1996 regarding Blue Sky Program	This Decree established a nationwide air pollution control program which targets level 2 regions (kabupaten/municipalities).
	Guideline for Stationary Source Pollution Standard	Head of BAPEDAL Decree No. Kep-205/BAPEDAL/07/1996 regarding Technical Guidelines for Air Pollution Control from Stationary Sources	This technical guideline was issued in conjunction with MOE Decree No. Kep-13/MENLH/3/1995 regarding Emission Standard for Stationary Sources.
1997	Nationwide Pollution Standard Index	Minister of Environment Decree No. Kep-45/MENLH/10/1997 regarding Air Pollution	This Decree sets the nationwide air pollution standard index.
1999	Lead Control	Ministry of Energy and Mineral Resources Decree No. 3195K/38/MPE (1999) on criteria for Marketing of Gasoline and Diesel in Indonesia	Specified the date of lead phease-out in gasoline as January 1, 2003.
2000	Vehicle Regulation	Governor of DKI Jakarta Decree no. 95 (2000) on Jakarta Tightening of Emission Quality Standard from Mobile Source	Requires that all vehicles comply with Emission Quality Standards Describes that inspection will be followed by maintenance, using a decentralized I&M system. Involves the private sector, with local government as facilitator
	Emission Standard	Governor of DKI Jakarta Decree No. 1061 (2000) on Motor Vehicle Emission Standards for Jakarta	Sets emission standards. Voluntary based. Issued by locality governments.

Previous/Present Studies

	Vehicles	Fuel	Emission	Concentration	Health
1. Aboeprajitno Aboejoewono, "Air Quality Management in Jakarta" Bapedalda http://www.kei.re.kr/asiairnet/publications/5-Indonesia.pdf	x	x		x	
2. Wirahadikusumah Kosasih "Jakarta Air Quality Management: Trends and Policies" Jakarta Environmental Management Agency Jakarta Metropolitan Government http://www.cse.polyu.edu.hk/~activi/BAQ2002/BAQ2002_files/Proceedings/Sub workshop1/sw1a-6Wirahadikusumah_paper.pdf	x	x	x		
3. Soemodihardo Soebiyijo "Urban Transport Development in Indonesia" Ministry of Communications http://www.unchs.org/unchs/english/transpor/indonesi.htm	x				
4. Shah J. et al., "Urban Air Quality Management Strategy in Asia" World Bank Technical Paper No.379 http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/1997/12/01/000009265_3980313101856/Rendered/PDF/multi_page.pdf			x	x	x
5. Syahril S. et al., "Study on Air Quality" ADB http://www.cleanairnet.org/caiasia/1412/articles-36531_recurso_1.pdf			x	x	
6. IIASA RAINS-ASIA Version 7.52 http://www.iasa.ac.at/~rains/asia2/index.html?sb=11		x	x		
7. Indonesia Energy and the Environment: A Plan of Action for Pollution Control The World Bank Report No. 11871-IND		x	x		x
8. Sani, Rasio R. "New Ways to Combat Air Pollution from Mobile Sources" http://www.cse.polyu.edu.hk/~activi/BAQ2002/BAQ2002_files/Proceedings/Sub workshop5/sw5b-3Sani_paper.pdf			x		
9. Laporan Kualitas udara di Indonesia (1994-98) Bapedal 2000				x	
10. Indonesia Environment Monitor 2003 World Bank http://wbln0018.worldbank.org/eap/eap.nsf/Attachments/062403-EnvMonitor2003/$File/indo+monitor.pdf				x	x

Potential utility of IDEA

The tool developed is expected to assist in:

- Developing a systematic knowledge base for city-level air quality management (including key data, studies, etc.)
- Environmental assessment (baseline, impacts, analysis of alternative polluting activities or mitigation measures)
- Providing relevant input information for appropriate analytical models
- Selection and analysis of options/scenarios
- Dissemination among key stakeholders and collaborative partners involved with various aspects of integrated air quality management

An IDEA can only go this far…

Of course, a tool such as this would have its limitations. Specifically,

- The information available is only as good as the source data (as IDEA relies exclusively on secondary information). There will be issues of coverage, quality, consistency, and access problems in sourcing the data in IDEA.
- The types of options for air quality management need to be considered in the specific context and political economy of each particular city.
- The data, tools, methodologies and options for any city will be constantly evolving and indicate a need for constant updating of IDEA.
- The involvement of multiple stakeholders and disciplines would make IDEA more and more complex as it evolves.
- The most important issue is that the data collated actually get USED for more informed decision support.

What Next?

The proposed future activities related to IDEA include:

- Institutional… Development of a collaborative working group on IDEA to further develop a shared knowledge base. An institutional "home" for IDEA is also proposed (e.g. the Clean Air Initiative).
- Going Deeper… This includes including expanding data coverage, improving consistency and quality, interfacing with modeling and decision support tools, piloting use in impact assessment and analysis of alternative strategies and options
- Going Broader… IDEA is proposed to be expanded to cover more cities in east Asia and other regions of the world
- Re-tooling…. Improve tools and techniques for information management and dissemination (e.g. web-based systems)

Disclaimer: This version of IDEA represents work-in-progress at the World Bank and is only intended to pilot the organization of information to support integrated air quality management. All information comes from secondary sources and no assessment of quality of these data has been made.

Request: We request all those who work in the cities initially targeted for IDEA development to suggest any additional sources of information or provide feedback on IDEA so that we can improve and update it further.

IDEA is a product related to the **DIESEL** (Developing **I**ntegrated **E**mission **S**trategies for **E**xisting **L**and transport) program at the World Bank. IDEA has been developed in the East Asia Region of the World Bank. Please direct future enquiries to Jitendra Shah (jshah@worldbank.org) and Eri Saikawa (esaikawa@indiana.edu).