AIR QUALITY MANAGEMENT IN MEGA-URBAN REGIONS OF SOUTHEAST ASIA

Hernani Yulinawati

University of Hawaii at Manoa, Department of Urban and Regional Planning
2424 Maile Way Rm. 107, Honolulu, HI 96822, U.S.A., hernani@hawaii.edu
East-West Center Degree Fellow, Lecturer at Trisakti University – Jakarta

ABSTRACT

This paper aims to propose an ideal integrated AQM framework for mega-urban regions in Southeast Asia. Based on an assessment of eight frameworks (e.g., Elsom, URBAIR, US-IES, etc.), a proposed integrated approach means: 1) to establish connections with other environmental issues and multiple sectors, such as land use, transportation and industrial sectors; 2) to include socio-cultural aspect besides technological and economical concerns; 3) to incorporate local or regional efforts into a global context; 4) to have strong coordination within and between agencies; and 5) to widen stakeholders participation in the decision-making process.

Key Words: Air Quality Management, Mega-Urban Regions, Southeast Asia.

1. INTRODUCTION

Urbanization is one of the most significant issues facing Asia. In 2001, 36 percent of Asia's 3,500 million inhabitants lived in urban areas, and by 2020 half of the total Asian population will be living in urban areas. There are 12 megacities (10 million or more inhabitants) in Asia: Beijing, Calcutta, Delhi, Dhaka, Jakarta, Karachi, Metro Manila, Mumbai, Osaka, Seoul, Shanghai, and Tokyo (UNEP, 2003). Many of these megacities have expanded as far as 50 km or more from their urban core into peri-urban hinterlands known as mega-urban regions or MURs (McGee and Robinson, 1995). Outdoor (ambient) air pollution is an important issue in these areas due to a growing number of motor vehicles and increasing industrial activities. Most of these cities have exceeded ambient standards limiting the average annual concentration of suspended particulate matter (SPM), particulate matter less than $10\mu m$ (PM_{10}), sulfur dioxide (SO_2), and nitrogen dioxide (NO_2) as indicated by the WHO Air Management Information System Database 1990-1999. Air pollution in Asian cities has put lives of millions in vulnerability, approximately 487,000 Asians or 61 percent from a global estimate of 799,000 at risk of premature death because of poor outdoor air (WHO, 2002). Urban governments need to establish an air quality management (AQM) framework that enables them to take measures to promote healthier air quality (Elsom, 1996).

Urban AQM requires an integrated approach that determines which air pollutants are more serious problems; identifies the measures that offer feasible solutions across a range of economic sectors and pollution sources, and builds a consensus among key

stakeholders concerning environmental objectives, policies, implementation measures, and responsibilities (World Bank, 1998). International organizations such as the WHO, World Bank, and ADB have already conducted projects to assist developing countries to develop AQM. Still, air pollution continues to be a serious problem in many Asian MURs. The challenges of AQM in Asia range from a lack of government commitment and stakeholder participation, weaknesses in policies, standards and regulation, to deficiencies in data on emissions, air quality and impacts on human health and the environment (APMA and CAI Asia, 2004).

It is realized that in pursuing cost-effectiveness AQM needs to formulate a policy that brings all the stakeholders together in managing better urban air quality. Therefore, this paper aims to propose an integrated AQM framework for MURs that facilitates broader participation from all air quality stakeholders in the context of good governance. Based on a literature review and secondary data, this paper evaluates eight AQM frameworks: 1) Elsom; 2) World Bank-Urban Air Quality Management Strategy (URBAIR); 3) Norwegian Institute for Air Research (NILU); 4) Asian Development Bank (ADB); 5) Air pollution in the Megacities of Asia (APMA) and Clean Air Initiative for Asian Cities (CAI Asia); 6) Europe-United Kingdom (UK); 7) the United States Integrated Environmental strategies (US-IES); and 8) Alabastro on how they address integrated AQM and stakeholders involvement. The paper also identifies the institutional mechanism of air quality governance in MURs of Southeast Asia, specifically Bangkok, Jakarta, Manila, and Ho Chi Minh City (HCMC) in formulating stakeholders involvement in AQM planning and implementation.

2. AIR QUALITY MANAGEMENT FRAMEWORKS

In recent decades, concern about urban air pollution has extended to a scale previously neglected, including smaller scales such as individual households and larger scales such as entire regions. Accompanying this expansion in scales has been an expansion in the nature of negative health impacts that are of concern. Examination of air pollution at smaller scales is necessary because it has become clear that in some cases potential health impacts associated with indoor air quality are not always well predicted by outdoor measurements. Expansion of concern to larger scales has also been required because it has become known that some pollutants can travel large distances over time beyond the emission site, thus resulting in regional and global impacts (Smith and Akbar, 2003).

Table 1 shows the AQM development approaches that are divided into three major periods. Some of the economically more developed regions, such as USA, Europe, and Japan, have step-by-step tackled, more or less, the first period, are well into the second period, and are starting to tackle the third period. Less economically developed regions, such as those in Asia, find themselves, even if progress has been made on the first and second periods, having to tackle all three periods simultaneously. That is an enormous task, which requires developing regions to mobilize a lot of resources (Larssen et al., 2003).

Table 1. Three major periods of AQM development in a region

Period	AQM Development	Focuses
First	Industrial source pollution control	• local and regional scale • SO_2, SPM/TSP, heavy metals • cleaning at stack/improving technologies/moving sources
Second	Urbanization and pollution control	• traffic/urban population exposure • households (space heating, cooking practices)
Third	Co-management of air quality and climate change issues	• benefits on air quality of climate change-driven policies • local emissions control options with a view to their effect on the climate

(Larssen et al., 2003)

Some examples of frameworks are discussed in this paper can be seen in Figures 1 to 3. Elsom's framework (Figure 1) shows the components of an urban air quality management system that they all form part of an integrated system (Elsom, 1996). He claims that if authorities give inadequate attention to one component, it is likely to result in limitations in the effectiveness of the entire system. Realizing that air pollution is influenced by rapid urbanization and motorization in the city, Elsom suggested to incorporate other air pollution–related aspects such as transportation and land use in the model if an integrated urban AQM framework is really employed.

The APMA and CAI Asia (2004) offer seven key components in the Strategic Framework for AQM in Asia, which are: 1) air quality policies, 2) air quality governance, 3) emissions, 4) air quality modeling, 5) air quality monitoring; 6) health, environmental, and economic risk assessments, and 7) financing of AQM. The AQM as envisioned in this Strategic Framework will enable governmental authorities to collaborate with a broad range of stakeholders. A simplified framework proposed by APMA and CAI Asia (Figure 2) recognizes the importance of emissions standards as well as air quality standards. Apparently, for developing countries, the regulations and implementations of these standards are formed mostly by the economic reasons and prevailing political constellation in the decision-making process. Lack of sufficient political will is a top barrier in AQM development in most of Asian cities (APMA and CAI Asia, 2004).

Dramatic increases in global population and urbanization, and rapid industrialization in many regions of the world may have significant consequences for air quality on a broad regional or even global scale (NRC, 2001). The U.S. Environmental Protection Agency (EPA) has initiated an integrated environmental strategy (IES) program for AQM that links local urban air pollution mitigation to global climate change mitigation – the greenhouse gases reduction (Figures 3). The IES utilizes a country-driven approach where each country tailors the program to best meet its need and priorities. Argentina, Brazil, Chile, China, India, Mexico, South Korea, and Philippines are participating in the IES program (US EPA, 2000).
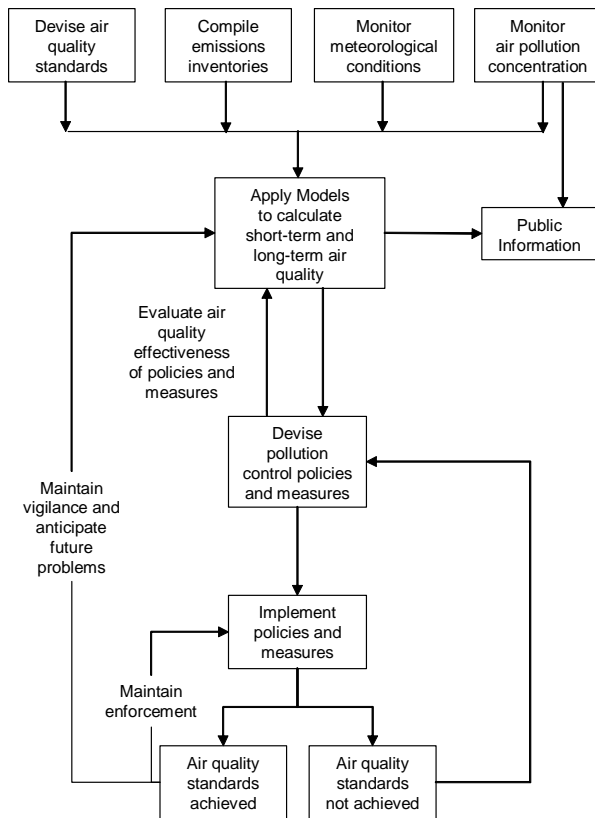
Figure 1. Elsom's framework for air quality management (Elsom, 1996)
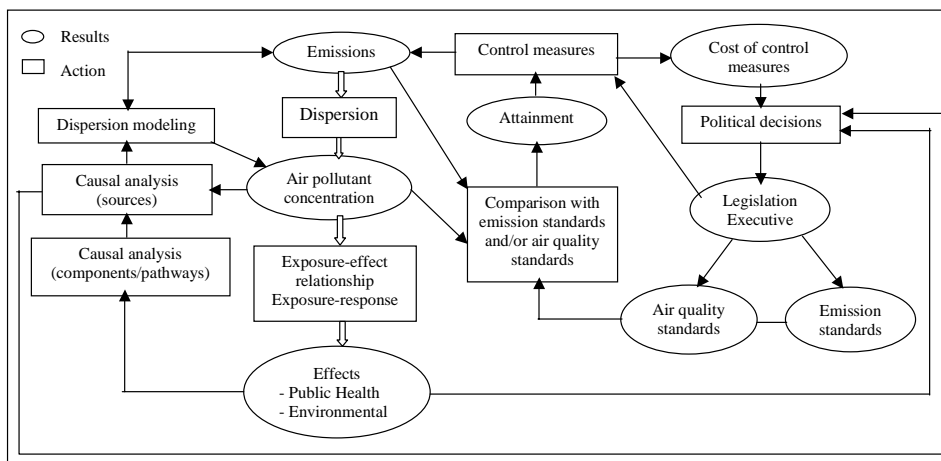

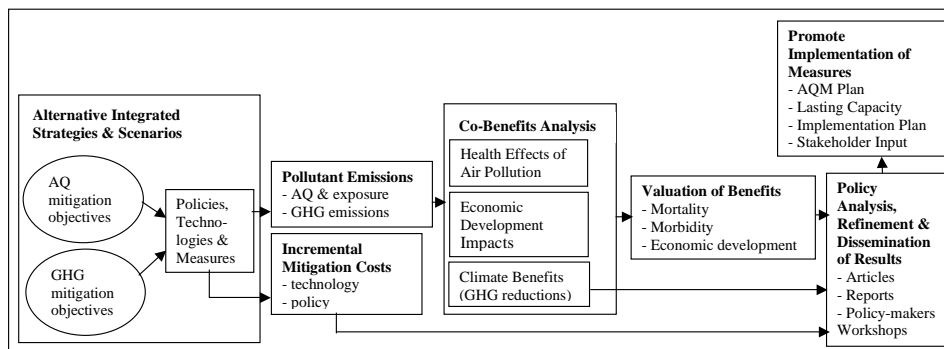Figure 2. Framework for AQM proposed by APMA and CAI Asia (2004)

Figure 3. The U.S. Integrated Environmental Strategies (US EPA, 2000)

Since mobile sources contribute over 60-80 percent of air pollution problems in many Asian cities, most AQM frameworks in Asia focus on mobile source. For long term, it is important to consider an overall view of urban air quality rather than to focus on a single-pollutant or isolated problems (Molina and Molina, 2004). Therefore, integration policy with other air pollutant sources, i.e., from industries and households should be carefully managed by MURs in Southeast Asia. In view of the multiple sources, multiple pollutants, and multiple impacts of air pollution, the ideal integrated urban AQM proposed for developing countries should be integrated with other environmental issues; integrated with social/cultural aspects as well as economic and technical aspects; and considering the relation between local, regional, and global air quality issues. The empowerment of local AQM will be an essential foundation for building integrated AQM in MURs of Southeast Asia that are currently experiencing decentralization. Local AQM would acknowledge its local socio-economic conditions, and should have inter-correlation with other local AQMs. Each local AQM should be consistent with national AQM guidelines and policies. On the other hand, the national AQM should acknowledge local socio-economic conditions. National AQM of a country should recognize neighboring countries and should juxtapose with regional and global AQM guidelines and policies.

In developing and implementing AQM policies, locals could also establish collaborations not only with other local or national entities, but also with regional and/or global institutions. Capable institutions are needed to coordinate the multi-sector issue, multi-sector approach, and multiple priorities of stakeholders in achieving better urban air quality. It is necessary that a good integrated urban AQM should have a framework that represents the stakeholders' roles besides the general aspects of AQM. Greater stakeholder involvement is a key in developing an AQM framework and implementing it. Although various AQM frameworks claimed that they pursue an integrated approach, none of the frameworks really fulfill the integrated term as mentioned above. It is difficult to capture local, regional, and global AQM aspects in one perfect framework, and even more difficult for MURs. Table 2 shows the summary findings from the various AQM frameworks.

1266

Table 2. Evaluation summary of AQM frameworks

AQM Frame-work	Approach	Integrated with other environmental issues or other sectors	Integration between technological, economical and social/cultural, aspects	Integration between local/urban, regional and global issues	Coordination between sector	Stakeholders involvement
1. ELSOM (1996)	Basic AQM	Limited to air pollution issue	More technical	General	Unseen	Public information
2. URBAIR (Shah et al., 1997)	Urban Metro-politan	Limited to air pollution issue	Economical and technical	Unseen	Unseen	Unseen
3. NILU (2003)	Country	Limited to air pollution issue	Economical and technical	Unseen	Unseen	Societal drivers
4. ADB (Huizenga et al., 2003)	Region-al	Focus on vehicles emission reduction	Economical and technical	Unseen	Land use, transportation and energy sectors	Considering stakeholders involvement
5. APMA and CAI Asia (2004)	Region-al	Focus on harmonization of emission standards	Economical, technical, and political	Unseen	Unseen	Unseen
6. EUROPE/UK (Beattie et al., 2001)	Local	Transportation issue, Agenda 21	All aspects at local level	Focus on local issue	Between department, local, and national authorities	Local stake-holders
7. US-IES (US EPA, 2000)	Local to Global	Integrated global climate change issue (GHG mitigation)	Economical and technical	Link urban to global	Unseen	Considering stakeholders input
8. ALABAS-TRO (2002)	Local to Global	Limited to air issues from transportation and industrial sector	Missing economical aspect	Considering international harmonization	Transportation and industrial sectors, institutional building	Stakeholders involvement in legislative and executive

Note: Unseen = not clearly shown in AQM framework.

3. STAKEHOLDERS INVOLVEMENT IN AIR QUALITY MANAGEMENT

It is believed that comprehensive and integrated AQM can be achieved through good air quality governance. Air quality governance is a relatively new discourse along with the democratization process that is underway in most Southeast Asian countries. A concept of governance recognizes that power exists inside and outside the formal authority and institutions of government. Three constituents of governance are government/state, the private sector/corporate economy, and civil society/public (UN Habitat, 2004). Inclusive strategic planning and decision-making processes are the keys to good governance and sustainable cities. Good urban governance is characterized by the universal norms of sustainability, subsidiarity (of authority and resources to the closest appropriate level), equity, efficiency, transparency and accountability, civic engagement and citizenship, and security. These norms are interdependent and mutually reinforcing and can be operationalized (UN Habitat, 2004), and are also applied in term of good urban air quality governance.

If reducing air pollution is not a priority for MURs, it will become a worsening problem. Many developing countries have extensive regulations but often are not applied effectively because of the lack of proper institutions, legal systems, political will, and competent governance. Unfortunately, established political and administrative institutions are usually obsolete for dealing with the problems that occur with the expansion of MURs, particularly where socio-economic conditions are changing rapidly. Political leadership is needed to cut through overlapping and conflicting jurisdictions and short-time horizons (Molina and Molina, 2004).

The most important challenge of air quality governance in Asia involves conflicts that arise because of overlapping responsibilities in AQM (APMA and CAI Asia, 2004). Further, air quality governance in Asia lacks baseline research on awareness-raising among stakeholders; rules and regulations, particularly in neighboring jurisdictions; marketing skills in awareness-raising programs; accountability of agency and staff for inefficient use of funds in AQM; staff with specialized skills; reporting to higher-level management in agencies (e.g. brief to Minister); clear public mechanisms to appeal against new laws and policies; inter-agency communication; and financial resources (APMA and CAI Asia, 2004). Therefore, institutional set-up and mechanisms for stakeholder involvement become important in air quality governance. A major hindrance in environmental decision-making is the lack of collaborative institutional arrangements among principal actors of government, civil society, and private enterprise because each of these actors has different drivers that lead them to manage the environment (Douglass and Ooi, 2000).

The stakeholders who have roles in AQM are the national and local government, implementing national/local agencies, legislators, judiciary, private sector, and civil society including non-governmental organizations (NGOs), media, and academia (APMA and CAI Asia, 2004). Lovei (2003) also includes an international organization (i.e., World Bank) as part of stakeholders. Divergent stakeholders play different roles in formulating and implementing air quality policies.

The impacts of AQM will affect all stakeholders. Hence, stakeholders need an understanding of risk perception that allows the establishment of risk communication strategies to enable the transfer of adequate and reliable information equally among them. Therefore, environmental justice is one crucial dimension of environmental management (Friedmann, 1999) that should be included in an ideal AQM. However, the information of epidemiologic studies of air pollution in Asia is limited. For example, in the period of 1980–2003, there were six studies in Bangkok, two in Jakarta, 16 in Hong Kong, five in Tokyo, and two in Shanghai. Daily time series studies, studies of chronic effects, and integrated capacity building are relatively new types research in Asian cities (PAPA, 2003).

Most of Southeast Asia's governances are in transition. Eeven though there is a trend toward strong environmental laws, the institutions have yet to evolve, especially in expanding role of local governance and people (Roychowdhury, 2003). Douglass and Ooi (2000) emphasized that innovative ways to dramatically raise local capacities for reversing trajectories of environmental deterioration are needed. New mechanism and institutional arrangements are required to widen stakeholders' involvement in the integrated AQM. In Indonesia, programs of the Division of Public Empowerment are still at the level of participation rather than the real empowerment and Jakarta Mega-Urban Region (Jabodetabek) is only a term, not an operationalized concept (World Bank, 2003). Vietnam has started public participation through Strengthening Institutional Capacity for Environmental Information Management (ADB, 2003).

In the Philippines, the operationalization of multisectoral coalitions is co-chaired by NGO, private sector, and government for raising public awareness activities to prepare the public for new policies. A permanent institutional mechanism, the Air Quality Governing Board, is formed to integrate stakeholders' involvement. Citizens can file lawsuits against anyone who is violating the Clean Air Act to ensure law enforcement work well. A comprehensive program to address air pollution in Metro Manila was approved with support funding from ADB (World Bank, 2000).

In 2002, the Government of Thailand announced the new institutional arrangements, the Ministry of Natural Resources and Environment that was created to oversee environmental management, including AQM. It is expected to improve coordination and integration of environmental functions across agencies and enhance service delivery, one of the weakest aspects. A metropolitan government also will be developed to cover four provinces of Bangkok, Thon Buri, Nonthaburi and Samut Prakan (World Bank, 2002).

4. CONCLUSIONS

Based on the assessment of various AQM frameworks, a proposed integrated approach means: 1) to establish connections with other environmental issues and multiple sectors, such as land use, transportation and industrial sectors; 2) to include cultural and social aspects besides technological and economical concerns; 3), to incorporate local or regional efforts into a global context; 4) to have strong

coordination within and between agencies; and 5) to widen stakeholder participation in the decision-making process. However, most AQM frameworks do not clearly show how to integrate different tiers of government within MURs.

Air quality governance is a relatively new discourse along with the democratization and decentralization process underway in most countries of Southeast Asia. The implementation of an integrated AQM at the MUR level is challenging as MURs often consist of different tiers of government within different authorities. Inclusion of three constituents of air quality governance —government, civil society, and private sector— in an integrated AQM needs formal legal and institutional set-up to achieve effective AQM implementation for better air quality.

To ensure that an integrated AQM could be implemented appropriately and give the desired results, several key components should be acknowledged: 1) effective communication, collaboration, and consultation between and within stakeholders; 2) functioning working groups (within local authorities and regionally); 3) collaborative processes within and between relevant bodies; 4) collaboration between different tiers of government; 5) although mobile sources are the current main concern for most MURs in Southeast Asia, integration policy with other air pollutant sources, i.e., from industries and households should be carefully managed; 6) ensuring that funding is available and properly allocated; 7) strong political commitment is crucial in developing institutional capacity; and 8) sharing information equally among stakeholders. It is hoped that this paper will contribute to the development of AQM planning, particularly for the MURs in developing countries of Southeast Asia.

5. ACKNOWLEDGEMENTS

REFERENCES

Air Pollution in the Megacities of Asia (APMA), Clean Air Initiative for Asian Cities (CAI Asia), 2004. A strategic framework for air quality management in Asia, Stockholm Environment Institute, Korea Environment Institute, Ministry of Environment-Korea, Seoul.
Alabastro, E., 2002. Model for an integrated urban air quality management, Presented at the A&WMA Forum, Baltimore, USA, 23-25 June.
Asian Development Bank (ADB), 2003. Integrated action plan to reduce vehicle emissions in Vietnam, ADB, Manila.
Beattie, C.I., Longhurst, J.W.S., Woodfield, N.K., 2001. Air quality management: Evolution of policy and practice in the UK as exemplified by the experience of English local government. Atmospheric Environment 35, 1479-1490.
Douglass, M., Ooi, G.L., 2000. Industrializing cities and the environment in Pacific Asia: Toward a policy framework and agenda for action. In: Angel, D., Rocks, M. (Eds), A clean revolution in Asia, Greenleaf, Sheffield.

Elsom, D., 1996. Smog alert: Managing urban air quality, Earthscan, London.

Friedmann, J., 1999. The new political economy of planning: The rise of civil society. In: Douglass, M., Friedmann, J. (Eds.), Cities for citizens: Planning and the rise of civil society in a global age, John Wiley & Sons, London, 19-38.

Huizenga, C., 2003. ADB policy guidelines on reducing emissions from mobile sources, Presented at the Mayors of the Asia Pacific Environment Summit (MAPES), Hawaii, USA, 22-24 September.

Larssen, S., Shah, J., Murray, F., Suzuki, K., 2003. Comparative approaches to air quality management in Asia, USA, Europe, Japan and Australia, Presented at the Better Air Quality (BAQ) 2003 Workshop, Manila, Philippines, 17-19 December.

Lovei, M., 2003. Reducing urban air pollution: Policies and effective approaches for mobile sources in Asian countries, Presented at the BAQ 2003 Workshop, Manila, Philippines, 17-19 December.

McGee, T.G., Robinson, I.M. (Eds.), 1995. The mega-urban regions of Southeast Asia, University of British Columbia Press, Vancouver.

Molina, M.J., Molina, L.T., 2004. Megacities and atmospheric pollution. Journal Air and Waste Management Association, 54, 644-680.

Norwegian Institute for Air Research (NILU), 2003. Air quality management strategy, www.nilu.org.

National Research Council (NRC), 2001. Global air quality: An imperative for long-term observational strategies, National Academic Press, Washington, D.C.

Public Health and Air Pollution in Asia (PAPA), 2003. Current knowledge, New research, Presented at BAQ 2003 Workshop, Manila, Philippines, 17-19 December.

Roychowdry, A., 2003. Integrated strategy to reduce mobile source emissions: Need for local action, Presented at the MAPES, Hawaii, USA, 22-24 September.

Shah, J.J., Nagpal, T., Brandon, C.J. (Eds.), 1997. Urban air quality management strategy in Asia: Guidebook, World Bank, Washington D.C.

Smith, K.R., Akbar, S., 2003. Health-damaging air pollution: A matter of scale. In: McGranahan, G., Murray, F. (Eds.), Air pollution and health in rapidly developing countries, Earthscan, London.

U.S. Environmental Protection Agency (EPA), 2000. Developing countries case studies: Integrated strategies for air pollution and GHG mitigation, U.S. EPA, Washington, D.C.

UN Habitat, 2004. Principles of good urban governance, www.unhabitat.org/campaigns/governance.

United Nations Environment Programme (UNEP), 2003. Global environmental outlook 3, Earthscan, London.

World Bank, 1998. Pollution prevention and abatement handbook: Urban air quality management, World Bank, Washington D.C.

World Bank, 2000. Philippines environment monitor, World Bank, Washington, D.C.

World Bank, 2002. Thailand environment monitor: Air quality, World Bank, Washington, D.C.

World Bank, 2003. Indonesia environment monitor, World Bank, Washington, D.C.

World Health Organization (WHO), 2002. World health report 2002, WHO, Geneva.