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28 December 2005

Technical Assistance to Viet Nam
for Air Pollution, Poverty, and Health Effects
in Ho Chi Minh City
(Financed by the Poverty Reduction
Cooperation Fund)

The attached Report is circulated for the information of the Board. The President approved the technical assistance on 5 December 2005.

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Technical Assistance

Project Number: 39076
December 2005

Technical Assistance
Socialist Republic of Viet Nam: Air Pollution,
Poverty, and Health Effects in Ho Chi Minh City
(Financed by the Poverty Reduction Cooperation Fund)

Asian Development Bank

CURRENCY EQUIVALENTS

(as of 01 November 2005)

Currency Unit	–	dong (D)
D1.00	=	\$0.000063
\$1.00	=	D15,903

ABBREVIATIONS

ADB	–	Asian Development Bank
ALRI	–	acute lower respiratory infection
APPH	–	Air Pollution Poverty and Health Effects in HCMC
AQM	–	air quality management
CAI-Asia	–	Clean Air Initiative for Asian Cities
CPRGS	–	Comprehensive Poverty Reduction and Growth Strategy
DOH	–	Department of Health
DOLISA	–	Department of Labor Invalid and Social Affairs
EWC	–	East West Center
HCMC	–	Ho Chi Minh City
HEI	–	Health Effects Institute
HEPA	–	HCMC Environmental Protection Agency
NILU	–	Norwegian Institute for Air Research
PAPA	–	Public Health and Air Pollution for Asia Program
PRF	–	Poverty Reduction Cooperation Fund
TA	–	technical assistance
US-AEP	–	United States-Asia Environmental Partnership

TECHNICAL ASSISTANCE CLASSIFICATION

Targeting Classification	— Targeted intervention
Sector	— Health, nutrition, and social protection
Subsector	— Health systems
Themes	— Environmental sustainability, inclusive social development
Subthemes	— Urban environment improvement, environmental policy and legislation, and human development

NOTE

In this report, “\$” refers to US dollars.

Vice President	L. Jin, Operations Group 1
Director General	R.M. Nag, Mekong Department (MKRD)
Director	U. Malik, Agriculture, Environment and Natural Resources Division, MKRD
Team leader	H. Gunatilake, Project Economist, MKRD

I. INTRODUCTION

1. Increasing evidence of the rapid deterioration of air quality and the associated potential health impacts on poor populations in Asian cities prompted the Clean Air Initiative for Asian Cities (CAI-Asia) secretariat of the Asian Development Bank (ADB) to develop a project concept on air pollution, poverty, and health effects in July 2004. The Vice President (Operations 1) approved the concept clearance request on 25 October 2004. The Fact-Finding Mission was held in Ho Chi Minh City (HCMC) and Hanoi during 1-4 February 2005. The potential partners of the technical assistance (TA)—Health Effect Institute (HEI), Norwegian Institute for Air Research (NILU), East West Center (EWC), and United States—Asia Environmental Partnership (US—AEP)—also took part in the Mission. The People’s Committee of HCMC signed a memorandum of understanding covering the impact, outcome, outputs, implementation arrangements, cost, and financing arrangements of the TA on 30 June 2005. The TA design and monitoring framework is given in Appendix 1.¹

II. ISSUES

2. One of the main short-term objectives, set out in the National Strategy for Environmental Protection in Viet Nam,² is to restrict pollution, remedy environmental degradation, and improve the quality of the environment in industrial and densely populated areas in major cities and several rural areas. Thus, urban air pollution control is an important part of this Government strategy. Reducing air pollution in urban and industrial areas has also been identified as a priority area, among others, by the Strategic Orientation for Sustainable Development in Viet Nam (Viet Nam Agenda 21).³ While the environmental policies and strategies of the Government have a clear focus on urban air quality management (AQM), the existing strategies have not related poverty issues with AQM. For example, the Comprehensive Poverty Reduction and Growth Strategy (CPRGS) of Viet Nam does not elaborate the linkages between poverty reduction and AQM.

3. The interface between air pollution, health, and poverty in Asia is important, especially, in areas where large populations of the lowest socioeconomic status are exposed to air pollution. The potential public health and social policy implications under these circumstances can be significant, yet the links among air pollution, poverty, and health effects in the Asian context are not well understood. There is emerging evidence, largely from studies in North America and Europe, that economic deprivation increases the magnitude of air pollution-related morbidity and mortality. Among the reasons why this may be true, two stand out: the poor have higher exposure to air pollution, and/or may be more susceptible to air pollution due to poorer nutrition, lack of access to medical care, and other factors. At the same time, air pollution could exacerbate the conditions of poverty.

4. The economic consequences of an increased burden of diseases due to air pollution, including cost of illness and loss of income, can also be substantial for the poor. For example, a day’s absence from work due to respiratory illness for a permanently employed non-poor person may not be translated into severe economic hardship as he/she can avail of paid sick leave, but a poor laborer could lose his/her day’s wages. Similarly, a hike in mass transit fare caused by

¹ The TA first appeared in *ADB Business Opportunities* (internet edition) on 19 February 2005.

² Ministry of Natural Resources. 2004. *National Strategy for Environmental Protection: Until 2010 and Vision Towards 2020*, Viet Nam.

³ The Socialist Republic of Viet Nam. 2004. *Strategic Orientation for Sustainable Development in Viet Nam (Viet Nam Agenda 21)*.

regulatory actions may be translated into significant diversion of household income for a poor person, but may not impact those who use private means of transport.

5. Policy makers in Viet Nam and other developing countries in Asia may hold the general perception that the poor are disproportionately affected by air pollution and they are more susceptible to air pollution-related morbidity and mortality effects. Yet, there is no scientific evidence on health and other effects of air pollution on the poor in Asian cities. The results from Western studies cannot be simply extrapolated to Asia for use in poverty intervention policy assessments either by governments in Asia or by ADB and other development agencies. Moreover, the composition and relative contribution of indoor and outdoor sources of exposure in Asia are different from those in the West and need to be studied in greater detail.

6. AQM is still a relatively new policy area in many Asian countries. Experiences from past and ongoing loans and TAs show the importance of decision makers having well-documented research findings on the negative impacts of air pollution as well as the policy instruments to tackle the sources of pollution.⁴ Previous ADB loans and TAs have frequently referred to the assumed relations between health, poverty, and air pollution but have not included in-depth analysis to substantiate this relationship.

III. THE TECHNICAL ASSISTANCE

A. Impact and Outcome

7. The expected project impact is improved air quality and decreased occurrence of air pollution-related health impacts among the poor populations, in HCMC in particular and in Asian cities in general. The impact will be achieved by developing an enabling framework that will integrate poverty effects, perceptions, coping mechanisms, and economic burden of air pollution-related health effects into policies and action plans for AQM in HCMC. The TA will facilitate the use of the developed framework by other Asian cities.

8. The proposed TA will develop a conceptual framework of the linkages among urban air pollution, poverty and health effects, and empirically test the developed framework in HCMC. The empirical analyses will consist of (i) an assessment of the impact of air pollution on the respiratory health of children in HCMC; (ii) a household survey to assess (a) exposure to multiple sources of air pollution; (b) baseline health conditions; and (c) perceptions, coping mechanisms, and economic burden of air pollution; (iii) a policy impact study, which integrates the results from (i) and (ii) for enhanced policy making in AQM for HCMC as well as for the CPRGS in Viet Nam.

⁴ ADB lending and non-lending assistance on air quality management include ADB.1998. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan to the Republic of Philippines for the Metro Manila Air Quality Improvement Sector Development Program*. Manila (Loan 1663-PHI, for \$200 million, approved on 16 December 1998); ADB. 2000. *Technical Assistance to the Socialist Republic of Viet Nam, Peoples' Republic of China, and Republic of Indonesia for the Action Plans for Reducing Vehicle Emissions*. Manila. (TA 5937-REG, for \$900,000 approved on 26 September 2000); ADB. 2001. *Technical Assistance to Asia for the Clean Air Initiative for Asian Cities*. Manila (TA 6016-REG, for \$150,000, approved on 19 December 2001); and ADB. 2003. *Technical Assistance to the South Asian Subregional Economic Cooperation Countries for Regional Air Quality Management*. Manila (TA 6159-REG, for \$400,000, approved on 19 December 2003). General conclusions on state of air quality management in Asia are discussed in Huizenga, Cornelius, Gary Haq, Dietrich Schwela, Herbert Fabian, and May Ajero. 2004. *Urban Air Quality Management Capability in Asian Cities*. Paper presented at the World Clean Air and Environmental Protection Congress and Exhibition. London, 25 August.

9. The TA will generate scientific, social, and economic information on the linkages between air pollution, poverty, and related health impacts on communities in HCMC. The information will help in formulating policies and programs to avoid, minimize, or mitigate such impacts. More specifically, the outputs of the project include (i) documented relationships among socioeconomic status, air pollution, and health effects for children in HCMC; (ii) documented relationship between baseline health and exposure to multiple sources of air pollution for the general population stratified by socioeconomic status; (iii) documented evidence on perceptions, coping mechanism, and economic burden of air pollution, stratified by socioeconomic status in HCMC; (iv) policy options to mitigate air pollution that take specific account of the poor; (v) enhanced local capacity of relevant Viet Nam agencies to undertake similar analyses of air pollution, poverty, and health effects; and (vi) increased awareness by decision makers and other stakeholders, including the urban poor, in selected countries and cities and in ADB, with respect to health impacts, coping mechanisms, and economic burdens of air pollution on the poor. Appendix 2 gives an outline of the contents of reports that will be produced under the project.

B. Methodology and Key Activities

10. Brief descriptions of the study objectives and methodologies, which will be used as the starting point for developing detailed study protocols, are in paras. 11–19. The methodologies will be further developed collaboratively by Vietnamese and international researchers and the consultants.

11. **Assessment of Air Pollution Impact on Respiratory Health of Children (component 1).** This component estimates the effect of short-term exposure to air pollution on hospital admission for respiratory illnesses, including acute lower respiratory infections (ALRI), among young children. The study will use existing data from records of two pediatric hospitals on clinical and sociodemographic characteristics. Socioeconomic status will be determined in several ways, including access to free or subsidized health care (medical insurance card) and location of residence. Air quality data at the HCMC Environmental Protection Agency (HEPA) will be used to estimate daily exposure for children. The impact of air pollution on the respiratory health of children will be assessed using case-crossover methodology. A stratified analysis will be used to evaluate any differential impacts of socioeconomic status.

12. **Detailed Assessment of Exposure to Air Pollution among the Poor (component 2).** Exposure to outdoor-related pollution from major “microenvironments,” including traffic and stationary sources, indoor air pollution, environmental tobacco smoke, and occupational exposure will be assessed, and differences in exposure by socioeconomic status will be examined. The findings will help in setting priorities for control strategies to abate air pollution. Differences between modeled estimates of exposure derived from ambient air quality monitors, household concentrations, and individual exposures will be explored.

13. **Baseline Health Survey (component 2).** Respiratory health symptoms of household members will be assessed using internationally accepted survey instruments. Together with the results of the exposure assessment, a baseline health survey can help assess the risk factors for air pollution-related respiratory illnesses.

14. **Public Perceptions Survey (component 2).** This activity will assess people’s opinion on how air pollution affects their lives and what type of coping mechanisms they adopt to avoid or minimize the impacts of air pollution. The survey will take account of the details of mitigating and averting activities undertaken by people who have been sick due to air pollution. The

survey will also assess people's perception of appropriate methods for reducing air pollution-related health impacts.

15. **Economic Burden of Air Pollution (component 2).** The economic burden of air pollution will be estimated taking into account the cost of mitigation, cost of averting activities, and income loss due to air pollution-related morbidity. Analysis will be segregated into socioeconomic groups to compare the impacts on the poor and the non-poor.

16. **Policy Analysis (component 3).** The existing air pollution policies and laws, and regulatory analysis conducted will be reviewed. This component will integrate the findings of all the other components to refine the air pollution control policies and practices, with special reference to their impact on poor segments of the population in HCMC. This activity will assess the possibilities of upscaling the finding to other cities and the national level in Viet Nam in particular and in Asia in general. The policy analyses will also focus on the implications of the study finding on the CPRGS of Viet Nam.

17. **Capacity Building.** Capacity building will involve a number of local and national agencies, including environmental scientists, public health researchers, and biostatisticians, who will receive targeted training⁵ as well as on-the-job experience. The special training programs designed for various technical aspects will be open to a selected number of people who are not involved in the project.

18. **Awareness Building.** A web page in the CAI-Asia website (<http://www.cleanairnet.org/caiasia>) will be set up to provide information about the project activities and its findings. National workshops will be held to inform local stakeholders of the project's progress. A regional workshop will be held to disseminate the findings of the TA. Researchers involved in relevant projects and programs of CAI-Asia in other countries will be invited to the workshops. The researchers will also be invited to visit HCMC to meet the project team and learn about the project approach.

19. The project requires the involvement of a number of government agencies in HCMC and a number of international institutes. An important assumption for the success of the project is smooth coordination and cooperation between the different agencies in conducting and following up on the different studies to be carried out under the project. It is important that the steering committee, to be established by the HCMC People's Committee, identify any coordination problems at an early stage and develop quick responses to overcome any problem. A second important assumption is that secondary data, which have been collected by different agencies, will be made available to the groups responsible for project implementation.

C. Cost and Financing

20. The total cost of the TA is estimated at \$950,000 equivalent comprising \$625,000 in foreign exchange and \$325,000 equivalent in local currency. ADB will provide \$600,000 equivalent to cover \$500,000 of the foreign exchange cost and \$100,000 equivalent of the local currency cost. HEI will provide \$200,000 equivalent to cover \$125,000 of the foreign exchange cost and \$75,000 equivalent of the local currency cost. The Government will provide \$150,000 equivalent to cover the remaining local currency cost. The ADB component of the TA will be

⁵ Capacity building includes targeted training for local agency personnel on statistical analysis, analytical technology, design and conduct of health and socioeconomics surveys, and operation and maintenance of microenvironment air quality monitoring equipment.

financed on a grant basis by the Poverty Reduction Cooperation Fund (PRF) administered by ADB. Details of the cost estimates and financing plan are given in Appendix 3.

D. Implementation Arrangements

21. The recipient of the Air Pollution Poverty and Health Effects in HCMC (APPH) project is the HCMC People's Committee. The Committee will appoint a steering committee, which will oversee the implementation of the project from the Viet Nam Government's side. The Department of Health (DOH) of HCMC will take the lead role as the Executing Agency. HEPA, Department of Natural Resources and Environment of HCMC, and Department of Labor Invalid and Social Affairs (DOLISA) of HCMC will serve as implementing agencies. HEPA, DOH, and DOLISA will take primary responsibility for pollution, health, and poverty-related aspects of the project, respectively.

22. The TA will be implemented over 30 months commencing in December 2005 and closing in May 2008. This period gives adequate time for phasing the planning, implementation, and review of the different components under the project. ADB will enter into a partnership agreement with HEI⁶ for implementing the project. HEI will enter into sub-agreements with other international and Vietnamese organizations to assist in implementing the project. Relevant ADB guidelines such as the *Guidelines on the Use of Consultants* as well as *Guidelines for Procurement* will be followed. Appendix 4 describes the main tasks to be realized in the project and the areas of expertise required.

23. APPH will be part of the Public Health and Air Pollution for Asia Program (PAPA), which is implemented by HEI on behalf of CAI-Asia. The International Oversight Committee of the PAPA program will be requested to provide scientific oversight to the project. DOH will appoint a local project director and he/she will be working on part-time basis to supervise the project activities. A full-time local project coordinator⁷ will be recruited to undertake day-to-day activities of the project. The project coordinator's salary will be paid from the project and he/she will carry out the work under the guidance of the project director. The methodology and findings of the project will be discussed in three national workshops: inception workshop, midterm workshop, and final workshop. A broad group of local, national, and international stakeholders will be invited to the workshops.

IV. THE PRESIDENT'S DECISION

24. The President acting under the authority delegated by the Board, has approved ADB administering a portion of technical assistance not exceeding the equivalent of \$600,000 to the Government of Viet Nam on a grant basis from the Poverty Reduction Cooperation Fund for the Air Pollution, Poverty, and Health Effects in Ho Chi Minh City, and hereby reports this action to the Board.

⁶ The reason for engaging HEI is because of HEI's track record both internationally as well as in Asia making it the best institute to handle this project. It has been providing globally refuted, high-quality, and relevant scientific expertise on the health effects of air pollution since 1980. (for more information about HEI: <http://healtheffects.org/about.htm>)

⁷ The project coordinator is not an official of the Government. He/she will be recruited for the Project.

DESIGN AND MONITORING FRAMEWORK

Design Summary	Performance Indicators/Targets	Data Sources/Reporting Mechanisms	Assumptions and Risks
<p>Impact Better air quality and decreased occurrence of air pollution-related health impacts among the poor populations in HCMC in particular and in Asian cities in general</p>	<ul style="list-style-type: none"> • By 2010 air quality in HCMC will have improved compared with 2005 levels, approaching WHO standards • By 2010 occurrence of air pollution-related health effects in HCMC will have been reduced compared with 2005 statistics. • By 2010, research on linkages among air pollution, poverty, and health in other Asian countries will have been initiated and undertaken with substantial involvement of local researchers. 	<ul style="list-style-type: none"> • Air quality monitoring data • Air pollution-related health indices in Asian cities • CAI-Asia website http://www.cleanairnet.org/caiasia 	<p>Assumptions</p> <ul style="list-style-type: none"> • HCMC authorities sustain interest in air quality issues and implement the recommendation of the project. • Authorities of other Asian cities enhance commitment to reduce air pollution based on the findings of the project.
<p>Outcome Enabling framework for integrating poverty impacts, perceptions, coping mechanisms, and economic burden of air pollution-related health impacts into policies and action plans for air quality management in HCMC</p>	<ul style="list-style-type: none"> • By 2008, air quality management policy documents and action plans in HCMC, which integrate poverty and health impacts, will have been available. 	<ul style="list-style-type: none"> • Air quality management policy and action plans for HCMC • Comprehensive poverty reduction plans 	<p>Assumption</p> <ul style="list-style-type: none"> • HCMC authorities agree to incorporate recommendations of the study into air quality management policies and action plans.
<p>Outputs 1. Relationships among socioeconomic status, air pollution, and respiratory health of children in HCMC</p>	<ul style="list-style-type: none"> • By June 2007, the report of the health impact of the children will have been available. 	<ul style="list-style-type: none"> • Review reports of the project 	<p>Assumptions</p> <ul style="list-style-type: none"> • Poor people are disproportionately exposed to air pollution.

Design Summary	Performance Indicators/Targets	Data Sources/Reporting Mechanisms	Assumptions and Risks
<p>studied and documented</p> <p>2. Exposure of the poor to air pollution from multiple sources studied and documented</p> <p>3. Evidence on perceptions, coping mechanism, and economic burden of air pollution, stratified by socioeconomic status in HCMC, studied and documented</p> <p>4. Policy options to mitigate air pollution that take specific account of the poor, identified, analyzed, and documented</p> <p>5. Enhanced capacity of relevant Viet Nam agencies to undertake similar analyses of air pollution, poverty, and health effects</p> <p>6. Increased awareness by decision makers and other stakeholders of health impacts, coping mechanisms, and economic burdens of air pollution on the poor</p>	<ul style="list-style-type: none"> • By September 2007, report of the surveys on baseline health conditions, perceptions, coping mechanisms, and economic burden will have been available. • By March 2008, the final report that combines the component reports and incorporate policy study findings will have been available • By March 2008, capacity of several local institutions, including at least 25 of their staff to address air quality, poverty, and health impacts and related issues will have been enhanced. • By May 2008, a national workshop and regional workshop will have been conducted and a special webpage prepared to disseminate the results of the study. 	<ul style="list-style-type: none"> • Review comments of the technical expert committee • Air quality management policy documents 	<ul style="list-style-type: none"> • Poor people are more susceptible to air pollution-related health effects. • HCMC health and environmental agencies make existing data available for the project. • Quality of domestic consultants is adequate to undertake the tasks. • Successful coordination among national and institutional institutes involved in the project is achieved.

Activities with milestones	Inputs
<ol style="list-style-type: none"> 1. Study of the impact of air pollution on respiratory health of children in HCMC 2. Detailed assessment of exposure of poor and non-poor households in HCMC to multiple sources of air pollution 3. Baseline health survey 4. Survey to assess perceptions and coping mechanisms 5. Assessment of economic burden of air pollution 6. Assessment of the policy implications of the findings in 1, 2, 3, 4, and 5 7. Capacity building and training 8. Dissemination through workshops (3 local and 1 regional) and web page 	<p>ADB–\$600,000</p> <ul style="list-style-type: none"> • Partnership agreement with HEI • International and domestic consultants to assist in coordinating project implementation • Local, national, and regional workshops <p>Government–\$150,000</p> <ul style="list-style-type: none"> • Counterpart staff • Laboratory use • Office space <p>HEI–\$200,000</p> <ul style="list-style-type: none"> • Field investigations • Training workshops • Subcontracting of air quality modeling studies, perception studies • Project management

ADB = Asian Development Bank, CAI-Asia = Clean Air Initiative for Asian Cities, HCMC = Ho Chi Minh City, HEI = Health Effects Institute, WHO = World Health Organization.

OVERVIEW OF CONTENTS OF REPORTS⁸

Report #1: Role of Socioeconomic Status in Determining Effects of Short-term Exposure to Air Pollution on the Respiratory Health of Young Children in Ho Chi Minh City

I. Introduction

1. The introduction will discuss the scientific and public health background, and objectives of the study. It will briefly review the international literature on health effects of short-term exposure to particulates and gaseous air pollution, including studies that explore the role played by social class. It will also discuss the burden of disease from acute lower respiratory infection (ALRI) and other respiratory diseases in children in developing countries. Key study designs (i.e., time-series and case-crossover approaches) will also be introduced. All reports will be specifically designed to communicate clearly and effectively to diverse stakeholders at the policy-science interface.

II. Methodology

2. This section will describe air pollution, meteorologic, and health data used in the study, and the approach used to classify the children on the basis of their economic status. The actual application of the analytic methods used (Poisson- regression and case-crossover analysis) to estimate the relative risk of admission to hospital for ALRI will be described in detail.

III. Results

3. The results of the analysis of short-term exposure to air pollution and hospital admissions for ALRI will be presented using a combination of text, graphics, and tables. Extensive descriptive analyses of key variables will be presented, focusing on issues (such as quality of air pollution data, geographic location of air pollution monitors, classification of disease outcomes, and socioeconomic status) that may influence the interpretation of the epidemiologic analyses. Estimates of the relative risk of admission to hospital for ALRI will be presented for the entire study population and for the population stratified by socioeconomic status.

IV. Conclusions

4. The results will be presented to clearly articulate the health impacts of air pollution in children and others at varying socioeconomic levels. Results will also be set in the context of international literature and its relevance to local public health and environmental decision making and the strengths, limitations, and scope of the study design and analysis.

Appendixes

⁸⁸ All reports describing the results of the Ho Chi Minh City study will be accompanied by a commentary from an expert panel of independent reviewers, organized by the Health Effects Institute Review Committee. The panel will include experts in all disciplines relevant to the project, including epidemiology, exposure assessment, clinical medicine, biostatistics, and the social sciences. The commentary will critically evaluate the study and its results with regard to design, conduct and interpretation, and will discuss the study's contribution to scientific knowledge and policy relevance.

Report #2: Differential Exposure of the Poor to Air Pollution from Outdoor, Indoor, and Occupational Sources in Ho Chi Minh City: Results of a Household Survey

I. Introduction

5. The introduction will present the scientific and policy background and the objectives of the study. It will comprise a brief review of the international literature on exposure to air pollution from multiple sources in urban areas of developing countries and show how exposure varies according to social class. It will also review the various reports on the current conditions of the poor in HCMC. Key research methods relevant to this study will also be described.

II. Methodology

6. This section will describe the data sources, measurement techniques, and analytic approaches used in the household survey, and any associated substudies (e.g., health prevalence and perception). The design of the survey will be discussed in the context of the study objectives, focusing in particular on the approach to classification of households by social class. The approaches used to estimate air pollution exposure, including the use of central, microenvironmental, and personal monitors will be described. The design and implementation of statistical analysis will also be described.

III. Results

7. The results of the analysis of exposure of the poor to air pollution from multiple sources will be presented using a combination of text, graphics, and tables. Extensive descriptive analyses of key variables will first be presented, focusing on issues (such as participation rates, housing characteristics, and technical performance of air quality monitors) that may influence interpretation of the results of the survey. Estimates of the exposures of the poor to air pollution will be characterized with regard to the contribution of indoor and outdoor sources, and in terms of housing and neighborhood characteristics.

IV. Conclusions

8. The results of this study will be presented in the context of the implications of the study of effects of short-term exposure to air pollution on the respiratory health of young children in Ho Chi Minh City (Component #1) and the contribution of the study to current understanding of the exposures of the poor to air pollution and its relevance to local and regional public health and environmental decision making. The strengths and limitations of the study design and analysis will be addressed.

Appendixes

Report #3: Final Report: Air Pollution, Poverty, and Health in Ho Chi Minh City

I. Executive Summary

9. The executive summary will present in a concise form (approximately 10 pages) the background, rationale, and objectives of the overall project and the design, methodology, and results of the component studies. The major conclusions of each component study will be summarized along with the policy recommendations that draw on them.

II. Introduction

10. The Introduction will present the background, rationale, and overall objectives of the project. It will also introduce each of the component studies.

III. Methodology

11. This section will briefly describe the methodologies used in each of the component studies.

- A. Component 1
- B. Component 2

IV. Results

12. This section will briefly present the results of each of the component studies.

- A. Component 1
- B. Component 2

V. HEI/PAPA Peer Review, Conclusions, Commentary

13. This section will present the conclusions of each of the component studies. The implications of the results of component 2 for the interpretation of the results of component 1 will be discussed and a commentary on the study quality, relevance, and conclusions provided.

VI. Review of Existing Policy Framework on AQM

14. This section will include results of the analysis of existing regulatory and policy framework on Air Quality Management in HCMC and in Viet Nam.

VII. Policy Recommendations

Appendixes

COST ESTIMATES AND FINANCING PLAN
(\$'000)

Item	Foreign Exchange	Local Currency	Total Cost
A. Poverty Reduction Cooperation Fund^a			
1. Consultants			
a. Remuneration and Per Diem			
i. International Consultants	180.00		180.00
ii. Domestic Consultants		60.00	60.00
b. International and Local Travel	60.00		60.00
c. Reports and Communications	10.00		10.00
2. Equipment	75.00		75.00
3. Quality Assurance and Peer Review	30.00		30.00
4. Training, Seminars, and Conferences	90.00		90.00
5. Surveys		40.00	40.00
6. Miscellaneous Administration and Support Costs	5.00		5.00
7. Contingencies	50.00		50.00
Subtotal (A)	500.00	100.00	600.00
B. HEI Financing			
1. Consultants			
a. Remuneration and Per Diem			
i. International Consultants	50.00		50.00
ii. Domestic Consultants		20.00	20.00
b. International and Local Travel	25.00		25.00
c. Reports and Communications	10.00		10.00
2. Equipment		20.00	20.00
3. Quality Assurance and Peer Review	15.00		15.00
4. Training, Seminars, and Conferences		20.00	20.00
5. Surveys		15.00	15.00
6. Miscellaneous Administration and Support Costs	5.00		5.00
7. Contingencies	20.00		20.00
Subtotal (B)	125.00	75.00	200.00
C. Government Financing			
1. Field Office, Equipment, and Supplies		50.00	50.00
2. Remuneration of Counterpart Staff		60.00	60.00
3. Travel		5.00	5.00
4. Workshops and Meetings		35.00	35.00
Subtotal (C)		150.00	150.00
Total	625.00	325.00	950.00

HEI = Health Effects Institute.

^aAdministered by the Asian Development Bank.

Source: Asian Development Bank estimates.

OVERVIEW OF PROJECT COMPONENTS AND TASKS

A. Component 1: Case-Crossover Study of Impact of Air Pollution on Children's Hospital Admissions in HCMC

1. This first component is a hospital-based study to assess the impact of air pollution on acute lower respiratory infections (ALRI) in children in Ho Chi Minh City (HCMC). The study will be conducted using case-crossover methodology, a method used to examine the acute effects of intermittent exposure to air pollution. The study has two major objectives:

- (i) Estimate the effect of short-term exposure to air pollution on hospital admissions for ALRI in young children (<5 years) in HCMC.
- (ii) Compare the magnitude of the effect of air pollution on poor children with other children.

1. Activities and Tasks

2. The specific activities are as follows:

- (i) Data on admissions for pneumonia, bronchiolitis, and bronchitis in children under 5 years of age will be extracted from the computerized records of pediatric hospitals #1 and #2. Admissions for asthma may also be included. Sociodemographic characteristics (including age and sex) for each case will also be obtained.
- (ii) Poverty status for each case will be determined by access to free or subsidized care (medical insurance card).
- (iii) Exposure assessment data will be provided by HCMC Environmental Protection Agency (in collaboration with Norwegian Institute for Air Research)
- (iv) A workshop to train local researchers on methods to evaluate the short-term health effects of air pollution will be held.

2. Required Expertise

3. Under the partnership agreement between HEI and ADB, HEI will be providing the consulting and other services⁹ in the following areas of expertise (approximate person-months are enclosed in parentheses): international biostatistician (3), international senior epidemiologist (1.5), international quality assurance auditor (2), international and domestic air quality experts (5), international senior investigator (1), international junior investigator (2), domestic survey administrator (6), local coordinator (18), and external peer review group¹⁰.

B. Component 2: Household-Based Survey: Pollution Exposure, Baseline Health, Economic Burden, and Public Perceptions of Social Economic Costs Associated with Air Pollution

4. This component will conduct a household-based survey of exposure to air pollution, baseline health, economic burden, and public perceptions of social and economic costs

⁹ Subject to the *ADB Guidelines on the Use of Consultants*

¹⁰ External peer review will be undertaken by International Oversight Committee of the PAPA program as a honorary service

associated with air pollution. A key consideration of the survey will be the ability to maintain linkage with key elements of component 1 (the case-crossover study).

1. Exposure Assessment

5. This activity aims to test the hypothesis that the poor are more exposed to critical air pollutants than those who are better-off economically. While households with young children are selected, exposure estimates for all members of the family will be made.

2. Tasks

6. The specific tasks are as follows:

- (i) Obtain district and ward-level data and maps from local urban planning, land use planning, labor and social issues and surveys such as Vietnam living standards survey (VLSS) and demographic and health survey (DHS) to identify areas of entire city as low-, middle-, and high-income areas.
- (ii) Design a sampling scheme to select relevant individuals from within those areas.
- (iii) Assess exposure to selected individuals through the use of 24-hour personal monitoring (individual or in major microenvironments) and detailed daily time activity diaries.

3. Baseline Health Survey

7. A health prevalence study will assess the respiratory health status of all household members using a survey that will be based on internationally validated survey instruments. If feasible, pulmonary function tests (spirometry) will be performed on a subset of household members. These data, in conjunction with results from the exposure component of the household survey, may provide information on local risk factors for respiratory illness.

4. Economic Costs and Public Perceptions

8. The aims of this survey activity are as follows:

- (i) Develop a conceptual model of the direct and indirect costs of and benefits from air pollution control at the household level.
- (ii) Survey households across socioeconomic groups to collect data for the above model.
- (iii) With the view to both supplement and complement the insights from (i) and (ii), survey households for their perceptions regarding air pollution.

a. Tasks

9. Both focus group discussions and household surveys will be used. The surveys will be integrated with the surveys on activity patterns and health prevalence.

b. Required Expertise

10. Under the partnership agreement between HEI and ADB, HEI will be providing the consulting and other services¹¹ in the following areas of expertise (approximate person-months are enclosed in parentheses): international and domestic health economist (4), international air quality expert (1), international quality assurance auditor (2), international senior exposure assessment expert (7), international junior exposure assessment expert (2), international epidemiologist/biostatistician (1), local survey administrator (12), international and local perceptions expert (4), local project coordinator (18), surveyors (18) and external peer review group.

C. Component 3: Policy Impact Study

11. This component aims to develop and communicate to decision makers the policy options to mitigate air pollution that take specific account of the poor. It will involve institutional analysis of air quality management (AQM) stakeholders to analyze their strengths and weaknesses as well as identify key decision makers. Recommendations on how to address air pollution in the Viet Nam Comprehensive Poverty Reduction and Growth Strategy (CPRGS) will be discussed in consultations with local and national decision makers and other stakeholders, including the urban poor in HCMC as well as poverty specialists in the Asian Development Bank (ADB).

1. Activities and Tasks

12. The following activities will be undertaken:

- (i) Review existing and proposed AQM-related policies outlining the relative benefits to different groups in the community from implementation of one or more measures, as well as the specific impact on the poor.
- (ii) Review and analyze the existing institutional framework to assess the responsibilities of each relevant institution in monitoring and enforcing air pollution management.
- (iii) Hold a regional workshop to increase awareness of decision makers and stakeholders, including the urban poor in selected countries and cities, and ADB with respect to the impact of air pollution on the poor and the coping mechanisms of the poor.

2. Required Expertise

13. The component will require the consulting services, to be recruited by ADB (approximate person-months in parentheses) of an international air quality management policy expert (1.5), a domestic air quality researcher (1) and an international poverty reduction specialist (1).

¹¹ Subject to ADB's *Guidelines on the Use of Consultants*.