



# Technical Assistance Report

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Project Number: 48059  
Policy and Advisory Technical Assistance (PATA)  
August 2014

## People's Republic of China: Study on the National Control of the Important Air Pollutant—Volatile Organic Compounds

This document is being disclosed to the public in accordance with ADB's Public Communications Policy 2011.

Asian Development Bank

## CURRENCY EQUIVALENTS

(as of 31 July 2014)

Currency unit	–	yuan (CNY)
CNY1.00	=	\$0.1620
\$1.00	=	CNY6.1710

## ABBREVIATIONS

ADB	–	Asian Development Bank
DMF	–	design and monitoring framework
FECO	–	Foreign Economic Cooperation Office
MEP	–	Ministry of Environmental Protection
O <sub>3</sub>	–	ground-level ozone
PRC	–	People's Republic of China
TA	–	technical assistance
VOC	–	volatile organic compound

## NOTE

In this report, "\$" refers to US dollars.

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## POLICY AND ADVISORY TECHNICAL ASSISTANCE AT A GLANCE

<b>1. Basic Data</b>		<b>Project Number: 48059-001</b>	
<b>Project Name</b>	Study on the National Control of the Important Air Pollutant—Volatile Organic Compounds	<b>Department /Division</b>	EARD/EAER
<b>Country Borrower</b>	China, People's Republic of China, People's Republic of	<b>Executing Agency</b>	Ministry of Environmental Protection
<b>2. Sector</b>	<b>Subsector(s)</b>	<b>ADB Financing (\$ million)</b>	
✓ Public sector management	Public administration		0.30
Energy	Energy efficiency and conservation		0.10
		<b>Total</b>	<b>0.40</b>
<b>3. Strategic Agenda</b>	<b>Subcomponents</b>	<b>Climate Change Information</b>	
Inclusive economic growth (IEG) Environmentally sustainable growth (ESG)	Pillar 1: Economic opportunities, including jobs, created and expanded Environmental policy and legislation	Climate Change impact on the Project	Low
<b>4. Drivers of Change</b>	<b>Components</b>	<b>Gender Equity and Mainstreaming</b>	
Private sector development (PSD)	Conducive policy and institutional environment	No gender elements (NGE)	✓
<b>5. Poverty Targeting</b>		<b>Location Impact</b>	
Project directly targets poverty	No	Nation-wide	High
<b>6. TA Category:</b>	B		
<b>7. Safeguard Categorization</b>	Not Applicable		
<b>8. Financing</b>			
<b>Modality and Sources</b>		<b>Amount (\$ million)</b>	
<b>ADB</b>		<b>0.40</b>	
Sovereign Policy and advisory technical assistance: Technical Assistance Special Fund		0.40	
<b>Cofinancing</b>		<b>0.00</b>	
None		0.00	
<b>Counterpart</b>		<b>0.00</b>	
None		0.00	
<b>Total</b>		<b>0.40</b>	
<b>9. Effective Development Cooperation</b>			
Use of country procurement systems		No	
Use of country public financial management systems		No	



## I. INTRODUCTION

1. During the 2013 country programming mission, the Government of the People's Republic of China (PRC), through the Ministry of Environmental Protection (MEP), requested policy and advisory technical assistance (TA) from the Asian Development Bank (ADB) for a study on the national control of the important air pollutant—volatile organic compounds (VOCs). The TA was included in ADB's country operations business plan, 2014–2016.<sup>1</sup> During the reconnaissance mission fielded on 11 April 2014, understanding and agreement were reached on the project's impact, outcome, outputs, implementation arrangements, cost and financing arrangements, and terms of reference for consultants as recorded in a memorandum of understanding. The design and monitoring framework (DMF) is in Appendix 1.<sup>2</sup>

## II. ISSUES

2. Air pollution emergencies are now a frequent occurrence in many cities throughout the PRC, leading to heightened concerns over public health. In response to the problem, the State Council promulgated the new Ambient Air Quality Standards in February 2012, which tightened the limits on the concentration of nitrogen dioxide, PM<sub>10</sub>, and other pollutants, and included new standards for PM<sub>2.5</sub> and ground-level ozone (O<sub>3</sub>).<sup>3</sup> The Air Pollution Prevention and Control Action Plan (the action plan) was issued in September 2013 and outlines the most stringent air pollution control measure in the PRC's history. The action plan, along with the accountability documents that MEP signed with each provincial government, calls for 5%–25% cuts in emissions of PM<sub>10</sub> and PM<sub>2.5</sub>. Most recently, at the opening of the National People's Congress on 5 March 2014, Prime Minister Li Keqiang noted that “we will declare war against pollution and fight it with the same determination we battled poverty.”<sup>4</sup> This indicates the government's strong commitment to tackling environmental pollution.

3. This TA supports the prevention and control of VOCs in the PRC. VOCs are recognized as precursors for the formation of O<sub>3</sub> and contribute to the formation of fine particles along with other aerosols.<sup>5</sup> O<sub>3</sub> and fine particles are important causes of photochemical smog and particle pollution. Further, many varieties of VOCs inflict direct harm on public health, such as benzene and methylene chloride. The prevention and control of VOCs has been a priority for MEP since the issuance and implementation of the action plan.

4. Compared with other major pollutants such as sulfur dioxide, nitrogen oxide, and PM<sub>10</sub>, the regulatory framework for the control of VOCs is lacking and scientific understanding of VOCs is far from meeting the requirements of policy makers. Major gaps to be filled are the need for (i) a VOC emission inventory; (ii) a legal and regulatory framework, with clearly defined roles for national and subnational government departments in setting and implementing air quality and emission standards, permitting, and monitoring and enforcing; and (iii) approaches to reduce VOC emissions, including mandating best available control technologies and adopting non-technology-based measures such as economic instruments and voluntary control measures.

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<sup>1</sup> ADB. 2014. *Country Operations Business Plan: People's Republic of China, 2014–2016*. Manila.

<sup>2</sup> The TA first appeared in the business opportunities section of ADB's website on 4 June 2014.

<sup>3</sup> PM stands for particulate matter. PM includes both solid particles and liquid droplets found in the air. Many artificial and natural sources emit PM directly or emit other pollutants that react in the atmosphere to form PM. These solid and liquid particles come in a wide range of sizes (e.g. PM<sub>2.5</sub>, PM<sub>10</sub>).  
[http://www.epa.gov/ttn/naaqs/pm/pm25\\_index.html](http://www.epa.gov/ttn/naaqs/pm/pm25_index.html).

<sup>4</sup> Financial Times. Asia Pacific. China. <http://www.ft.com/cms/s/0/5c9b4d18-a437-11e3-b915-00144feab7de.html>

<sup>5</sup> Fine particles include PM<sub>2.5</sub>, which causes significant health damages in the PRC. In the PRC, semivolatile organic compounds (along with primary organic aerosols) play an important role in aerosol formation.

5. Understanding the emission sources is a basic step toward providing a regulatory framework. An emission inventory provides (i) estimates of the contributions of various source categories to overall pollution levels, (ii) a basis for determining control measures to be implemented, and (iii) a means to monitor progress in reducing emissions and to measure the effectiveness of chosen control strategies. Past and ongoing research efforts have been made in establishing national, city, and regional level emission inventories for VOCs, using various estimation methodologies. Results from these inventories are inconsistent, due to large and inherent uncertainties in modeling and inaccurate and incomplete knowledge about source profiles, emission factors, and source activities. To have a basis for regulation, it is important to clarify the needs for and selection of methodologies for national and subnational emission inventories, taking into account priority of source categories, desired accuracy, and resource requirements.

6. Although there are large discrepancies in estimates, existing inventories show that the petrochemical industry, motor vehicles, and surface coating are among the major sources of VOC emissions in the PRC. Among these sources, the petrochemical industry can account for 10%–23% of VOC emissions and these emissions are fast growing as a result of increasing capacity expansion.<sup>6</sup> The action plan also calls for improving VOC control measures by targeting stationary sources, which makes the petrochemical industry a top priority. With regard to mobile sources, the action plan sets clear targets for phasing out high-polluting vehicles (the so called “yellow label vehicles”) in the three key regions — Beijing-Tianjin-Hebei, Pearl River Delta, and Yangtzi River Delta—and provides a clear road map for upgrading fuel quality. These measures will help reduce emission of VOCs as well as other pollutants from motor vehicles.

7. ADB has provided a range of support to improve air quality in developing member countries, including the PRC. In the PRC, ADB supported (i) the establishment of regional environmental supervision centers in 2007,<sup>7</sup> which will be important in enforcing the regional collaboration mechanisms of the action plan; (ii) the design of the national sulfur dioxide emissions trading system in 2009;<sup>8</sup> and (iii) sustainable transport and clean energy projects to reduce air pollution, including low-carbon transport, and piloting cutting-edge renewable energy and clean coal technologies.<sup>9</sup> Regionally, ADB, along with the World Bank, supported the establishment of Clean Air Asia, which is committed to promoting better air quality in Asian cities through sharing knowledge and experiences among stakeholders. ADB is currently preparing a regional TA on Rolling Out the Clean Air Scorecard in Asian Cities to help cities improve their capacity for air quality management.

8. The proposed TA is the first initiative on VOC pollution control in the PRC. Based on the PRC’s needs regarding pollution control, and building on past ADB initiatives, the TA will help develop a road map for improving the control of VOC emissions from industrial sources in the PRC, including requirements for a legislative framework, institutional arrangements, and regulations. In addition, the TA will help prepare an outline management plan for the petrochemical industry for the control and prevention of VOC emissions.

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<sup>6</sup> Estimates provided by Air Pollution Prevention and Control Division, Pollution Prevention and Control Department, Ministry of Environmental Protection.

<sup>7</sup> ADB. 2005. *Technical Assistance to the People’s Republic of China for the Institutional Development of SEPA’s Regional Supervision Centers*. Manila.

<sup>8</sup> ADB. 2008. *Technical Assistance to the People’s Republic of China for the National Sulfur Dioxide Emission Trading System*. Manila.

<sup>9</sup> ADB has been financing low-carbon transport, focusing on bus rapid transit systems in the PRC cities since 2008, including Lanzhou, Yichang, and Jiangxi Province.



9. The national 12th Five-Year Plan includes the government's long-term goal of building a harmonious and prosperous society through environmentally sustainable growth. The subsequent 12th Five-Year Plan on the Environment calls for strengthened control and monitoring of VOCs, among other air pollutants. In parallel with the government's strategy, the TA is also in line with ADB's country partnership strategy, 2011–2015 for the PRC, which supports the government's goal of building a harmonious society by promoting environmentally sustainable development.<sup>10</sup> The TA will contribute to a cleaner and more sustainable growth process by strengthening the capacity for environmental management.

### III. THE POLICY AND ADVISORY TECHNICAL ASSISTANCE

#### A. Impact and Outcome

10. The impact will be improved air quality through effective VOC emission control in the PRC. Comprehensive VOC control measures will be implemented in key industries by 2017. The outcome will be improved management of VOC emissions through introducing a new policy and regulatory framework in the PRC. A proposed strategy to improve the policy and regulatory framework will be endorsed by the TA consultative committee and submitted to higher-level decision makers at MEP for consideration by the first quarter of 2016.

#### B. Methodology and Key Activities

11. The TA will produce the following outputs: (i) a review of the current status in the PRC and international experience in VOC management, (ii) a strategy to improve the policy and regulatory framework for the prevention and reduction of VOC emissions, and (iii) a knowledge product summarizing the key findings.

12. **Output 1: A review of the current status in the People's Republic of China and international experience in VOC management.** This output will involve the following:

- (i) A review of existing national and subnational VOC emission inventories in the PRC will be conducted, to identify key industrial sources and evaluate methodologies used by existing national, regional, and city level inventories. Key challenges in establishing national and subnational inventories will be identified, and recommendations will be provided on standardized emission inventory structures for the selected key sources. Further, current VOC control efforts in the PRC will be reviewed, including policies, legislations, standards, institutional arrangements, and control technologies.
- (ii) A review of international experience will also be conducted in the prevention and control of VOC emissions. Based on challenges identified in the current status review of the PRC situation, review relevant international experience in establishing VOC emission inventories, data and information management, review reporting and documentation requirements, and key steps and options in policy, administrative, and legal aspects of rule making related to prevention and reduction of VOC emissions.

13. **Output 2: A strategy to improve the policy and regulatory framework for the prevention and reduction of volatile organic compound emissions.** A road map will be

<sup>10</sup> ADB. 2012. *People's Republic of China: Country Partnership Strategy, 2011–2015*. Manila.

prepared for establishing a management framework for the prevention and reduction of VOC emissions in the PRC. Drawing on relevant international experience, the road map will outline main categories of VOC emissions and policy options to prevent and reduce these emissions, in terms of defining roles and responsibilities of key stakeholders, introducing necessary legislations or amendments, management plans, regulations, and technical guidelines. To demonstrate how to implement the road map, an outline management plan will be prepared for the prevention and reduction of VOC emissions from the petrochemical industry in the PRC. The outline management plan will include total pollution load control target, regulations, and technical guidelines.

14. **Output 3: A knowledge product summarizing the key findings.** The knowledge product will be published in English and Chinese, and a dissemination plan will be prepared.

15. There are no major risks associated with the TA, but restructuring of government departments concerned and coordination challenges are possible. The main assumptions are that relevant central government departments will adopt the policy and regulatory recommendations developed under the TA and allocate funds accordingly. A secondary assumption is that international experience can be adapted to the institutional and socioeconomic situation in the PRC.

### **C. Cost and Financing**

16. The TA is estimated to cost \$450,000, of which \$400,000 will be financed on a grant basis by ADB's Technical Assistance Special Fund (TASF-other sources). The government will provide counterpart support in the form of remuneration and per diems for counterpart staff, including counterpart staff's time, remuneration, and travel expenses; logistics support in arrangement of workshops and conferences; and a fully functional office space for consultants, with free water and utility supply, and free access to internet and photocopying machine, and other in-kind contributions.

### **D. Implementation Arrangements**

17. MEP will be the executing agency. A TA consultative committee, led by MEP's Department of Pollution Prevention and Control, will be established to provide guidance on project implementation. The committee will comprise the deputy director general and a director of the Department of Pollution Prevention and Control, and a director of the Project Management Division 1 of the Foreign Economic Cooperation Office (FECO) of MEP. FECO will be the implementing agency, and a TA management office will be established in FECO to carry out day-to-day TA operations. The director of the Project Management Division 1 of FECO will serve as the executive director of the TA management office responsible for coordinating day-to-day operational matters between ADB, consultants, and government agencies.

18. A consulting firm will be engaged to assist ADB and the executing agency in the implementation of the TA. The firm will provide a total of 32 person-months of consulting services, which will involve two international consultants (6 person-months) and four national consultants (26 person-months). The consultants will be engaged following ADB's Guidelines on the Use of Consultants (2013, as amended from time to time), using the quality- and cost-based selection method, with a quality-cost ratio of 90:10, and by inviting a simplified technical proposal. The quality of the consulting services is of overriding importance for the outcome of the project, as the TA undertakes an urgent and high-priority task of the government with large downstream impacts. In addition, the services require highly specialized knowledge about the

industries that are important sources of VOC emissions. The TA funds will be disbursed following ADB's *Technical Assistance Disbursement Handbook* (2010, as amended from time to time). Resource persons may be recruited to provide specific advice on the strategic framework or management plan as needed.

19. The TA will be implemented tentatively from 1 December 2014 to 30 March 2016. Inception, interim, and final review missions will be fielded. Tripartite discussions will be held during the missions to review the consultants' performance, overall TA implementation, and status of deliverables based on the DMF of the TA. The missions will also monitor the government's inputs and contributions. The performance of the TA, including its outcome and outputs, will be evaluated during the final review mission based on the DMF. Good practices and lessons learned will be disseminated through workshops and publication of a knowledge product.

#### **IV. THE PRESIDENT'S DECISION**

20. The President, acting under the authority delegated by the Board, has approved the provision of technical assistance not exceeding the equivalent of \$400,000 on a grant basis to the Government of the People's Republic of China for the Study on the National Control of the Important Air Pollutant—Volatile Organic Compounds, and hereby reports this action to the Board.

### DESIGN AND MONITORING FRAMEWORK

Design Summary	Performance Targets and Indicators with Baselines	Data Sources and Reporting Mechanisms	Assumptions and Risks
<p><b>Impact</b> Improved air quality through effective VOC emission control in the PRC</p>	<p>Compared to 2012, concentration of PM<sub>10</sub> reduced by at least 10%, and PM<sub>2.5</sub> reduced by about 25% in Beijing-Tianjin-Hebei region, by 20% in the Yangtze River Delta region, and 15% in the Pearl River Delta region by 2017</p>	<p>MEP annual environmental reports  13th Five-Year Plan</p>	<p><b>Assumptions</b> The government continues to support prevention and control of VOC emissions  Relevant central government departments will adopt the policy and regulatory recommendations developed under the TA, and allocate funds accordingly</p>
<p><b>Outcome</b> Improved management of VOC emissions through introducing a new policy and regulatory framework in the PRC</p>	<p>Proposed regulatory framework is endorsed by MEP management by 2016</p>	<p>TA reports  Relevant government agencies' comments on the strategic framework during the final review workshop  Government policy announcements, notices, or public speeches of officials</p>	<p><b>Assumption</b> A secondary assumption is that government officials are receptive to adapting international best practices to PRC circumstances</p>
<p><b>Outputs</b> 1. A review of the current status in the PRC and international experience in VOC management  2. A strategy to improve the policy and regulatory framework for the prevention and reduction of VOC emissions  3. A knowledge product</p>	<p>An inception report including preliminary findings submitted by month 2 and a sub-report on the current status in the PRC submitted by month 5  Case study countries, methodology, and scope agreed with MEP by month 3  A subreport on the review of international experiences prepared by month 7  A road map document prepared by month 13  An outline management plan for the petrochemical industry finalized by month 13  A paper that can be</p>	<p>TA review missions and reports  Consultant technical reports and reviewers' comments  Regular communication with and feedback from the executing agencies  Consultations with stakeholders</p>	<p><b>Assumptions</b> Government provides timely support to consultants in information collection  Government provides timely counterpart contribution  <b>Risk</b> Staff turnover delays TA implementation</p>

<b>Design Summary</b>	<b>Performance Targets and Indicators with Baselines</b>	<b>Data Sources and Reporting Mechanisms</b>	<b>Assumptions and Risks</b>
summarizing the key findings	<p>published as a knowledge product finalized by month 16</p> <p>Knowledge product disseminated to air quality management authorities of the developing member countries and posted online for general readership by month 16</p>		
<p><b>Activities with Milestones (after consultants' recruitment)</b>  Mobilize team of experts and develop study framework by month 1.  Prepare draft inception report with detailed work plan and conduct inception workshop by month 2.  Prepare interim report and conduct interim workshop by month 7.  Prepare the draft final report (including draft knowledge product) and conduct final workshop by month 14.  Finalize the final report and knowledge product by month 16.</p> <p><b>1. A review of the current status in the PRC and international experience in VOC management</b>  1.1 Review existing research on VOC emission national and subnational inventories through literature review and consultations with relevant government departments by month 2.  1.2 Review current VOC control efforts in the PRC in terms of policies, legislations, standards, institutional arrangements, and control technologies by month 5.  1.3 Determine case study countries, methodology, and scope for the review of international experience in consultation with MEP by month 3.  1.4 Prepare case studies for the selected countries that will help finding solutions for the challenges identified in the current status review of the PRC situation by month 6.  1.5 Finalize subreport on review of international experience by month 7.</p> <p><b>2. A strategy to improve the policy and regulatory framework for the prevention and reduction of VOC emissions</b>  2.1 Prepare a draft road map for establishing a management framework for prevention and reduction of VOC emissions and consult with the government by month 9.  2.2 Finalize draft road map by month 12.  2.3 Determine objectives and scope of the outline management plan for prevention and reduction of VOCs by month 6.  2.4 Prepare the draft outline management plan and consult with MEP and key stakeholders of the petrochemical industry by month 8.  2.5 Finalize the outline management plan by month 13.</p> <p><b>3. A knowledge product summarizing the key findings</b>  3.1 Prepare a draft knowledge product, outlining and evaluating key findings and policy recommendations by month 12.  3.2 Incorporate comments and feedback and finalize the final report and the knowledge product by month 16.</p>			<p><b>Inputs</b></p> <p><b>ADB: Technical Assistance Special Fund (TASF-other sources) \$400,000</b></p> <p>Note: The government will provide counterpart support in the form of remuneration and per diems for counterpart staff, including counterpart staff's time, remuneration, and travel expenses; logistic support in arrangement of workshops and conferences; and a fully functional office space for consultants, with free water and utility supply, and free access to internet and photocopying machine, and other in-kind contributions.</p>

ADB = Asian Development Bank, MEP = Ministry of Environmental Protection, PRC = People's Republic of China, TA = technical assistance, VOC = volatile organic compound.

Source: Asian Development Bank.

**COST ESTIMATES AND FINANCING PLAN**  
(\$'000)

Item	Amount
<b>Asian Development Bank<sup>a</sup></b>	
1. Consultants	
a. Remuneration and per diem	
i. International consultants	120.0
ii. National consultants	155.0
b. International and local travel	30.0
c. Reports and communications <sup>b</sup>	15.0
2. Workshops <sup>c</sup>	30.0
3. Surveys <sup>d</sup>	10.0
4. Miscellaneous administration and support costs <sup>e</sup>	10.0
5. Contingencies	30.0
<b>Total</b>	<b>400.0</b>

Note: The technical assistance (TA) is estimated to cost \$450,000, of which contributions from the Asian Development Bank (ADB) are presented in the table above. The government will provide counterpart support in the form of remuneration and per diems for counterpart staff, including counterpart staff's time, remuneration, and travel expenses; logistics support in arrangement of workshops and conferences; and a fully functional office space for consultants, with free water and utility supply, and free access to internet and photocopying machine, and other in-kind contributions. The value of government contribution is estimated to account for 11% of the total TA cost.

<sup>a</sup> Financed by ADB's Technical Assistance Special Fund (TASF-other sources).

<sup>b</sup> Includes a translator for the translation of reports.

<sup>c</sup> Includes three workshops to be organized by the consulting firm.

<sup>d</sup> Field studies will be conducted by the consulting firm with logistic support from the government.

<sup>e</sup> Includes interpreter and publication of reports.

Source: Asian Development Bank estimates.

## OUTLINE TERMS OF REFERENCE FOR CONSULTANTS

### A. Introduction

1. A consulting firm will be engaged by the Asian Development Bank (ADB) following ADB's Guidelines on the Use of Consultants (2013, as amended from time to time) using the quality- and cost-based selection method, with a quality–cost ratio of 90:10, and by inviting simplified technical proposals. It is estimated that the implementation of the proposed technical assistance (TA) will require two international consultants (6 person-months) and four national consultants (26 person-months). The international consultants include an air quality policy specialist, who will be deputy team leader, and a volatile organic compound (VOC) control specialist. The national consultants include an air quality specialist, who will be team leader, a VOC emissions inventory specialist, an air quality management specialist, and a petrochemical VOC control specialist.

2. The following terms of reference are indicative and meant to provide guidance on achieving the objectives of the TA. Consulting firms are encouraged to propose modifications on the team members' assigned tasks that would facilitate achieving the objectives and outputs.

### B. Terms of Reference

3. **Air quality specialist and team leader** (national, 8 person-months). The team leader should have a postgraduate degree in the relevant fields and at least 12 years of policy and research experience in air pollution control regulations and VOC emissions in particular. The team leader will have extensive work experience with international organizations concerning air quality management, and be proficient in written and oral communications in English; will be responsible for day-to-day liaison with the Ministry of Environmental Protection and other government agencies to facilitate TA implementation; and will be responsible for the final outputs of the study and the daily coordination and supervision of the TA team. Specifically, the specialist shall undertake the following tasks:

- (i) develop a detailed work plan and tasks for the consultant team in consultation with the executing agency, key stakeholders, and other experts;
- (ii) develop outlines of the inception, interim, and final reports;
- (iii) draft the inception, interim, and final reports, and edit their revised versions;
- (iv) conduct the inception, interim, and final workshops;
- (v) provide guidance on: (a) reviewing current VOC control efforts in the People's Republic of China (PRC) in terms of policies, legislations, standards, institutional arrangements, and control technologies; (b) evaluating the effectiveness of current national, subnational, and industry-specific VOC control and management measures; and (c) identifying gaps and challenges;
- (vi) draft a subreport on the current status of VOC emissions and management measures in the PRC;
- (vii) manage and ensure timely implementation of TA activities, including overall coordination of inputs from team members; and conduct inception, interim, final, and dissemination workshops;
- (viii) organize workshops and surveys;
- (ix) prepare a road map for establishing a management framework for prevention and reduction of VOC emissions;<sup>1</sup>

<sup>1</sup> The road map should outline the problems to be tackled, main categories of VOC emissions, policy options, and efficiency of alternative policy approaches to prevent and reduce VOC emissions, and next steps to get started,

- (x) prepare an outline management plan for prevention and reduction of VOC emissions from the petrochemical industry in the PRC;<sup>2</sup>
- (xi) participate in and present the results and findings of the TA in workshops;
- (xii) draft a knowledge product; and
- (xiii) conduct other related work assigned by the executing agency and ADB project officer.

4. **Air quality policy specialist and deputy team leader** (international, 3.5 person-months). The specialist and deputy team leader should have a postgraduate degree or equivalent and 12 or more years of experience in the relevant fields. Demonstrated project-related experience in the PRC is desirable. The specialist shall undertake the following tasks:

- (i) assist the team leader in developing the detailed study framework, work plan, and tasks for the consultant team in consultation with the executing agency, key stakeholders, and other experts;
- (ii) assist the team leader in drafting the inception, interim, and final reports, and their revised versions; in consultation with the executing agency, determine case study countries, scope, and methodology for case studies;
- (iii) with inputs from other team members, review international experiences and prepare a summary subreport on:
  - (a) relevant inventory development experience that will shed light on ways of tackling challenges identified in the current status review of the PRC situation, such as selection of appropriate methodologies for the PRC and model parameterization for source categories similar to those in the PRC;
  - (b) data and information management, including reporting and documentation requirements, data flow, analysis, and projections;
  - (c) development process of legislative and administrative frameworks, outlining key steps and options in policy, administrative, and legal aspects of rule making related to prevention and reduction of VOC emissions; and
  - (d) programs and measures for the prevention and reduction of VOC emissions, including institutional arrangements, total pollution load control, subnational reduction targets, prevention programs, control instruments, permitting, emission standards, control technologies and process design specifications, and monitoring requirements;
- (iv) assist the team leader in preparing a road map for establishing a management framework for prevention and reduction of VOC emissions; and
- (v) assist the team leader in drafting a knowledge product summarizing the findings of the TA.

5. **Volatile organic compound control specialist** (international, 2.5 person-months). The specialist should have a postgraduate degree in the relevant fields and at least 7 years of experience in VOC emission modelling and policies. The specialist shall undertake the following tasks:

- (i) assist the team leader in reviewing international experience in the prevention and control of VOC emissions, particularly the technical aspects such as standards and control technologies;
- (ii) assist the team leader in preparing the road map;

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including defining roles and responsibilities of key stakeholders, introducing necessary legislations or amendments, management plans, regulations, and technical guidelines

<sup>2</sup> The outline management plan will include total pollution load control target, regulations, and technical guidelines.



- (iii) assist the team leader in preparing an outline management plan for the prevention and reduction of VOC emissions from the petrochemical industry in the PRC; in particular, provide technical guidance on setting total pollution load control target, VOC control technologies and emission standards, and monitoring requirements;
- (iv) provide inputs to develop and refine the work plan and outlines of various TA reports;
- (v) contribute to presenting the results and findings of the TA projects in workshops;
- (vi) provide inputs to various reports, including progress, inception, interim, final reports, and knowledge product, and their revised versions; and
- (vii) conduct other related work assigned by the team leader.

6. **Volatile organic compound emissions inventory specialist** (national, 6 person-months). The specialist should have a postgraduate degree in a related field and at least 7 years of experience in VOC inventory research and modeling, and should also be proficient in written and oral communications in English. The specialist shall undertake the following tasks:

- (i) review existing research on national and subnational VOC emission inventories and critically evaluate methodologies followed by existing inventories and, based on existing research:
  - (a) identify key industrial sources and compile source profiles, emission factors, and source activities;
  - (b) estimate annual emissions, spatial distribution, and source structure;
  - (c) for several top industrial sources, summarize monitoring methods and measurement data; and
  - (d) identify challenges in establishing national and subnational inventories level for the three key air pollution control regions in the PRC;
- (ii) provide inputs for developing and refining the work plan and outlines of various TA reports;
- (iii) provide inputs for the preparation of the road map and outline management plan;
- (iv) contribute to presenting the results and findings of the TA in workshops;
- (v) provide inputs to various reports, including progress, inception, interim, final reports, and knowledge product, and their revised versions; and
- (vi) conduct other related work assigned by the team leader.

7. **Air quality management specialist** (national, 6 person-months). The specialist should have a postgraduate degree in a related field and at least 7 years of policy and research experience in air pollution control. A university degree with considerable specialized experience in air pollution control may be considered in lieu of a postgraduate degree. The specialist should also be proficient in written and oral communications in English, and shall undertake the following tasks:

- (i) review recent policies and legislations on air quality management, particularly with regard to the Air Pollution Prevention and Control Action Plan and the associated policy measures to implement the plan, especially with regard to co-control benefits related to comprehensive treatment and synergy through co-control of multi-pollutants, coordination mechanism for regional air pollution prevention and control;
- (ii) under the guidance of the team leader, review current VOC control efforts in the PRC in terms of policies, legislations, standards, institutional arrangements, and control technologies; and evaluate the effectiveness of current national, subnational, and industry-specific VOC control and management measures, and identify gaps and challenges;

- (iii) assess the efficiency of alternative policy approaches to the regulation of VOC emissions;
- (iv) assist the team leader in analyzing the feasibility, constraints, and effectiveness of international experience in the PRC context;
- (v) assist the team leader in preparing the road map, in particular with regard to needs for technical standards for relevant industries;
- (vi) provide inputs for developing and refining the work plan and outlines of various TA reports;
- (vii) contribute to presenting the results and findings of the TA in workshops; and
- (viii) provide inputs to various reports, including progress, inception, interim, final reports, and knowledge product, and their revised versions; and conduct other related work assigned by the team leader.

8. **Petrochemical volatile organic compound control specialist** (national, 6 person-months). The specialist should have a postgraduate degree in a related field and at least 7 years of policy and research experience in air pollution control. A university degree with considerable specialized experience in air pollution control in the petrochemical industry may be considered in lieu of a postgraduate degree. The specialist should also be proficient in written and oral communications in English, and shall undertake the following tasks:

- (i) assist the team leader in reviewing current VOC control efforts in the PRC in terms of control technologies and monitoring requirements; and evaluating the effectiveness of current national, subnational, and industry-specific VOC control and management measures, and identify gaps and challenges;
- (ii) assist the team leader in analyzing the feasibility, constraints, and effectiveness of international experience in the PRC context;
- (iii) assist the team leader in preparing the road map, in particular with regard to needs for technical standards for the petrochemical industry; assist the team leader in preparing an outline management plan for prevention and reduction of VOC emissions from the petrochemical industry in the PRC (footnote 2);
- (iv) provide inputs for developing and refining the work plan and outlines of various TA reports;
- (v) contribute to presenting the results and findings of the TA in workshops; and
- (vi) provide inputs to various reports, including progress, inception, interim, final reports, and knowledge product, and their revised versions; and conduct other related work assigned by the team leader.

### C. Reporting Requirements

9. The consulting firm will submit the following reports: (i) an inception report within 2 months of mobilization, (ii) a revised inception report within 2 weeks of the inception workshop, (iii) an interim report within 6 months of mobilization, (iv) a revised interim report within 2 weeks of the interim workshop, (v) a draft final report within 15 months of mobilization, and (vi) a final report 1 month after the final workshop. The revised inception, interim, and final reports should incorporate comments from the executing and implementing agencies, ADB, and other invited reviewers.

10. All documents will be submitted in both English and Chinese languages to the executing agency and ADB in hard and electronic copies. The final outputs will be made available online in both languages.